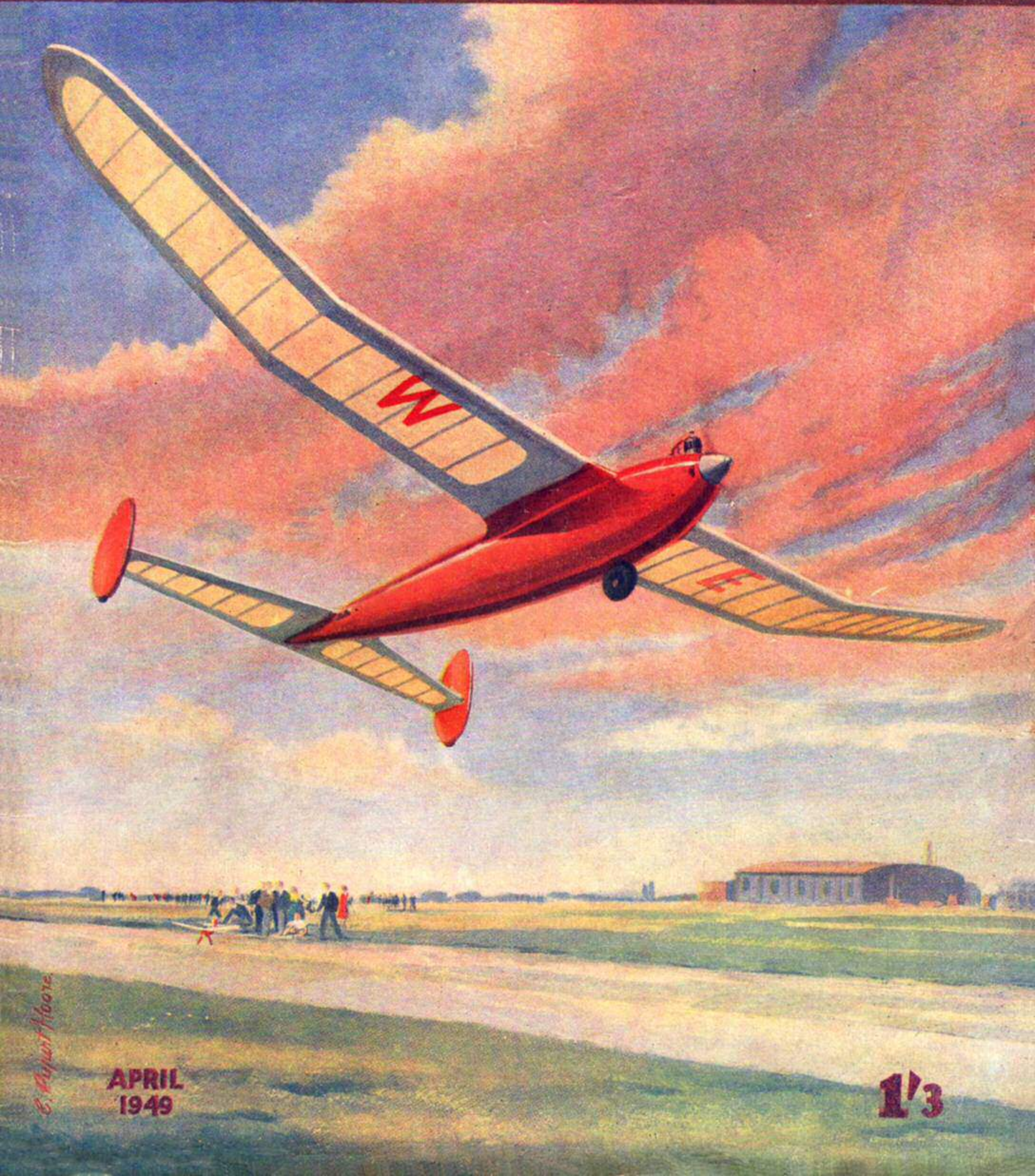
AEROMODELLER



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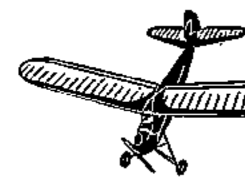

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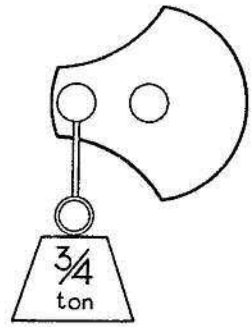
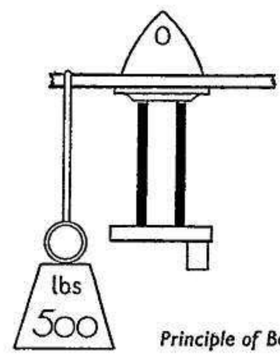
Principle of Torque Test.





Principle of Bend Test.

Unretouched photo of shaft after test.

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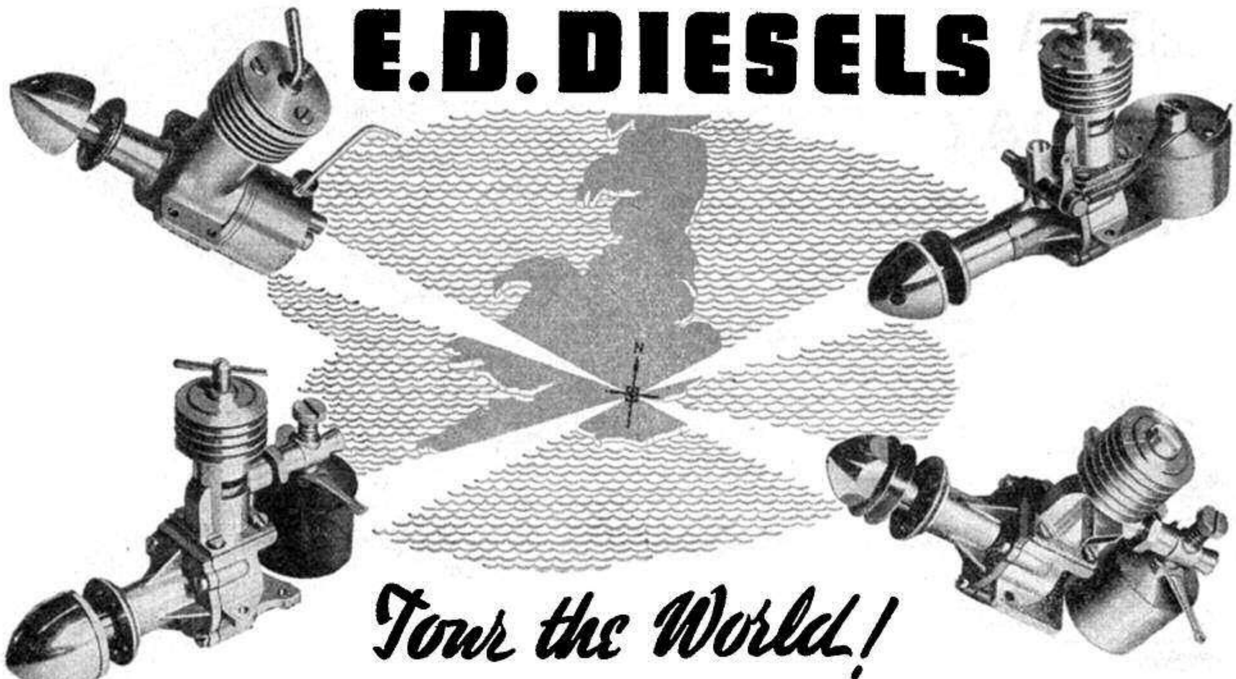

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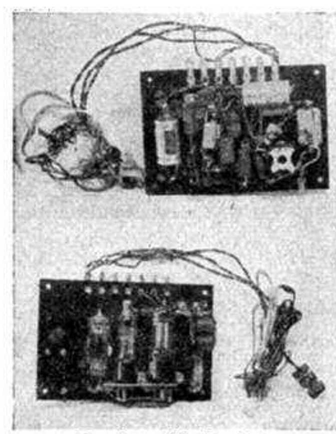

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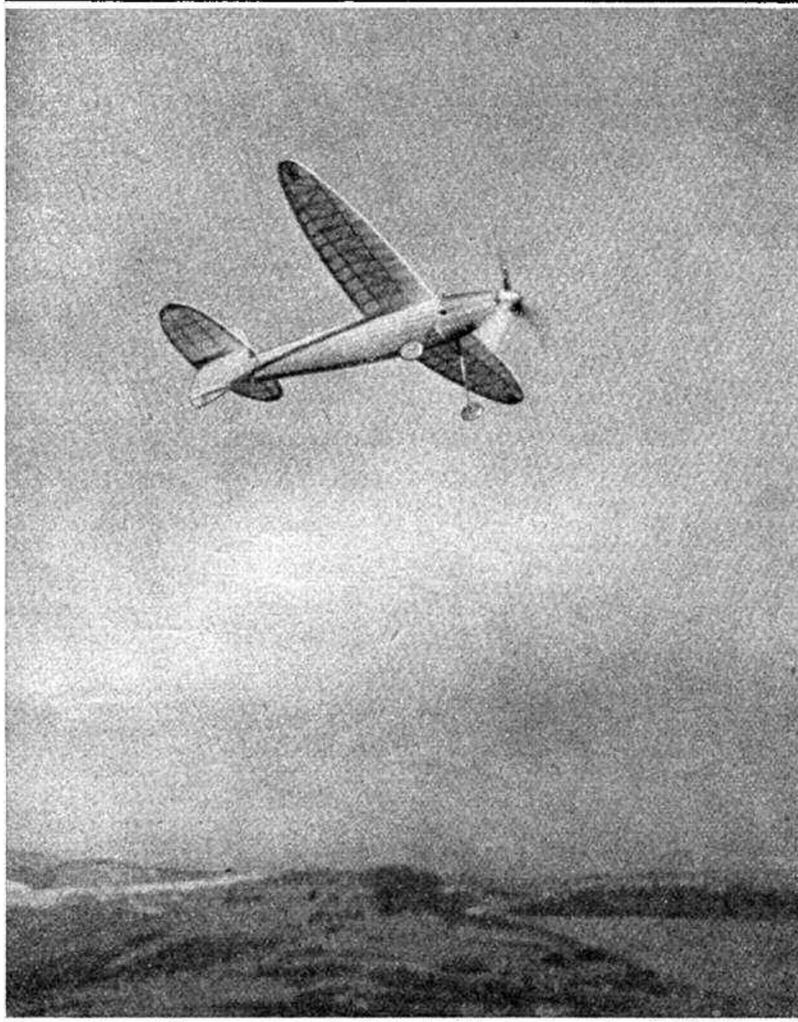


An omen of summer pleasures yet to come is this pleasing flying shot of a "Bittern" Wakefield over the South Downs photographed by J. B. Smith.

CONTENTS

VOL. XIV No. 159 APRIL, 1949

EDITORIAL

Where and When to Fly

NOT only is the question of *where* shall model aircraft be flown becoming one of National importance but the question as to *when* flying shall take place is also being discussed.

Recently the West Yorkshire Model Aeronautical Society made application to the Dewsbury Town Council for permission to fly on the local Feast Ground.

Having satisfied the Council that they had arranged adequate insurance cover, they then found that their application must be considered formally at the next Council meeting.

A Mr. Auty said " it will be creating rather a dangerous precedent to allow Corporation ground to be used on Sundays". He had nothing whatever to say against the objects and activities of the Society, and " no doubt the sport had an educational aim " ; but the application stressed that the displays were of entertainment value, which, he suggested, might lead to the younger generation being attracted from the Sunday schools in close proximity to the Feast Ground.

Considerable support was afforded to Mr. Auty's viewpoint by representatives of the local Sunday schools, and it was suggested that in an age of five-day weeks, there would be ample time for flying on Saturdays. Another speaker put the point that if Corporation property was allowed to be used for " entertainment " on Sunday afternoons, how then could the Committee turn down requests for Bowling Grounds and Tennis Courts to be used on Sundays ?

Another speaker was in favour of the application, saying that if young men were prevented from playing football on Sundays, where would they be if they could not kick a football about in the open air ? He thought many men would be much better spending their time on the bowling green than in some places he knew of. He did not think that Sunday schools should claim a monopoly of Sunday.

Big business profits from entertainment in the shape of football matches and dirt tracks on Saturday, and that was the reason that Sunday was required for aircraft flying. Perhaps, too, Sunday was the day when the womenfolk wanted the men to clear out of the house for a time, and if they fiddled about with model aircraft, that was all to the good.

Finally, a free vote was taken, resulting in 17 votes being cast against the amendment (proposed by Mr. Auty that permission should not be granted) and 8 for.

This is the first time that it has been brought to our knowledge that it has been thought fit to consider whether the activity of aeromodelling should or should not be indulged in on a Sunday, and I should be interested to know if the matter has been debated in any other part of the country. Meanwhile, it may be noted that a two-to-one vote was cast in favour of granting permission for Sunday flying.

American News Letter

A recently announced increase in the paper ration for periodicals is most welcome. It enables us to increase slightly the number of pages in this and subsequent issues. Consequently, we are now able to increase the number of pages devoted to editorial matter and so cover an even wider field of interest for our readers.

In this issue, we publish the first of a monthly series of articles from the pen of William (Bill) Winter, late Editor of our American contemporary " Air Trails ". This American News Letter is being written exclusively for publication in the AEROMODELLER and is the result of discussions we had with Bill during our trip to America last August.

Warring's Wakefield

From time to time, Mr. R. H. Warring produces a " Wakefield " model, and we are pleased to announce publication in this issue of his latest design. Whilst this is certainly Mr. Warring's most recently announced design, it has been under development during the past five years during which it has established itself as a most consistent flier, by a series of performances the regularity of which gives a plain indication of its capabilities.

The news has just been released by the S.M.A.E. that this year's Wakefield contest will almost certainly be flown at Cranfield aerodrome and the interest created by this competition for Wakefield type models will, undoubtedly, lead many readers to consider carefully Warring's latest design. A large scale drawing, size 46½ × 33½ ins. in which all parts are drawn out full size, is, of course, available through the Aeromodeller Plans Service.

Eaton Bray Camps

During the past three years, an increasing number of aeromodellers have taken part in the 7-day camps organised at Eaton Bray. Despite the rather austere conditions imposed by limited accommodation, there has been an increasing amount of interest and enthusiasm for those 7-day " courses " in aeromodelling. This year, greatly improved accommodation will be available. During recent months a large Nissen hut nearly 100 ft. long has been erected and by the time the first camp opens, accommodation for some 22 campers will have been provided. The lay-out has been arranged in such a manner that the camp will be organised as a self-contained unit within the one building. There will be a large workshop, with benches, work tables, light hand tools, etc. ; showers for washing, and cloakroom facilities ; a comfortable dining room ; and lastly a large dormitory in which each camper will be provided with his own single bed together with lockup cabinets and individual clothes hanging space and so on. Courses will run from Saturday to Saturday and 7 camps will be organised commencing on the following days :—16th July, 23rd July, 6th August, 20th August, 27th August, 3rd September, and 10th September.

An illustrated brochure, descriptive of the camping facilities, particulars of the " 7 day course ", and all facilities available, can be obtained on application to the Public Relations Officer, The Aerodrome, Eaton Bray, to whom all applications for reservations should also be made.

This brochure also gives full particulars of the Season's programme which opens on Easter Monday, April 18th.

A varied and comprehensive scheme has been arranged, care being taken to see that so far as is possible, meetings do not clash with the main fixtures on the National calendar.

Flying with Care

In our last issue we published in the bottom right-hand inside of the cover corner, a membership form for the N.G.M. Unfortunately, due to a printer's error the initial letters were not published in the correct order, also the address of the offices was omitted. We, therefore, reprint the form in the same position in this issue for the benefit of those readers who, last month, may have not realised just what it was to be used for.

We are pleased to note that a steadily increasing number of aeromodellers are taking up the N.G.M. Insurance cover and look forward to the time when at least all the readers of the AEROMODELLER are properly insured. Incidentally, we have been asked why the letters have been changed from N.G.A. to N.G.M. The answer is that some time ago the insurance was extended to include the owners of model cars, consequently it was thought appropriate to change the name to the National Guild of Modellers, instead of Aeromodellers.

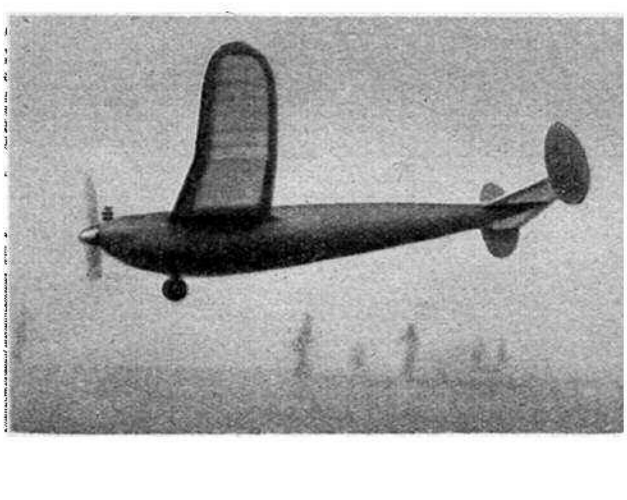
The Dolphin

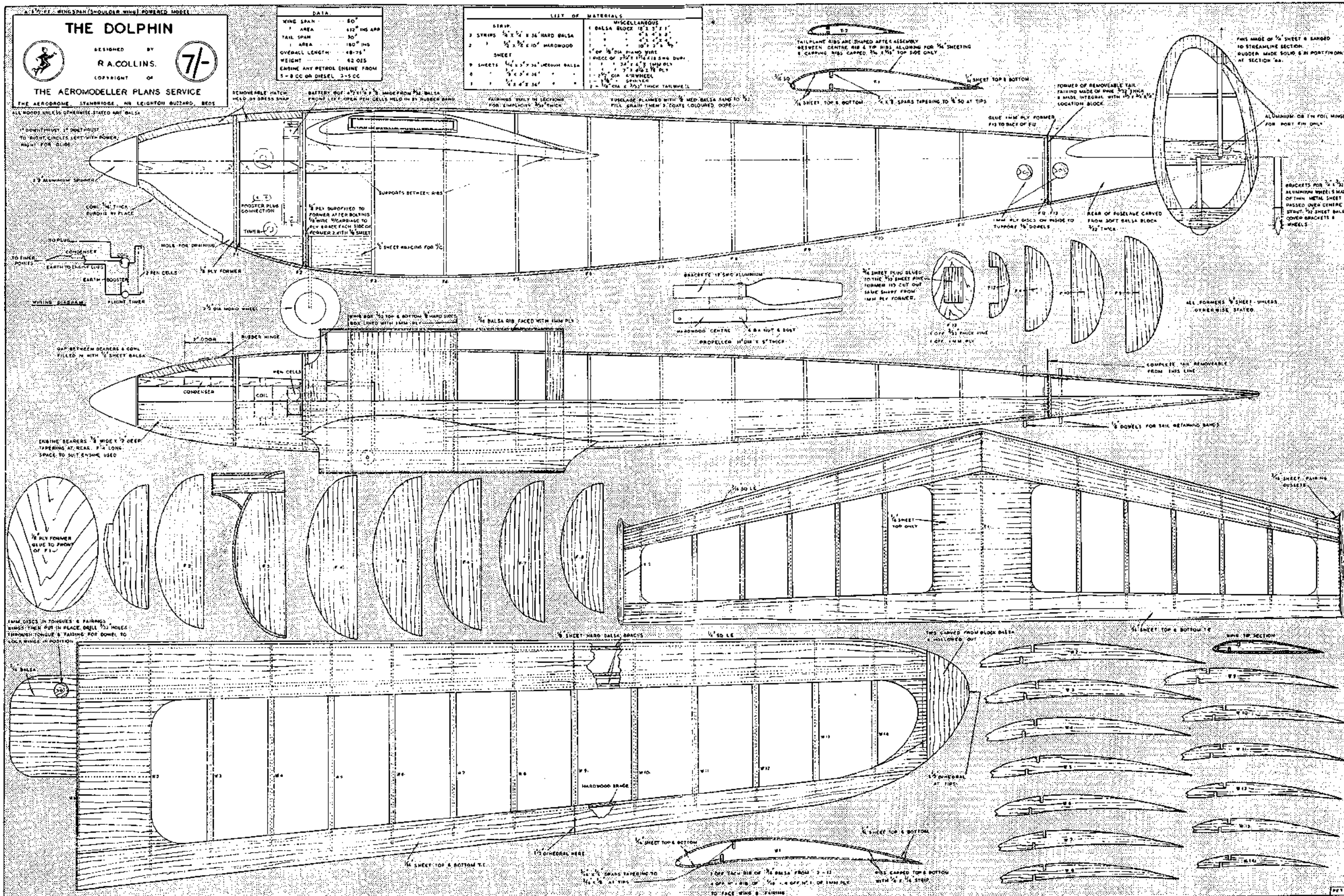
BY R. A. COLLINS

THE DESIGNER : *R. A. COLLINS . . . 26 . . . married . . . modelling for 14 years . . . member of the West Essex Aeromodellers, but cannot find time for control lining, prefers free flight, both rubber and power . . . spends more time on Wakefields than anything else . . . engineers' pattern maker by trade . . . lives at Forest Gate, London.*

MANY experts contend that the ideal model for performance is a powered sailplane, but nevertheless very few enthusiasts ever seem to follow on these lines, clinging rather to a system of designing and flying which appears to be based on the maxim " get it up there fast and high, and let the glide take care of itself." As this is not intended to be a criticism of other models we will only say that the Dolphin is not a power model in the latter class. To some people this might seem detrimental, but before one gives hasty judgment, think how many power models can put up a consistent glide/motor run ratio of 10 : 1. The Dolphin can, and does, and naturally the item to which it owes this outstanding performance is its long floating glide—a glide which by good design is obtained without sacrifice to the climb.

Featured on the cover this month, the Dolphin is a handsome 6 ft. 8 in. span model of excellent performance, and its unusual grace of line has won it additional honours in such surroundings as those of the 2nd Aeromodeller Exhibition, where it took 2nd prize against some of the country's finest exhibits. Shown at that time with a fully concealed inverted Forster 29 driving through an extension shaft, practical considerations have since made it necessary to mount the engine directly forward and upright, which affects the lines very little but makes a great deal of difference to the accessibility of the engine. Another practical modification is the removal of the original fully retracting undercarriage, a fixed single leg and airwheel being substituted in its place. The slight extra drag from both these alterations amounts to very little, and has no appreciable effect upon the performance. Incidentally, this model anticipated the increasing modern trend towards folding airscrews, as right from its original conception the Dolphin has been equipped with this device to cut down drag and materially reduce airscrew breakages.





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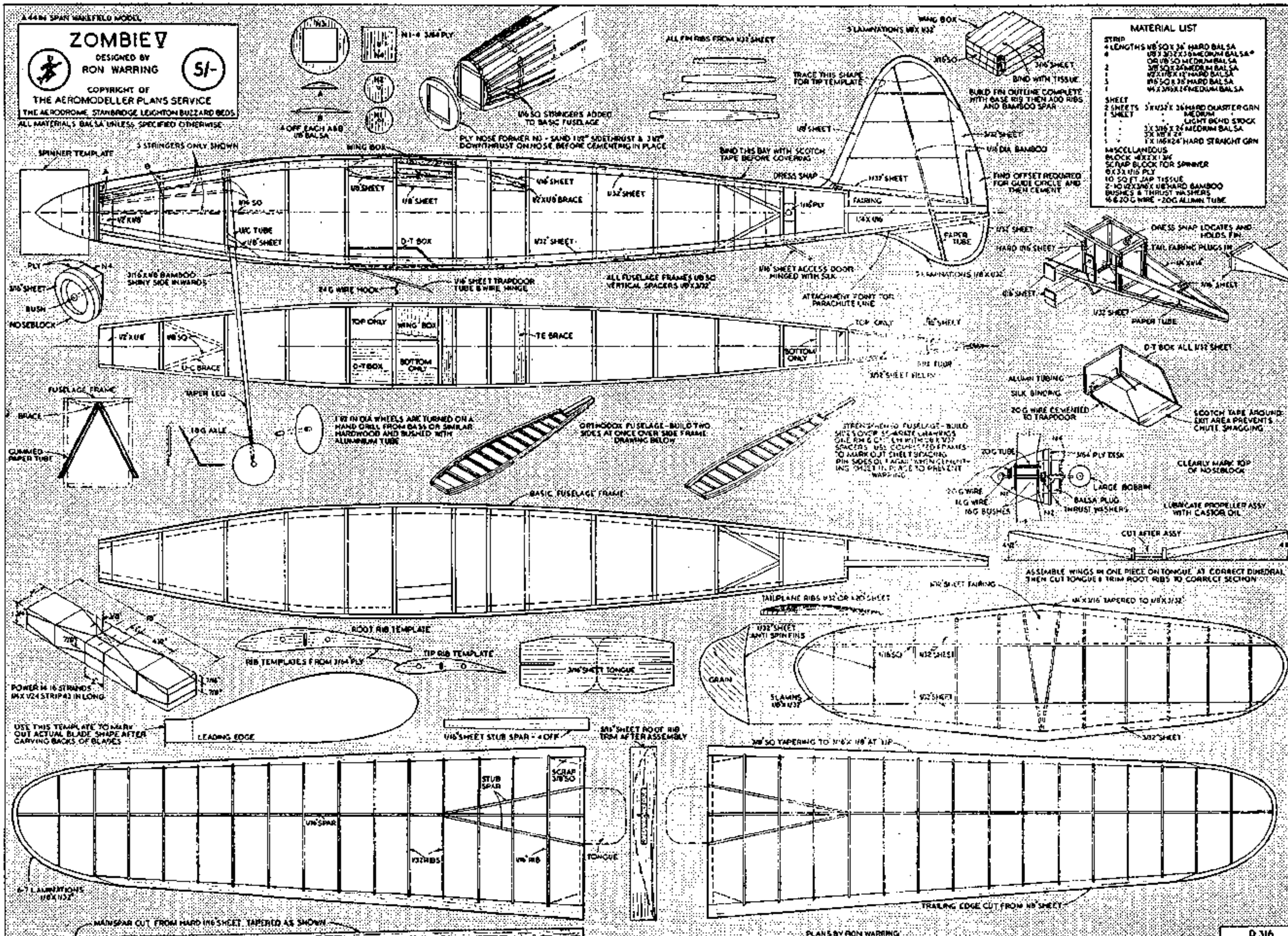

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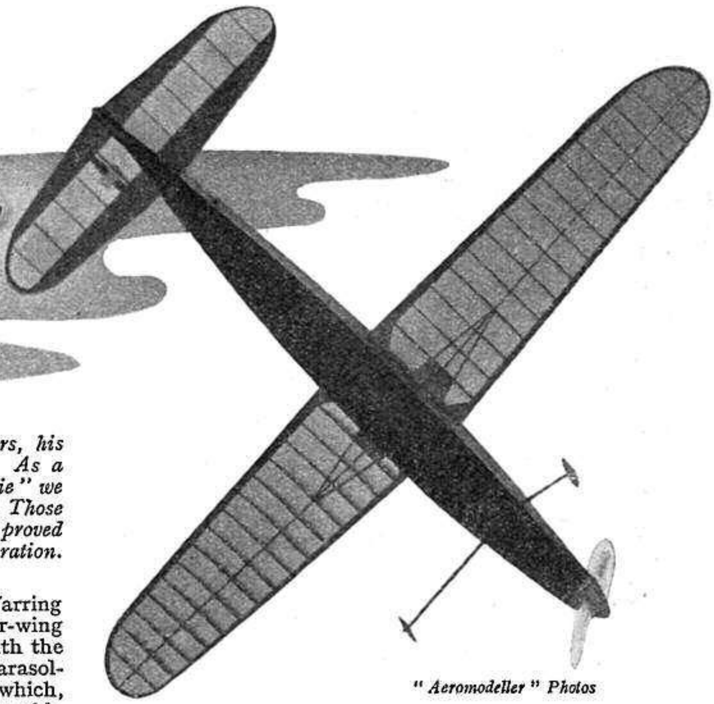
Zombie



"*Aeromodeller*" *Photos*

R. H. WARRING needs no introduction to our readers, his articles and designs are known wherever modellers meet. As a Wakefield designer he is in the front rank and in "Zombie" we have the ultimate result of 5 years' design and development. Those aspirants for the 1949 Wakefield Contest who wish to fly a proved design would be well advised to give this model every consideration.

IN the summer of 1944, Bob Copland and Ron Warring both produced, quite independently, shoulder-wing slabsided "lightweights" (actually to FAI loading) with the main idea of breaking away from the rut of high and parasol-wing designs in this class and also to have a model which, when rigged correctly and trimmed, would always assemble in *exactly* the same way. Once trimmed, therefore, it should be possible to take the model out of the box and make a competition flight without any need for a short trimming flight. Both models, incidentally, were also about the first to carry internally-stowed, parachute-type dethermalisers. Copland used an airdraulic timer and Warring a burning fuze.

This new design layout produced many unexpected difficulties, prominent amongst which was the inherent tendency to spin. The solution to this particular problem was the result of combined effort and discussion between the two designers, extending over several months and took the form of increased fin area given by auxilliary outrigged fins. The whole problem of spiral stability as affecting rubber models and the use of outrigged or anti-spin fins to bring the centre of lateral area on approximately the same level as the centre of gravity has been dealt with in previous articles. The two models in question were the "guinea-pigs" which led to the development of this modern theory which has now become standard practice.

Ron Warring with "Zombie" which incidentally has only placed lower than 4th on two occasions in its contest history.

The other major problem brought out by these original designs was structural—the wing/fuselage joint. Copland has pursued the shoulder-wing slabsider layout little further.

Warring, on the other hand, adopted the shoulder-wing slabsider as the basic layout for his Wakefield designs and, in doing so, has produced the new streamlined-slabsider class of model which has a comparable overall drag figure with any full streamliner, coupled with the simpler and more robust construction of the slabsider. Similarly, all the components lock into place to ensure identical line up each time.

The tongue and box-wing fixing has proved very satisfactory and extremely reliable, once localisation of stress could be avoided. This is achieved by triangulated stub spars in the wing which distribute the maximum bending load, which would otherwise be concentrated on the mainspar at the end of the tongue, along the mainspar itself. No breakage has yet been recorded with a wing of this type, the main necessity being that the fuselage must be braced rigidly where the leading and trailing edges contact the sides, otherwise the wing will tend to break into these sides if displaced roughly as in a bad landing.

This system, and the type of fuselage box, has remained basically unaltered throughout the series. Several forms of mainspar have been tried, the tapered 1/16 in. sheet spar passing through the middle of the ribs as now used being definitely superior. The lightest wing (1 ounce complete) had 1/16 in. square top and bottom spars, but was locally weak. The standard wing shown on the plan has been tested to carry a 12 ounce dead weight on the tip without failure.

The first Wakefield of the series was completed at the end of 1945 and prepared for the 1946 competition season. The basic slabsided fuselage was cleaned up considerably by employing a circular nose former and nose stringers and the propeller was fitted with a spinner enclosing the freewheel. A monowheel undercarriage was used which, with the underslung anti-spin fins, gave a three-point support for take-off.

Good rubber was particularly scarce at the time, but a small batch of 3/32 in. square section brown rubber was forthcoming from some quite unlikely source and showed up exceptionally well on torque test. The model was first flown in competition in the 1946 Gamage—and conditions were just about ideal that day. A fifteen-minute dethermaliser fuze was used, i.e., the model took off trailing over a foot of fuze string underneath its belly, and the flight times are still probably the best consecutive times ever recorded in a rubber comp. in this country. Both the first and second flights were, of course, terminated by the dethermaliser. With the five-minute rule now introduced it is improbable that they will ever be beaten. 1st flight 1,368·5 secs. 2nd flight 988·0 secs. 3rd flight 450·2 secs. Agg.: 2,806·7 secs.

Thus 1946 had established the basic design as a good one for competition work, with a definite need for improvement on several details.

On the whole the still air performance of this particular model was not outstanding. Sinking speed on the glide was apparently fast, and yet if there was the slightest suspicion of thermal lift around it seemed to find it and keep in it. Hence its very fine contest record. Another aerodynamic fault was the stall recovery. The model was spirally stable to the point of excess. If it stalled under power, the stall was an "up-and-down" affair, with a loss of as much as 100 feet in height. It just would not spin or turn out of it.

Stall recovery and the various structural weaknesses were dealt with in the development model produced in early 1947. The fuselage was shortened (and reduced in cross section); and the tailplane was strengthened, the anti-spin fins becoming underslung endplate fins. The freewheel clutch was moved in front of the propeller itself and did not rely on a soldered joint to the shaft. The same wing section—a thin Davis—was employed. At the same time a high-wing Wakefield was produced with a very thin, flat undersurface wing for comparative purposes.

Further test flying of this model produced the final aerodynamic modification—a thickening up of the wing section. All of the 1948 models were based on this 1947 design incorporating a Joukowski wing section and results obtained with them have confirmed that too thin a wing section on a Wakefield of this layout, at least, will produce either a poor glide (high sinking speed) or inconsistent glide.

Four models of this type were built for 1948, together with a full streamliner (circular fuselage, with same wings, tail and prop. units). One only retained the mono-wheel undercarriage as this had been found rather unreliable under poor weather conditions. A single wheel allows a wing to drop as soon as the tail rises and before the model is airborne, which may have disastrous consequences if the model is caught by a side gust at the same time.

Two models of these four—one twin-leg and one single-leg, and the streamliner, were trimmed at length. The streamliner persistently refused to come up to the performance of the other two and was finally put aside. Criterion for trimming became 3 mins. plus on 800 turns in still air. When the model would do this consistently it was definitely at optimum trim.

The designer demonstrates the structural qualities of the wing by supporting the whole model at the wing tip. Just a few of its earlier successes are:—4th, Irish Nationals 1946. 2nd, Northern Heights Gala 1946. 1st, Caton Trophy 1946. 3rd, Gutteridge Trophy 1946.

This corresponded to just under 4 mins. *consistently* on 950 turns—the maximum ever approached with the rubber used (T-56 and Dunlop). Incidentally, optimum trim was fairly critical. A change of motor—T-56 to Dunlop, or *vice versa*—if of different weights, required a change of trim. And the C.G. of the motor is only just over 1 in. from the C.G. of the whole model.

A check trim at Epsom two days before the 1948 Gutteridge nearly proved tragic. The mono-wheel job—at 8.30 p.m. and on 950 turns—jammed its D/T and eventually disappeared upwards o.o.s. after 25 mins. 47·4 secs. During that time it had drifted no more than ½ mile. It was eventually located over twelve miles away. Prior to that the same model had aggregated 555·6 secs. in the London Cup against Croydon.

Under the very poor weather conditions at the Gutteridge the twin-leg model was held down to flights of 136·4 and 154·0 secs. and wound up to 900 turns for the last flight, which was 442·0 secs. o.o.s., the 'chute coming out at about 7 mins., but the model so high and so far away that it was impossible to follow its descent. Unfortunately, too, the job was never recovered. Its performance here placed it first in the London Area and third in the Gutteridge proper.

Model No. 3 was written off trimming—stalling and coming in inverted under power.

Between the Gutteridge and the Final Trials, Model No. 4 was completed, but the weather was so bad that it was impossible to get out and trim it properly. A quick check flight on reaching Fairlop early in the morning produced a 5 mins. o.o.s. flight and the job was lost! Thus, once again, the golden rule of *never* being lax with the dethermaliser was underlined.

The 1947 model (with 1948 wings) was therefore flown in the finals. The first flight—291·75 secs.—was, again, the last. Although brought down extremely effectively by the dethermaliser it was quite impossible to locate the job.

The final development of this design as detailed on the plan is essentially similar to the two-leg 1948 layout with various structural modifications. A definite attempt has been made to produce an anti-warp tailplane and the structure evolved has worked out no heavier than the lightest orthodox unit. A modified form of fuselage construction has been used where 1/32 in. sheeting is cemented inside the longerons to stiffen the structure. The standard ⅛ in. square box is quite satisfactory for general use, but will not stand up to really rough handling or hamfisted "recovery". The new structure is very much stronger and, strangely enough, almost identical in weight, particularly if slightly lighter longerons are used. An alternative solution, bracing the definite weak spot, is by running 3/32 in. square sub-longerons inside the main structure from nose to wing box. The two bubble fairings mentioned in the last "Wakefield Models" article in our March issue, have been discarded as flight performance of the "Zombie" has proved the superiority of the plain type fuselage.

The only other marked structural difference is the use of formers and 1/16 in. square hard balsa stringers for the nose fairing instead of soft 1/16 in. sheet super-stringers. All of the other features should be clear from the plans.

It is doubtful, now, whether the design can be developed any further. Performance has now reached the point where, with optimum trim and first-class rubber, a five-minute still air flight should be possible. The wing design in its present form is satisfactory for general use. It is light and slightly flexible and will tend to warp upwards slightly and wash-out towards the tips. In fact, after doping and pinning out, wings are best left to age for some two to three weeks before use to take up their permanent set. With the type of structure used no asymmetric warps should appear. The most common rigging fault with models of this type is to give one wing more incidence than the other, which should be apparent from flight tests. Probably a rigid, non-warp wing structure will be tried experimentally during the year, but in all other respects the design is about finalised.

BILL WINTER writes . . .

THOUGH hobbyists of both our countries have much in common, perhaps the most extraordinary mutual need is information about the other fellow's developments. Luckier American modellers avidly devour each issue of the AEROMODELLER, a favour repaid by those among you who are able to lay hands on magazines from the States. So, thanks to your editor's desire to break this news bottle neck, the writer found himself honoured with an invitation to provide this monthly American Newsletter, a responsibility both appreciated and held in awe.

Biggest news in the hectic month of January was the new rules. No changes in indoor but, in outdoor rubber and glider, cabin models now required to R.O.G. and towline length increased to 200 feet, the line to be supplied by the Contest Director. No changes in free flight gas, although the proposal (inevitable in the future) that 15 seconds engine run be allowed on hand launching, and 20 seconds for r.o.g. the choice being the builder's was narrowly defeated.

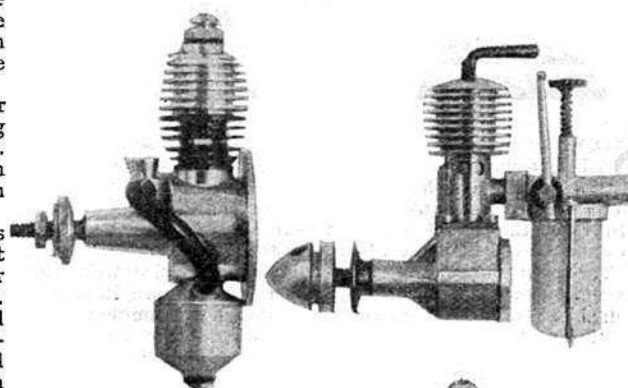
In speed, line diameter now must be at least ·001° for each two ounces of plane weight, with line lengths being changed to 52½ ft. in Class A, 60 ft. in Class B, and 70 ft. in Classes C and D. R.O.G. rule retained despite opposition of many true speed fliers, and of various sections that sanction disregard of this take-off requirement.

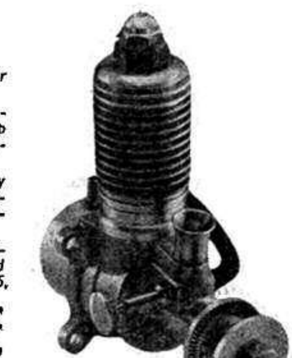
Fixed or retractable gear required in precision, no dollies or hand launching being permitted. Quite a few point alterations but space does not permit. Jet models okayed for stunt and flying scale, in addition to speed as last year. In control-line flying scale, much greater emphasis to be placed on fidelity etc., and less on flying. Good pilot with fair airplane, but one adaptable to control stunting, easily topped real scale fanatics last year. Continued over emphasis on flying ability—though scale jobs still must fly well—threatened degeneration of event into stunt pilot's circus.

Biggest furore ever created by a new engine occurred when K & B introduced the glow-plugged Infant on only ·02 cubic inch displacement. Infants still sell right out of the shipping cases. Turns a prop of about 5½ to 6 inches diameter, 3/16 inch thick at the hub, and from that thickness down to 3/64 inches at the tip. Uses the hotter fuels, such as Glow Flite. No special rules yet, but Infant contests being held! Optimum free flight area for contest performance seems to be 75–85 square inches, stunt 80 sq. inches. Needle valve sometimes too tricky for control line work. Personal experience includes a 170 square inch free flight cabin job (about right for Arden ·099) which flew like a pepped up radio job, and a 36 square inch control semi-scale of 2½ ounces weight with a 12 inch span. The latter did 30 m.p.h. on 20 foot lines indoors.

Series of trial contests being held by Lakewood Model Club,

(Continued on page 263)





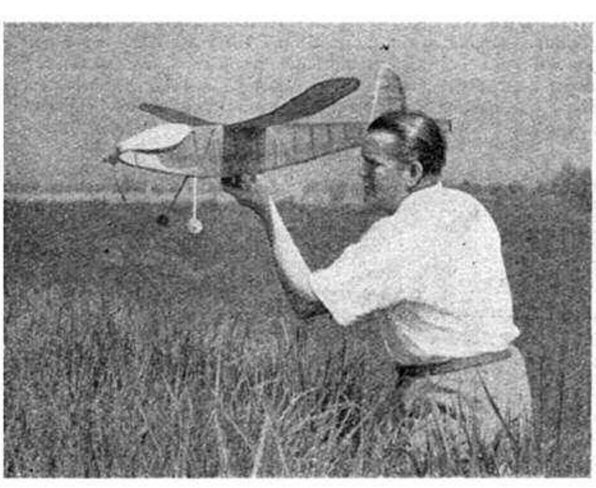
Heading photo shows Bill Winter with a "Jetex" powered model.

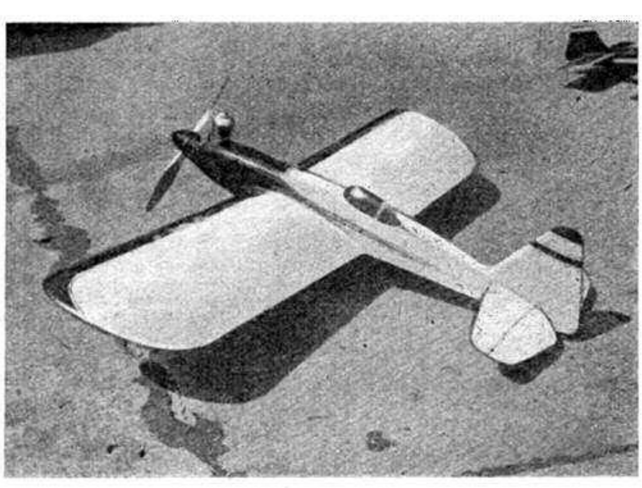
Above. The K. & B. Infant photographed alongside a 2 c.c. Kemp diesel. They are both shown approximately full size.

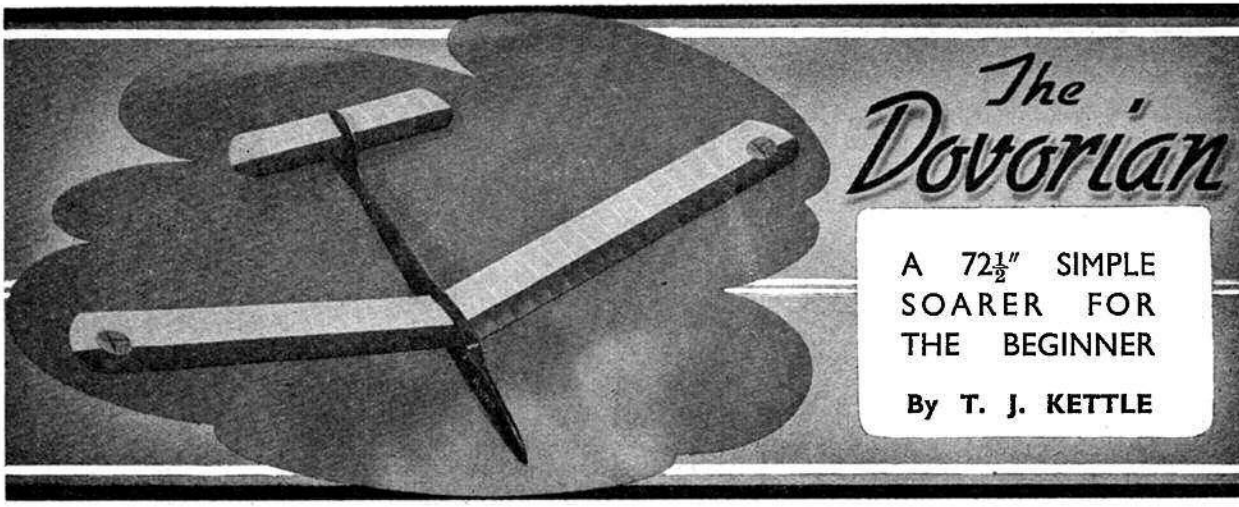
Right. The Mel Anderson "Baby Spitfire" another American Glow-plug miniature also shown approximately full size.

Bottom left. Walt Schroder, well-known American modeller and friend of Bill Winter test gliding one of 5, Wakefields they built last year.

Bottom right. Palmer's "Go-Devil" a stunt c/l job in the "Madman" tradition. Palmer is incidentally a "sidekick" of Yates, designer of the "Madman."







The Dovorian

A $72\frac{1}{2}''$ SIMPLE SOARER FOR THE BEGINNER

By T. J. KETTLE

SO many people are more or less experts these days that the beginner, poor fellow, is often left to struggle along without much of a helping hand, and, in particular, models that are really suitable as a first effort are difficult to find. However, the model described here should give very little trouble to even the veriest tyro with the ability to read a plan.

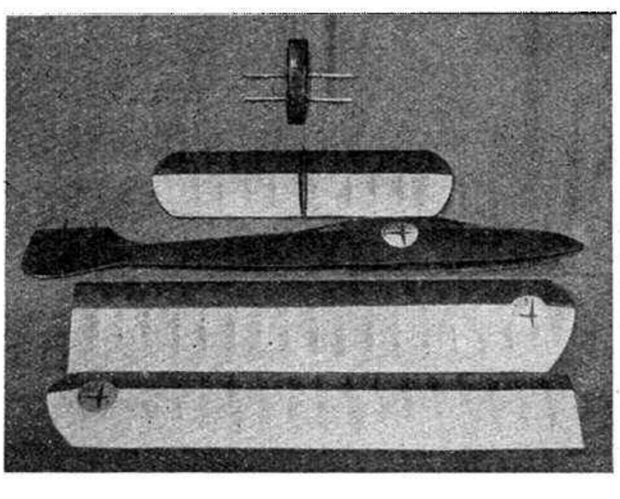
The plan shown opposite is one-fifth full size with the exception of the wing, tail, and fin ribs which are all shown full size. To scale up the rest of the design is a simple matter as the borders of the drawing are marked off in a one inch grid. All that is necessary is to join this up and chart out the borders of the full size drawing, on which the grid lines, of course, have to be drawn at one inch intervals. The relative positions of any line on the drawing opposite can then be easily located on your full size drawing and the curves in particular will be found much simplified. The whole machine, excepting the nose block and wing centre section, is made entirely of balsa and although no difficulty should be encountered full building instructions are given below.

The Fuselage. First cut out all ten formers and cement to keel, which is made of a length of balsa 36 ins long × 1 in. × $\frac{1}{8}$ in. Mark off $34\frac{1}{2}$ ins. along top edge, $17\frac{1}{2}$ ins. bottom edge, place straight edge between these points, and cut, smallest piece is then reversed and cemented on top of longest piece and bound with cotton. Nose block is shaped from hardwood to conform with F.I. and tapered off. Cut out slots to take keel, longerons, etc., (also cut out complete section for lead weight which is made to same shape as piece of wood removed and fitted as shown). When nose block is complete cement into position, and complete assembly of fuselage as on plan. Build tail fin up complete and cement into position of fuselage. Next, add wire undercarriage, wing position dowels, under fin, etc., and cover entire fuselage with 1/16 in. sheet balsa, sand smooth, and apply two coats black dope. Fuselage is then complete.

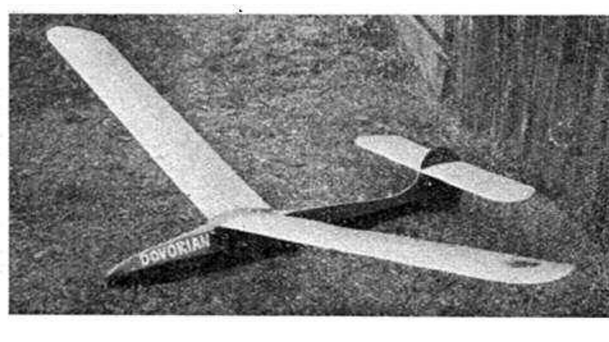
Wing Centre Section. Shape hardwood block to measurements described and trim down to aerofoil section, with flat bottom. Drill four holes to take $\frac{3}{8}$ in. dowels at indicated positions (holes are drilled approx. $11\frac{1}{2}°$ angle to give 9 ins. dihedral at wing tips). Countersink holes, insert dowels, and cement well in. Centre section is held in position by means of elastic bands, fixed to dowels on fuselage.

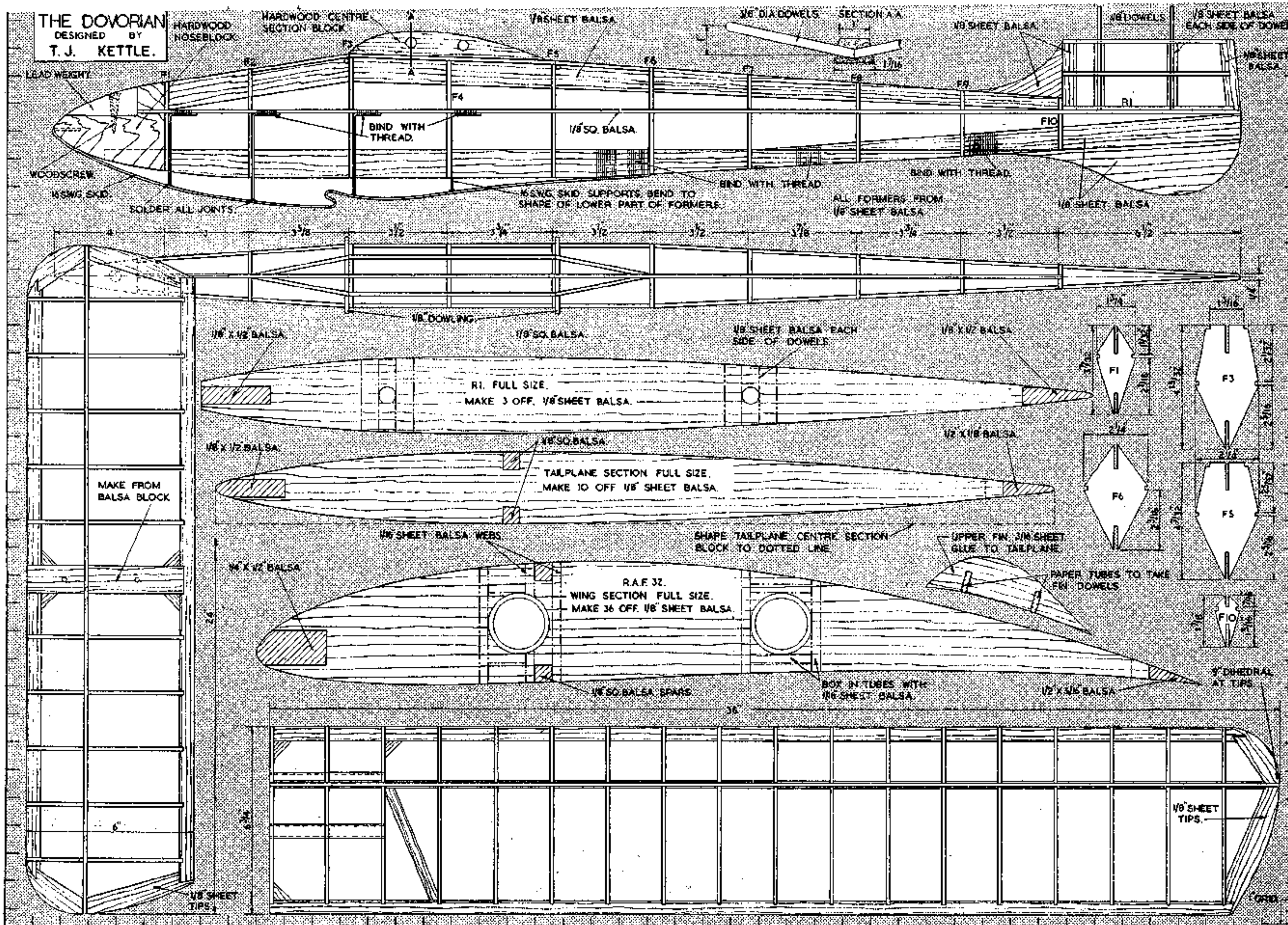
The Wings. First cut 36 ribs of $\frac{1}{8}$ in. sheet balsa (shown full size on plan). Place 2 ins. apart and cement $\frac{1}{8}$ in. square mainspar top and bottom, add leading edge, trailing edge and wing tips, insert paper tubes and cement well into position, then box in paper tubes with scrap pieces of sheet balsa. Complete wings by adding strengthening pieces and gussets and cover with 1/16 in. sheet up as far as rib 3, sand smooth. Cover completed wings with strong tissue and apply two coats clear dope. Wings are then inserted onto centre section dowels and are ready for fixing to fuselage.

Tailplane. Make centre section of block balsa as described on plan, cement $\frac{1}{8}$ in. sq. mainspars top and bottom, and add aerofoil sections 2 ins. apart (aerofoils are shown full size, make 10 of $\frac{1}{8}$ in. sheet), leading edge, trailing edge and wing tips are then cemented into position, also gussets. Cut out upper tail fin of 3/16 in. sheet balsa, insert paper tubes to take $\frac{1}{8}$ in. dowels (which pass right through tailplane centre section, and into upper fin). Cement fin into position in centre of tailplane and fit complete assembly to fuselage.

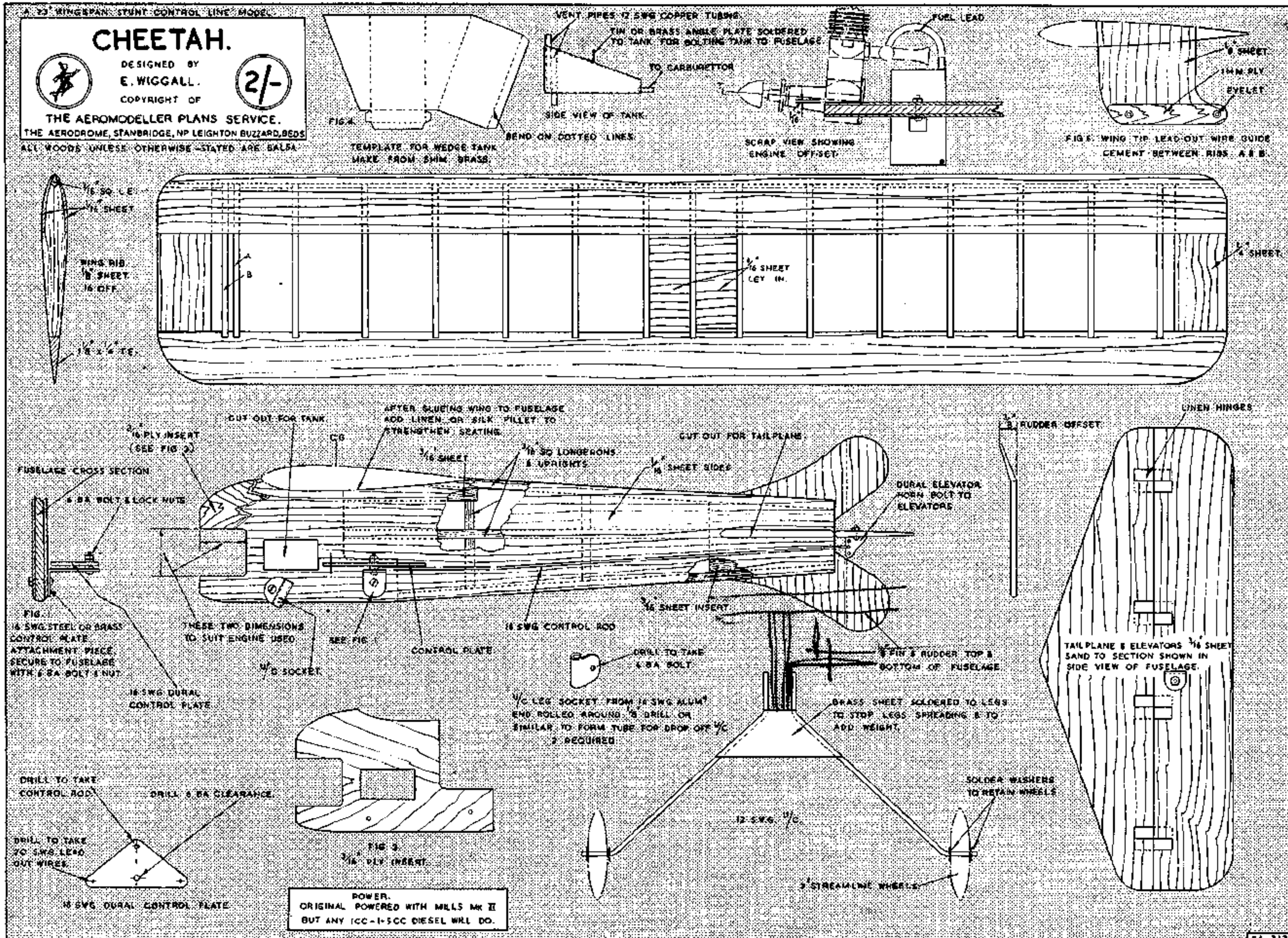


THE DESIGNER: *T. J. KETTLE . . . 36 . . . married . . . founder member of the Dover Youth Club M.F.C. . . . modelling for 10 years . . . started while recovering from pneumonia, having an understanding wife " who doesn't mind balsa in the bed " . . . ardent soaring sailplane enthusiast . . . likes watching seagulls . . . by trade a transport official . . . lives at Dover . . .*





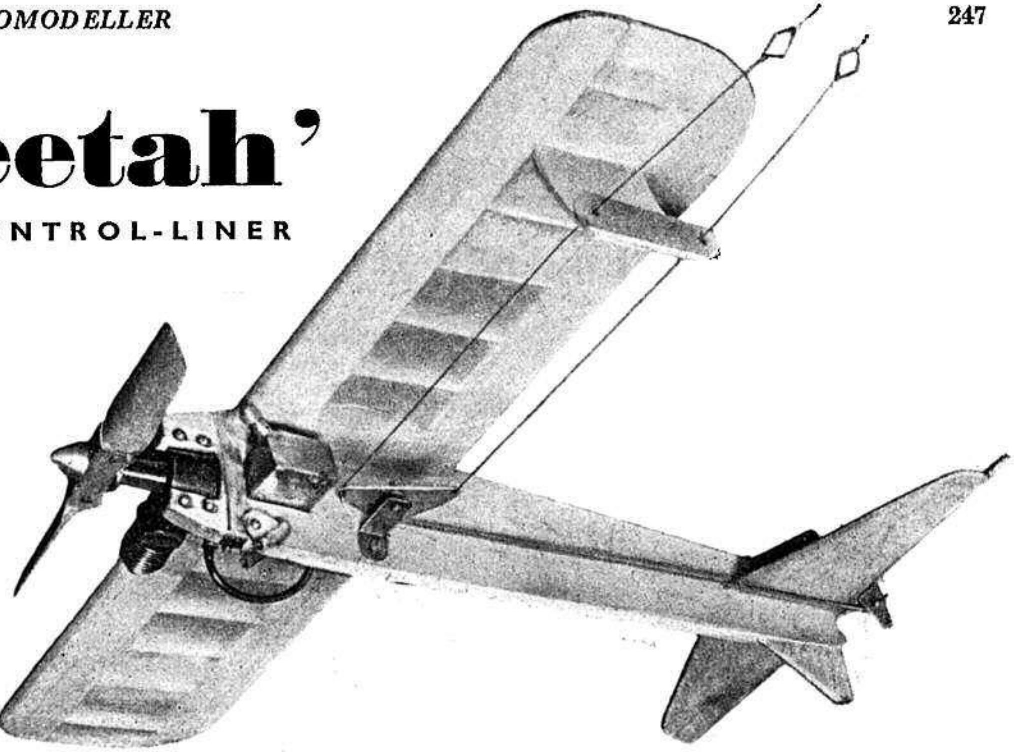
THE DOVORIAN
DESIGNED BY
T. J. KETTLE.
HARDWOOD NOSEBLOCK.
HARDWOOD CENTRE SECTION BLOCK
1/8 SHEET BALSA.
3/16 DIA. DOWELS.
SECTION A.A.
1/8 SHEET BALSA.
1/8 DOWELS.
1/8 SHEET BALSA EACH SIDE OF DOWELS.
1/8 SHEET BALSA.
LEAD WEIGHT.
WOODSCREW.
16 S.W.G. SKID.
SOLDER ALL JOINTS.
BIND WITH THREAD.
1/8 SQ. BALSA.
16 S.W.G. SKID SUPPORTS. BEND TO SHAPE OF LOWER PART OF FORMERS.
BIND WITH THREAD.
ALL FORMERS FROM 1/8 SHEET BALSA.
BIND WITH THREAD.
1/8 SHEET BALSA.
1/8 DOWLING.
1/8 X 1/2 BALSA.
1/8 SQ. BALSA.
R1. FULL SIZE.
MAKE 3 OFF. 1/8 SHEET BALSA.
1/8 SHEET BALSA EACH SIDE OF DOWELS.
1/8 X 1/2 BALSA.
1/8 X 1/2 BALSA.
1/8 SQ. BALSA.
TAILPLANE SECTION FULL SIZE.
MAKE 10 OFF 1/8 SHEET BALSA.
1/2 X 1/8 BALSA.
MAKE FROM BALSA BLOCK
1/16 SHEET BALSA WEBS.
SHAPE TAILPLANE CENTRE SECTION BLOCK TO DOTTED LINE.
UPPER FIN 3/16 SHEET. GLUE TO TAILPLANE.
PAPER TUBES TO TAKE FIN DOWELS.
1/4 X 1/2 BALSA.
R.A.F. 32.
WING SECTION FULL SIZE.
MAKE 36 OFF. 1/8 SHEET BALSA.
1/8 SQ. BALSA SPARS.
BOX IN TUBES WITH 1/16 SHEET BALSA.
1/2 X 3/16 BALSA.
9" DIHEDRAL AT TIPS.
1/8 SHEET TIPS.
1/8 SHEET TIPS.
36"
24"
6"
1" GRID.



THIS IS A 1/2 SCALE REPRODUCTION OF THE FULL SIZE PLANS WHICH ARE AVAILABLE PRICE 2/- POST FREE FROM THE AEROMODELLER PLANS SERVICE.

'Cheetah'

STUNT CONTROL-LINER



DESIGNED FOR THE MILLS BY E. WIGGALL

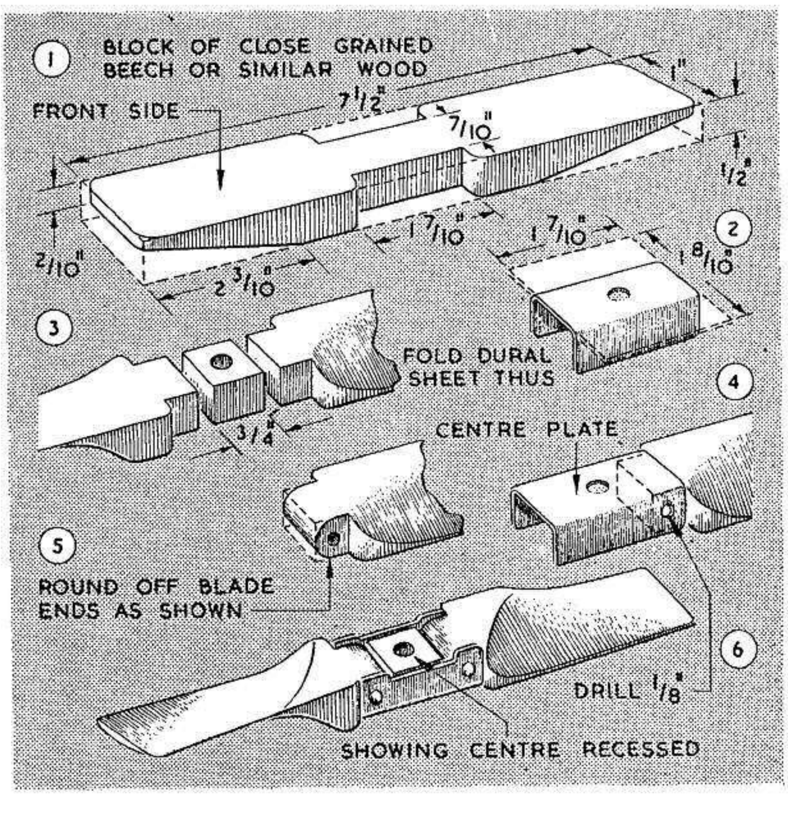
"CHEETAH" is the result of 18 months' work on stunt control line planes and though no pretence whatever is made that this represents the ultimate or anything particularly out of the ordinary, the builder can be sure that it really will do loops either single or successive, inverted flight and inverted loops, true vertical wing-overs, figure eights and single outside loops. I have personally done 22 successive inside loops and then started to untwist the control lines by means of single outside loops, but owing to a smallish fuel tank you have to be prepared to straighten out the plane and land before you find the engine cutting just at the top of a loop!

As for accidents, the model certainly isn't crash proof, but you will find that it will stand up to very much more than the ordinary type. The original has taught many people their first loops and has crashed in a frightful way owing to mistakes on the operator's part, but it is still going strong, no structural faults have shown up and repairs have been simply patches of tissue on the wing. One final word if you really value your engine (and also your pocket) do the same as I and use a folding propeller, either single or double bladed. I find the single blade particularly efficient and I am now using nothing else. The original folding propeller has stood all the year so far and is still O.K. If you are dubious about their efficiency I feel sure that The AEROMODELLER staff who have thoroughly tested the prototype plane will bear out my claims. (*We do, Ed.*)

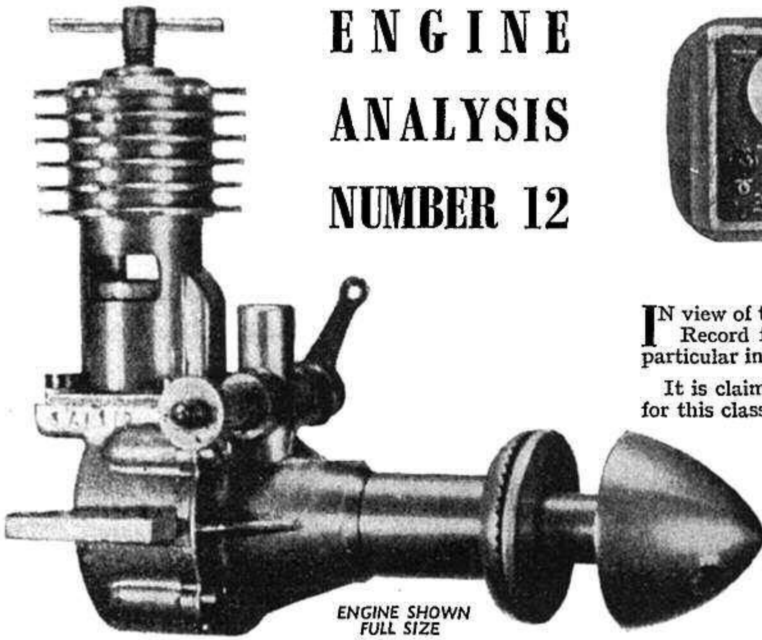
These instructions are for the propeller shown in the diagram but are equally applicable for any type and any pitch. I have used them exclusively for many years and have had no trouble of any sort. Choose a good quality straight-grained wood, for the Mills-powered "Cheetah" a block $7\frac{1}{2}$ ins. long, 1 in. wide and $\frac{1}{2}$ in. deep will be required. First recess this as shown so that the centre width is reduced to

(*continued on page 263*)

THE DESIGNER: *ERIC WIGGALL . . . 38 . . . married . . . two keen aeromodelling sons of 5 and 12 . . . member of Gloucester and District Club . . . building and flying for sixteen years . . . successes included three local "firsts", two seconds in freeflight power . . . this year won all three control line contests entered . . . favourite hobby is aeromodelling, then model engineering . . . sports are fishing and competition motor cycling . . . lives at Cheltenham.*



ENGINE ANALYSIS NUMBER 12



ENGINE SHOWN FULL SIZE

THE E.D. Mk III

IN view of the fact that the E.D. Mark III holds the World's Record for the Class " C " model race cars, it was with particular interest that this engine was tested.

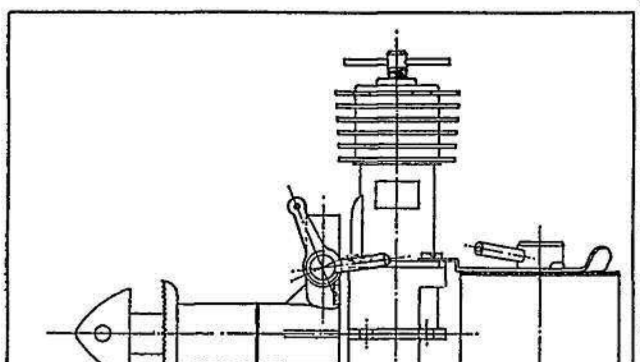
It is claimed that the Mk. III engine is specially designed for this class of race car, and for control-line flying, and the general layout of the engine seems well adapted to these purposes. The low overall height of 3¼ inches should ensure that it will fit snugly into 'plane or car. Another advantage is the engine's useful forward length, being 5 5/8 ins. from the tip of the spinner to the rear edge of the fuel tank. This length is due to the extended position of the tank at the rear of the engine, and to the exceptionally long crankshaft. The tank is also of unusually large size. These are good features, and well worth the small extra space occupied.

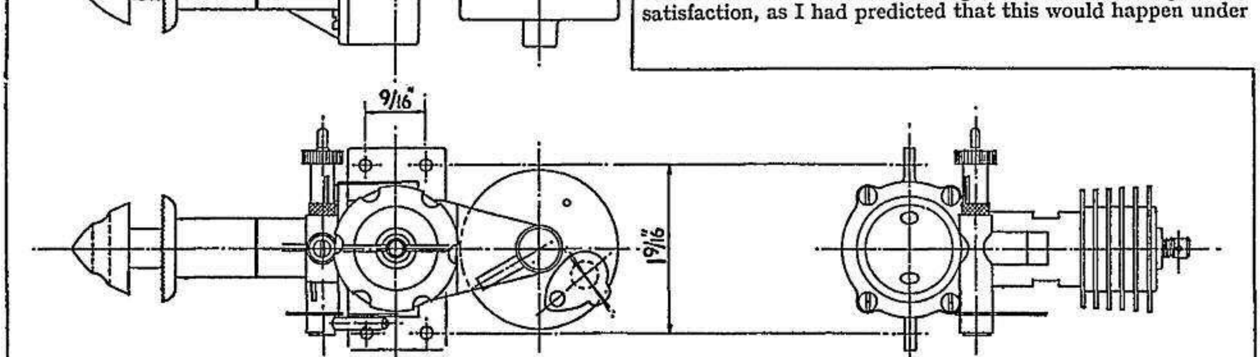
The long crankshaft, and forward position of the propeller, makes it convenient and safe to operate the throttle control on the rotary-shaft valve which is situated on the main bearing housing close up to the crankcase. The cut-out is also in a convenient position.

Throttle control is smooth and responsive over all the useful range of speeds, but there is a tendency for the needle to vibrate out of setting, on the particular engine tested. The needle is locked by means of a small compression spring housed internally, and although I stretched the spring to its limit, thus increasing the tension, it failed to cure the trouble.

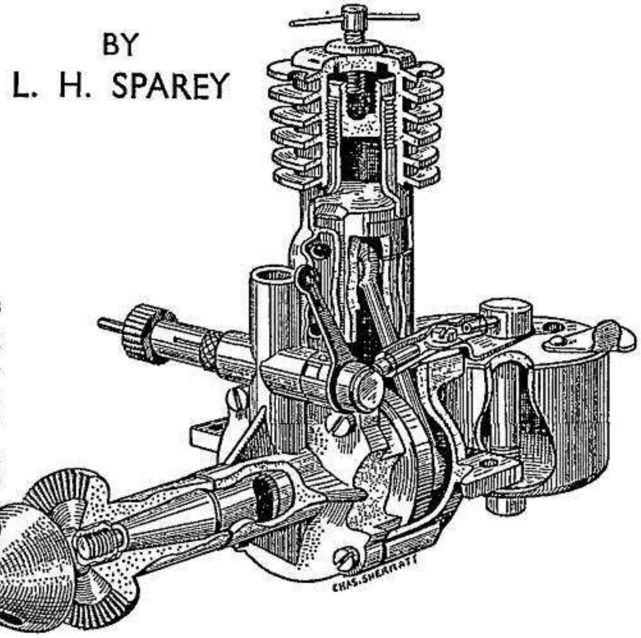
This variation in needle setting gave rise to erratic running and " hunting ", so a needle lock of different type was devised in order to steady the running when under test. The trouble immediately cleared up to a great extent, but was still evident when the engine was lightly loaded at the higher speed range, above 9,000 r.p.m. I did, on the maker's advice try "Mercury" No. 3 diesel fuel, which almost completely eliminated the trouble, and, incidentally, put up the power over the whole range of speeds.

The engine was actually tested up to a speed of just over 11,000 r.p.m., although, when even more lightly loaded, the engine would do more than this. However, when running at about 13,000 r.p.m. the flexible mounting plate on the carburetter fractured. This gave me a rather ghoulish satisfaction, as I had predicted that this would happen under





BY
L. H. SPAREY



the abnormally severe conditions under which these engines must run during these protracted tests. When running light, at extremely high speeds, vibration periods are set up for which such engines are not designed, and " failures " may occur which would not happen under normal conditions. This, of course, is the whole object of " testing to destruction ", although this is not one of the tests which I undertake.

An efficient cut-out is fitted to the Mk. III engine which operates on all speeds. In addition, the large fuel tank was found to be extremely handy for these tests.

TEST.

Engine : **E.D. Mk. III, 2·49. c.c.**

Fuel : Maker's recommended : and Mercury No. 3.

Starting : Hand Starting throughout.

Running : Running was inclined to be erratic at the beginning of tests, due to alteration of needle setting under vibration. On fitting new needle-lock engine ran steadily at speeds up to about 9,000 r.p.m., above which speed the engine tended to " hunt ". This was cured by the use of " Mercury No. 3 " diesel fuel with addition of equal part of ether. At the point of peak b.h.p. output engine ran quite steadily.

B.H.P. : A remarkably good curve was obtained for this engine over a test range of 3,700 r.p.m. to 11,200 r.p.m. At the lowest speed a power output of ·073 b.h.p. was recorded, while at the other end of the scale readings showed a b.h.p. of ·085. Peak output was obtained at 7,800 r.p.m., with a maximum of ·128 b.h.p. It was expected that peak output would lie at a rather higher speed than was shown, but repeated checking yielded similar results. It will be seen, however, that the curve is fairly flat at the portion lying between 6,000 and 9,500 r.p.m., so that between these speeds the drop from maximum output is only ·008 b.h.p. This is an important feature in control-line flying.

Checked Weight : 7 ozs.

Power/Weight Ratio : ·293 b.h.p./lbs.

Remarks : The E.D. Mk. III seems to be well and strongly made as, apart from the breakage of the flexible tank mounting, no other troubles were experienced during a long and severe test.

GENERAL CONSTRUCTIONAL DATA

Name : E.D. Mark III.

Manufacturer : Electronic Developments Ltd., 18, Villiers Road, Kingston-on-Thames.

Retail Price : £4. 5s. 0d.

Delivery : Ex-stock.

Spares : 48 hours.

Type : Compression Ignition (Diesel).

Specified Fuel : Equal parts Castor oil, Paraffin, Ether plus 2% Amyl Nitrate. Mercury No. 3, or No. 6 or mix 20% Mercury No. 6 with equal parts of first mixture.

Capacity : 2·49 cubic centimetres ·151 cubic inches.

Weight : Bare 7 ozs.

Compression Ratio : Variable.

Mounting : Beam, upright and inverted.

Recommended Airscrew : Free Flight, 10 in. × 5 in. Control-line 9 in. × 9 in.

Recommended Flywheel : 5 ozs.

Tank : Unit with engine.

Bore : ·550 ins.

Stroke : ·625 ins.

Cylinder : Hardened steel, 2 ports.

Cylinder Head : Screwed to cylinder.

Contra Piston : Centre adjusting screw.

Crankcase : Pressure die cast.

Piston : Cast iron, lap fit no rings.

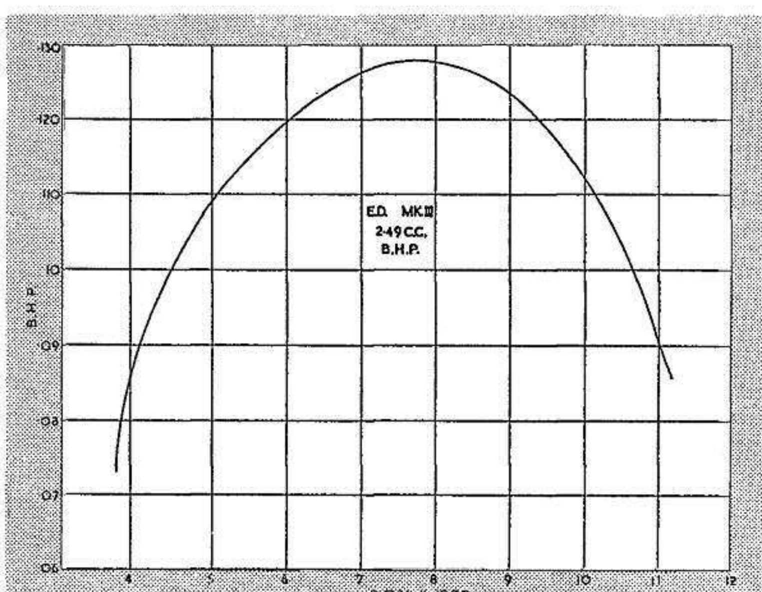
Connecting Rod : Hardened steel.

Mainbearing : Roller Bearing.

Little End Bearing : Plain.

Crankshaft Valve : Shaft type.

Plug : ¼ in. × 32 T.P.I. when used Glow plug.



NOW that the resonant cycle Jet Engine has appeared on the English market a word or two on their practical operation, and application to control line flying is not amiss.

It has been said that this type of engine is difficult to start, but this is not true provided certain details are attended to. The American Dyna-Jet and its English counterpart are particularly easy to " boom-off " and with care and attention to details no trouble should be experienced.

The accessories should first be checked, and these comprise :

(a) A large car-type pump.
(b) A six-volt trembler coil.
(c) Six-volt accumulator.

Pump. The pump should be hand operated and capable of delivering a steady blast of air. A foot pump is unsatisfactory owing to its short delivery stroke. The rubber connections should be free from leaks at each union, and the small restrictor, found in the base of some pumps, removed. In fact, it is advantageous to drill out to the maximum diameter the delivery tube at the base of the pump and the metal union at the end of the rubber connection.

Quick release connections should be discarded as they are apt to shed small pieces of rubber into the fuel jet with resultant stoppage. The screw-on type is best and may be further improved by fitting a lead washer inside so that only third turns are necessary to connect and disconnect from the air injector pipe. This is an important point because the average jet gets red hot in six seconds, and the model's insulation from the heat generated is severely tested. In addition, the individual holding the model gets progressively more anxious to release it !

Long steady strokes are best suited for injecting the starting mixture but only experience will show what pressure to apply to each thrust.

Trembler Coil and Accumulator. The trembler coil should be capable of delivering a really crackling good spark at the plug. The coil should be mounted on a wooden base board with a press button switch. This obviates devastating shocks to the individual disconnecting the leads who forgets in the haste of the moment to switch off the coil first !

The high tension wire from the trembler coil should be attached by means of a crocodile clip to a short length of wire permanently fixed to the plug head. This method prevents damage to the porcelain insulator and the crocodile clip may be pulled off the wire for a quick get-away.

The earth wire from the trembler coil should be plugged into the model by means of a wireless type socket plug permanently attached to the engine mounting on the model. This may also be disconnected quickly by pulling.

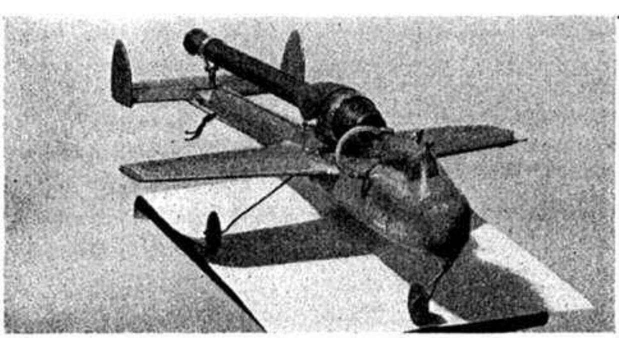
An accumulator, although a little unwieldly, is far better than a dry battery owing to the heavy drain imposed upon it by the trembler coil. Personally I find two small 2 volt. 20 amp. accumulators are ideal. Use long leads on the accumulators so that this item is well clear of the flight circle.

The Jet Control Line Model. Model jet engines should invariably be flown on control line models which can either be trainer, speed or semi-scale models.

The chief design factor is a secure attachment of the control plate and a weight factor in keeping with the length and type of control line used. It follows that the maximum weight of your model should not be more than 3 lbs. as the forces involved are considerable, remembering that the average jet engine is capable of 100 m.p.h. plus.

Model jets can be flown on lines of 30 ft. only, at speeds of 70 to 80 m.p.h. with the trainer type of model. This method is not recommended however, owing to the high rate of individual rotation and the excessive centrifugal force imposed on the lines. For speeds of 100 m.p.h. and over, a line length of 60 to 70 ft. is recommended. The control lines should be stressed with a double safety factor and should always be tested before each flight.

Undercarriages should be steady and capable of taking high speed landings. When the engine cuts in the air the model will tend to climb sharply owing to the high thrust line involved in models, and this characteristic should be anticipated as



The heading pictures convey a very good impression of the starting procedure for jet propelled models. An idea of the noise involved, rather like a liner's siren in full blast, and which has to be heard before it can be realized, can be gathered from the attending gentleman's efforts to protect his eardrums from the resonance. Note the difference in the colour of the jet tubes in the photographs, the right hand one shows the moment when the single "woomphs" become a steady roar, while the left hand shows the model eight seconds after, the tube a bright cherry red. It is not difficult to understand the need for efficient insulation of wings and fuselage —and a quick take off!

Left is a close up of the author's model shown in the heading photographs. The wide bore feed tube and large transparent tank are clearly seen together with the uncoloured asbestos covering on the fuselage top.

far as possible. The engine note will rise slightly in pitch a few seconds prior to stopping.

When testing a model jet for the first time use large air wheels and thick cable lines, of not less than 54 ft. In other words intentionally add as much drag as possible to cut the speed down in order to test the handling qualities. If these are satisfactory then reduce the line diameter consistent with the retention of a double safety factor and fit streamline wheels or a dolly undercarriage.

A flat surface is necessary for take-off as most jet engines are prone to cut if there is much pitching during the take-off run. Full-up should be given so that the high thrust line moment may be overcome as soon as flying speed is reached.

Control Line Handle. The control handle should be metal and the lines spaced not more than 2 to 3 inches apart in order to reduce sensitivity at speeds in excess of 100 m.p.h. This is important.

Fuel Tank. This should be constructed in the best speed control line tradition with the outlet on the side of the tank. The capacity should be at least 6 fluid ounces as the model jet engine's thirst is terrific! An air vent facing forward and providing ram air to the opposite side of the tank is an advantage. A satisfactory tank may be fabricated out of perspex which has the advantage of being transparent and may be embodied to conform to a cockpit canopy in the model.

The level of fuel for starting is very critical indeed and it is best to experiment with a movable tank that may be raised or lowered before building one into your model. Err if anything on the rich side (the fuel level just below the level of the jet intake) *with the model at rest*. On attempting to start the model this will result on one or two warming up bangs before the correct level is reached and the engine starts.

Too weak a mixture is denoted by weak intermittent explosions, while an excessively rich mixture will produce bursts of yellow flame from the tail pipe at each stroke of the pump.

Finding the correct level of fuel with the model at rest is extremely important as it eliminates the guesswork of the enthusiastic helper who tilts the model backward and forward in an effort to find the correct starting mixture. Remember, a good jet engine with a correct level of fuel will start with 4 to 8 strokes of the pump.

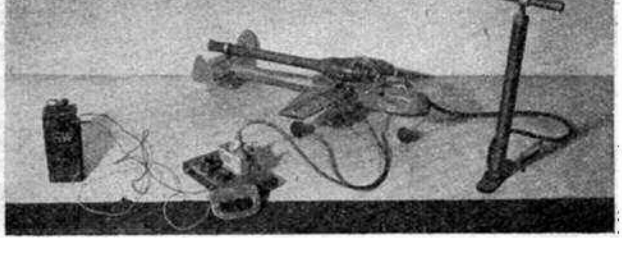
The Model Jet Engine. Little maintenance is required since there is only one moving part, namely the valves, and these should be checked frequently for wear and pitting. They must be kept scrupulously clean because any dirt collecting between the valve and its seat will cause difficulty in starting. Inspect the fuel jet for general cleanliness and ensure that the fuel injector is providing a sufficiently intense spray into the combustion chamber. The alignment of the injector is very critical and this fitting should always be treated carefully. Clumsy attempts to disconnect the pump connections may cause mis-alignment which again will result in difficult starting. Should this occur tests may be carried out with the injector removed from the head of the jet engine, and with care and patience the correct angle of the blow-pipe necessary to produce the spray may be found.

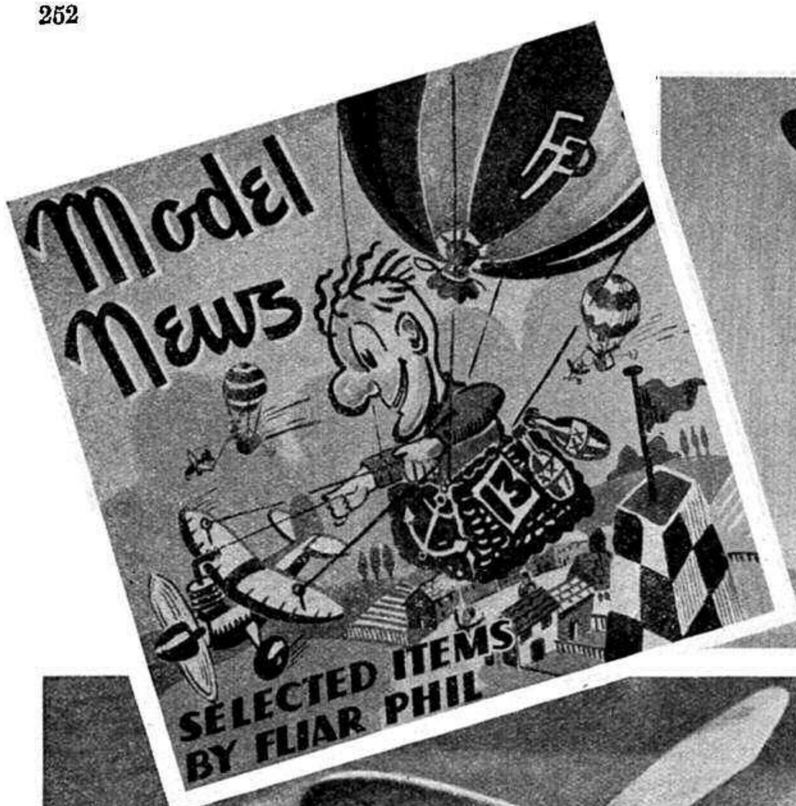
At the moment experiments are proceeding with a variable intake fuel jet in an attempt to control, within limits, the power output of the jet engine.

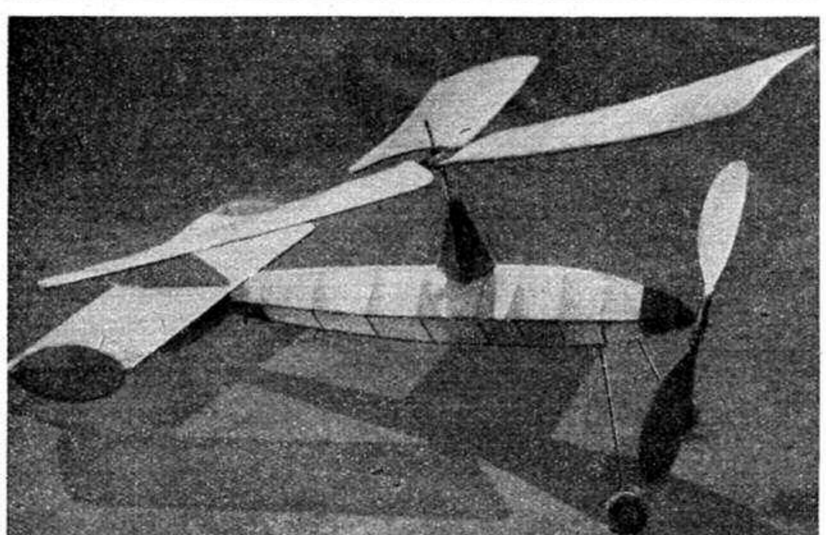
Finally, model jet engines will give years of service; the only replacement being the valves. If you are unfortunate enough to damage the tail pipe of the engine any dents must be removed before starting as the resonance factor, upon which this type of engine relies, is critical.

Remember above all "fly with care". Jets are not in themselves dangerous, any more than other speed control line aircraft. The noise factor must be considered, as well as the curiosity aroused in casual spectators, who often fail to realise that it is essential to keep a safe distance away from the flight circle. It is your personal responsibility to ensure the safety of others. Never let keenness blind you to this essential factor. Thoughtlessness, selfishness, and lack of responsibility will only result in great harm to the aeromodelling movement.

Below left is another of the author's models, a "Speedbird", minus the jet unit. Note the simple but sturdy fixing for the unit, and the author's standard system of transparent fuel tank cum cockpit canopy. Right shows the starting impedimenta, from left to right battery, trembler coil, and long-stroke hand pump.





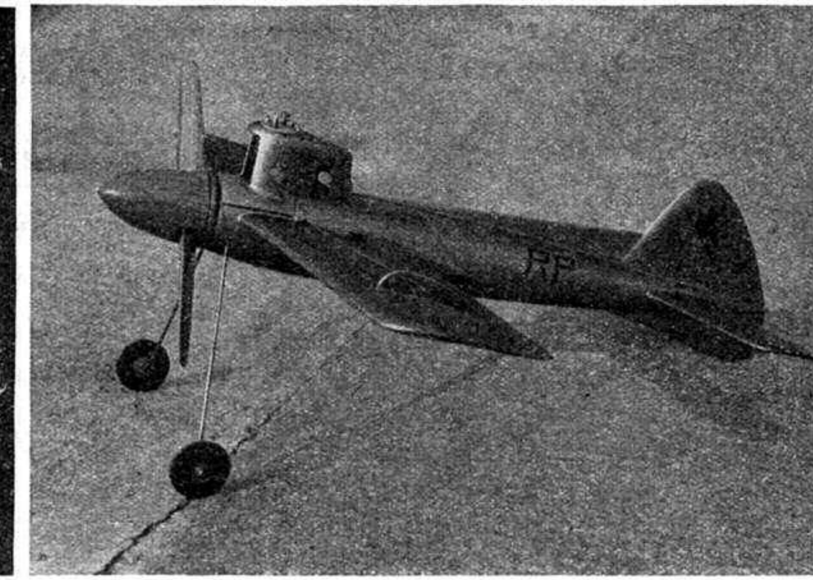


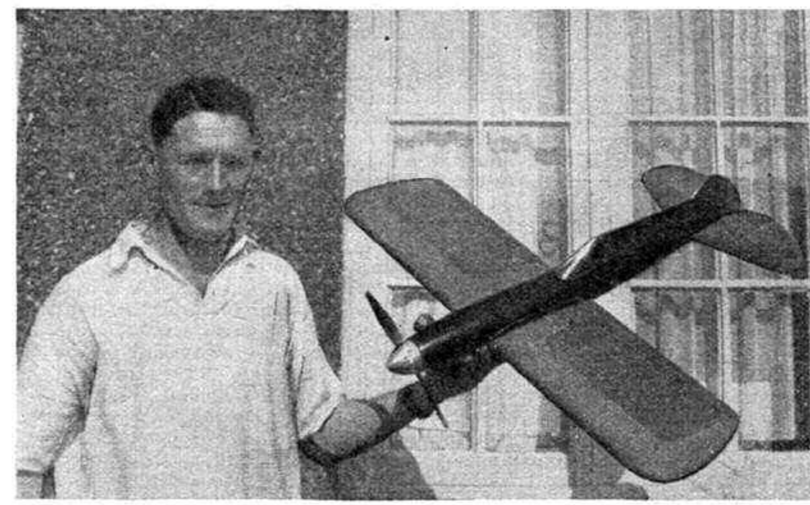
ALTHOUGH Fliar Phil never expected to be kept up by his own hot air he so far has not managed so badly, only unfortunately the balloon never seems to carry quite enough ballast to keep up with the rate by which he, in the best professional manner, empties it!

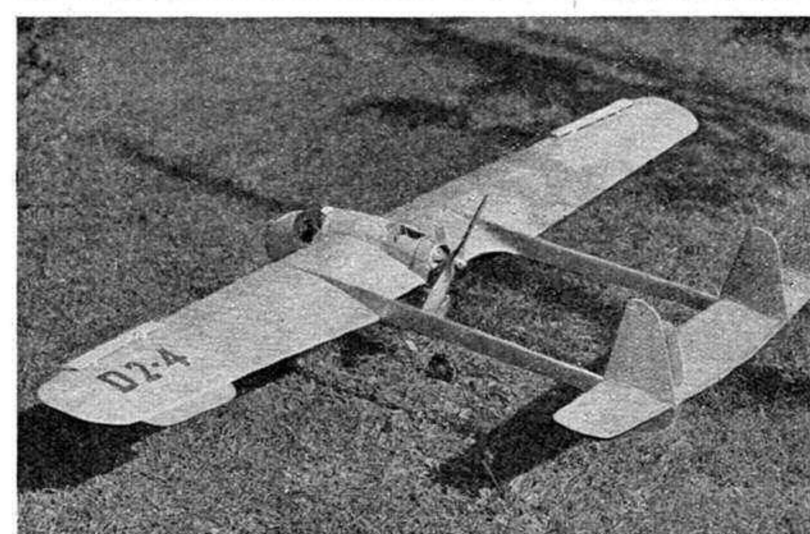
Models by G. B. Willett of New Malden have quite often appeared in these pages and our Model of the Month is another tribute to this modeller's prowess. The photo shows a most elegant 8 ft. span cabin model of his own design powered with a 5·9 c.c. Mechanair. Wing area is 720 square inches and all up weight 4½ lbs., of which Fliar Phil reckons at least one and a half pounds must be elbow grease! The fuselage is completely sheeted with balsa and the flying surfaces nylon covered. All together a most attractive effort of which Mr. Willett may well be proud.

The dumpy little nylon effort on the left is the brain child of Lewis Heath, photographed by I. C. Lucas. Powered by a Mills 1·3 c.c. it is only 30 ins. span and has a sheet fuselage and cowled engine. Fliar Phil always says that a simple cowling increases the attractiveness of such models by 100 per cent., and with a little forethought need not affect the working accessibility of the engine at all—Mr. Heath apparently agrees with him.

A seldom explored branch of aeromodelling these days, autogyros have a fascination of their own which is never shared by the supremely functional helicopters. Our photo on the left is of an outdoor rubber driver autogyro designed and built by L. Gabriels, a compatriot of Raymond Musgrove the well-known exponent of rotating wing models. The rotor diameter is 20 ins. and the area of the blades 90 square inches. The length of the model is 15 ins. The whole is tissue covered, the rotor being single surfaced, and the model is no less functional despite its quite attractive appearance. We should very much like to see more photographs of this type of model, particularly in flight, so what about it, Messrs. Gabriel, Musgrove, and any others interested?





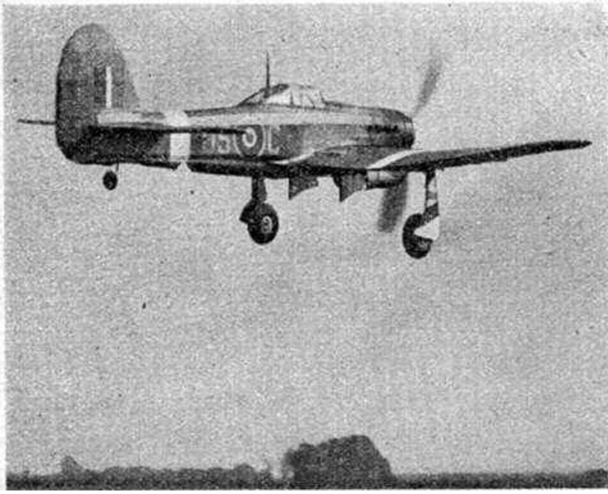


A somewhat neglected section of control lining speed flying is now receiving increasing attention by enthusiasts in this country, as photographs reaching our offices show. Above is a very well finished little sports-speedster designed and built by D. Tilleray of Sidcup, powered with an ETA 5 c.c. diesel. Span is 22½ ins. and interesting features are the attractively cowled motor and the handsome carved spinner.

There are few people in the South Midlands Area who do not know Don Beattie of Bedford whose name has featured in top placings in quite a few contests. Proud inheritor of A. H. W. McBean's "Thunderbird," famous jet flying wing, he has now turned his interest to control line flying, and the centre picture on the left shows him with his latest model, a stunter of 32 ins. span powered with a glow plug McCoy 29. A pleasant change from the usual "box-car" stunters this sleek model circulates at around the 80 m.p.h. mark. A new and even faster version for the Nordec is promised—Fliar Phil wonders just how long Don can think one second faster than his model behaves!

Again the unusual, K. G. Dalzell's 44 ins. "pod" pusher in the bottom photograph has managed to combine the unorthodox with a far from unattractive appearance. The model is powered by a "K" Eagle 1 c.c. which, in an unwary moment before ballast was added to the nose, sent the job up in one beautiful loop. The result is not recorded! The slots are interesting, as are the other stability devices which include the two large trim tabs, visible in the photograph, necessary to counteract a tendency towards a vicious left hand turn. With the aid of these various odds and ends however, the model is now flying well. These attractive and novel designs are seldom unsuccessful. Why don't more people venture them.

Fliar Phil, his voice a little hoarse from another Model News, settles down in his basket and arranges a satisfying drip feed lubrication from his rapidly dwindling ballast . . .



THE FLYING SCALE MODEL

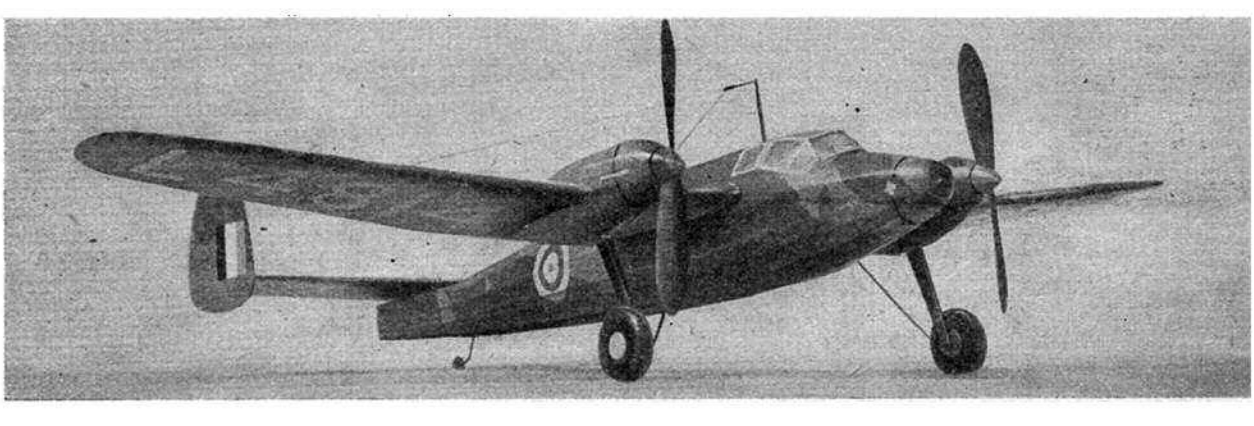
PART NINE

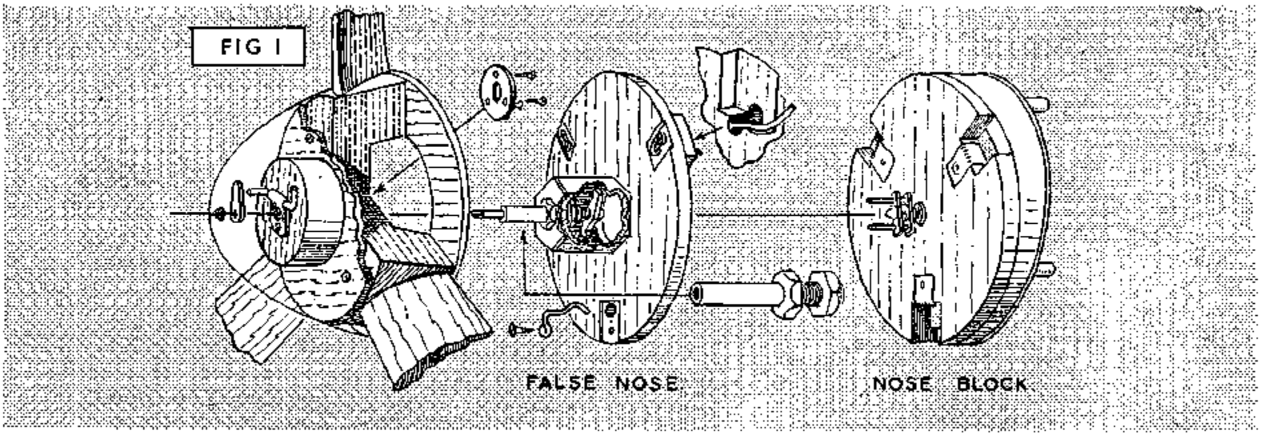
THE TYPHOON IB CONTINUED

BY C. RUPERT MOORE A.R.C.A.

CONSIDERABLE correspondence has come in about the handling of rubber motors when used with " knock offable " airscrews. As pointed out last month, the habit of handling the motor by the airscrew must be broken (or the model will be !). The usual twist brace, wire hook and eye in the propeller shaft is no use because the tension of the motor " breaks " the prop. shaft every time. I am going to describe the Typhoon's nose block, false nose, and airscrew first as a typical of this type, and then describe a winder which gets over these difficulties.

The nose block is made from a circle of ⅛ in. ply and a rim of 1/16 in. ply separated by balsa block. Pegs are used to locate it in the nose (Fig. 1). Three small rectangles are cut from the circumference of the ⅛ in. ply and cemented to the ⅛ in. ply false nose for location. Holes are drilled under these rectangles and a groove cut in them to allow piano wire clips to pass through the false nose and have room to move. These are screwed on the front surface. Tin is bent over the appropriate part of the nose block to form a snap. Considerable force should be necessary to part these snaps. The centre of the false nose is drilled out to ⅝ in. diameter. A hexagonal box is built of hard balsa later to be cemented in front of this hole and a plug made of balsa and ply to fit the front end. Inside this box is located the fork and T joint described in the December issue, page 50, Fig. 2A. The propeller shaft is made from 12 s.w.g. knitting needle and the bush from brass tube. If an exact fit cannot be found take a slightly smaller bore, file the knitting needle to a square and clear with this. A thread is put on one end and it is fixed tight through the hexagonal plug, just made, by a nut on each side. This is then cemented to the hexagonal box. The airscrew boss is cut away to take this hexagonal box. After being mitred the blades are joined by a 1/16 in. ply ring at the back and a circle at the front. These are cemented and screwed in place. Note carefully direction of grain. The front bearing is carried on a ⅜ in. thick hard wood disc which is cemented on. The rear bearing is a washer which rides outside the bush and is drilled to take three screws. This fits at the bottom of the cutaway. The front bearing is the folded tin freewheel plate, also drill for three screws. The freewheel is very simple and efficient, in fact it is the only thing which I have been unable to improve upon since I first used it about 1937. It is absolutely automatic and was evolved in conjunction with the " Moore Drive " in order that multi-engined models could have self-setting freewheels. It is absolutely automatic and consists of a double right angle 18 s.w.g. piano wire paul, held *very freely* in a bearing made of cocoa tins. This is formed by folding a strip of tin over a slightly thicker piece of wire or nail. The tin is opened so that the preformed paul can be put in place. A hole is drilled through this tin freewheel plate to form the front bearing. The only possible weakness in this freewheel is the fixing of the little strut brass (20 s.w.g.) ratchet arm on the front of the prop. shaft. By filing a square on the shaft with a pyramidal point at the front (Fig. 1) and drilling an undersized hole in the ratchet arm, the shaft can be gently forced through the hole to form its own square. Drills can be made from piano wire filed to a similar shape, but should be short, ½ in. beyond the chuck being ample. The shaft end and rachet are tinned carefully. A paper washer is slotted on first to prevent the ratchet being soldered to the freewheel plate and then a collar built up from fuse wire to keep the ratchet about ¼ in. clear of the plate. Fuse wire is also wound in front and then soldered solid. The T at the other end of this shaft is fixed in a similar way.



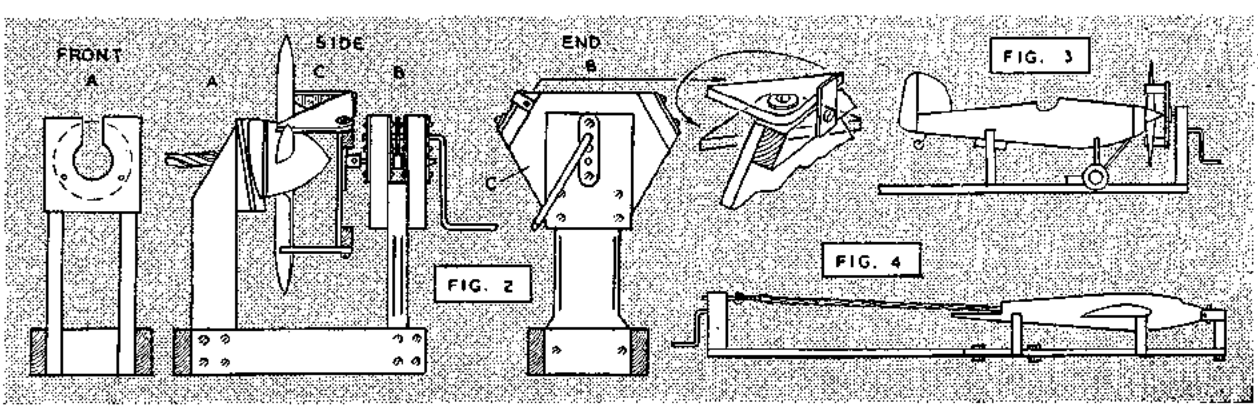


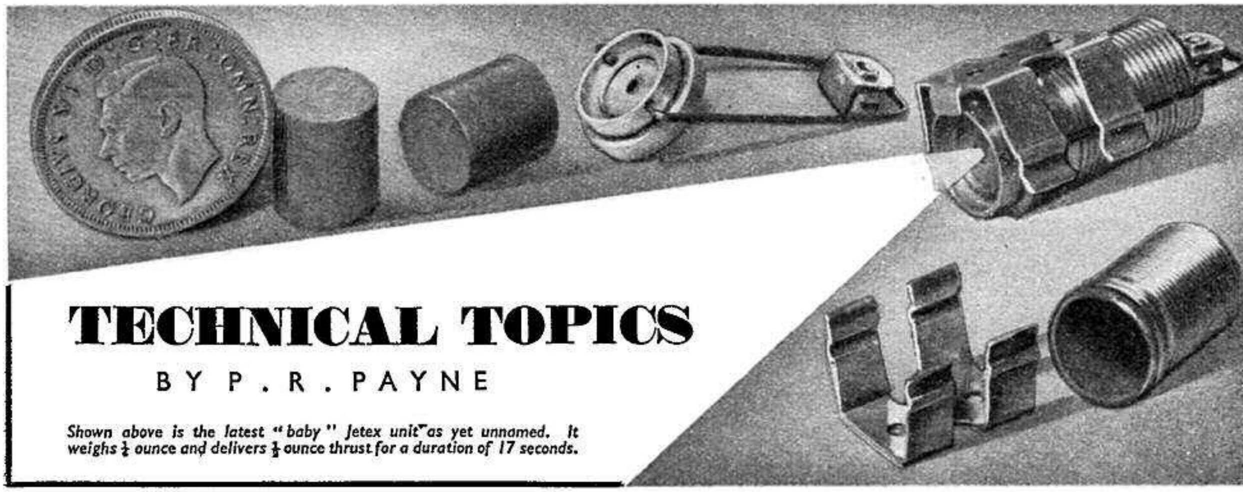
The rear half of the shaft is made of 16 s.w.g. wire and appropriate screwed bush. A mechanical tensioner is a great advantage. Where required packing washers cut from tin should be placed behind the rear bearing to give clearance between spinner and false nose.

To align the fork and T break joint, the rear half is fitted with its fork. The T end of the prop. shaft is put inside the hexagon and engaged with the fork. The hexagon should be moved about until there are no stiff points when the shaft is revolved between the fingers. This can then be cemented. There should be 1/16 in. clearance between the shaft ends to allow for a mechanical tensioner.

The spinner is faired in with balsa. Winders for this "broken shaft" or "knockoffable" idea must incorporate a support for the nose block as well as the winding mechanism. The side view, Fig. 2, shows the general idea with the nose block in winding position. The framework is built of $\frac{3}{8}$ in. thick wood throughout. The base and supports for A are about 2 in. deep. Winder pylon B is 3 in. wide and is rounded to make a comfortable handgrip. Two measurements are vital, the vertical distance from thrust line to base and clearance between the spinner and the winder should be enough to allow the whole unit to be pulled forward to allow engagement and disengagement of the nose block. The upright holder A has a $\frac{1}{8}$ in. ply former in which is cut a U, this is drilled to take the two bottom locating pegs, the top peg falls in the open U cut to allow the rubber to pass. This is fitted after the model's thrust line has been ascertained at such an angle that it cancels out both side and down thrust, making the propeller shaft exactly in line with the window shaft. The winding mechanism is built up from Meccano parts. A $1\frac{1}{2}$ in. gear drives a $\frac{1}{2}$ in. pinion. The bearings are simple 4 or 5-holed Meccano strips screwed inside and outside of their wood supports. Meccano gears and faceplates have their hubs riveted only and these must be soldered over otherwise they will slip. Flats can be filed for the grub screws, but it is far better to solder gears to shafts. When the gears are fixed the bearings should be slotted on and these screwed to pylon B. The 4 in. crank is then bent on the $11\frac{1}{2}$ in. shaft and the faceplate soldered to the end of the winding shaft. Screwed to this faceplate is a plywood equilateral triangle of 10 in. sides whose corners have been removed leaving 2 in. flats. These flats are reinforced and to two of them are screwed triangles (Fig. 2C) to engage the airscrew blades. The third must be made to swivel out of the way, otherwise it would be impossible to get the airscrew in and out again. This is done simply by leaving one screw out and fixing a small brass stop instead. This swivelling triangle should always be at the top when engaging or disengaging. Once this winder has been built, adaptors can be made to screw on to the nose block holder A and where two-blader airscrews are used, such as the Tiger Moth, a simple two-stop winder can replace the triangle. This, of course needs no swivelling remember.

The winders shown in Fig. 3 and Fig. 4 are for the Viper and my semi-scale twin "Castor". These are now largely of academic interest as multi skein motors have been largely replaced by "Moore Diaphragms". Multi skein motors being too strong to stretch they can be wound together without stretching (Fig. 3) or wound skein by skein from the tail end (Fig. 4). Castor's winder is telescopic and by handling each skein separately a higher gear ratio was possible, thus cancelling some of the loss of time caused by handling separate skeins. Both Viper and Castor are heavy models and carry $6\frac{1}{2}$ oz. of rubber each, which means fairly low gear ratio. It has frequently struck me that much wear and tear could be taken from starting power models by building a cradle like the Viper's and incorporating a suitable freewheel to the winder mechanism.





TECHNICAL TOPICS

BY P. R. PAYNE

Shown above is the latest "baby" Jetex unit as yet unnamed. It weighs ½ ounce and delivers ⅓ ounce thrust for a duration of 17 seconds.

On Test—The Jetex "350".

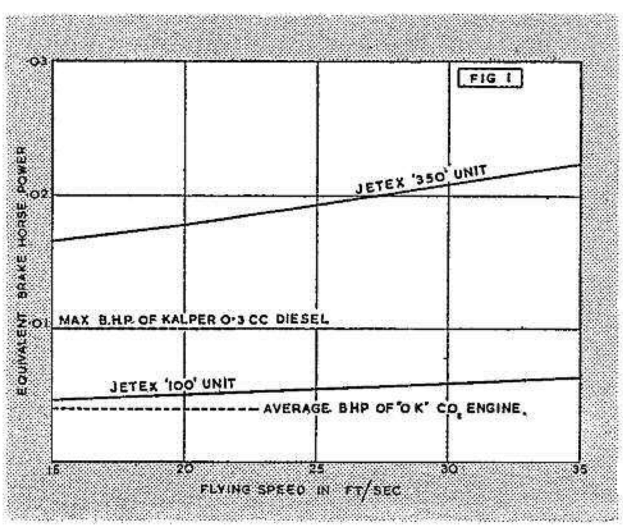
AT first sight a Jetex unit seems an exceptionally complicated way of getting an exceptionally small thrust. Howard Boys, it can be pointed out, gets almost the same results with a unit which is little more than a twopenny squib without the bang—or usually without the bang . . .

Fuel Efficiency. The effectiveness of a rocket fuel depends on four factors as far as aeromodelling is concerned: these are thrust developed, thrust variation, duration, and weight of fuel. Three of these are accounted for in the "Specific Impulse" number of the fuel, which is:

$$\text{S.I.} = \frac{\text{Thrust} \times \text{Duration}}{\text{Charge weight}}$$

where Duration is in seconds,
Thrust and Weight are in ozs.

Comparative values of S.I. are given in Table I, and it is at once obvious that the Jetex fuels have achieved a great increase in efficiency. It is to be hoped that the manufacturers will also succeed in reducing the weight of the unit itself, which is a rather high percentage of the total weight at the moment. All those springs for instance: surely a screw-on cap with a simple relief valve would be far lighter?



Comparison with I.C. engines. Fig. 1 shows the equivalent b.h.p. of the "100" and "350" units: that is, the efficiency of a normal airscrew has been allowed for. It is usual to ignore this and calculate the thrust h.p., which is hardly fair to the unit concerned because it is roughly half the equivalent b.h.p.

The graph shows that at normal model speeds the "350" is comparable with a half c.c. diesel, whilst the "100" unit gives a little over half the power of the 0·3 c.c. Kalpher. Both units have the same b.h.p./weight ratio as the Kalpher, and thus on these grounds there is little to choose between an under 0·5 c.c. diesel and a Jetex unit for small free-flight models.

In passing, it is interesting to note that at 70 m.p.h., the power of a "350" is the same as a "Frog 100"; or putting it another way, they both deliver about three and a half ounces thrust at this speed. Control line fans please note!

Finally, the point on which rockets really score over engines is of course their complete freedom from torque troubles. This is partly offset by the trouble involved in keeping the tail well clear of the efflux, but taking all things into account the balance seems just to tip in favour of rockets for small models, although the superiority is not great.

Design Considerations. No alterations in design methods are needed for a rocket machine, except the purely practical precautions of;

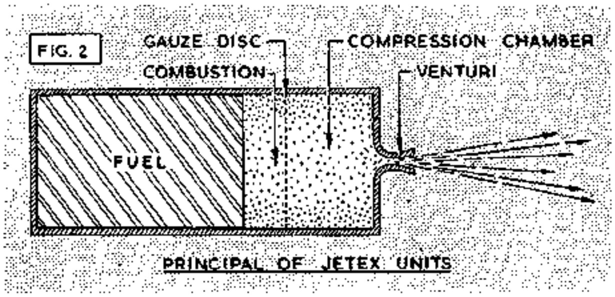
(*a*) keeping the tail well out of the way
and (*b*) putting the unit over the C.G.

It is desirable to put the unit above the C.G. as this has the same effect as downthrust on a normal model in steadying the climb. The fact that nearly every kit design so far produced has a low position is probably due to the preconceived ideas with which we entered this new field. Against it should be set not only theory, but the experience of Howard Boys, who has been making bangs for years, and is literally the father of model rocket propulsion.

Another important point with the "350" is that it must be quickly detachable. Contrary to popular thought, it requires more attention than an engine between flights, and a lot of effort is needed to get the five safety clips on and off.

Thrust Augmenters. Broadly speaking, the combustion of a rocket fuel causes a gas to be given off, and since it can only occupy the relatively small combustion chamber (Fig. 2) a high pressure is built up. In the "350" a value of 100 lbs./sq. inch is required for 3·5 ozs. thrust. Generally, the pressure is governed by

(*a*) The volume of gas produced in unit time,
(*b*) The temperature in the compression chamber,
(*c*) The size of jet or orifice.



If the jet is very small the internal pressure will be high and the velocity of the efflux correspondingly great. Indeed, with ordinary fireworks of good quality, the outflow velocity is of the order of 1,000 m.p.h., and high internal pressures are not here possible because of relatively weak construction. As Table 2 shows, the optimum speeds are nearer 5,000 m.p.h., if the jet venturi can be accurately machined, and the casing made strong enough.

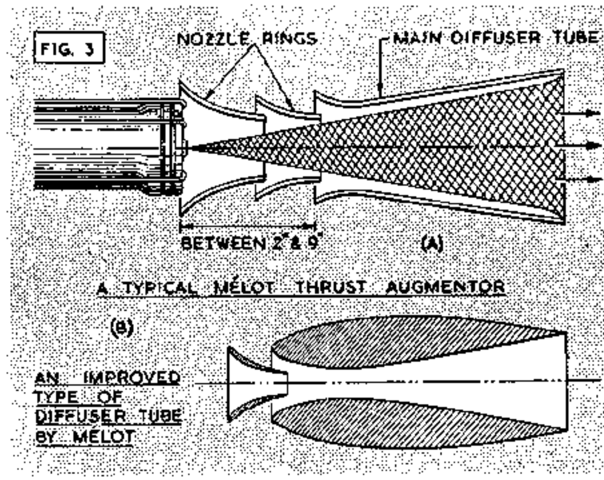
The writer has calculated the " 350 " outflow velocity to be 2,450 m.p.h., for three and a half ounces thrust. This is rather low, compared with the values given in Table 2, but it is probable that the increase in internal pressure needed to give 5,000 m.p.h. would necessitate a prohibitive increase in structural weight.

Although the unit expels gas at such a high speed, the actual mass forced out per second is low — 0·03125 ozs./sec. in fact. It is possible, by the use of the apparatus shown in Fig. 3, to induce some of the surrounding air to flow with the gas. As far as is known, no work has been done on really small thrust augmenters, but there is no reason why suitable ones cannot be evolved: either by careful design, or a process of trial and error. The main feature of a successful design is that the gas should have expanded to atmospheric pressure as it reaches the end of the last diffuser tube, and when this is done successfully with type A an increase in thrust of at least 50 per cent. can be obtained. From test results available, it would appear within the bounds of possibility to double the thrust of the Jetex " 350 " by this method.

Finally, the theoretical design of thrust augmenters is likely to prove a very difficult problem because of compressibility effects. It is known, for instance, that shock waves occur near the throat of the Jetex venturi, and that the flow is probably unsteady. (In practice this means that the internal pressure is probably higher than the calculated value.) Moreover, it is highly probable that the first nozzle ring in an augmenter will be affected by compressibility. But it is nevertheless interesting to notice that not only has the low speed aerodynamicist encountered supersonic speeds, but speeds which are considerably greater than any practically experienced in " full scale " aeronautics!

Conclusions. The above test report has covered a rather large field in order to present contemporary rocket propulsion in its true light. Of the " 350 " unit it may be said to provide an attractive alternative source of power for small models of less than 45 inches span. Whilst there is a chance of broken crankshafts with normal engines, this " unbreakable " motor will probably be regarded as a poor man's friend: unfortunately, this is quite untrue. The unit costs as much as a small diesel in the first place, and the net cost of a hundred flights (neglecting replacements) is £4. 8s. 9d., as against only 5/– for a small diesel using commercial fuel. The extra £4. 3s. 9d. more than offsets any repair costs encountered with a diesel.

It seems then, that Messrs. Wilmot, Mansour & Co., Ltd., are boosting one of the more uncertain qualities of their units. Thus, there is a danger of our forgetting the really important points of novelty, constant thrust, trouble-free starting, and the quality of being adaptable to almost any aerodynamic layout. These alone are worth a little extra cost.



Structurally, the unit cannot be considered perfect until the casing weight is reduced to about 35 per cent., and the re-charging made easier. Nevertheless the present design is an excellent start in this completely new field.

TABLE 1

Fuel Specific Impulse and percentage weight of various rockets.

Rocket	S.I.	Fuel Weight / Total Weight
Brock's No. 3	16·25	57%
Jetex " 100 "	68	31%
Jetex " 350 "	106	33·3%
" Jato "	180–200	—
V.2	208	70%

TABLE 2

Optimum Jet Speeds for Powder Rockets.

Type of Fuel	Outflow Velocity
Resine Rocket	3,580 m.p.h.
Pistol Powder No. 3	5,120 m.p.h.
Smokeless " Infallible "	5,450 m.p.h.

(Ref. J. Steinmer: " Flugwehr und Technik " August, 1941.

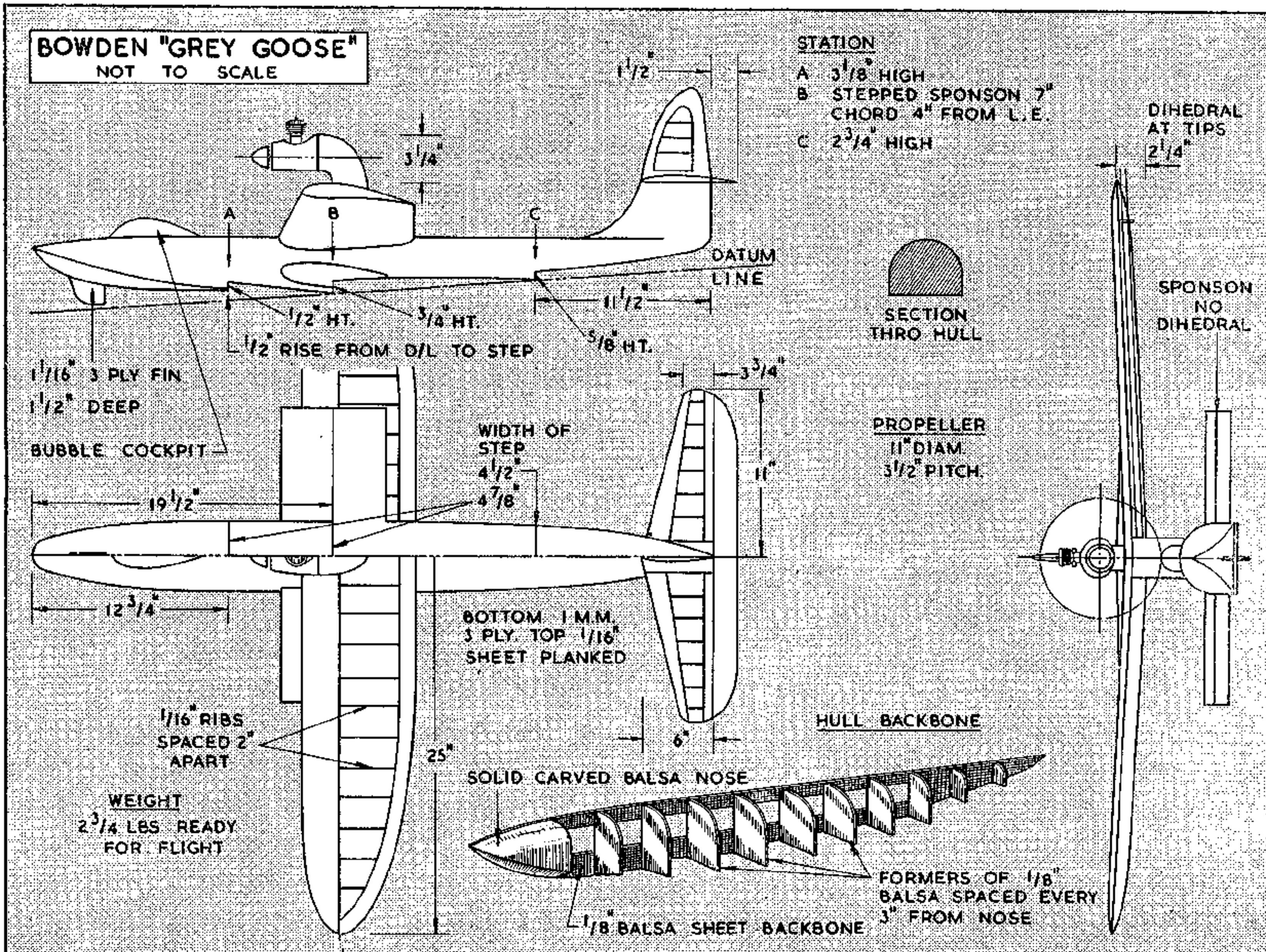
TABLE 3

Details of Commercial Rockets.

Unit	Thrust	Duration	Empty Weight
Jetex " 100 "	1·07 ozs.	20 secs.	0·625 ozs.
Jetex " 200 "	1·93 ozs.	40 secs.*	1·125 ozs.
Jetex " 350 "	5·06 ozs.	40 secs.*	2·5 ozs.
Brock's 1 c.c.	0·8 ozs.	5 secs.	0·3 ozs.
Brock's No. 3	2·5 ozs.	13 secs.	1·5 ozs.

* Or 20 secs., as desired.

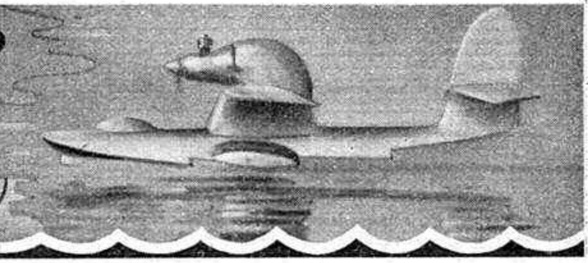
(Tests made by L.S.A.R.A.)


BOWDEN "GREY GOOSE"
NOT TO SCALE
STATION
A 3 1/8" HIGH
B STEPPED SPONSON 7" CHORD 4" FROM L.E.
C 2 3/4" HIGH
DIHEDRAL AT TIPS 2 1/4"
1 1/2"
3 1/4"
A
B
C
DATUM LINE
11 1/2"
1/2" HT.
3/4" HT.
5/8" HT.
1/2" RISE FROM D/L TO STEP
1 1/16" 3 PLY FIN
1 1/2" DEEP
BUBBLE COCKPIT
SECTION THRO HULL
SPONSON NO DIHEDRAL
3 3/4"
WIDTH OF STEP
4 1/2"
4 7/8"
11"
PROPELLER
11" DIAM.
3 1/2" PITCH.
19 1/2"
12 3/4"
BOTTOM 1 M.M. 3 PLY. TOP 1/16" SHEET PLANKED
1/16" RIBS SPACED 2" APART
25"
6"
HULL BACKBONE
SOLID CARVED BALSA NOSE
WEIGHT
2 3/4 LBS READY FOR FLIGHT
FORMERS OF 1/8" BALSA SPACED EVERY 3" FROM NOSE
1/8" BALSA SHEET BACKBONE

PETROL VAPOUR

BY LT. COL. C. E. BOWDEN

Control-line Flying Boats (cont.)



I FEEL that a third engine control line would be an advantage so that a reliable over water landing can be relied upon, although it certainly is fun manœuvring and whipping to ensure this without an engine cut-off.

One can safely say that a man who habitually makes a mess of landing a land C.L. model, or who is unable to land near a given spot will experience some hectic moments with a water C.L. model! Have you tried landing a series of touch-downs at a pre-selected spot? It is amazing how few people who rather fancy their chances at C.L. flying are able to land in a nominated quarter of the flight circle.

If you have a pond or a sheet of water, or go to the seaside for your holidays, you must in future take a C.L. flying-boat or a floatplane with you. The game can of course be developed into smaller speed flying-boats, etc., which will possibly loop and perform other stunts.

The Design Problem.

Before we examine my particular boat and why it handles on the water properly, it is worth discussing a few points which should be borne in mind if you are designing your own craft.

(1) In order to ensure taut lines at the critical beginning phase of the take-off, before the speed over the water builds up, a very long hull with a small under-water fin set outwards located at the nose is required. The long hull gives a good moment arm at very low water speeds.

(2) A long water-line should be used to prevent porpoising. This ensures that the model skids off the surface of the water on the tea-tray principle. Step angles should be kept fine. My first boat had too short a hull with too coarse angles. This is a fatal set up.

(3) Very ample sponsons are necessary, or the boat will drop the nearside sponson into the water at the beginning of the take-off run, when the weight and water drag of lines tend to pull the boat inwards and downwards. If this is not attended to, there will be no take-off.

(4) The model must be kept light so that it floats near the surface of the water when at rest. In this way the hull quickly rises on to the surface as the low-pitch propeller bites the air with engine screaming. A deep floating hull requires vast power to raise it on to the surface.

(5) The hull bottom should be of 1 mm. three-ply to resist damage of emergency landings over land and the hard smack of a dud landing on water. Steps are best flat for quick planing, but the bows should be veed to break up shock of dud landings and a nose-in.

(6) Light waterproof flyfishing lines are best, as they float on the water's surface at the beginning of the take-off. I personally dope mine with a special waterproofing material supplied for fishermen at the local sports shop.

Here I must digress for a moment, as it has a bearing on flying a large control-line flying-boat from a dinghy moored off shore, another branch of this new sport.

I have recently got what I consider to be the finest control-line accessory ever produced. I refer to the American "U REELY CONTROL" handle, designed and produced by the father of control flying, Jim Walker. It takes all the tedium out of C.L. flying, for there is no more winding and possible kinking of wire lines on to a separate drum after flying. The handle is very light being made with plastic housings. It is provided with a winding handle so that one can wind in the wires as the model is flying or let out the wires after a start, for there is a thumb-operated brake to the enclosed wire drums. One can start flying on very short lines (from a dinghy or an enclosed space) and when circumstances permit the lines can be let out up to about 70 ft. If a crowd of spectators gets too near, then one simply winds in the lines and shortens the flight circle whilst the model is flying! We want something like this over here on our market, but it must be light and well made like Jim Walker's handle.

Construction Details of the Flying-boat "Grey Goose".

The accompanying sketch and the remarks below should enable any reasonably experienced modeller to build a similar boat to mine if he wants to start off with a proved model as a jumping-off point for bigger and better things in the future.

The Hull. This is built up on a backbone of 1/8 in. balsa sheet. The top turtle deck is planked with 1/16 in. by ¼ in. balsa planks. The bottom is 1 mm. ply, or can be 1/8 in. balsa sheet if ply not obtainable. Cabin and tail pylons are built on and covered 1/16 in. sheet. Wing and tail are permanently glued and attached to the platforms, reinforced with plastic wood.

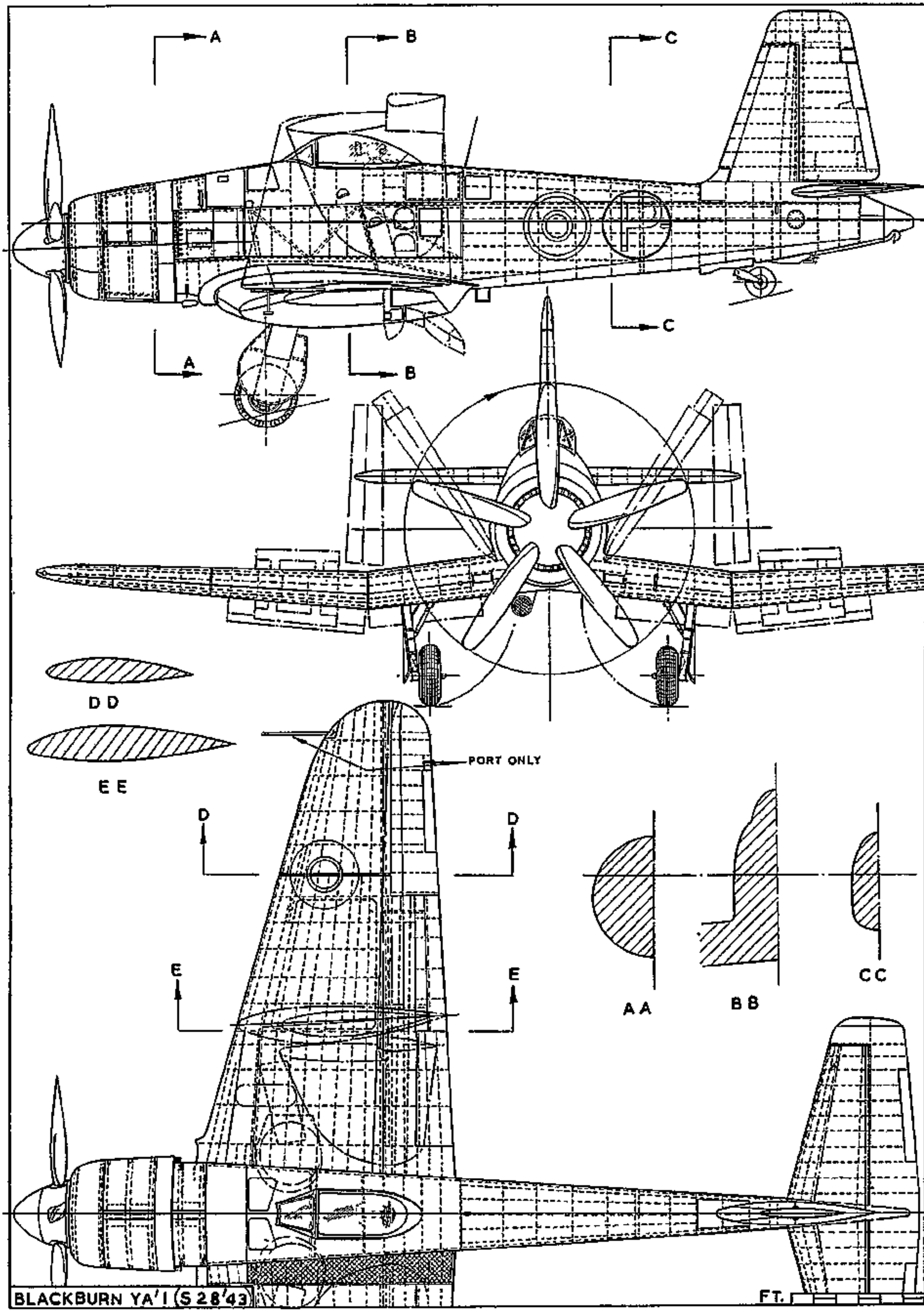
Wing and Tail. Built in my usual method as "Contest" builders will know, from 1/16 in. balsa ribs with sheet covering on leading edge and trailing edge, top and bottom. An engine nacelle is made from laminated balsa and fixed on to the centre section of the wing. This centre section is strengthened by covering top and bottom with 1 mm. ply to take centrifugal force loads. The Mark III E.D. diesel is mounted on to one of my usual elektron castings which makes it possible to quickly detach the power unit for cleaning or drying in the event of a "mistake in piloting". The mount is held to the nacelle by rubber bands and therefore thrust-line adjustment can be effected by slips of wood between mount and nacelle. The engine and mount are cowled in by sheet aluminium as can be seen in the photographs. The mount is set to look outwards slightly, and the fin is also set to fly the model out to keep lines taut.

Tail and fin are built up in the normal way, and the elevator is made from a streamlined sanded down 3/16 in. sheet of balsa, attached by fabric hinges, and having a 1 in. wire horn strengthened in the balsa by plastic wood.

Control Mechanism. This is external because sea water corrodes wire and metal parts, and is best left where it can be rubbed over with oil after flying. A 1/8 in. three-ply control plate is used and located below the port wing, well reinforced at the anchorage by plastic wood. The wires are carried through a balsa guide block below the wing tip. The block has brass guide tubes. A 14 s.w.g. wire connecting rod goes from control plate to elevator horn.

Covering. If it is the last piece of silk or nylon you will ever possess, it pays to cover a flying-boat with this sturdy fabric covering, for paper becomes waterlogged and breaks. I dope my fabric with full strength Cellon glider dope, covering with Cellon adhesive, because this does not become affected by water as photo paste does. A final coat of real boat varnish makes the whole affair waterproof. Only one thin coat, please, or the weight goes up too much.

Remember there are ponds and lakes all over Britain, and we are an island surrounded by sea. All this simply cries out for flying-boat work, and control-line flying now removes the difficulty that some find in procuring a dinghy to chase and retrieve a free-flight water-plane. I will therefore close by wishing you good control-line boating with wonderful takes off and landings on the drink every time!


A
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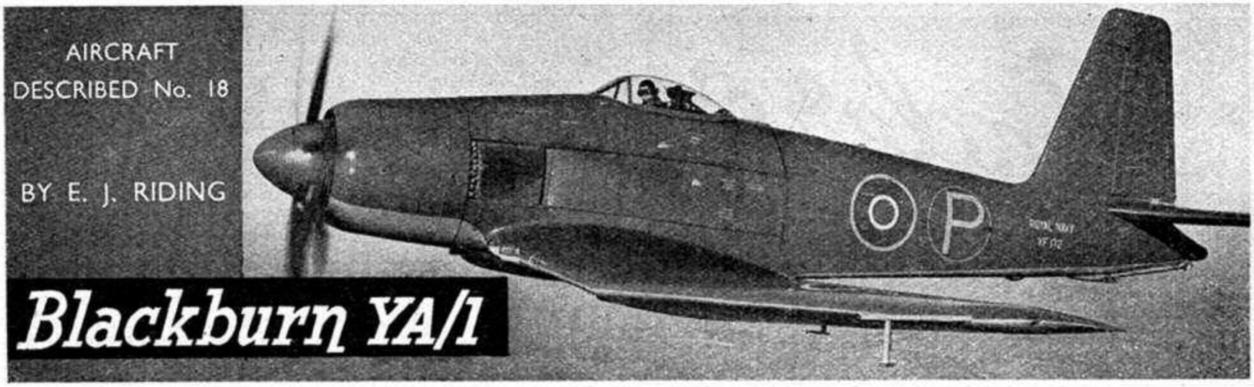
BLACKBURN YA'1 (S 28/43)
FT.



AIRCRAFT DESCRIBED No. 18

BY E. J. RIDING

Blackburn YA/1

LATEST of a long line of sea-going aircraft, the Blackburn YA/1 was originally scheduled to be a derivative of the Firebrand, to which it bears a strong resemblance. Blackburns have received an order for three machines, but it is understood that the type will not go into production. At the time of our visit, the third machine, VF.172, was receiving a final check over at Brough before going to Boscombe Down for its official trials. In outward appearance it is distinguishable from the other machine by the fact that the outer planes have had their dihedral angle reduced considerably.

Designed for operation with the Royal Navy as a torpedo/dive-bomber aircraft, the YA/1 embodies such modern features as mechanically operated folding wings, hydraulically assisted aileron controls, and dive brakes fitted to the upper and lower wing surfaces. The ailerons appear to give the machine a very high degree of lateral control, in fact Blackburn's Chief Test Pilot, Peter Lawrence, says that when doing consecutive rolls he logs 50 per cent. of his flying time as night flying because he is usually blacked-out during that period.

Power is supplied by a Bristol Centaurus 59, eighteen cylinder, double row, sleeve valve, two-stage supercharged, air-cooled, radial engine developing 2,475 h.p. and driving a five-bladed metal airscrew. The engine incorporates fuel and methanol/water injection systems, cooling being assisted by a fan mounted in the airscrew spinner. It is encased in a self-contained power egg (Power Plant Type "A"), attached to the fuselage front bulkhead at four points.

Construction. All metal. The fuselage is divided into two portions, the front one containing the pilot's cockpit being of steel tubular construction with detachable panels. The rear section is a frame and stringer light alloy monocoque structure joined to the front portion a short distance aft of the cockpit. The wing is built in five sections, comprising a centre plane and two outer panels, which are in turn sub-divided into an inner and outer section hinged for folding. The sequence in the folding operation is as follows:—

1. Outer section of extension plane folds upwards. 2. Inner portion complete with outer portion folded, is raised, the final position being shown in chain dotted line on the G.A. drawing. The operation is completed in about thirty seconds. The centre and outer planes are fitted with high-lift flaps mounted on roller guides.

Wing Section: NACA 3017 modified at centre section, NACA 66 at root end of outer plane, NACA 64 at tip. Fuel is carried in three tanks, one of 92 gallons capacity in each outer wing and one of 52 gallons capacity in the fuselage beneath the cockpit floor. This can be augmented by the addition of three drop tanks, one of 100 gallons capacity carried beneath the fuselage, and one of 45 or 90 gallons capacity under each wing.

The hydraulically operated undercarriage legs retract inwards into the centre plane, each wheel being equipped with pneumatic brakes, hand operated from the control column and working differentially in conjunction with the rudder controls.

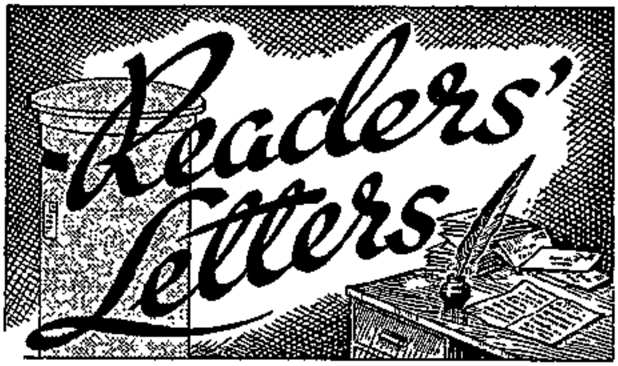
The fully castoring tail wheel assembly is retractable into the rear portion of the fuselage, the two compartment doors being automatically closed on retraction by means of a link system connecting the doors with the oleo cylinder.

Colour. Standard Navy camouflage. Red, white and blue roundels on fuselage sides and upper and lower wing surfaces. Red, white and blue fin flash. Yellow underside of wing, fuselage, etc., with black serial number. Yellow circumscribed "P" on fuselage.

Specification. Length: 39 ft. $7\frac{1}{2}$ ins. Span: 44 ft. $11\frac{1}{2}$ ins. Height: 18 ft. $1\frac{1}{4}$ ins. Wing Area: 361·5 sq. ft. Tare Weight: 10,500 lbs. Loaded Weight: 15,280 lbs. Max. Speed: 370 m.p.h. Cruising Speed: 260 m.p.h. Range: 400 miles at 260 m.p.h. at 10,000 ft. Service Ceiling: 33,000 ft.

Quarter-inch to one-ft. reproductions of the G.A. drawing may be obtained price 1/- from Aeromodeller Plans Service. Copies of photographs from Eaton Bray Studios at the usual rates.

"Aeromodeller" Photos.



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

DEAR SIR,

Although I feel sure you did it without malicious aforethought, your comment on Mr. Honnest-Redlick's letter (February issue) is likely to get me into trouble with the L.S.A.R.A. Let me hasten to say, then, that the L.S.A.R.A. report was written before the frequencies were changed, and I am not sufficiently an enthusiast of Radio Control to have noticed that the change was made.

I cannot comment on your contributor's experiments, except to say I would accept his judgement against mine any day. But we have managed to bring out our point—that Radio Control experts are far too insular. If only Mr. Honnest-Redlick would now sit down and write an article, on his work, with particular reference to :

(*a*) What is the best type of equipment and,
(*b*) Plans of a receiver and transmitter which can be made at home.

The "theoretical quarters" referred to by Ron Warring in the same issue—in connection with the venerable C.L.A.—is comprised of nearly all our theorists. At the moment I believe Walker, Annenberg and myself are on the duty rosta, taking it in turns to point out Warring's error every time he gets onto the subject. Nothing now can be said, except to point out that if the C.L.A. theory is correct, there is no excuse for a spirally unstable model. Yet Warring's fins seem almost invariably too small, since he has to add "anti-spin" fins. I do this on any model when my fin area guess is wrong but I usually hasten to make a new and larger fin to get rid of them. It seems that Warring's use of the C.L.A. theory is no different from my guessing, except it gives consistently low values for fin area, and has to be corrected.

May I make just this contribution to the argument? L.S.A.R.A. Report No. 6 *proves* that the C.L.A. theory is absurd: will Warring indicate where the mistake in that Report lies? If he cannot find a mistake, then obviously we must say goodbye for ever to the C.L.A. Surely this is not too much to ask of the writer who has done more than anyone else to popularise the theory in England.

Stanbridge, Beds. P. R. PAYNE.

DEAR SIR,

May I be permitted to reply to Mr. H. F. Weller's letter published in the Feb. issue. Mr. Weller dismisses my case for the professional without stating any *facts* for doing so. I maintain that the vast majority of aeromodellers, and I know quite a number, made their first successful model, directly or indirectly through the help of professionals. I am not ashamed to say that I did. Way back in about 1908 I bought a T. W. K. Clarke flyer for 2/6 and learnt more from this one professional model than all my then amateurish attempts put together. "The Kite and Model Aeroplane Association," the first organised body in this country was founded largely by pros. and the S.M.A.E., was definitely started by pro's. I could give names. I would remind friend Weller that it was not easy in those days to get people interested and often in competition the "active handful" competed against each other, in many cases pro's. against pro's., there being very few amateurs. Regarding trophies, Mr. Weller is probably correct about the position today, but my contention still is that the pro's. provided the trophies, did most of the donkey work and laid the foundation of the Aeromodelling movement as we know it today.

Mr. Weller implies that the amateur has nothing to thank the pro. for and is quite equal to him. This is rather confusing as I thought that the amateurs' complaint was that the pro. had an unfair advantage. If I have understood him rightly, I'm glad to be able to agree with him in that the pro. hasn't any unfair advantage over the amateur. To conclude, in this sport as in any other, may the best man win.

London, S.W.18. D. A. PAVELEY.

DEAR SIR,

As a purchaser and user of aeromodelling materials for nearly 20 years I look with fair displeasure upon the array of mediocre covering tissues now being offered for sale at not too low a price.

The best of these for light and medium work seems to be the material known as rag tissue. I have never seen or heard of it being obtainable in colours.

Can the explanation for this be that "it sells so who cares"? I sincerely hope not.

The monotony of a collection of all white models is rather discouraging to both the onlooker and the modeller alike, discouraging also is the effect of a coat of colour dope on the performance of anything but a large power model.

It has occurred to me that rag tissue may be manufactured primarily for some purpose other than aeromodelling; if this is so then I suppose we must be thankful for small mercies and put up with it.

If however this is not the case cannot something be done in the way of stirring the imagination of the manufacturers so that we might once again enjoy that measure of relatively trouble free flying with attractively coloured models which prevailed before the unfortunate war?

There would then be no need to import Swedish tissue which admittedly looks very nice but splits in all directions at the mere mention of a day's flying.

Godalming. C. S. WEST.

DEAR SIR,

In your February issue Mr. W. A. Tickman raises a complaint against British engines, and asks for "An English Arden or Dooling".

Exactly what qualities he expects I cannot find out, for whilst saying that diesels don't interest him, he asks for a petrol motor, with its "many components parts which all have an interest" and which "one can examine and test to find the trouble".

Surely one of the diesel's great advantages is its simplicity and reliability. Elimination of batteries, coils and condensers, etc., has removed perhaps 90% of the source of trouble in model engines.

As for "English Ardens or Doolings"—well I believe the British "Nordec" is a very near approach to the Dooling, whilst I see that a Mills diesel powered speed model has recently attained 85 m.p.h. as compared with the best the Arden ·099 has done in the States 76 m.p.h.

Further, I have seen Wilf Johnson's "Mousetrap" (54 in. span) powered with an Ohlsson 19. The performance was not spectacular. I have seen the same model powered with one of the first Rawlings 30's and myself flown a similar machine and can assure Mr. Tickman that the results are terrific, overpowered in fact.

Why should British Manufacturers copy American practice? By doing so we can never have superior engines, while at the present we have engines at least as good, especially in the smaller classes.

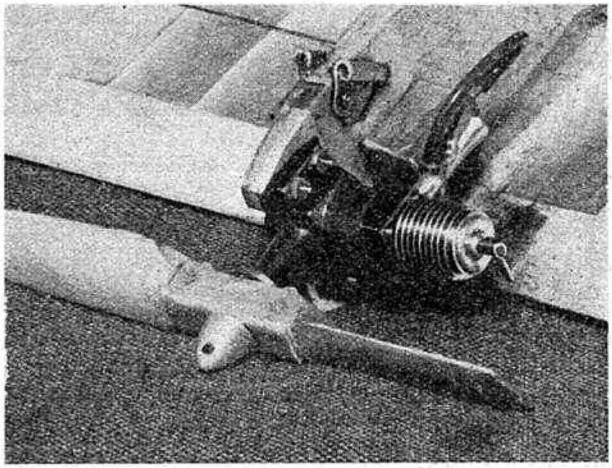
Stratford on Avon. RONALD DOUBLE.

'Cheetah' *(continued from page 247)*

7/10 in. for 1-7/10 in. Then taper the block at each end to a thickness of 2/10 in. starting this taper from a point 2-3/10 in. distant from each end. (See Fig. 1.) Now proceed to carve the propeller in the normal way, leaving the narrow centre section untouched (this is where the dural channel section plate fits to form the hinges) noting that the flat untapered side is the front of the propeller. Carve the blades to a Clark Y section. Having completed the carving, sandpaper the whole to a good finish and prepare the dural plate to form the centre hinges. This will be a plate approximately 1-7/10 by 1-8/10 in. bent as shown in Fig. 2. I actually use the propeller as a former to bend the plate on as this ensures a really perfect fit, which is very important. Having bent the plate, put it over the centre section of the prop. and drill the 3/16 in. clearance hole for the shaft of the engine. You now come to the part where you must be extra careful—the fitting of the hinges. Personally I use $\frac{1}{8}$ in. soft brass rod, but I have used one of the alloy knitting needles with equal success. To fit the hinges proceed as follows. Leave the plate on the centre in position and turn the propeller over onto its front, then mark off two lines, each $\frac{3}{8}$ in. each side of the centre. Now remove the dural hinge plate and carefully saw through the propeller at these two lines. This gives you the two blades (Fig. 3).

Put one blade back into the dural hinge and carefully drill a $\frac{1}{8}$ in. hole through (this is presuming you are going to use $\frac{1}{8}$ in. pins for hinges—if you are going to use a different size, drill accordingly). Make sure the drill is at right angles to the side of plate. This is shown in Fig. 4.

Repeat for remaining blade. Now carefully radius off the ends of the blades as in Fig. 5 and try them in the centre. With a $\frac{1}{8}$ in. pin pushed through make sure that they will fold right back—if they do not, round off the radius at the end a little more. Having made sure they fold O.K. put them in, put your $\frac{1}{8}$ in. pins through and rivet securely over. I rivet mine so that the blades are quite stiff to fold, they fold back quickly enough when they hit anything and it makes it easier to start the engine until you get used to the folding propeller.



The above photograph shows the engine mounting and folding airscrew as fitted to the original "Cheetah". Note the simple but efficient set-up of all components. In this underneath view the rolled metal tubes for the drop-off undercarriage can be clearly seen, together with the homemade wedge tank.

If you find the thickness of the centre section too much and you feel the propeller securing nut has not sufficient threads gripping, don't risk stripping the nut, but recess the back of the centre section with a file, using a thinner centre-block, shown in Fig. 6.

Full-sized plans are available 2/- post free from Aeromodeller Plans Service, The Aerodrome, Billington Road, Stanbridge, Nr. Leighton Buzzard.

American Newsletter *(continued from page 243)*

California, call for Infants exclusively and include endurance, precision, U-control speed and U-control precision. Free flight precision was judged by minimum number of seconds away from $1\frac{1}{2}$ minute average of three flights, Endurance by three-flight total with a $4\frac{1}{2}$ ounce loading per 100 square inches. Held in a parking lot of only 400 × 600 feet in size, both contests made hit—specially with small-fry spectators.

Climbing on the radio control bandwagon, the writer and Walt Schroder got excellent results with a six-foot, six-square foot cabin model powered by an Ohlsson 60. Used Beacon Electronics (Good brothers design) equipment for rudder only control . . . Mel Anderson supplies pix and drawings of new ·045 Baby Spitfire. Weighs one ounce . . . Trend in stunt seen in De Bolt's 676 square inch stunter for ·60 engines. Is six inches bigger than free-flight Zipper, claims near 100 m.p.h. level speed . . U-control is slight slump for past six months. Many builders losing interest in pointless speed, exposed crutch airplanes, with a trend toward better looking machines flown for fun . . . Bill Tyler, indoor, class B, open stick record holder at 26 minutes plus is fooling with three geared (connecting rods, actually) motors . . . the 18th Nationals to be held again at the huge naval air station at Olathe, Kansas, with provision for 2,000 entrants. Dates of July 26–31 conflict directly with Wakefields, but time is that of best weather. Also, corn is not high (location in corn belt) permitting good chances of ship recovery . . . many builders think new Wakefield rules aimed against American type of flying and feel this event is international enough to justify international control. . . C. O. Wright, prominent in Kansas State Teachers Association re-elected as A.M.A. president. Nation wide traveller "C.O." is best president in A.M.A. history. Both "C.O." and son, "C.O. 2" are prominent free flighters . . . Carl Goldberg developing a free flight kit. Indications that free-flight will stage a comeback. With competitive U-control proving that it, too, has feet of clay, builders have to make something . . . Trend definitely is away from big engines, hobby shops currently reporting biggest interest in 23 to 29 cubic inch displacement . . . Bell City Aeromodellers, of Bristol, Connecticut recently put on exhibition of control-line flying before International League Ball game, with jet, stunt, and speed. The crowd loved it. Last fall, the half time period in a Canadian football game was given to a demonstration of U-control. Quoted Model Airplane Newsletter to the trade, "This activity of the hobbyists created much interest and illustrated one of many opportunities by which both dealers and fans can bolster the position of the hobby".

To The Trade . . .

We are preparing further TRADE REVIEWS. Manufacturers and Distributors are invited to send specimens as prepared of ANY ARTICLE, free flight as well as control line for test and impartial review. We do not review any product unless a standard article is submitted.

Modellers' Menu . . .

★ **PLANS:** "SEABEE" flying scale amphibian (H. J. Towner). British record holding gliders. "COBRA" (R. Twomey); "JET TRAINER" (R. C. Jude)

★ **ARTICLES:** "THE WAKEFIELD MODEL" (Van Wymersch) "SPOTTING DIESEL TROUBLES" (R. Burns) "WOUND FORMERS" (R. A. Alexander).

★ ALL THE REGULAR FAVOURITE FEATURES

For your future digestion in next month's

AEROMODELLER

S.M.A.E. NEWS PAGE

All enquiries to the Hon. Secretary S.M.A.E., Londonderry House, Park Lane, London, W.1.

Wakefield Cup Contest, 1949.

Pending final considerations, Cranfield, Bucks., site of the Royal Aeronautical College plus aerodrome, is all set as the venue for the 1949 Wakefield Cup Contest, with two International Power contests on the following day. Advance information suggests this venue is little short of terrific, not only from the flying point of view, but also the "four-star" accommodation for the overseas contestants.

There is a Trophy Missing.

Have you seen or heard of the C.S.S.A. Trophy just recently? Or what was the latest information you had on it? If you do have a line on its whereabouts please rush the information to the Records Officer, Mr. C. S. Rushbrooke, at Londonderry House, Park Lane, W.1. And that goes for any other unaccounted for S.M.A.E. trophies there may be around. Could you do that, please?

New Speed Record Category.

Of undoubted interest to the control-line speed men is the additional class of 2·51 c.c.–3·5 c.c. With hot British engines in the offing in that group, plus its suitability for the ·199 cubic inch (i.e. about 3¼ c.c.) capacity, the classification should become popular.

As has been published, sanction is required to attempt to set a new speed record. Whilst final details of the sanction requirements are being worked out by the Control-line Sub-Committee (Messrs. R. Moulton, W. A. Dean, and R. H. Warring), clubs holding open days throughout the year should apply for sanction and so give every opportunity for new records to be turned in. The first meet to be sanctioned is the South Eastern Area Control-line Rally at Dover on Easter Monday, April 18th.

Waiting Time on New Records.

Henceforth there will be a waiting period of two months between the provisional acceptance of a new record (both free-flight and control-line) and, should no objection be raised during that period, the final ratification.

The first two records to come under this ruling are J. Marshall's (Hayes & D.M.A.C.) Outdoor Power Tailless time of 1 min. 50·8 secs. on Hounslow Heath, 13th February, 1949, and R. Booth's (Manchester M.A.C.) Indoor Free-flight H.L. Tailless time of 53·3 secs. chalked up in the A. V. Roe & Co. Design Office on 17th January, 1949.

The specifications of these aeroplanes are as follows:—Marshall used a 48 ins. span, 354 sq. ins., 16 oz. aircraft powered by a Mills Mark II (pusher type) to capture his record; Booth flew a small delta wing aircraft of 12 ins. span and 37·88 sq. ins. area for his attempt. It weighed but ·06 ozs. and was powered with 3 strands of 1/32 in. rubber, 9½ ins. long.

Both records are provisionally accepted and receive final ratification in two months' time.

Omission from the Published Record Lists.

There is a blank space beside the Indoor Free-Flight H.L. Fuselage Record in the published lists and this category should be accredited to Mr. D. Gilbert with a time of 6 min. 44·4 secs., for a flight set up before the war.

Another correction to the list is the initial to Mr. Young, holder of the Outdoor Rubber-powered Biplane record. Correction is the K. to J. O. We want to make this correction particularly, as "Joe" Young of the Harrow Club was killed in the recent war.

Area Officials Conference.

A newly-conceived meeting is the Area Officials Conference on 24th April, 1949. Such a meeting as this will give opportunity for discussion of area problems and organisation and should make for closer and even better area relations.

Merit Certificate Awards.

The following Merit Certificates were awarded, on February, 27th, 1949:—

No. 255 F. Mason (Saints)
No. 256 B. G. Boyle (Mancunian)
No. 257 D. Morgan (Wigan)
No. 258 N. W. Verney (R.A.F. Middle Wallop)
No. 259 M. Wickens (North Kent)

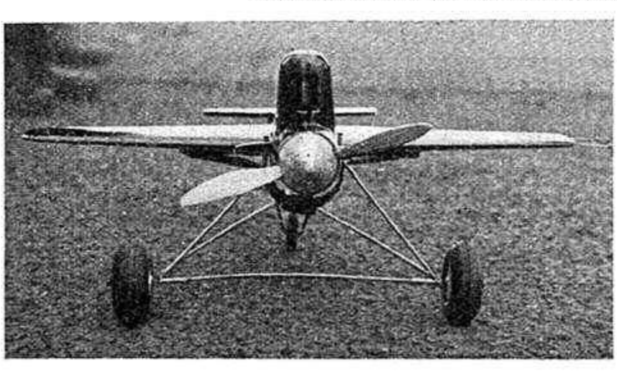
The Wakefield Fund.

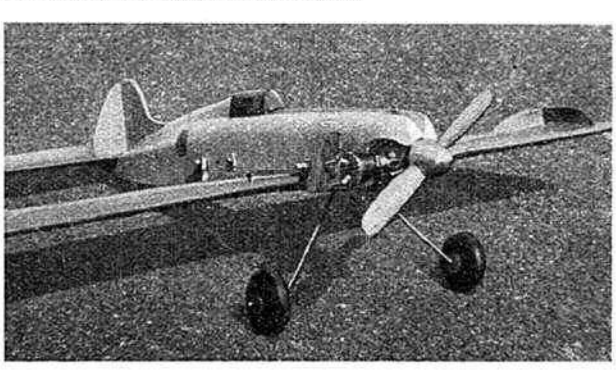
It will be appreciated that in view of the fact that the S.M.A.E. will be playing host to the Wakefield contestants this year, contributions to the Wakefield Fund will be very gratefully received.

Do you feel your support is being requested? You are right, it is. All contributions will be duly acknowledged.

E. J. BUXTON,
P.R.O., S.M.A.E.

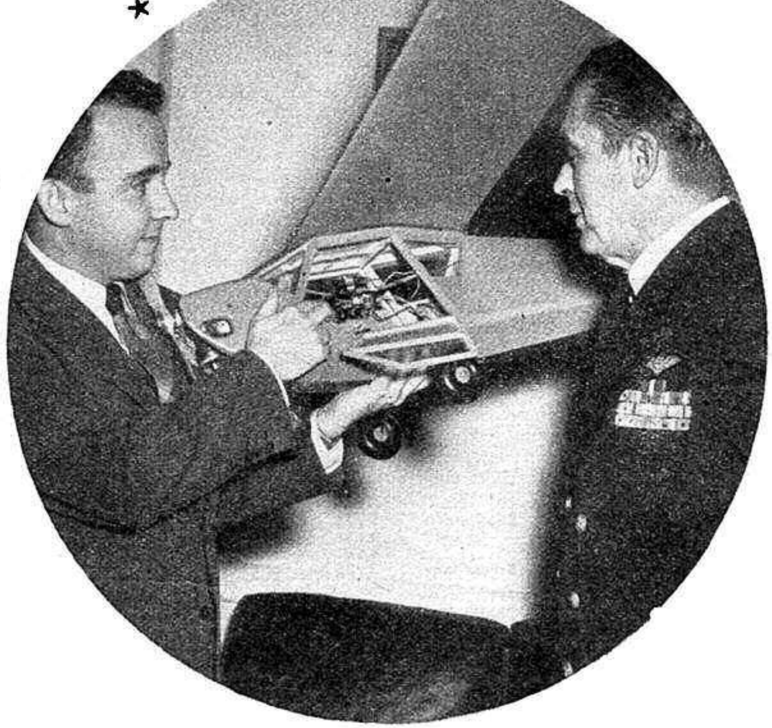
Photos below by K. J. Miller of Croydon show, left, Cyril Shaw's super finish McCoy 49-powered speed control-liner, and right, an attractive stunter by Dennis Allan, powered by a twin ignition Super Cyclone





CLUB NEWS

BY CLUBMAN



Dr. Walter Good of the A.M.A. explaining his R/C. model to Admiral E. C. Owen.

MANY clubs who have been handicapped by losing the use of R.A.F. airfields for their outdoor activities will welcome the news that the S.M.A.E. has now concluded satisfactory arrangements for the provision of an Insurance cover to meet the Air Ministry requirements for a Deed of License and Indemnity of £25,000. For the very nominal sum of 25/- per annum, a policy is now made available on application to the Secretary of the S.M.A.E., Londonderry House, Park Lane, W.I.

Whilst very appreciative of American methods and hospitality, I doubt if I could be accused of wanting English aeromodelling to follow the American pattern. One thing I do whole-heartedly admire, however, is the way in which official bodies back the hobby in the States, and the manner in which the resources of Service accommodation and personnel are placed at the disposal of the organisers of aeromodelling meetings, vide the 1948 Wakefield event reported in the October, 1948, issue.

Now news comes through that, for the second year running, the U.S. Navy has announced a year-round support for model aeroplane enthusiasts, which includes the sponsorship of all kinds of events, the most important being the staging of the 1949 " Nationals " again at Olathe (huge Navy Air Station in Kansas) in collaboration with the A.M.A. In his message enjoining individual Naval Commands to support the model aircraft movement, Secretary of the Navy John L. Sullivan said : " I desire to encourage further, active participation by the Navy in this valuable aviation training programme by promoting model airplane building, and local, regional and national meets."

In announcing the sanctioning of the 1949 model aviation classic, the A.M.A. Contest Board and officials expressed the belief that Navy support of the national aeromodelling programme constitutes the greatest single boost given the activity since its inception.

Can you imagine our status should the R.A.F. come through with such practical backing of our activities ? Instead of which, what do we find ? The powers-that-be in this country are so short-sighted that they even prevent Station personnel clubs from flying on their own station pending the taking out of the aforementioned £25,000 cover, which, until the S.M.A.E. fought the case was an entirely impractical proposition.

Oh for a pair of American pattern scissors for Red Tape, cutting, for the use of. May I suggest to the Society the dispatch of copies of the American programme to some of our Service heads, even though personal experience of R.A.F. methods convinces me that the matter would never get beyond a moustache-bound adjutant (if that far) and be finally lost amidst miles of red ribbon and—that term expressive of all that is obstructive—" bull ".

The first Council Meeting of the newly formed **SOUTH EAST OF SCOTLAND AREA** took place at Edinburgh on February 12th. Main item for discussion was the 1949 contest programme, when arrangements were made for all semi-centralised contests. Thus for the first time the Scottish aeromodellers will be able to compete for National honours on their home ground. Those wishing further details and particulars of the Wakefield eliminators can get same by contacting H. F. Grieg, of 19, Loughborough Road, Kirkcaldy, Fife.

The date of the **NORTHERN AREA** Rally at Baildon has been provisionally fixed for July 17th. Programme details will be announced later.

The **WESTERN AREA** announce a West of England Control Line Rally to be held at Weston-super-Mare on July 3rd, for stunt, scale, jet and speed. Details of this and other meetings obtainable from E. G. Elliott, 131, Salisbury Road, Downend, Bristol.

An ambitious affair will be the **SOUTH EASTERN AREA** control line championships at the Crabble Athletic, County Cricket Ground, Dover, on Easter Monday, April 18th, commencing at 11 a.m. A full programme includes all classes of C/L work, and will introduce a scale stunt class for the " Skipworthy Trophy ". I understand that some French competitors are expected, so this should be worth a visit, and I intend to be there. Full details can be obtained from H. D. Austen, 1a, Balfour Road, Dover, Kent.

Having had to give up the idea of using Haddenham Aerodrome for their rallies, the **SOUTH MIDLAND AREA** will stage a full scale affair on May 15th, at Aldermaston Aerodrome, near Reading. Events will include the Wakefield eliminator, power ratio, open glider, junior open rubber, and what is termed an " all-in " control line event. Should be fun working out the points between stunt and speed classes, and I suggest a roped-off area wherein the contestants and judges can fight it out to the enjoyment of the interested lookers-on !

I was fortunate in being able to attend the Indoor Flying Rally staged by the **MANCHESTER AND DISTRICT COUNCIL OF MODELLERS** on February 20th. Held at the usual venue in Manchester, this year brought out only two Area Teams to compete for the "Daily Dispatch" trophy, and for the first time the London boys had to return without the ironware. A very strong Northern Area team, consisting solely of Sheffield club members, had obviously practised very assiduously, and their times were well ahead of anything seen before at these meetings. Record holder Muxlow was overshadowed on this occasion by his team-mate Blakey, and I hear on the grape-vine that no-one will be surprised when this chap pushes the r.t.p. record up still further. He got within three seconds of Muxlow's record time at this meeting, under conditions not at all conducive to record breaking.

It is apparent that interest in this type of flying has taken a nose-dive, even the usual hot London team not being up to standard. I had the feeling that they "couldn't care less", which is hardly the spirit in which to tackle such a contest. Organisation was hardly up to scratch, coupled with a sad lack of showmanship, which was a pity in view of the large crowd of spectators lining the balcony. I would further suggest that speed r.t.p. flying be kept to club nights, this being neither interesting or spectacular enough for such a meeting. One further observation which I trust will be noted by the organisers is that the main event of the day, i.e. the Team Contest, should be held before the individual events, as it was very noticeable that many machines flagged in performance as the day wore on, as a study of the results amply indicates.

INDIVIDUAL CLASS A.

1.	E. Muxlow	Sheffield	5 : 28	5 : 33·5
2.	J. Parsons	,,	4 : 57	4 : 46·4
3.	J. Blakey	,,	6 : 02	—
4.	J. Wingate	Streatham	2 : 35·7	2 : 54

INDIVIDUAL FREE-FLIGHT.

1.	E. Muxlow	Sheffield	4 : 57·4	4 : 58·5
2.	J. Wingate	Streatham	1 : 36·5	2 : 41·6
3.	R. Booth	Manchester	1 : 55·3	1 : 55·3
4.	I. Dowsett	Brentford	1 : 24	1 : 55·5

INTER-TEAM CONTEST.

1. NORTHERN AREA	J. Blakey	5 : 27·1	4 : 54
	J. Parsons	4 : 00·1	3 : 42
Score : 1945.6	E. Muxlow	3 : 15·5	3 : 10
	C. Exley	4 : 38	3 : 19
2. LONDON AREA.	J. Knight	—	3 : 37
	J. Wingate	4 : 10	4 : 39·8
Score : 1194.8	R. Kreeger	2 : 32	2 : 47
	L. Barr	2 : 09	—

SPEED CONTEST.

1.	F. F. Heaton	Whitefield	31·8 m.p.h.
2.	G. Borr	,,	28·8 m.p.h.

The evening preceding the Manchester meeting I had a thoroughly enjoyable time at the **CHESTER M.F.C.** dinner. This newly affiliated club seems set for a good season, and has plenty of scope with a fine airfield and some very good builders, if the examples exhibited around the dining room are any criterion. E. Meredith carried away most of the club trophies for the past season, no less than five cups now requiring cleaning in the Meredith household! Other trophies went to Frank Wilde, D. Cave, and juniors M. Chidley and S. Evans. The entertainment provided by illusionist W. F. Gilbert was a scream, his droll patter being well suited to an aeromodellers' gathering!

The **COLCHESTER S.M.E.E.** is holding an exhibition from the 2nd to 9th April inclusive, and support from surrounding clubs is invited. The model aircraft section fly week ends at Boxted Aerodrome, with weekly meetings for indoor flying, etc., at St. Mary's Maw Hall on Tuesdays at 7 p.m.

Members of the **WARRINGTON M.F.C. (Y.M.C.A.)** had a most unusual complaint to deal with at the local Agricultural Show last year, to the effect that too many people were ignoring the rest of the show to watch the boys put over a control-line stunt exhibition! Can forsee the farmers teaching their cows to rumba as a counter attraction in future shows!

June 18th will see the Sports Day staged by Vickers Armstrongs at the Byfleet ground, to be followed on the Sunday by a Control-Line Gala under the auspices of the model aircraft section. Full details can be obtained from the Secretary at "Rosemary", Queen's Avenue, Byfleet, Surrey. I understand the ground is large enough for four full-size football pitches, so there should be enough room to try out that 1 c.c. powered job!

Recent fly-off of the **ST. GEORGE'S HEIGHTS M.A.C.** challenge speed trophy resulted in a win for M. Lee with a speed of 78·6 m.p.h. (McCoy 29), breaking the existing club record in the process. This followed a serious prang in the morning which necessitated rebuilding the whole nose end. The rapidly increasing number of 10 c.c. engines will make this record short lived. This club is looking for a new club meeting hall in the Weybridge district, having lost their previous place owing to fuel oil being allowed to clutter the floor. (I would say they deserve to be without if that is the way members look after facilities!)

The recently formed **WESTBOURNE M.A.C.** now exceeds the thirty mark in membership, and is steadily increasing. Main activities have been taken up with C/L work, the first comp. (held on January 30th) being won by R. Bellis with 151 points.

Scotland seems to be waking up in the aeromodelling sphere lately, news now to hand from the **FALKIRK & D.M.F.C.** giving news of an exhibition they held at the end of January. P. McQueen won the "Building Contest" with his "Ethereal Lady", J. Shanks and T. A. Hatton being the place men. Contests during last season were howling gales rather than howling successes, but that is most definitely not a Scottish monopoly.

Many interesting projects are under way with the **PIONEER SCALE A.C.** A considerable variety, includes an Interstate L.6, Hornet Moth, Dichi (Jap), Tiger Moth, Bristol Fighter, Tempest, Stinson Reliant and Typhoon. In that lot only one is control line. Can you wonder that the Ealing club changed its name?

The **WORCESTER M.A.C.** has been kept active largely by C/L flying during the winter, having been without indoor facilities until quite recently. Consequently Reg. Parham has done no r.t.p. work, but has several models just asking for another go at the British records. Reg. did turn out with a rubber powered Canard, and got within 5 seconds of the existing record with a flight of 93 seconds.

First news from the **MANCUNIAN M.A.C.** indicates that an effort to create the team spirit has resulted in four teams being formed within the club with a view to getting plenty of practice for outside events. C/L flying took the boys by storm last year, G. Boyle winning the challenge trophy. Records for this club stand at 4 : 55 for sailplane, 3 : 30 for power, and 3 : 20 for rubber powered jobs.

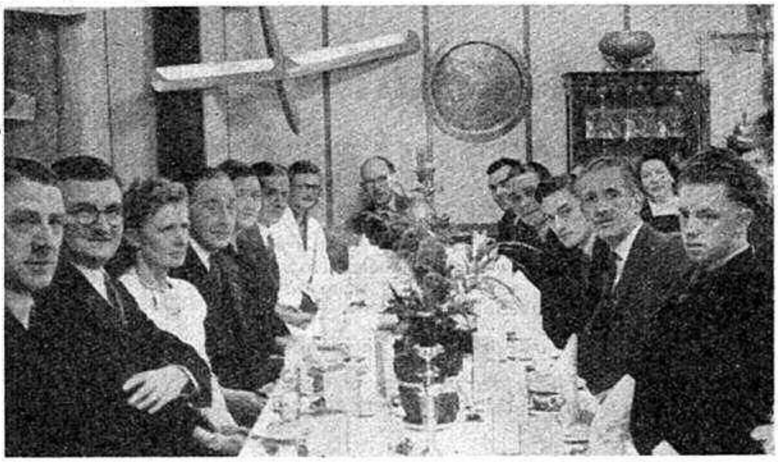
The **LEICESTER M.A.C.** press secretary in announcing a semi-scale precision type contest writes: "We intend to encourage this type of model as much as possible in the future for I am sure that if it became more popular it would be of infinite value to our hobby, and so help the public to believe that we really do make 'model aircraft'. At present I can fully understand a person who refuses to take us seriously when they see some of the weird contraptions which hurtle skywards (and more often than not earthwards) from our flying field". I couldn't agree more!

Members of the **ABERDEEN M.A.C.** have now recovered from their exertions at the first post-war exhibition, opened by Lord Provost Duncan Fraser. In his opening address the Provost said: "there are far too many people to-day in the role of spectators at various sports without taking an active part in the games. In this respect aeromodelling compares more than favourably with football." Well chosen words sir, and I am pleased to note that you have been widely quoted in the Scottish press. The show, with over seventy models staged, was an unqualified success from all angles.

Den Allen and "Funf" Taylor of the **WEST ESSEX AEROMODELLERS** hope to have their radio-control jobs flying by the end of April. From all I hear of these machines, we shall have quite a sizeable entry for the event at the Nationals . . . and that contest was exempted from the "minimum of ten" rule for this year's official programme! Interest in free-flighters is on the increase in this club, though C/L still reigns supreme. Lightweight glider fans are preparing for the year's contests.

The **PRESTON & D.M.A.C.** membership has shown a favourable increase recently, but more keen modellers are needed. Mr. Taig has raised the club C/L speed record to 56·95 m.p.h. with his Elfin powered model, and Sharples has at last shown them how to stunt . . . and with an Amco! Activities are swinging to Wakefields now that the Trials are getting near.

Several well known modellers will be recognised from this photograph taken at the Chester M.F.C. dinner held recently.



Formed last May, the **WHYTELEAFE AREA F.M.C.** has faced the usual bans and antipathy of the local residents, but still bashes on regardless. The chairman is building for radio control, and plans are being laid to convince the local council that aeromods are a worthy part of the community. Club C/L speed record is 125 m.p.h. using a McCoy.

As a contrast to conditions around Whyteleafe, the **QUINTON** (B'ham.) **M.A.C.** meet regularly each week in premises provided by the Birmingham Education Committee. The club voted its subs (weekly) at 1/6 seniors and 6d. juniors, a very worthwhile fee, as I am sure that 99 per cent. of the clubs that go out of existence do so owing to their subscription finance being far too low for adequate services. How can any club operate efficiently on as little as 5/- per annum!

After four years in temporary "lodgings", the **BELFAST M.F.C.** has at last procured premises, and plans are under way for the installation of workshop equipment, etc. As is usual at this time of the year there are dozens of "world beaters" on the board, which will not be seen until the big two-day exhibition due for the 6th and 7th May.

Main news from the **BURNLEY SKYRANGERS** is of a joint club effort radio control job. The model, a "Stentorian", is almost completed, and rudder-cum-elevator control is featured. Heaven help the bod who prangs it when it's his turn to fly!

To round off the indoor winter flying season, the **SOUTH NOTTINGHAM M.F.C.** arranged a free-for-all among the more enthusiastic "tissue and microfilmies". The only r.t.p. model entered was the winner, all others being free-flighters. D. Boulton totalled 6 : 03 for four flights, B. Walker 4 : 01 and J. Howard 3 : 15.

Mr. Pashley of the **OSWIN AVENUE M.A.C.** has reached 78 m.p.h. with a Mills-powered Mustang after much whipping, while search is still being made for the bod who attempted to loop from a hand launch—and nearly brained the launcher!

Henry Tubbs of the **LEEDS M.F.C.** won the Anderton Cup for the third year in succession as all-round champion, the power trophy going to P. Albericci. Ken Foster reached 90 m.p.h. with his souped up E.D., which I understand has been modified so much that it is now unrecognisable by the makers! Seven Wakefields were out on test recently, all giving much satisfaction by the end of the day. (That's strange to me . . . I'm usually minus model by that time.)

The "pen-friend" of the Swedish paper "Teknikens Varld" invites readers to take up correspondence with Swedish enthusiasts. Those interested should write to Karl Gunnar Knutsson, 27B Lastmakaregatan, Stockholm, Sweden, stating name and address, age and sex, aviation and other interests and hobbies.

Also seeking pen-friends are Zbynek Macha, Praha-XV-Branik, Jasna-697, Czechoslovakia (main interest 1914/18 warplanes), and D. McKay of the Cottage, Summerland, Caswell Hill, Mumbles, Swansea, who wants someone around the 13–16 mark.

That brings us to the end of the March batch of reports, etc. and here goes for a bash at the 1949 contests. I trust you have all got your jobs in good order, and ready for an all-out effort at comps., records and what have you. Good luck, and remember the D.T.

The CLUBMAN.

NEW CLUBS

MAIDENHEAD AEROMODELLERS CLUB.
A. W. Cox, 15, Spencers Road, Maidenhead.
WESTBOURNE M.A.C.
C. F. Simmonds, 54, Belmont Road, Upper Parkstone, Dorset.
THAMES VALLEY M.A.C.
P. Taylor, 31, Eastbury Road, Kingston, Surrey.
NORTH WOOLWICH & D.M.A.C.
J. G. Jessop, 56, Liffler Road, Plumstead, S.E.18.
READING SOLID MODEL SOCIETY.
D. J. Weekes, 41, Kenilworth Avenue, Reading.
ZENITH M.A.C. (Formerly Chilwell Junior M.A.C.).
J. Wilson, 3, Charles Avenue, Chilwell, Beeston, Notts.

SECRETARIAL CHANGES

WEST KENT M.A.C.
A. Walsh, 3, Glebe Way, West Wickham, Kent.
NEWPORT & D.M.F.C.
R. Morgan, 24, Ty-Coch, Cwmbran, Nr. Newport, Mon.
COVENTRY & D.M.A.C.
R. T. Abbey, 153, Capmartin Road, Coventry.
BRIXTON DISTRICT F.C.
F. Fleming, 9, Wynne Road, London, S.W.9.
ASHFORD & D.M.A.C.
R. Webb, 221, Godinton Road, Ashford, Kent.
MERSEYSIDE M.A.S.
R. A. Alexander, "Barach," Storeton Lane, Barnston, Ches.
OSWIN AVENUE M.A.C.
D. Threlfall, 136, Bentley Road, Doncaster.
LEEDS M.F.C.
L. Mann, 100, Crossgates Lane, Seacroft, Leeds.
REGENT'S PARK M.F.C.
E. J. Tink, 6, Dunollie Road, Kentish Town, N.W.5.
BLACKHEATH & HALESOWEN M.A.C.
D. C. Roberts, 34, Stennels Crescent, Quinton, Birmingham 32.
CHARNWOOD M.A.C.
H. Emerey, "Bowling," Newton Lane, Markfield, Leicester.
CHESTER M.F.C.
F. Hammond, 144, Foregate Street, Chester.
NORTH WEST AREA S.M.A.E.
R. Musgrove, "Marcka", North Gate, Garden Suburbs, Oldham.
TIMPERLEY & D.M.F.C.
J. H. Read, 5, Farndon Drive, Timperley, Ches.
ST. ALBANS M.A.C.
L. Howell, 112, London Road, St. Albans, Herts.
WEETON (R.A.F.) M.A.C.
2384714 AC/2 Holland, E, Hut X46, No. 2 Wing, R.A.F. Station, Weeton, Nr. Preston, Lancs.
EAST BIRMINGHAM M.A.C.
A. D. Sanson, 28, Ingestre Road, Hall Green, Birmingham, 28.
LEICESTER M.A.C.
A. H. Harrott, 9, Sandhurst Road, Leicester.
CHORLEY & D.M.A.C.
H. Cook, 45, Chapel Street, Chorley, Lancs.
MALDEN & D.M.A.C.
D. W. H. Bond, 10, Oxford Crescent, New Malden, Surrey.
SEVENOAKS & D.M.A.C.
N. F. Couling, 8, Manor Road, Sundridge, Sevenoaks, Kent.
GOSPORT & D.M.F.C.
G. Elgood, 126, San Diego Road, Gosport, Hants.
GODALMING & D.M.F.C.
T. D. R. Redman, "Crossings" Quarter-Mile Road, Godalming, Surrey.
ROCHDALE & D.M.F.C.
H. Fitton, 140, Bolton Road, Rochdale, Lancs.
ERDINGTON & D.M.A.C.
A. A. Rutter, 39, Belvedere Road, Birches Green, Erdington, Birmingham, 24.
GRANGE M.A.C.
R. A. Harvey, Farnborough Grange Hostel, Hawley Lane, Farnborough, Hants.
CANNOCK CHASE M.A.C.
J. R. Whorton, 170, The Square, Norton Canes, Cannock, Staffs.
MID-SUSSEX A.M.C.
W. Robins, 11, Hanbury Lane, Haywards Heath, Sussex.
WHITEFIELD M.A.C.
R. Woodhouse, 32, Chapel Road, Rainsough, Prestwich, Lancs.
PRESTON & D.M.A.C.
G. Fare, 61, London Road, Preston, Lancs.

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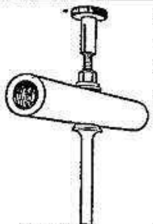

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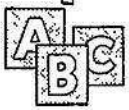

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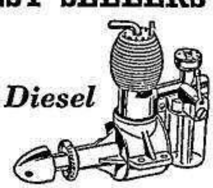

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8 in.× 8 in. ..	4/6	10 in.× 12 in. ..	5/9
8 in.× 10 in. ..	4/9	11 in.× 6 in. ..	6/–
8 in.× 12 in. ..	4/9	11 in.× 8 in. ..	6/–
9 in.× 4 in. ..	5/–	11 in.× 10 in. ..	6/3
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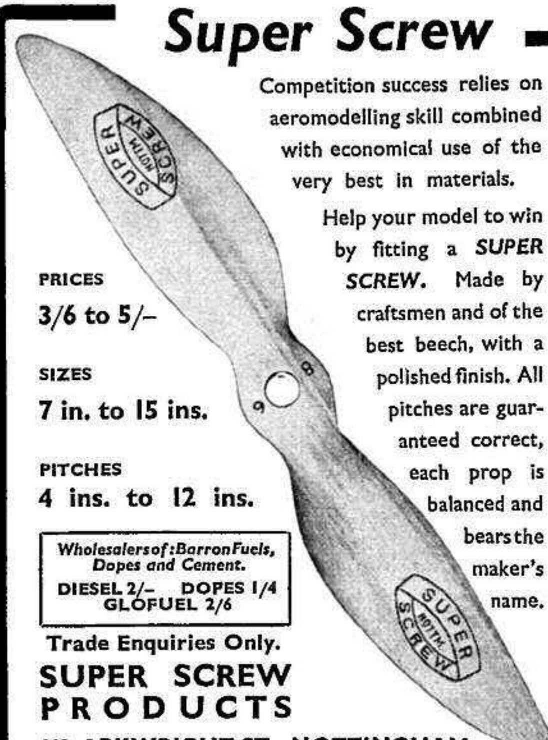

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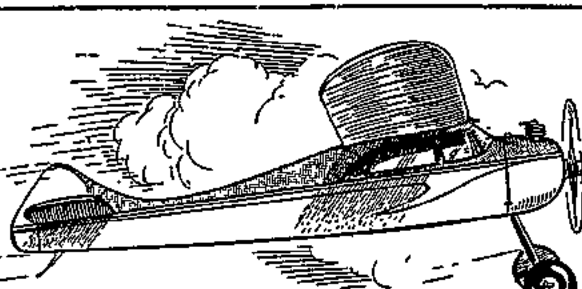

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"K.K. Phantom," Mills 1·3 c.c. and accessories, £5. "Slicker 42" with timer, 15/–. Robson, 35, West Park Road, South Shields.

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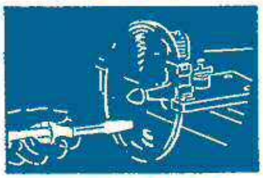

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