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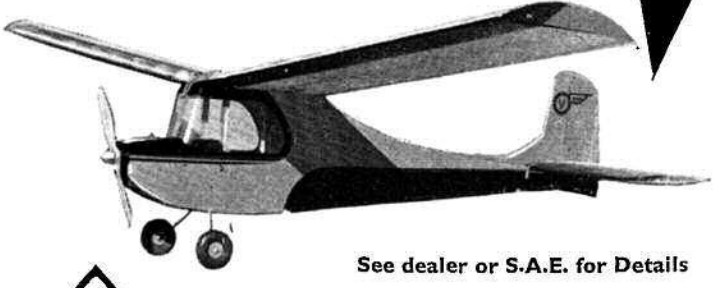

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(The illustration shows Capt. Cesare Milani with his ⅛th scale Bristol F.2.B. which won the Championship Cup at the last Model Engineer Exhibition.)

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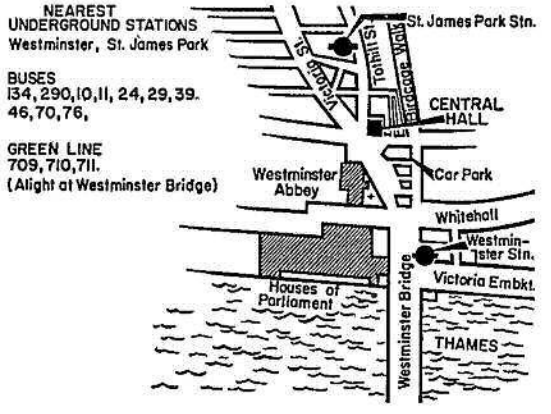

MODEL aircraft

AUGUST 1961

No. 242 VOLUME 20

The official Journal of the SOCIETY OF MODEL AERONAUTICAL ENGINEERS

IN THIS ISSUE

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Here and There

EVER since the first internal combustion engine suitable for model aircraft appeared on the market in the mid-thirties, development has followed two distinct lines. Initially, the universal requirement was reliability; but once this reached an acceptable level, one faction concentrated on improving efficiency and providing more powerful motors of a given capacity to satisfy the contest modeller. The other, and equally enthusiastic group, competed to build the smallest practical power plant chiefly for the sport flyer mass market. Development still follows the same lines, although, at times, the two seem to overlap and the contest motor designers are currently the more active.

Before the war, when diesel and glow-plug engines were unknown, the major limitation to miniaturisation was the ignition equipment—spark coil, condenser, battery, wiring, etc.—the weight of which could not be reduced below several ounces.

Right up until 1945, any engine as small as 1.5 c.c. was considered something of a freak, demanding a very light, vulnerable, airframe to carry the disproportionately heavy power plant ancillaries.

The most popular engines in pre-war days were the big " 6os " such as the Super Cyclone, Ohlsson 60 and Brown Junior. They were reliable if, by modern standards, inefficient, giving only about 0.4 b.h.p.—a figure which is currently exceeded by top 2.5 c.c. motors ! Small engines meant those of around 3-5 c.c., which were used to power high wing cabin jobs of about 5 ft. span and weighing 3 lb. or so.

The diesel came along some 15 years ago and, requiring no ignition gadgets, the " let's-see-how-small-we-can-make-it " boys hailed it as the answer to all their problems. Engines of 1.5 c.c. were no longer freaks, but a practical proposition. Smaller and smaller engines appeared on the market, but it was soon realised that the high compression ratios required by the compression ignition engine, demanded comparatively heavy, rugged, construction. The critical compression and needle valve settings of the really small ones, plus their generally temperamental behaviour, quickly overshadowed whatever charm they possessed and 0.5 c.c. became the new low limit for a practical power unit.

In the meantime, design refinements and development increased their efficiency until, even the small engines, demanded comparatively large models to handle their increasing power output ! So, that elusive beast, the *practical* miniature power model, seemed as far away as ever.

With development of the glow-plug engine, power output of the babies increased still further, but

glow engines can be built much lighter and often more cheaply than diesels; they also dispense with the space-consuming contra piston and eliminate its attendant production problems.

New mass production techniques, of fantastic accuracy, allowed miniaturisation at realistic cost and only a few years ago we "drooled" over the results of these developments, in the shape of the beautiful little Pee-Wee of only 0.32 c.c. The models it powered, however, were still no smaller than those powered by our existing 0.5 c.c. diesels, but it was now, obviously, only a matter of time before even the Pee-Wee would seem large. As M.A. readers will be aware from our engine test in last month's issue, that time has arrived and Cox have come up with a real winner—the Tee-Dee 0.010 which is only half the size of the Pee-Wee.

This motor is no freak and, unlike previous new engines, there is no shortage of suitable model designs to suit all tastes. Elsewhere in this issue, will be found details of how to adapt existing rubber powered models for Tee-Dee 0.010 power, and Model Airplane News plan set 83 contains full size drawings for a very original pod and boom free-flighter illustrated below.

Latest release is M.A.N. plan set No. 84 which features *Arrowhead*—3 (three C/L stunt combinations for the 0.010) and Bill Winter's *Lightning Bug*—the smallest *practical R/C model* yet—also for the 0.010. On the *same* plan set, you will find drawings for *Voodoo*—the 0.35 powered U.S. Nats stunt winner, also a Pee-Wee powered *Tri Pacer* F/F profile model. No less than SIX plans for 7s. 6d.! Numbers will be strictly limited and early ordering is essential.

R/C—the next step

OUR recent series of articles on radio control have certainly stirred up interest. Every post brings letters from readers telling of their own experiences and, from these, it is apparent that we made an important ommission in not emphasising the importance of using insulated coupling rods. However, this point is covered in Radio Topics on page 264.

Also discussed in Radio Topics is the point concerning battery drain with the receiver, and two actuators, operating off three pencells. Our model is now modified with a separate battery pack and, we must confess, we feel far happier with this arrangement, when setting out for a full day's flying. It is easy to say in advance that one will change the batteries after three or four flights, but in the excitement of preparing for another flight it is, oh, so easy to forget to do so!

Almost invariably letters conclude by asking: "What are you going to do next?" We have thought long and hard about this and, obviously, we would like to go the "whole hog" with eight channels, but this is too much of a jump. We, therefore, posed this question: "What does the average sports and scale enthusiast, who wants just a little more than single channel require?" Obviously, not the full gamut of manoeuvres, but rather a model which will take off, "steer" accurately, do circuits, and bumps, and a few of the simpler manoeuvres.

Bearing in mind cost, we decided that four channels was the limit. Having seen what Stewart Uwins can do with his *Jackdaw*, using three channels to operate rudder and engine only, initially we thought that being able to use these two controls, proportionally and reliably with two Duramites, would be ideal. However, the attraction of elevator control kept niggling at our minds. We were unable to consider dispensing with engine control, which is essential for touch and go and scale type power on landings, and as we wanted the whole system to be as uncomplicated as possible, discarded the idea of cascaded controls. Equally, it was unthinkable to dispense with the benefits of proportional rudder.

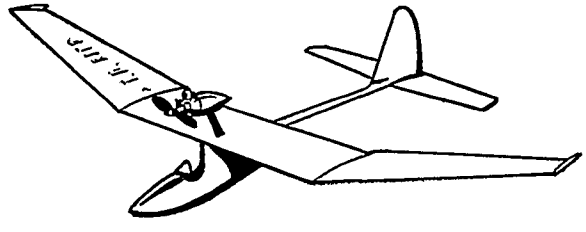
A compromise was obviously necessary and this we have reached. With a model trimmed to virtually zero, all our requirements would be fulfilled with "up" elevator only—thus leaving one channel for engine. The only remaining problem was the purely mechanical one of how to get proportional engine control, and George Fletcher came up with a solution which, as far as we know, has not been used before.

Briefly, then our next essay into the thrills of R/C will be with a Frog *Jackdaw*, fitted with an E.D. Black Arrow four-channel receiver, two Bonner Duramites supplied by Roland Scott Ltd., and a lot of hard work from the editorial staff! This new series will be commencing very shortly in MODEL AIRCRAFT as soon as our commitments with International contests, etc., allow, so please do not write and ask when—it *will* be *as soon as possible*!

Mosquito Museum

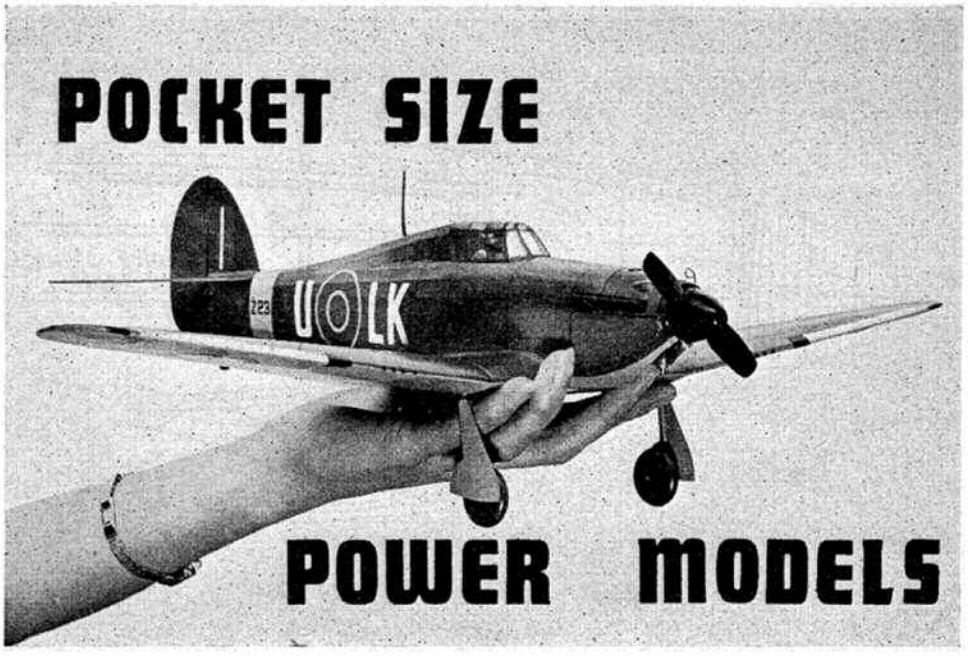
WHILE motoring across Dartmoor recently, we were surprised to hear an aircraft noise which, although once very familiar, is now seldom heard. On stopping the car, we were able to verify our audio recognition, as a *Mosquito* flew low overhead and disappeared towards Plymouth. It might have been en route for Plymouth Air Show, or it might have been one of the few remaining replicas of this marque, still giving reliable service.

However, we realised that many people, particularly youngsters, seeing one of these aircraft flying at an air show, might not realise that the original prototype of this famous machine is on show to the public, in its "birthplace" at Salisbury Hall, London Colney, near St. Albans. Full details of opening hours, etc., are given on advertisement page xiv.



The R/C Westland "Widgeon," which is featured on M.A.N. Plan sheet 83, together with the "Tee-Dee Bird" (right) for the Cox .010. See text.

The new 0.16 c.c. Cox Tee-Dee motor has at last made it really practical to build . . .



DOUG McHARD describes how he converted a simple rubber powered *Hurricane* to fly with a Cox Tee-Dee .010

Full size drawings of all extra parts are given overleaf

I HAVE been fascinated by the really miniature flying scale model ever since pre-war days, when 15 in. wingspan flying scale kits cost 9d. each! These, of course, were rubber powered and their performance was indifferent. The present day equivalent of these early efforts cost about 4s., and although generally better designed than their predecessors, their flying characteristics, even when expertly built, leave much to be desired.

A *really* miniature engine was the obvious requirement and, after the war, the advent of the model diesel, with its absence of ignition equipment, gave promise of fulfilling this dream. Many attempts were, in fact, made to produce tiny engines of between 0.1 and 0.2 c.c. with varying degrees of success, but in order to stand up to the high stresses involved in diesel operation, the resulting engines were unduly heavy for the power developed.

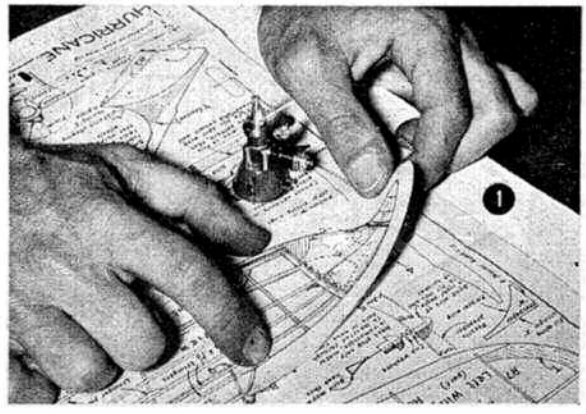
The physical bulk of these "tiddlers" was also out of proportion to their capacity, and the problem of accommodating them within the cowling of a scale model was invariably frustrating. Starting them was usually equally frustrating and the fragile, fuel soaked, model structures often took more in punishment during this operation, than they did in the worst crash landings.

Nevertheless, there were still some fanatics (some called them stronger names) who persisted despite the odds, and at least one sub-miniature diesel, the Dragonfly, is still in limited production. The D.C. Bambi of 0.15 c.c. had a production run of several years, until manufacture was terminated early this year.

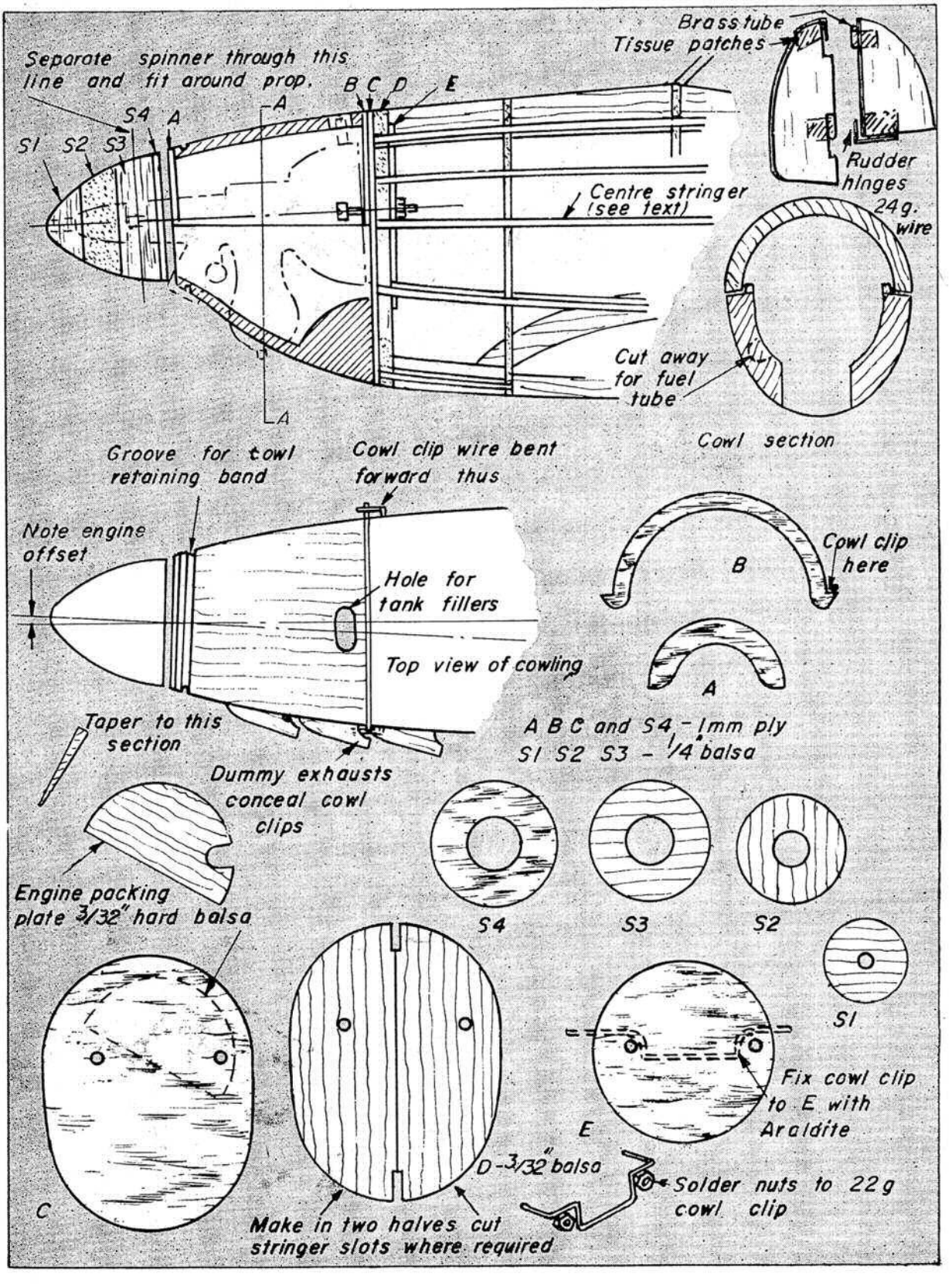
When the 0.33 c.c. Pee-Wee first appeared, we thought the problem had been solved. This glow-plug engine was smaller and lighter than most of the tiny diesels, but it was so efficient that it developed far too much power for our needs, being in fact more powerful than most of its contemporary 0.5 c.c. diesels!

But now, at last, we have the perfect power plant, the Cox Tee-Dee .010 (0.16 c.c.)—light—only 0.6 oz. with tank; compact—look at these photographs; giving ample power—but not too much; and, most important, it is very easy to start with the built-in starter spring.

There are at present no kits specifically designed for the Tee-Dee, but the conversion of suitably proportioned rubber kits presents very few problems. I proved this by taking a 4s. 2d. Keilkraft 20 in. wingspan Hawker *Hurricane*, which I knew flew well as a rubber job, and modified the structure, where



A tracing of the modified nose assembly is laid accurately over the original plan.


Separate spinner through this line and fit around prop.
S1 S2 S3 S4 A B C D E
A
A
Brass tube
Tissue patches
Rudder hinges
24g. wire
Centre stringer (see text)
Cut away for fuel tube
Cowl section
Groove for cowl retaining band
Cowl clip wire bent forward thus
Note engine offset
Hole for tank fillers
Top view of cowling
Taper to this section
Dummy exhausts conceal cowl clips
Engine packing plate 3/32" hard balsa
B
Cowl clip here
A
A B C and S4 - 1mm ply
S1 S2 S3 - 1/4" balsa
S4
S3
S2
S1
Fix cowl clip to E with Araldite
E
C
D - 3/32" balsa
Make in two halves cut stringer slots where required
Solder nuts to 22g cowl clip

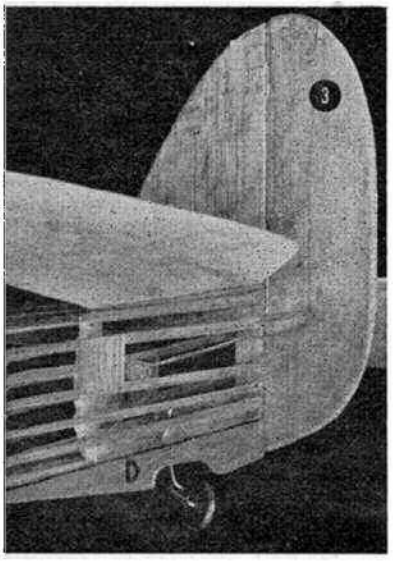
necessary, to take the engine. Several alterations were made during construction, with a view to strengthening the airframe and improving the scale appearance, and these are all noted in this article. All new parts necessary to adapt the model for Tee-Dee power are drawn full size opposite and, together with the accompanying photographs and the photograph of the completed model on the cover, you should find no difficulty in producing your own miniature *Hurricane*.

Building

The first step is to cut out the nose side view from page 238 and lay it over the Keilkraft plan, carefully lining up the stringers and formers (see Photo 1). Since we are using an engine, we are able to make the nose shape more accurate than the original rubber kit, so to correctly align the two drawings, lay a ruler along the stringer marked "*Centre Stringer*" and accurately line it up with the corresponding stringer on the plan.

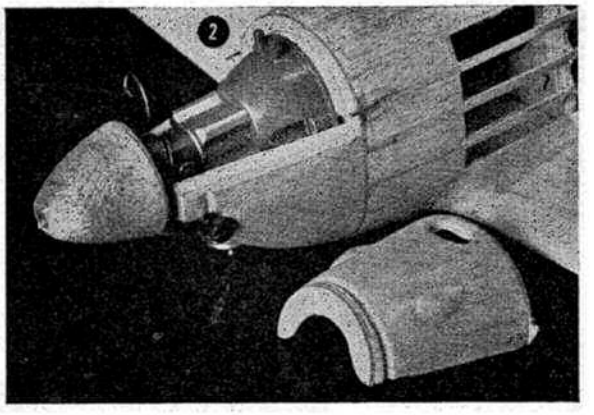
Build the left fuselage shell on the plan in the normal way. The original formers 1 to 5 are no longer required and in place of 5 we now have the 3/32 in. hard balsa former "D." Since the fuselage stringers are now shorter it is possible, using the material supplied with the kit, to achieve complete "runs" from "D" to the tailpost without resorting to joins. This produces a neater and stronger job, but some of the stringer slots will now be out of position. To get round this difficulty it is best to cut out the formers, ignoring the stringer slots, and to carefully cut these as required after the former halves have been assembled to the fuselage keels. These slots must be cut out with great care, using a very sharp knife or razor blade, in order to avoid splitting the wood.

Upon completion of the left half-shell, and before adding the stringers to the right half-shell, cement the ply disc "E" to the rear of "D" and make up the cowl clip wire and engine retaining bolts, securing the assembly with Araldite.



Left : the pendulum rudder—note counterbalance weight "buffers" on fuselage sides.

The neat and almost totally enclosed engine assembly. Note removable cowling top and built up balsa spinner.



When all the stringers are in place, the front bay between formers "D" and 6 is filled between stringers with $\frac{1}{16}$ in. balsa and this is continued along the fuselage decking to former 10. The model receives considerable handling in this area during starting and, in the light of subsequent experience, the $\frac{1}{16}$ in. filling could advantageously be extended along the fuselage sides to former 7.

The mm.-ply former "C" is now fixed in place and the cowling is carved and hollowed from medium hard balsa as shown in the drawings and Photo 2, which should be self-explanatory. Be particularly careful to get the thrust line correct as shown.

A simple pendulum rudder is incorporated, the construction of which is clearly shown in Photo 3. The 22 s.w.g. pendulum arm is bent and recessed in the side of the rudder and well cemented, being secured in place with a tissue patch.

The pendulum weight consists of a $\frac{3}{16}$ in. dia. loop in the wire which is filled with solder, and the rudder is arranged to have a slight right bias when the model is held level.

Most of the remaining alterations to the basic Keilkraft kit are optional, but their adoption is recommended since, although adding to the complexity of the construction, they also add considerable strength and immeasurably improve the scale appearance. These alterations are all clearly shown in the photographs and consist of sanded-down 1/32 in. medium balsa covering on the wing leading and trailing edges, with $\frac{1}{8}$ in. × 1/32 in. rib capping strips and 1/32 in. vertical grained webs, between the upper and lower wing spars. The L/E sheeting could, without undue weight penalty, be carried under the wing to form a very strong box spar.

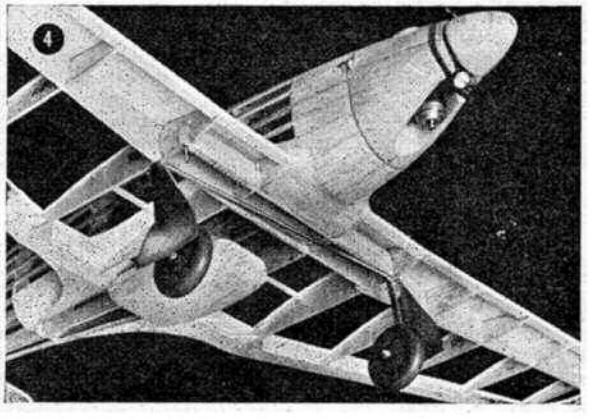
The landing gear spar is increased in section to $\frac{1}{8}$ × $\frac{1}{4}$ in. and the 20 s.w.g. wire supplied is bound to it as shown in Photo 4 to form a torsion spring. This wire is bent back along wing ribs R.1 to the mainspar, where it is fixed in place by $\frac{1}{16}$ in. balsa strips on either side.

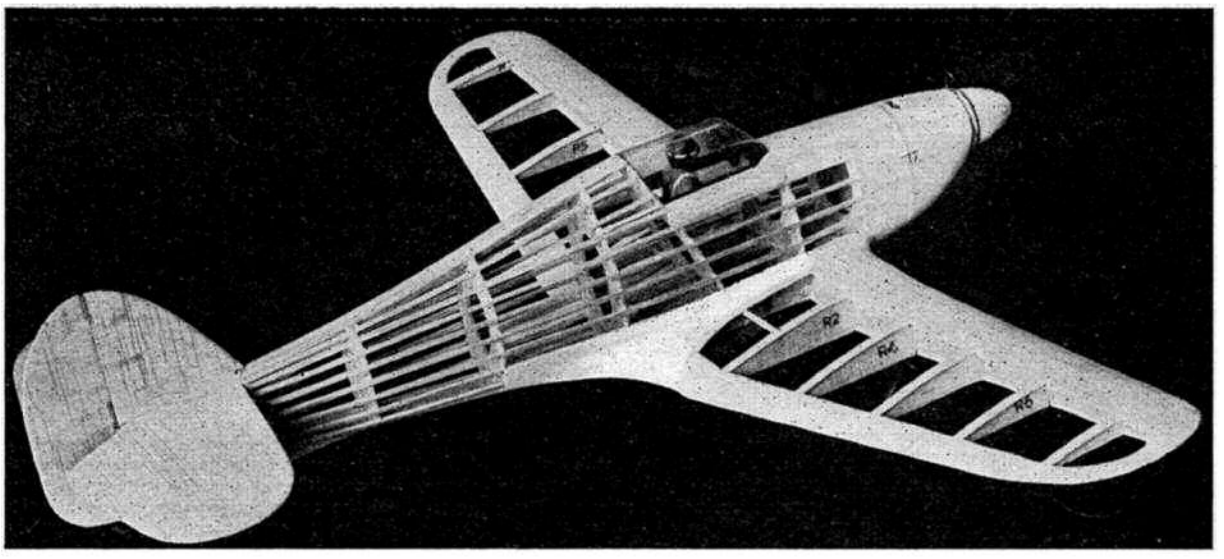
A drop-off U/C was fitted by bending the legs and cross bar from one piece of 16 s.w.g. wire, and soldering short lengths of 20 s.w.g. brass tube to locate over the short stubs projecting from the wing underside.

The wing root leading edge is faired in, with soft block balsa, hollowed out to $\frac{1}{16}$ in. thickness and the belly radiator is also carved from soft block and similarly hollowed (Photo 4).

A moulded cockpit cover was made

Right : the drop off undercarriage shown with one leg removed from its retaining wire.





and formers 8 and 9 dispensed with. A new elevator was cut from quarter grain medium balsa; although of similar area to the Keilkraft elevator supplied, the new one conforms more closely to the scale proportions by having $\frac{1}{2}$ in. shorter span and $\frac{1}{4}$ in. broader chord. The fuselage formers are relieved between the stringers by sanding with fine glass-paper wrapped round a piece of $\frac{3}{16}$ in. dowel; this is very easy to do, and produces a vastly superior covering job (see photos 2 and 3).

The propeller spinner (see notes on flying) is laminated from $\frac{1}{4}$ in. balsa discs (S.1, S.2 and S.3) cross grained and backed by a mm.-ply disc S.4. After shaping, the spinner is split across S.3 and fitted round the propeller, but before cementing together, the alloy engine spinner and prop fixing bolt must be dropped in ahead of the prop. The bolt is tightened with a screwdriver through the $\frac{1}{8}$ in. hole in the S.1. spinner disc. An added embellishment to the model is a pilot's bust carved from soft balsa.

Jap tissue was used to cover the *Hurricane* since it absorbs much less dope than other tissues, and thus provides a very light covering. One coat of clear butyrate was given and the camouflage finish was thinly sprayed on, additional dope being applied around the engine bay to cut down the fuel absorption.

All up weight worked out at just over $2\frac{1}{2}$ oz. without undercarriage.

Flying

Trimming the model for flight demands a certain amount of patience! To begin with, it is advisable to fit the propeller on backwards for first test flights, and if only one propeller is available, this will mean carrying out flight trimming before building the spinner. It will probably be found that there is more than ample thrust available, even with the reversed propeller, and in this event it should be mounted reversed in the spinner, since excess thrust can be extremely difficult to handle in a model of this layout and size.

The *Hurricane* should balance level when supported at the wing mainspar and, as mentioned earlier, the rudder must be very slightly over to the right. If no warps are present, an almost straight glide should result from a gentle hand-launch which should, of course, be carried out over the longest grass you can find.

When satisfied with the glide trim, start the motor and adjust the needle valve to give the slowest possible steady running (see July issue of M.A.). The model must turn *slightly* left under power—*a right turn is fatal*! It may be necessary, during initial flights, to fit a small trim tab to the right wing, which should be slightly turned *up* to correct any tendency to spiral too sharply to the left.

Although normally flown without the undercarriage, there is no doubt that flight trimming would be simplified, if the plastic wheels supplied with the kit were fitted. On the debit side, the glide would suffer due to the added weight and drag, and unless perfectly smooth ground is available, the landings are not improved by fitting the undercarriage. Test flying, of course, should never be carried out over a hard surface, since it is so unyielding that the results of a bad landing could be disastrous.

Conclusions

The 20 in. span *Hurricane* is undoubtedly a "hot ship" to handle, and is not recommended as a beginner's model! The lively performance in this case is not due in any way to an overheavy wing-loading, and models of this size are quite practicable, providing a strict eye is kept on excess weight, by careful material selection (soft but not "pithy" balsa) and no warps are present. The Tee-Dee likes to rev. and thrust but must be moderated by using an inefficient propeller, but the engine is so light and compact, that this is not unreasonable.

From experience with this model it would seem that a 24 to 30 in. wingspan, with an all-up weight of $3\frac{1}{2}$ to 5 oz. would be a manageable size for non-critical performance, using the Cox .010 engine. A biplane could, of course, be smaller and the additional drag afforded by this layout would usefully moderate the flying speed, to make trimming less critical.

The 3 in. propeller supplied with the engine would look a bit ridiculous on, for instance, a 22 in. *Gladiator* which would have a 3 in. dia. radial cowling! The spinner would be $1\frac{1}{4}$ in. across, or almost half the propeller diameter! A larger propeller might introduce engine running and torque troubles, so prototype selection must be very carefully considered.

The desirability of knock-off flying surfaces for these "tiddlers" is debatable. If inconspicuous, light, yet positive, fixings can be devised, they are useful. But it is often not realised just how much weight such luxuries can add. This, in turn, necessitates a higher flying speed to stay in the air, and increases the risk of damage upon impact.

Some of this weight can frequently be more usefully incorporated in strengthening the airframe, and the resulting light, but strong, model will often "bounce" rather than "bend." It all depends upon careful design, material selection and really accurate building. For those who persevere the rewards are very satisfying and the little Cox opens up an entirely new field for the experimentally-minded modeller (see also Here and There).

TOPICAL TWISTS

by PYLONIUS

On Circuit

Club membership is about as stable as a novice's radio job, and as permanent as a soap bubble. If the average Secretary sees the same faces two meetings in succession he's riding high, and if the members see the same Secretarial face more than twice they're off to a club where they get some action.

So when I read that the Cheadle Club had a mass walk-out of members over a transport dispute I could not see this to be in any way exceptional. What I did find exceptional was the fact that the club knew how many members had left, when they had left, and why they had left. This says much for their very efficient calculating system.

Interchangeability of members between local clubs is now part of our way of life. Some restless characters shuttle from one club to another with such rapidity that they're often half way through a meeting when it occurs to them they left that particular club in high dudgeon only a fortnight before. They might not remember what the grievance was, but it was some pretty stupendous issue like the colour of the club card or the shape of the club badge. Some of the more furious shuttlers get so lost that they even get caught for membership fees.

However, no good shuttler ever pays club fees, and can pride himself on never throwing away good money on any of the dead loss clubs in the district. Most clubs are so pleased to take in a new member that they hesitate to spoil things by pressing for anything so indelicate as money. In the same way a club is so overcome by the return of a prodigal that it extends a fee-less welcome home.

This makes conditions ideal for a quick sort out of the club hierarchy, and provides a ready excuse for a mass walk-out. It only requires one of the more outspoken troubleshooters to demand a statement on the club's finances to set things going. Needless to say the club is broke, and the unpaid members threaten to leave unless the committee resigns on the spot. With the committee out of the way, and no one else prepared to take on the official duties, the club either disbands, or the flying members decide to carry on the business with an occasional scratch meeting in someone's back room.

For the main posts of Chairman and Secretary many clubs rely upon the services of the circuit official. He is a chap with an executive mission in life. At one time he may have lived out his career in one club, but in these hectic days he must keep moving in order to fulfil his role of dedicated leadership. He has the touch that inspires confidence. Members look to him to rebuild the club into an organisation of fantastic splendour, which he modestly agrees to do. The trouble is that the members somehow expect him to build their models for them, and it's not long before the roving official is once more roving.

When a club exhausts the local supply of modelling officials it can call upon the services of the type of roving demagogue who is not too particular what the club is in aid of. He is just as much at home in reorganising the Horse Trough Preservation Society as in regrouping the New Town Rock 'n' Roll Association. Somewhere along the line he takes over the affairs of the local model club, and often brings to the job one or two quaint ideas from previous chairmanships. Perhaps he may have been right in opposing the use of flit guns in the Moth and Butterfly Collectors' Annual Scramble, but his expertise might be of dubious benefit in debarring rubber models from the club all-in contest on the grounds that only those made of balsa should be eligible.

Complete Sell-Out

In the world of sport and outdoor recreation the traditional role of the model flyer is the abject, cap in hand, airfield beggar. He doesn't expect much. He is only too happy to seize on any crumb that might be tossed from the Council table. When he ventures on the grudgingly conceded bit of open space he does so with all his p's and q's a-quiver and a wary eye cocked for the ever threatening big boot.

To the public, and often, official, mind, model flying is the most contemptible of all outdoor activities. If there is any order of priorities in the allocation of permits the poor old modeller must be so far down the list that any kid with a ball probably has the authority to kick him off. Only the modeller is required to carry enough insurance cover for a national disaster, while a cricket ball of model weight is unrestricted. It's now an accepted fact that you can do almost anything in a park or open space except pick the flowers and fly model aeroplanes.

But now someone has come up with a suggested way of overcoming our fly-on-sufferance, airfield difficulties. In our affluent society even the lowly modeller has a spare copper or two to jingle. At least most beginners these days seem to kick off with a thirty guinea radio job. With that sort of ready in his money belt he doesn't need to go to public assistance for his airfield favours; he can hire out his own grassy pitch for a few quid per annum.

That's the theory, anyway. How it might stand up in practice is quite another matter. In America, Australia and other wide open lands, you can not only hire out the acreage by the square mile. You might even be given a government grant for opening up new territory. But, in our tightly controlled little island the going would be tougher. After locating a stretch of land you start making the necessary applications to the Board of Trade, Ministry of Town and Country Planning, the Ministry of Agriculture and Fisheries and the Air Ministry. By the time the permit comes through, limiting the proposed flying of propelled airborne craft to a maximum ceiling of ten feet, a new council estate will have gone up on the site.

Given a bit more luck you would get the use of the field on a 999 year lease at a cost of £5,000 per acre, plus the cost of a two mile road to gain the only permitted access. A week after taking possession the local Council would move in to requisition it for use as a public park.

Thus you would be back where you started, cap in hand for the usual permission. Minus of course the cash for that new radio equipment.

Puzzle Corner

" Why should I buy a receiver with relays, when a relayless receiver is so obviously better? "

This conundrum, to which the answer could well be a lemon as far as I'm concerned, is the sort of thing the radio expert gets thrown at him every day. It is one of the hazards of his calling.

Possibly, if you examined the question with great care, analysing it bit by bit, some sense may emerge—that is, if you are technically minded. On the other hand it might be just a piece of nonsense patter; a sort of recognition code among the " multi " millionaires. Back in the old, pre-radio days, recognition between modellers was obvious and immediate. True the odd tramp was sometimes given the old wings up sign by mistake, but, as there were more tattered modellers than tattered tramps, such social gaffes were rare.

With the radio type, operating as he does at the other end of the social scale, more finesse is required. Anyone with a ducal appearance and the peculiar tonsorial style caused by the rooting out of handfuls of hair is a fairly safe bet. But you could easily cause offence by intimating that a duke flies toy aeroplanes. Anyway, your bird might well turn out to be a property speculator with a scalp disorder, and, in posing your recognition riddle, he would not, perhaps, see anything amiss. He would just ask you to hold up the contract while he rings his accountant.

Straining Your Luck

It pays at times to keep up with the latest technical guff. For instance, had I not chanced to read odd bits of that lengthy correspondence on speed control wires I would still be working on that hundred yard safety factor when venturing near the speed circle. But, since getting the lowdown on breaking strains I can see how foolish I have been. In future I shall make it at least half a mile.

Another sort of breaking strain is in the news: the snapping of overwound rubber motors. Mostly these disasters seem to have occurred with ingenious types who wind up outside the fuselage. This seems to suggest that whilst it's safer to use the tube it's not always cheaper.

MODEL aircraft ENGINE TESTS

TWO OF THE MOST POWERFUL

2.5 c.c. INTERNATIONAL CLASS ENGINES

OLIVER TIGER Mk. III

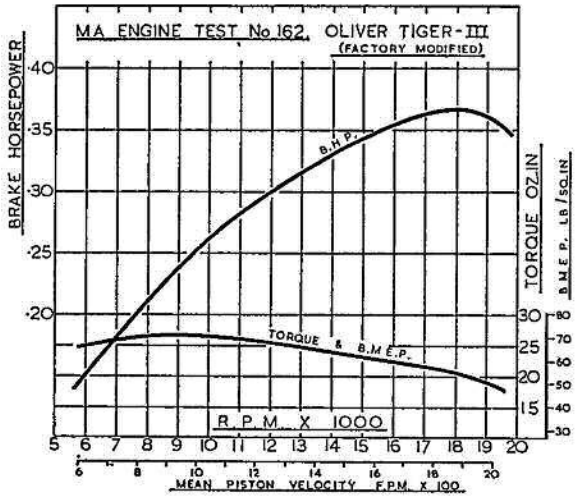
(works modified)

COX'S TEE-DEE .15

FOR this month's tests we have two highly interesting subjects, one from Britain and one from the U.S.A. Each is representative of the highest levels of development in its particular class and the performance figures achieved on test are the highest for, respectively, diesel and glowplug 2.5 c.c. engines so far published in this series.

Not only do these engines confirm (and, indeed, exceed) the new 2.5 c.c. performance standards predicted in MODEL AIRCRAFT during recent months, they also give us cause for some revised thinking about the accepted patterns of performance of diesels and glow engines in comparison with each other. In the past, the accepted belief, based on tests and actual prop/model performance, has been that the diesel is essentially a high torque engine that must not be under-propped for maximum performance, whereas the glow engine can only give of its best when running at very high speeds.

In general, this is still true but it is interesting to note that the latest modified Oliver tested, rivalled fast glow engines as to its high peaking speed, whereas the Cox proved at least equal to the best diesels in regard to maximum torque developed and was substantially superior on a "hot" fuel. In fact, so far as our tests of these two particular engines are concerned, the accepted view of diesel v. glow performance is almost reversed.



In regard to the Oliver, our tests bear out the idea that under the new F.A.I. fuel regulation prohibiting the use of nitromethane for 2.5 c.c. glow engined speed models, this diesel, in modified form, may not be entirely outclassed as a speed engine. At around 18,500 r.p.m. our test example was approximately equal to the Cox at the same speed on straight F.A.I. fuel. We would doubt whether the diesel can wrest the lead from the glow engine in F.A.I. speed, but it is interesting to note that in some recent events, modified Olivers (and Eta 15's) have put up speeds of 100 m.p.h. and over: only a little short of the times recorded with the glow engines on straight methanol and castor oil.

A word of explanation is necessary in regard to the test figures for the Cox Tee-Dee .15. Originally, in early February of this year, three of these engines were received from the manufacturer. These were "pilot run" samples and tests on these engines gave the average b.h.p. curve shown by the broken line on our graph in which a peak output of just on 0.40 b.h.p. was recorded on 30 per cent. nitromethane fuel. Two months later, when production was under way, the Cox company sent us a further example from their regular production, commenting that production engines were averaging up to 500 r.p.m. better than the pilot run batch on an 8 × 4 prop. This is more than confirmed by our tests on the

latest sample submitted which was, in fact, some 900 r.p.m. up on the previous average, using the same fuel and Top-Flite 8 × 4 nylon prop.

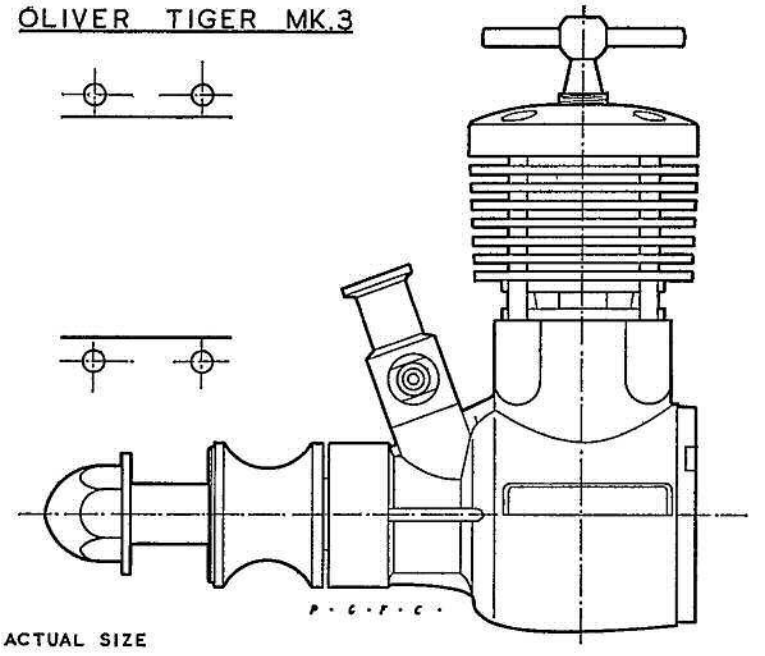
Oliver Tiger Mk. 3 (1961) Works Modified

The Oliver Mk. 3 needs no introduction to MODEL AIRCRAFT readers, or to keen modellers in general. First marketed seven years ago, it has only recently, in stock form, been equalled in the 2.5 c.c. diesel class as regards performance. As tested by MODEL AIRCRAFT in 1954, the standard Mk. 3 gave 0.305 b.h.p. and was the first 2.5 c.c. motor to top 0.3 b.h.p. Since that time, its external appearance has hardly altered, although minor internal changes have resulted in small power increments culminating in a present figure about 10 per cent. higher than the earlier average output. Structural changes include the use of a new crankshaft material and a gravity diecast, instead of a sandcast, crankcase, with strengthened bearing housing section. In place of the split sleeve type needle valve, current engines now have a flat spring type ratchet.

Oliver engines have always been limited production units in which a great deal of "hand" work is employed. For those who demand the ultimate in performance, further hand work is undertaken by the makers on customers' individual units in the form of tuning modifications aimed at increasing top end power. Some contest enthusiasts prefer to do their own "hotting up," but where this is carried out by the maker, the cost is £2 10s.

Our test engine began life as a standard unit selected from a batch of 12 production engines and was then modified by Messrs. J. A. Oliver in accordance with their usual practice. Examination of the engine revealed that this included work on the crankshaft, gas passages and web, lightening the piston and smoothing the transfer passages and backplate interior.

The Oliver is, of course, an engine of basically "traditional" design. Its stroke/bore ratio is high by modern standards and it retains a conventional shaft valve set-up with circular valve aperture and crankshaft port. One of the theoretical limitations of the basic design has been the size of the shaft journal (⅜ in.) dictated by the dimensions of standard British ball races available. This imposes limitations on valve port and gas passage size in the interests of structural strength and the Tiger Mk. 3 actually has a smaller bore (7/32 in.) shaft passage than its baby brother, the Cub Mk. 2. In factory modified form, however, the leading and trailing edges of the shaft port are ground, modifying the port to an oval shape and increasing the induction period to 175 deg. of shaft rotation. Actual timing, as measured on our example, was 55 deg. ABDC to 50 deg. ATDC. Also, a stronger shaft material (E.N. 36) has been adopted for all Mk. 3's for some months past and no failures have been reported to date. Other shaft modifications include radiussed edges on the crank web, the face of which is also grooved to form a lead from the induction passage.

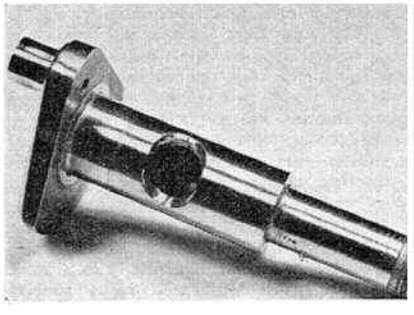


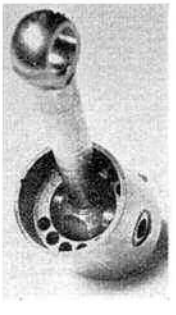
ACTUAL SIZE

Modification to the crankcase interior consists of extending and smoothing the transfer grooves at their bottom ends, to assist gas flow from the crankcase, and the inside edge of the backplate is also rounded off for the same reason. Exhaust and transfer port timing remain unaltered, the latter already being well advanced in accordance with the current trend. Below the inclined transfer ports, vertical flutes are ground in the liner to line up with the crankcase grooves. The piston is lightened by the drilling of 10 vertical 1/16 in. dia. holes in the gudgeon pin band, five each side of the gudgeon-pin bosses.

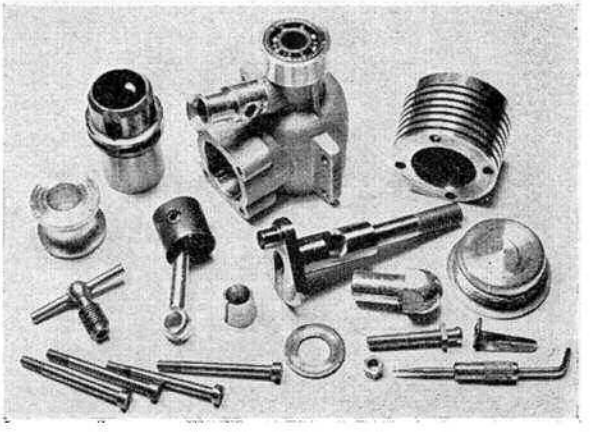
Needless to say, the fine workmanship that has been a feature of every Oliver engine for more than a dozen years, is continued in this latest 1961 model. Incidentally, the measured bore of this latest version was 0.004 in. above the

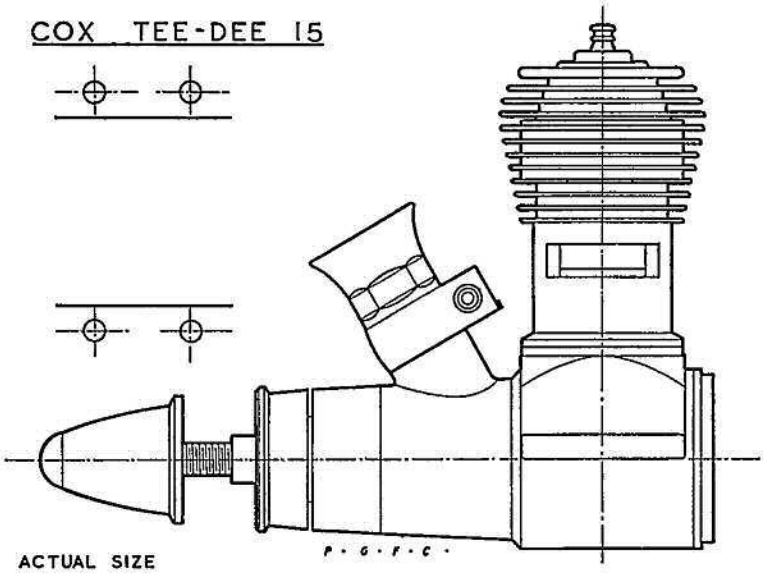
Below: left, the modified crankshaft with enlarged port and chamfered web; right, lightening holes drilled in piston.





Parts of the Oliver Tiger.





nominal 0.550 in. of the original 2.43 c.c. Mk. 3 and thereby brings its displacement somewhat nearer to the 2.5 c.c. limit.

Specification

Type: Single-cylinder, air-cooled, reverse-flow scavenged two-stroke cycle, compression ignition. Crankshaft type rotary valve induction with sub-piston supplementary air induction, conical crown piston and matching contra-piston.

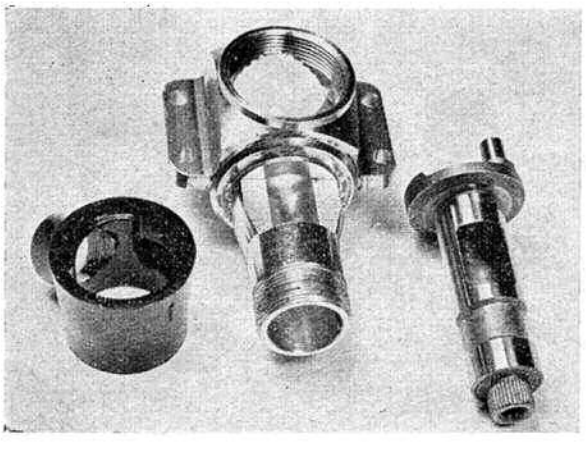
Bore: 0.554 in. Stroke: 0.625 in.
Swept Volume: 0.1506 cu. in.= 2.466 c.c.
Stroke/Bore Ratio: 1.128 : 1.
Weight: 5.5 oz.

General Structural Data

Gravity diecast crankcase and main bearing housing of LAC.113B, shot blasted on main external surfaces. Screw-in crankcase backplate machined from alloy bar stock. Counterbalanced crankshaft of hardened and ground E.N.36 steel with 13/64 in. dia. hollow crankpin. Shaft supported in one R & M $\frac{3}{8} \times \frac{7}{8}$ in. seven-ball inner ball journal bearing and one Hoffmann $\frac{1}{4} \times \frac{5}{8}$ in. eight-ball outer ball journal bearing. Hardened, ground, lapped and honed cylinder, flanged at exhaust level to seat on crankcase and encased by finned cylinder barrel and head unit. Cylinder assembly secured by four long screws into casting. Meehanite piston with pressed-in $\frac{3}{16}$ in. dia. tubular gudgeon-pin and machined RR.56 alloy connecting-rod. Machined alloy prop driver mounted on shaft via steel split taper collet. Sleeve nut type propeller fitting. Brass spraybar type needle-valve assembly, reversible for left- or right-hand control. Beam mounting lugs.

Test Conditions

Running time prior to test: 3 hours.
Fuel used: KK Record Powerplus diesel (4 per cent. nitrate).
Air temperature: 54° F.
Barometer: 29.6 in. Hg.



The unique and highly effective induction arrangements of the Cox Tee-Dee can be seen from this photo of its crankshaft, crankcase and front housing.

Performance

Starting qualities of the Modified Tiger were good at all times. No exhaust priming was necessary and the engine was started after intake choking only. This ease of starting continued throughout the 14,000 r.p.m. speed range over which the engine was tested.

The Tiger offers high performance over almost the whole of this wide range, although there was little indication of its ultimate peak performance from the figures obtained at speeds much below 14-15,000 r.p.m. At 7,000 r.p.m. a vibration period was picked up which, however, is unimportant since these revolutions are far below any speed at which the engine is likely to be operated in a model. At 13,000 r.p.m. a tendency to spit as the engine warmed up was detected and could not be entirely eliminated with precise adjustment of the needle-valve and compression-lever. This, however, disappeared as the load was further reduced and revolutions rose to 15,000. At above 15,000 the Tiger now began to show an astonishing performance, culminating in a peak b.h.p. of .365 at no less than 18,000 r.p.m. This is a quite exceptionally high peaking speed for a diesel and it was a revelation to see how the Modified Tiger spun a 7 × 4 Power-Prop at a steady 18,500 with the smooth ease of a racing glow engine.

Clearly, despite the big strides made recently with new 2.5 c.c. diesels by other manufacturers, the "Mod-Olly" is far from ready to give up the struggle.

Power/Weight Ratio (as tested): 1.03 b.h.p./lb.

Specific Output (as tested): 148 b.h.p./litre.

The Cox Tee-Dee 15

A FULL description of the design and construction of the new Cox 15 was given in our April issue and will not, therefore, be repeated in detail here. However, for the benefit of readers who may have missed this, we will go over the main points.

Cylinder components of the Tee-Dee 15 are basically similar to those of the previous Olympic 15 model but with a new combustion chamber shape. Bottom end components are entirely different, however, and the new engine uses a unique form of shaft valve induction in place of the Olympic's reed valve. This has meant the abandonment of twin ball-bearings but, unquestionably, results in a far more efficient engine.

The new Cox shaft is no less than $\frac{7}{16}$ in. dia. and the shaft passage through it is a full $\frac{5}{16}$ in.—the biggest yet seen on a 2.5. There is a correspondingly large rectangular valve port—$\frac{7}{16}$ in. long—registering with a bearing aperture of similar size and shape, giving an induction timing of 55 deg. ABDC to 45 deg. ATDC. The bearing aperture is produced by a flat milled across the extended nose of the machined crankcase forming the shaft bearing. This nose section is then encased in a special

(moulded) housing carrying the carburettor. A large chamber is thereby formed between the carburettor and rotary-valve and the accumulated gas serves as a fluid link between the high velocity flow through the relatively narrow carburettor throat and the pulsed movement through the large, unrestricted valve ports with their rectangular shape giving very rapid opening and closing.

The carburettor is of the well-known Cox pattern in which fuel is metered by a needle-valve externally located on the carburettor and is then fed into it through three small jets in the venturi throat. Provision is made for a timed pressurised fuel system via a nipple located on the side of the front housing.

The quality of construction throughout is to the usual Cox high standards.

Specification

Type: Single-cylinder, air-cooled, reverse-flow scavenged two stroke cycle, glowplug ignition. Crankshaft type rotary valve induction with sub-piston supplementary air induction. Provision for rotary-valve timed pressurised fuel system.

Bore: 0.585 in. Stroke: 0.556 in.

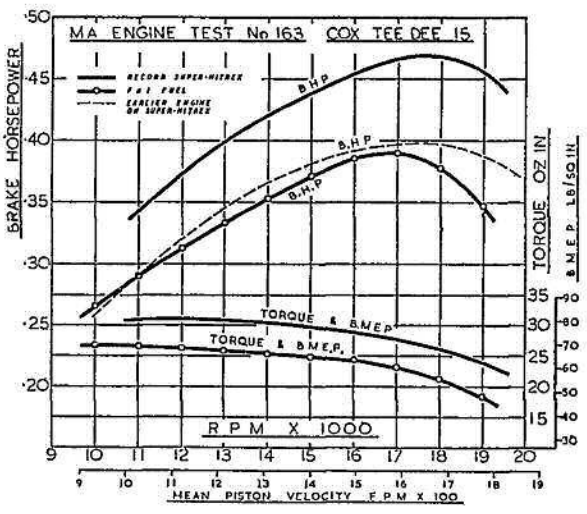
Swept Volume: 0.1494 cu. in.=2.449 c.c.

Stroke/Bore Ratio: 0.95 : 1.

Weight: 4.1 oz.

General Structural Data

Crankcase and main bearing machined from extruded aluminium alloy bar with screw-in rear cover. Hardened and ground steel crankshaft with crescent counterbalance, 7/16 in. dia. divided main journal and 5/32 in. dia. crankpin. Shaft end knurled for pressed-on gold-anodised alloy prop driver and tapped for prop retaining screw. One piece, non-hardened steel cylinder with two exhaust ports and two transfer flutes, blued on external surfaces and screwed into crankcase. Lightweight steel flat-crown piston with hardened working surface and ball and socket joint to hardened steel connecting-rod. Screw-in alloy cylinder head seating on soft copper gasket and with integral glow filament. Moulded main bearing housing and carburettor boss secured with alloy lock ring. Screw-in carburettor intake with gold anodised needle-valve body having steel thread insert and blued steel needle. Needle-valve assembly reversible for left or right hand operation and can also be inclined rearward and upward. Beam mounting lugs.



Test Conditions

Running time prior to test: 1½ hours.

Fuels used: (i) Regulation F.A.I. speed blend of 75 per cent. Methanol and 25 per cent. Duckham's Racing Castor-Oil. (ii) KK Record Super-Nitrex (30 per cent. nitromethane).

Air temperature: 58° F.

Barometer: 29.7 in. Hg.

Performance

Tests on the Tee-Dee 15 were carried out on both a 30 per cent. nitromethane content fuel, as recommended by the maker, and on the new standard F.A.I. 75/25 alcohol-castor fuel.

Starting qualities were good, although not quite so foolproof, perhaps, as with the earlier Olympic model, and the engine seemed to respond best to port priming both hot and cold. Backward starts were rather prevalent on small light props. Needle adjustment was just a trifle critical on straight fuel. Response to the needle-valve is, at all times, quite appreciably delayed (due, no doubt, to the unique accumulator chamber induction system) and the needle could be moved a full turn with no immediate effect, so that a fair amount of careful and unhurried adjustment was necessary to arrive at the optimum setting for maximum revolutions under any given load.

With such attention, however, the Tee-Dee 15 responded by delivering some impressive performance figures. Most remarkable is the incredibly high torque developed by this engine. Even on straight fuel, this exceeded 26 oz. in. at approximately 10,500 r.p.m. which is equivalent to a brake mean effective pressure of 69 lb./sq. in. On some well matured Super-Nitrex, this jumped to 80 lb./sq. in. (31 oz. in.) at around 12,000 which is by far the best b.m.e.p. figure yet reached in these tests, irrespective of engine type or size.

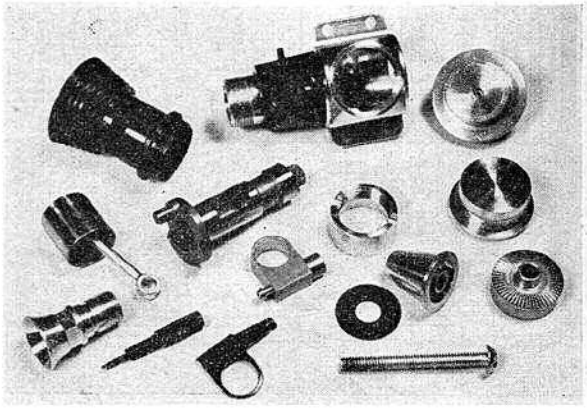
Decline of the torque curves was even and smooth and resulted in the Tee-Dee 15 showing an output of nearly 0.39 b.h.p. at 16,900 r.p.m. on straight fuel and a phenomenal 0.47 b.h.p. at 17,700 on the 30 per cent. mixture. Just what all this means in terms of prop r.p.m. figures is demonstrated by the fact that the Tee-Dee turned a 10 × 4 Tornado nylon prop at some 10,600 r.p.m. on *straight* fuel and bettered 11,300 on nitro. At the other end of the scale, 16,400 r.p.m. were obtained with an 8 × 4 Top Flite nylon, 17,400 on an 8 × 3½ Top Flite and 19,300 on a 7 × 4 Power-Prop—using Super Nitrex.

The penalty of such high performance was a couple of burned out glow filaments at speeds in excess of 18,000. In the normal way, however, with the engine propped for not more than 16,000-16,500 r.p.m. static, filament life should be reasonable for F/F work.

It may well be that this particular example is a "good" one, but even taking the most pessimistic view, it is clear that, on average, the Tee-Dee 15 is capable of exceeding 0.40 b.h.p. on a 30 per cent. nitromethane mixture and, with its exceptional power/weight ratio, should make a formidable F/F motor.

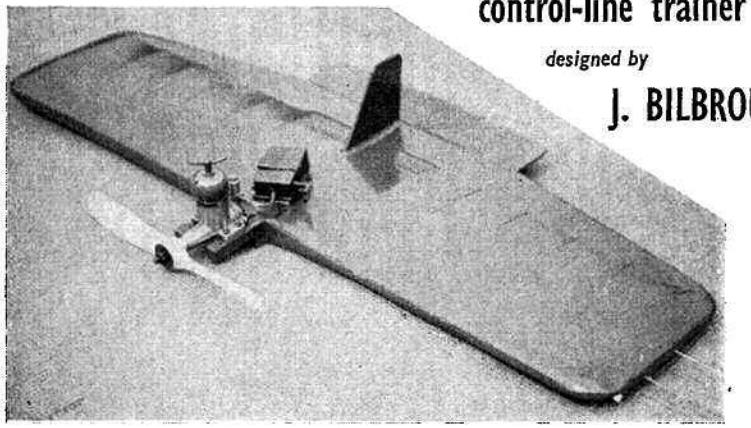
Power/Weight Ratio (as tested): 1.50 b.h.p./lb. (straight fuel). 1.83 b.h.p./lb. (30 per cent. nitro).

Specific Output (as tested): 159 b.h.p./litre (straight fuel); 191 b.h.p./litre (30 per cent. nitro).



Parts of the Cox Tee-Dee 15

KLIPPER — a simple control-line trainer



designed by

J. BILBROUGH

AFTER breaking up several kit models, I decided that it would be cheaper and easier, in the long run, to design a trainer which would withstand the hard knocks and crashes which are inevitable when learning the basic principles of how to successfully fly control-line. The following requirements were borne in mind—ruggedness, simplicity, quickness of building and cheapness. *Klipper* fills all these requirements and has proved to be a strong, stable trainer.

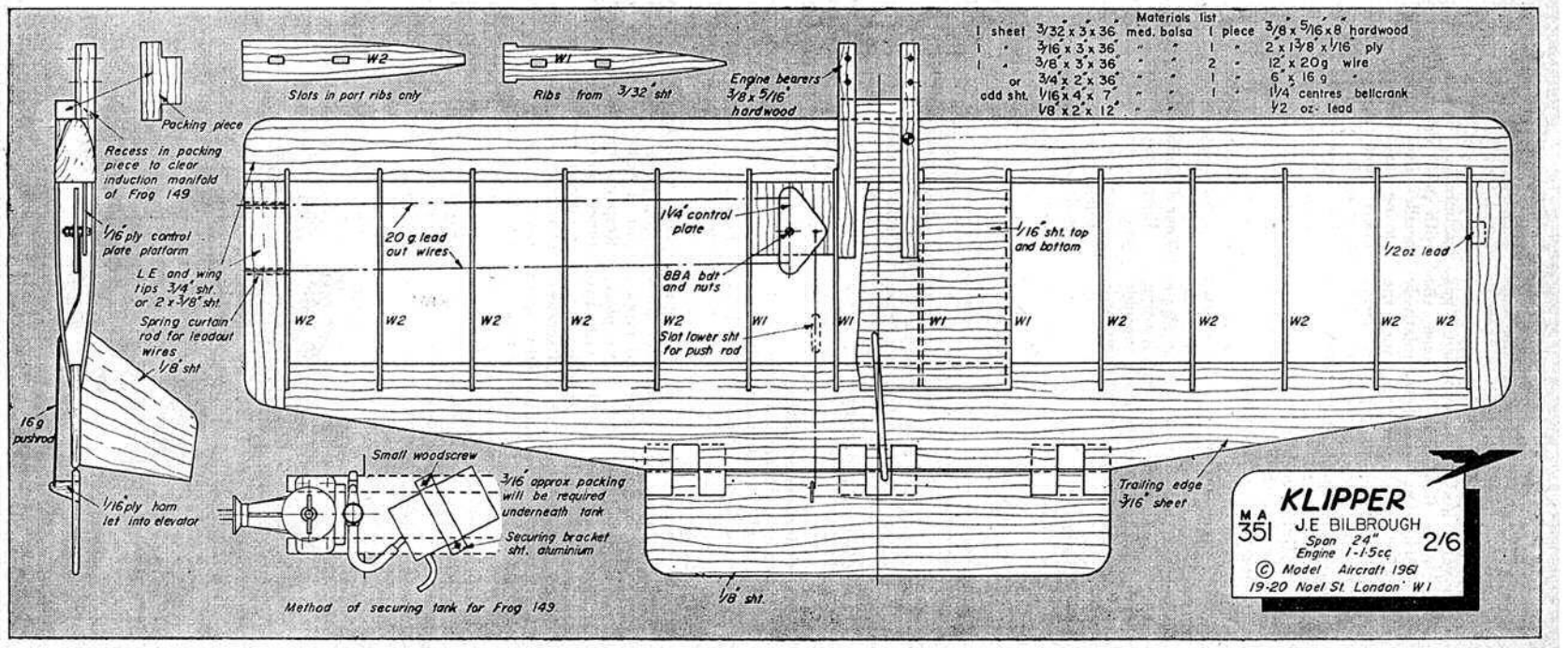
A Frog 149 was used in the original, but any 1-1.5 c.c. engine is suitable, provided the distance between the inner wing ribs W.1, to which the engine bearers are cemented, is varied to suit. Similarly the position of the tank may also have to be adjusted.

Construction

1. Pin L.E. and T.E. over plan, slots in line, the T.E. being raised 9/32 in. using scrap balsa.
2. Cement in wing ribs.
3. Whilst this assembly is drying, add lead-out tubing to port wing tip, and weight to starboard wing tip. By using two thicknesses of $\frac{3}{8}$ in. sheet, these can be easily recessed to take the tubes and weight, and then cemented together.
4. Cement horn into elevator.
5. Remove wing from plan and cement wing tips in position.
6. Recess L.E. for engine bearers and cement bearers to L.E. and ribs.
7. Cement packing piece between engine bearers.

(*Continued on page 253*)

FULL SIZE WORKING DRAWINGS ARE OBTAINABLE FROM YOUR LOCAL DEALER, OR BY POST FROM THE "MODEL AIRCRAFT" PLANS DEPARTMENT 19-20, NOEL STREET, LONDON, W.1, PRICE 2s. 6d., POST FREE



LETTERS
to the Editor

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.

Good show!

SIR,—After visiting our first Nationals, may I take this opportunity, on behalf of the All Arms Junior Leaders Model Club, to congratulate the camp organisers for a clean and well-run camp. We all had a wonderful time and were keenly interested in all the different types of interests and models.

We did feel though, that the actual contests could have been better marked out, with a notice board at the entrance showing visitors the exact location of a contest and how to get there. A bit more thought is required for crowd control, especially near parked models. It was rather disheartening watching some modellers defending their property, not only from curious spectators, but dogs as well: will owners please keep their pets under control?

To the amateur, the Radio Controlled event appeared almost professional with some amazingly wonderful flying; how, we wonder, with our limited resources (we have to eat), can we ever hope to achieve their standard on single channel British equipment?

On the last evening a party of our Junior Leaders toured the aerodrome and picked up an E.D. Baby-powered model (nameless as usual), also two glider towing reels, one bearing the name of G. K. Barratt, Lincoln. Will the owners please contact me, giving an accurate description of the items, so that we may return them to their rightful owner.

Would any modellers living near Tonfanau like to visit our club room? The club is situated near Towyn, overlooking the Cardigan Bay, in a camp once very well known to trainees in the A.A. section of the Royal Artillery. We have two large huts in which to work. We also possess an epidiascope which, together with a 16 mm. film projector and loaned films, helps to liven up the long winter evenings. We have a disused airfield just a mile from the camp for flying, but actual test flights can be made from a sports field adjoining the huts.

The club has 35 very keen members (ages 15-17½), 10 of whom paid their own fare in order to be of assistance at the Nats. The hobby is incorporated in the Duke of Edinburgh's Award Scheme as a pursuit.

Anyone in the area is invited to come and visit us if they drop me a line first, informing me of the time and date of their arrival.

Lastly, does anyone know of any old, repairable, full-size gliders, primary or otherwise, going cheap?

RONALD C. BOTT.
19032805 Sgt. R. Bott, R.A.,
All Arms Junior Leaders Regiment,
Tonfanau Camp, Towyn, Merioneth.

An aeromodelless!

SIR,—I have been amused recently to read Mr. Pylonius' comments concerning lady aeromodellers, and I have been equally interested to read Miss Allsop's replies. However, in case your readers should gather the impression that there is only one such aeromodeller, let me hasten to assure them that there are, in fact, two. Unfortunately my own qualifications do not bear comparison with those of Miss Allsop, although she was not so successful at the Nationals as she predicted.

My own achievements so far amount to one glider and my competition results are 4 min. and 3 min. respectively, so that my progress is, in fact, in reverse. I have not yet achieved the distinction of a maximum, but the resident expert assures me that this is possible, providing I tow my glider higher than my normal 10 ft. I find myself requested to "run like the clappers," quickly followed by "fetch the so and so shovel."

However, on a more serious note, I have thoroughly enjoyed the three months taken to construct the glider, and the pleasure of seeing it fly has more than repaid the efforts involved. To remove any doubts you may have I enclose a photograph of my proud possession taken after the Thurston Trophy, which I did not win this year.

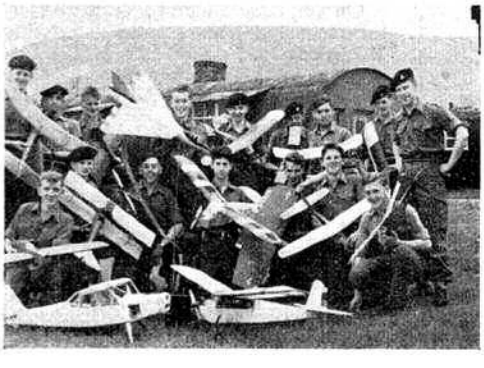
Yours faithfully,
YVONNE MOSEDALE.
Chief Tissue Ironer,
Essex M.F.C.

What is wanted?

SIR,—Much impressed as I was by Mr. Weller's impassioned plea (MODEL AIRCRAFT, June) for whatever it is he was pleading for, perhaps he would do me the favour of elucidating one or two details.

We in the London Area, and I am sure other Areas also, have always been aware that the contest flyers are a minority, in numbers if not in interest. Perhaps Mr. Weller can give the solution to a problem often discussed, but never resolved, by us—what exactly does he, as an Associate, want from the Society? Certainly not contests, or he would be a full member with the privilege of paying a much higher membership fee, the

(*Continued on page* 251)



Left: members of the All Arms Junior Leaders Model Club.

Right: Miss Mosedale with her glider.

If Only They Had Modelled!

DO you know that the first Model Engineer Exhibition was held as long ago as 1898? To visit it, the enthusiasts had to travel through the London of Sherlock Holmes; at any moment a Hansom bearing the solid figure of Dr. Watson might pass, with a tinkle of harness, in the foggy direction of Baker Street.

In many ways, the first Exhibition was remarkably like the one which some of you will see, and all of you would like to see, in August of this year. As the world was still living in the Age of Steam, the locomotives were there in 1898 much as they are now, except that the ones which were modern in the last years of Queen Victoria are modelled today as antiques. There was, however, one big difference. If you could travel back on a Wellsian Time Machine to the Exhibition of 63 years ago, you would not see a single example of an aircraft.

Readers of *Model Engineer* were far ahead of nearly eyeryone else in realising the possibilities of flight. They experimented; they sent in queries which, with the answers, were of value to other pioneers; and as the years passed, their interest grew to such an extent that a second magazine was needed. You are reading it now.

But in 1898 aviation was still in the era of gliders and the kite. Hargrave flew his cellular kite in that year, while it was not until two years later that Clement Ader built the *Eole*, a weird machine which was, nevertheless, entitled to be called an aeroplane. Successful heavier-than-air flight had to wait for the new century. Six Model Engineer Exhibitions had been held before Wilbur and Orville Wright—their family had emigrated to America from Kelvedon in Essex—flew for a trifle over twelve seconds on a cold, wet December day in 1903.

By that time the Exhibition had done a great deal for the craft of modelling. It had raised standards, it had brought the practitioners into contact with one another and it had made the public aware of the modellers' skill.

The new science of aviation profited from this. All the early pioneers—Cayley, Stringfellow, and the others—had worked from models. But the experimenters in the Wright period tended to apply their ideas at full-size, without first testing them in the way that a model makes possible.

Many of their ideas were hopeless. If the inventors had tried them out in model form, they would have lost a few shillings at most. Instead, they began with the real thing. Some of them lost fortunes; others their reason, or what remaining shreds of reason they possessed. Had they been modellers, had they possessed the inclinations and skill of the average Wingman, they would have saved themselves and their families untold heartbreak.

Next month I shall describe some of the strange contraptions which they evolved.

ALAN WINTERTON.

Dear Alan Winterton—I am between 10 and 16 years of age and would like to become a member of the Model Aircraft Wings Club. With this coupon I enclose a postal order (overseas readers should send an International Money Order as local postal orders cannot be cashed in England) for 1/- to help cover the cost of the badge, transfers and membership book. *All membership applications must be on this form.*

Name in full.....
(Underline christian name normally used)

Address.....

.....

..... Year of birth.....

School or College.....

Name of other club or clubs to which I belong (if any).....

.....

Send to—MODEL AIRCRAFT WINGS CLUB, 19-20 NOEL STREET, LONDON, W.1.

Wingmen write . . . .

Thank you very much indeed for sending my badge and transfers so quickly. I have just built a Keilkraft *Champ* which is powered by a Davies-Charlton Sabre. Also, I have just received a Frog M.E.109. The *Champ* is my first control liner, although I started modelling at the age of six.

Yours faithfully,
PETER EATON.

Gt. Bookham,
Surrey.

* * *

This photograph shows me holding my 27 in. span Keilkraft short *Seamew*, which was my first flying scale model.

I have many other Keilkraft models such as, *Venom*, *Lysander*, *Cessna* 140 and the *Spitfire*. My father is also a keen aeromodeller and has many models.

Yours faithfully,
RODERICK BUSKELL.

Chipping Campden,
Glos.

* * *

Several months ago, I purchased a not quite completed kit with a reasonable motor. I'm afraid the kit was rather advanced for me then, and in my eagerness to complete it, I made a mess of it. However, I have taken the model to pieces and have started again, rather successfully, I might add.

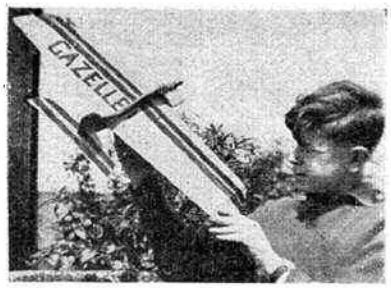
Oh yes, congratulations on a wonderful magazine and a most interesting Wings page.

Yours faithfully,
PAUL BUTLER.

Richmond,
Surrey

* * *

I thought you might be interested in some of my model planes. I am interested in most kinds of models, especially glider and F/F power. I have sent you photographs of myself with my K.K. *Gazelle* stunt model, which is fitted with an Allbon Spitfire diesel, and my



"Contest Kits" *Inch Worm* A.2 glider. Both fly well.

Control line models last longer than F/F models where I live, as these latter seem drawn towards houses, brick walls, T.V. aerials, etc.!

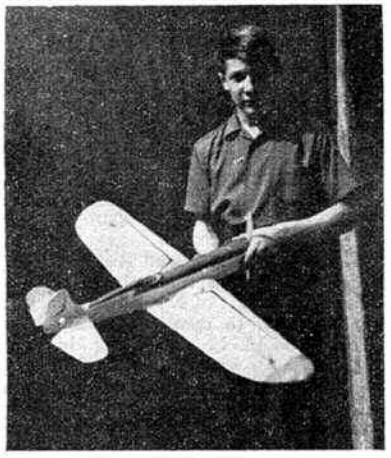
Yours faithfully,
JOHN J. FINNIGAN.

Oldham, Lancs.

(Unfortunately there is insufficient space to reproduce both of John's photographs, but here is his GAZELLE*—A.W.)*

* * *

A model which I have recently built is a stunter called *Falcon* for the A.M.25. It is 38 in. wingspan and is pale yellow with mauve, black and white trim.



My main interest is control-line, but I build occasional rubber models and gliders, mainly to experiment with different structures. My next scale model is going to be a detailed Dornier 215 twin for the A.M.25 and 35.

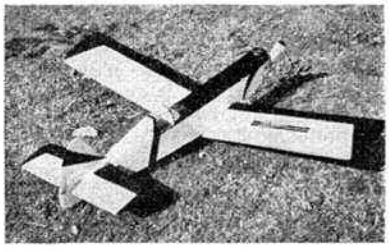
Yours faithfully,
GEOFFREY WOODWARD.

Harow Weald,
Middx.

Geoffrey also sent me two excellent photographs of his rubber and glider models which, unfortunately, there is insufficient space to print—A.W.

* * *

I built the *Wee Snifter* featured in the January issue of MODEL AIRCRAFT. It took me a week to build and I must say I thoroughly enjoyed building it. So far it is my most successful free flight model as it performs really well, and also attracts considerable attention on the flying field. The photograph shows my *Wee Snifter* which is finished in black and yellow.



I am looking forward to the next model you feature and recommend to Model Aircraft Wings Club members.

Yours faithfully,
TERENCE DEMMER.

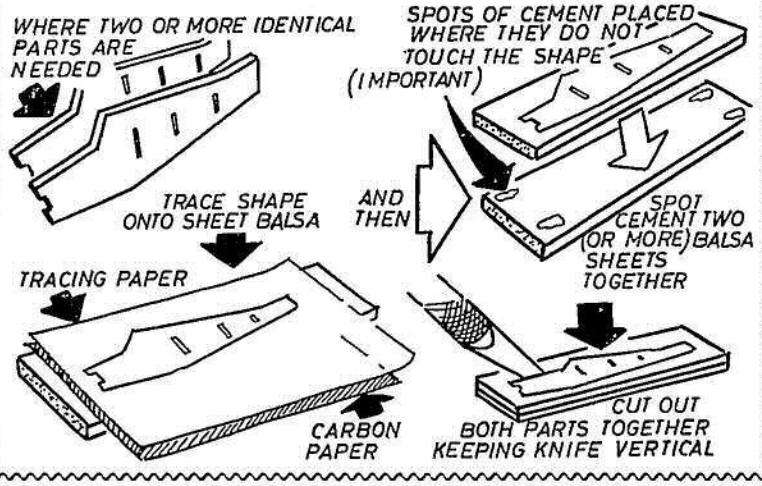
Cape Province, South Africa.

IMPROVE YOUR MODELLING *with this months* Tip

BY RAY MALMSTRÖM

IDENTICAL SHAPES

BUILDING instructions often start: "Cut two fuselage sides from sheet balsa." Obviously, for accurate assembly both sides must be identical. "Spot-cementing" is the answer. Follow the diagrams below. Trace the part (fuselage side, nose doubler, etc.) onto sheet or plywood. Take another sheet and put small spots of cement on it (usually, but not necessarily), at the corners. In any case the important point is not to put a cement-spot on the shape to be cut out. Put sheets together and allow cement to set. Cut out shape with knife or fret-saw—but *please* keep the blade vertical. When separated two or more identical shapes result. "Dead accurate—dead easy!"



Twelve-year-old Tommy J. Croskery (Wings Club No. 4719), of 6, Cairburn Road, Belfast 4, Northern Ireland, would like to write to a fellow enthusiast who is interested in C/L stunt and team racing.

Pen Pals wanted . . . .

Eleven-year-old Rodney Tanner (Wings Club No. 4928) would like to correspond with other modellers interested in either control-line or free flight models. Rodney's address is "Newlands," Seaford, Sussex.

Query Corner

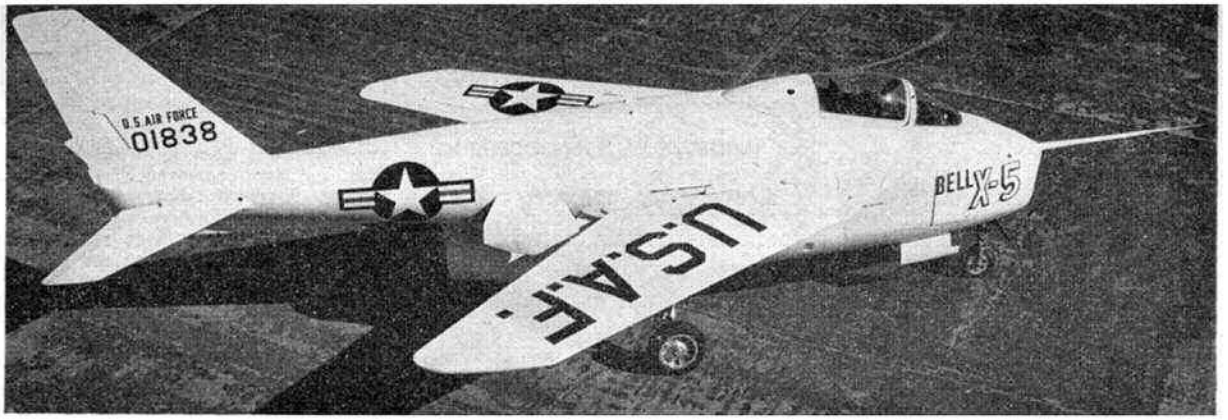
Although a very reliable engine, my Frog Mk. II 149 diesel occasionally gives a rapid burst and then stops. Apparently this is because all the fuel in the fuel pipe disappears back into the integral tank.

I would be pleased if you could tell me the cause of this phenomenon and what I can do to combat it. The fuel does not return to the fuel tank when the engine is running for any length of time.

Yours faithfully,
IAN V. HIBBERT.

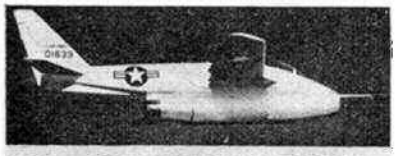
Belfast.

The fuel runs back into the tank when the fuel is below the level of the needle valve. The trouble can be avoided if the tank is kept full during starting, and care is taken to avoid tilting the nose of the model upwards. When the engine is running, of course, the suction from the carburettor maintains the constant flow of the fuel from the tank—A.W.



John W. R. Taylor's **PLANE of the MONTH**

The BELL X-5

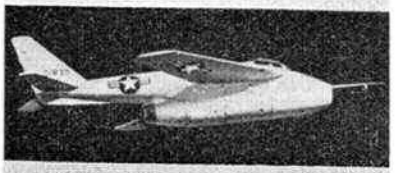


The Bell X-5 in normal flight . . .

The X-5 begins to sweep its wings.

Wings are moved back 50 per cent.

Sweep requires only 30 seconds.



Wings now in fully swept position.

THE recent surge of publicity for Dr. Barnes Wallis's *Swallow* aircraft with variable-sweep wings has led to renewed interest in the Bell X-5, which was the first aircraft to vary its wing sweep in flight. Even the manufacturers of plastic model kits now consider the X-5 a worthwhile addition to their range, although it first flew more than ten years ago and never made headlines to the same extent as the supersonic X-1 and X-2 from the same stable.

Its story began in mid-1944 when the *Luftwaffe* High Command issued a specification calling for a single-seat fighter powered by the forthcoming 2,865 lb. thrust Heinkel HeS 011 turbojet, armed with four 30 mm. Mk.108 cannon and with a top speed of around 620 m.p.h. at 23,000 ft. Blohm & Voss, Focke-Wulf, Heinkel, Junkers and Messerschmitt all produced design studies, and in July 1944 Messerschmitt received the go-ahead on their P.1101 project.

The basic layout of the P.1101 was not particularly inspired. The turbojet was simply slung under the wing in the fat centre-fuselage, and exhausted under a slim tailboom. But the wing was unique in that it was a single-spar wooden structure and could be adjusted on the ground to any angle of sweepback between 35 deg. and 45 deg.

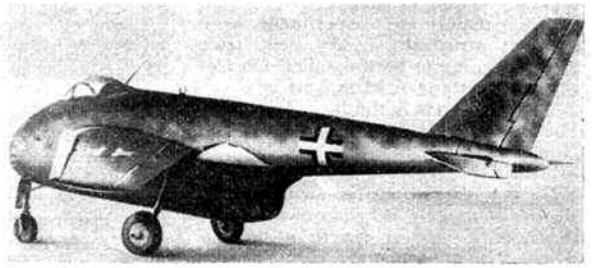
As the HeS 011 was not ready in time, the prototype P.1101 V-1 was built with a 1,960 lb. thrust Junkers Jumo 004B turbojet. Before it was completed, the Messerschmitt factory at Oberammergau was captured by the Americans, who promptly packed the aircraft off to the United States.

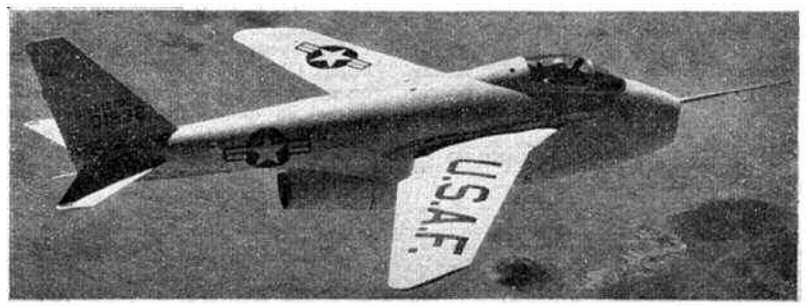
It must have created quite a good impression because, when Bell Aircraft began work on the X-5 three years later, they decided to base its general layout on that of the P.1101. A few refinements were made; but the only major innovation was that the all-metal wings of the X-5 were so built that their sweepback was variable in flight from 20 deg. to 60 deg.

Bell went into the mechanics of this very thoroughly and in the final design the wing operating mechanism compensated automatically for changes of c.g. as the wings moved, while a specially-designed fairing kept the airflow smooth over the roots regardless of the angle of sweep. Full-span leading-edge slats were fitted.

The X-5 was intended primarily for research into the aerodynamic effects of varying the angle of sweep in flight, but was designed to combat standards, so that it could be evaluated by the U.S.A.F. as a potential tactical fighter. It promised considerable flexibility in this role, as the low-speed handling problems inherent in the swept-wing designs of that era could be eliminated with the wings in their forward position

Right : a full size "mock up" in wood and metal of the Me.P1101. This photo has never before been published.





for take-off and landing, while the full 60 deg. sweep was regarded even then as the optimum for high-speed cruising.

Two prototypes of the X-5 were built, and the first of these flew on June 20th, 1951. Powered by a 4,900 lb. thrust Allison J35-A-17 turbojet, it had a top speed of 650 m.p.h. with wings at maximum sweep, dropping to 695 m.p.h. with minimum sweep.

Basically, the X-5 achieved its target of proving that variable sweep is practicable and safe, and it was still being flown quite recently by N.A.S.A. pilots. But subsequent advances in aerodynamic know-how have made possible acceptable standards of handling and control throughout the speed range, without the complexities of variable sweep. As a result, this particular line of development was abandoned until Barnes Wallis came up with the *Swallow*. Whether or not this will progress from idea to ironmongery we can only wait and see.

Data: Span (20 deg. sweep) 30 ft. 9.8 in., (60 deg. sweep) 18 ft. 7.2 in.; length without nose-probe 33 ft. 4 in.; height 12 ft.; wing area approx. 175 sq. ft.; weight loaded 9,892 lb.

READERS' LETTERS

continued from page 247

normal contests entry fee of 2s. 6d., and the trials entry fee of 10s. He is already getting insurance, plus the right to sport the Society's badge both on his models and on himself. The only other desire apparent from his letter, is for "informal, happy-go-lucky" flying; by which I assume he means that the Society should find his flying site, and then go away, only returning at the end of the day to clear up the litter.

Mr. Weller objects to paying 10s. to enter S.M.A.E. contests (which he is not apparently interested in anyway) and thereby subsidising "a handful of competitors" in world championship events. Why? I for one am no more likely to find myself in an international team than he is, but am quite happy to pay my few shillings a year to help support this country's efforts to remain in the forefront of international flying. Was there ever any amateur sport wherein the body of the membership did not finance "a handful"?

Lest the above give the impression that the London Area, or myself, are "against" associates, I would repeat: we are most anxious to do whatever we can for any member of the Society, or for that matter any aeromodeller, if he, or they, will only tell us what they want. Any modeller, who is genuinely interested in the future of the hobby, will always be welcome to come and speak his mind at our, and I am sure at any other Area's, meetings. May I suggest therefore that instead of fulminating in the Press, Mr. Weller does just this

Yours faithfully,

P. MULLER.

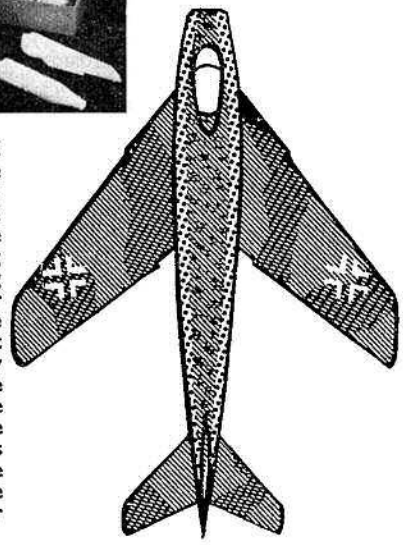
P.R.O. London Area S.M.A.E.

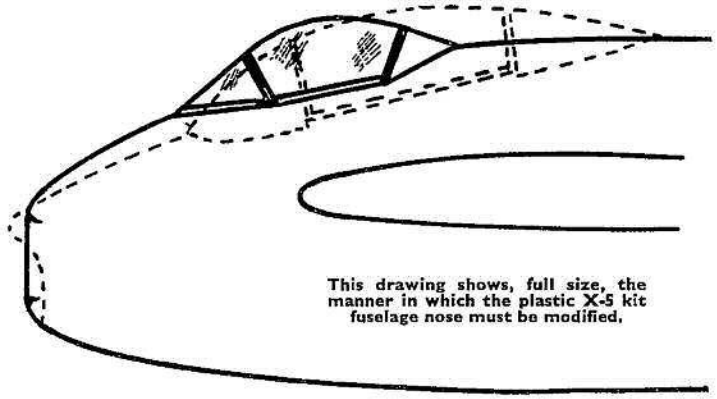
Convert your Bell X-5 plastic kit into a replica of the Me. P.1101

PLASTIC enthusiasts will welcome the new Revell kit of the Bell X-5 because of its potentialities for "re-working." The dotted outline in the drawing below indicates the fuselage profile of the Bell X-5. The solid line is a close approximation of the nose shape of the Messerschmitt P1101.

To convert the $\frac{1}{4}$ in. scale Revell kit the "lip" over the air intake must be removed and the pilot and cockpit interior must be moved forward about $\frac{3}{8}$ in. To modify the nose contours we suggest using Bondafiller, and details concerning this material were published in our July 1960 issue (p. 210). The same article also dealt with cockpit moulding, and since a completely new canopy is required for the P1101, we would strongly advise those who do not have this issue to obtain one from our Back Numbers Department price 1s. 6d. Only one other modification is necessary—the removal of the long underfin under the tail boom.

The prototype 1101 never quite reached the painting stage, but as a fighter, it would eventually have been camouflaged as shown in our drawing. The upper surfaces of the wing and tailplane olive and forest green, fuselage sides and fin, mottled forest green and light grey (or pale blue) merging into a forest and olive green mottled fuselage top. All undersides either light grey or pale blue. White outlined national markings (with no black) on the upper wing surfaces and fuselage sides, black Swastika on the fin and black outlined crosses under the wings.





This drawing shows, full size, the manner in which the plastic X-5 kit fuselage nose must be modified.

NOW that practically every household owns one of the popular small electric power drills, the many useful ancillary tools can make modelling very much easier and one which we tested recently was a set of **Rexburrs.** We found this set of six assorted burrs to be extremely useful for such jobs as cleaning up and lightening the inside of cast speed and team race pans, and for hollowing balsa cowling blocks, etc. They "bite" into balsa very well and provided it is medium to hard, leave a very smooth "planed" type finish.

Of hardened steel and with ¼ in. shanks, the burrs showed little tendency to clog with balsa or hardwood, although an occasional rub over with a wire brush was necessary when cleaning up an aluminium pan. Distributed by B. O. Morris Ltd., Morrisflex Works, Briton Road, Coventry, the Rexburrs cost 22s. 6d. per set of six, complete with wall fixing racks.

* * *

Latest addition to the **Frog** "Battle of Britain" series is a twin—the *Mosquito.* A profile model, of similar construction to the *Hurricane, Spitfire* and M.E.109 already in the series, the "Mossie" is an ideal subject for someone looking for something different.

Designed for two Frog 100's or similar motors, it will remain airborne on one motor and is docile to handle. In the air one does not get the impression of it being a profile model, as it looks most realistic and is a certain crowd drawer.

The kit, which includes wheels, spinners, all tank parts, etc., has all its balsa and plywood components either die cut or band sawn to shape, and is fully to the standard now expected from this manufacturer. The price is 48s. 2d.

* * *

Samples of a new lightweight nylon chiffon covering material, have been received from **Sheen Models.** This is of considerably lighter texture than the material we used to cover our *Super* 60 and, consequently, is suitable for quite small models. Most models of above, say, 3 ft. span, benefit from the added strength of nylon and at 7s. 11d. per yd. 45 in. wide, this is good value.

From the same source comes a heavy duty, wet, unspillable, 2 volt accumulator. Measuring 2 × 4 × 7½ in. and weighing approximately 4 lb., the cost is 7s. 6d. dry or 8s. 11d. filled, charged and ready to use. Dropping leads for use with 1½ volt plugs cost 3s. 11d., complete with spade ends and crocodile clips.

* * *

Kits of the **Jetex** *Theron,* which was announced earlier this year, have now been in the shops for some time and an exceptionally complete kit it is. The entire fuselage is beautifully formed in four parts in plastic, with balsa formers and orthodox wing and tail construction.

Designed to be flown either as a glider or with the Jetex P.A.A. Loader motor, the model performs well, its combination of old and new building techniques bringing it constructionally within the reach of beginners. It sells at 16s. 9d. which, considering the kit is complete even to two tubes of cement (plastic and balsa), transfers, sandpaper, etc., is most reasonable.

* * *

The Blackwell *Ranger* S-10-W R/C kit, recently received from **Malcolm Douglass,** shows that although the quality of the balsa wood, etc., is still to the high standard expected from American kits, on the score of die cutting and plan presentation, our own industry no longer follows in the footsteps of U.S. manufacturers but if anything leads them. This is not to say that the kit is in any way inferior, but if one were laying out the purchase price of 103s. 6d., on a British kit, one would expect far more in the way of prefabrication and accessories.

In fairness, of course, imported products have to pay carriage rates and import duty and if purchased in America this kit has the basic fuselage assembled. To import it in this state, the freight charges would almost equal the value of the kit itself!

A simple slab-sided 63 in. span high-wing design for .19-29 motors, the plan details various radio installations and link-ups which are most helpful, while a separate instruction leaflet explains trimming techniques.

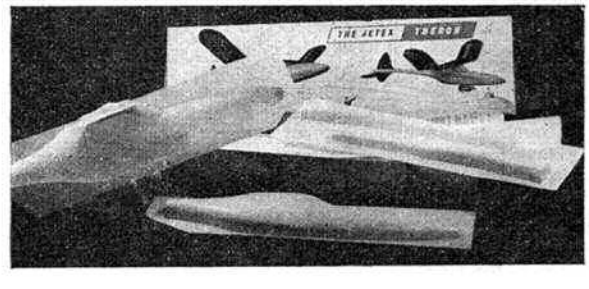
* * *

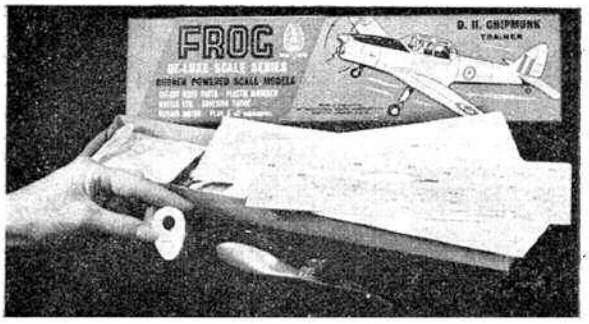
As if to underline the foregoing remarks, the same post brought, from

Below : a set of Rexburrs.

Right : Revell's new kit for the "Starfighter" with "Sidewinder" missiles—an illustration of their X-5 kit is on page 251.

Below right : the Jetex "Theron" showing moulded plastic fuselage.





Above: Frog's "Chipmunk" and right their "Mosquito."

Roland Scott Ltd., one of the German Schuco kits of the Schleicher K.8.B semi-scale R/C glider. In this also, the die-cutting is far below the standard we now expect, but in other respects the kit is extremely good. A detailed plan has all parts numbered to correspond with numbers on the various block, sheet, printed plywood and die-cut parts, which makes the assembly, of what would otherwise be a fairly complicated design, quite straightforward. This is assisted by a comprehensive instruction booklet, with photo illustrations, and English as well as German text.

A complete set of hardwood, glue and some extremely good transfers are also included in this kit which costs 106s. 0d.

* * *

Loose engine mounting bolts are a thing of the past if you use **Loctite.** This liquid, applied over the threads, forms a plastic seal which is proof against vibration, but is fairly easily broken to unscrew the nuts. Costing 7s. 6d. per tube (sufficient for 100 applications), Loctite appears to be proof against fuels, but, and this is the only real limitation we can see, it does take some 12 hours to go off.

* * *

Exhibition finishes take hours of work, often as long as the actual construction of the model, and various wood fillers, stoppers, etc., are essential during the preparation and final finishing. **Brummer Ltd.** produce a range of such materials, which are entirely suitable for model use. All types and colours are available, the list being far too long to detail here, but any good Handicraft, or "Do-it-Yourself" shop, is sure to carry a selection.

* * *

That up-to-the-minute model shop, **Roland Scott Ltd.,** realising that many modellers have not the time, nor the inclination, to write for goods and are often unable to telephone during business hours, have now installed a telephone answering machine. Anyone wishing to place an order merely phones Bolton 27097, gives their name and address, followed by a list of what they require, and the goods are sent off C.O.D. next day.

When a call is made the machine says "This is Roland Scott Ltd., in the absence of our staff this machine will record your order. Please speak now." It is essential to make a list of one's requirements as, if there is more than a 10 sec. pause without anything being said, the machine will acknowledge the order and automatically switch itself off. Say anything—but keep talking!

* * *

Fascinating kit of the *Jupiter "C"* rocket from **Revell's** looks, on first opening the box, to be either a railway station or girder bridge. This is because the rocket is dwarfed by the massive launching superstructure which is on rails.

More conventional is the *Starfighter* with *Sidewinder* missiles, although this kit departs from standard practice, in that the wings are moulded integral with the top half of the fuselage. The third, and possibly the most interesting, of the new Revell kits is the Bell X-5. This fascinating variable wing-sweep experimental machine, developed from the German Messerschmitt P1101, provides the plastic modifying fiends with lots of "meat." (See page 251 of this issue.)

Needless to say, these kits, which cost 22s. 6d., 8s. 6d. and 8s. 6d. each respectively, contain all the finely moulded detail and accuracy that we have come to expect from this company.

* * *

First in a new series of rubber powered scale models from **Frog** is a *Chipmunk.* Of 21 in. wingspan, this is a nice "flyable" little model, within the scope of the beginner who has already built a couple of really basic designs.

Construction is quite orthodox, with all the parts accurately, and very cleanly, die-cut to shape. The kit which includes rubber, wheels and a plastic propeller, costs 7s. 6d.

* * *

Le Pages Ltd., who have been established at Beckenham for many years, have now moved their offices to Gillespie Road, London, N.5 (CANonbury 8414/5).

KLIPPER

Continued from page 246

8. Sand L.E. and wing tips to rough shape, T.E. to $\frac{1}{8}$ in. thick at edge.

9. Drill bellcrank mounting plate for 8 B.A. bolt and cement in position.

10. Secure elevator to T.E. with tape hinges.

11. Thread lead-outs through wingtips and ribs, and secure to bellcrank. Secure pushrod to bellcrank. Mount bellcrank on plate, check that elevator movement is approximately 30-35 deg. in either direction and secure pushrod to horn.

12. Add $\frac{1}{16}$ in. sheeting over ribs (W.1), top and bottom.

13. Sand all over to finished shape, apply two coats of sanding sealer, sanding lightly between each coat.

14. Cover with lightweight silk or nylon and apply at least two coats of clear dope.

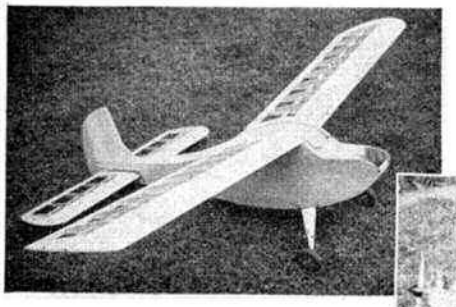
15. Now cement fin in position—note offset. Add generous fillet of cement all round.

16. Colour to suit—the original was finished in the new Humbrol enamel and one 8d. tin was sufficient to cover the model.

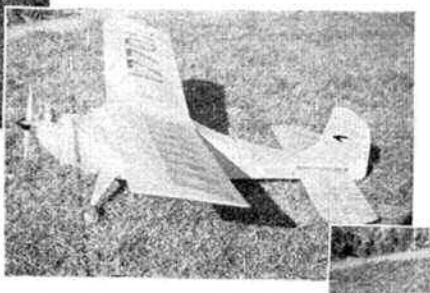
Flying

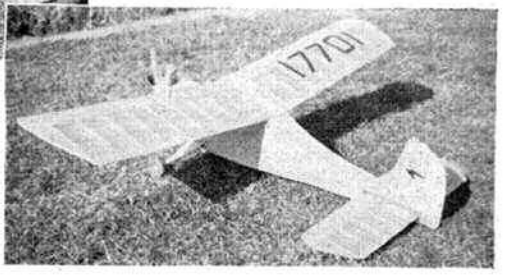
Before attempting any flying, check that the model balances at the correct position as indicated on the plan.

Lines should be 30-35 ft. long; wait for a calm day and for preference pick a field with long grass. The launch should be made down-wind. Your only concern during the first few flights is to get used to the feel of the model—so forget all about stunts. Concentrate on steady level flying. Then try gentle climbs and dives. As you gain more confidence you can attempt more ambitious stunts—the very best of luck.



PIKA — a 'rudder only' radio model for 2.5 — 3.5 c.c. motors





designed by W. LISTER

THIS model was designed to out perform any model in its competition class, whilst, at the same time, providing a rugged trainer for the radio novice, by using slightly less rudder movement. This latter point should be stressed, as I have found that the degree of rudder movement makes all the difference with this model. On no account should the novice use full rudder movement—he would find it rather like walking the garden fence in hob nailed boots with the same chance of success!

However, if the actuating rod linkage is moved from the top hole in the E.D. multi servo arm, to its lowest position, then there is sufficient rudder movement to both keep him out of trouble and not get him into it.

P.V.A. glue is recommended for use throughout the construction, as it is sufficiently slow setting for large areas of sheeting to be carried out comfortably, but dries quite fast enough for normal needs. It is very good for gluing hardwoods, is oil proof and only shrinks slightly on drying.

Fuselage

The two side frames are built from strong pliable $\frac{3}{16}$ in. sq., directly over one another on the plan. While these dry out, the engine bearer assembly with formers F1 and F2 is constructed, great care being taken to ensure accuracy as, if the above are accurate, the fuselage must end up "square" and well aligned.

The side frames are lifted from the plan and their stern blocks chamfered to fit the $\frac{1}{16}$ in. ply sternpost and rudder centrepiece, which should, at this stage, be hinged with thread. The side frames are now fixed to the nose assembly and allowed to dry out; F3 is then added and the sternpost, followed by F4, F6 and F5 complete with tailskid and holes for servo wires. The stern is best held by a clamp of some description at this stage. Finally add spacers, fill-in sheeting, gussets, etc., and sand smooth, before adding the outer covering of $\frac{1}{16}$ in. sheet. Let this assembly dry out and then make the dowel holes before finally sanding and covering with heavyweight tissue.

Give two to three coats of full strength dope, sanding lightly between each, followed by the final coat of colour. I find it best to use some brand of plasticised enamel, which is much more durable in many cases than the normal cellulose finishes. The plywood U/C board may now be added and the dowels inserted, together with T/P platform.

Before the fuselage is covered, the fin should be assembled from three cross grained layers of $\frac{1}{16}$ in. sheet balsa and attached to the fin post, which should ensure accuracy of alignment. This is then faired into the fuselage with soft balsa. It is essential to use strong firm balsa for the fin, as it must not warp and must be capable of taking the shock of a nose over landing.

Wing

Twenty pieces of $\frac{1}{16}$ in. hard balsa approximately 9 × 1 in., are pinned together and sanded to the wing section shown. The slots for the mainspars are best cut at this stage too, although the centre slots for the secondary spar will have to be cut individually. The four $\frac{3}{16}$ in. sq. spruce mainspars and their dihedral braces from $\frac{1}{16}$ in. ply and $\frac{3}{16}$ in. balsa, are now assembled, likewise the $\frac{3}{16}$ and $\frac{1}{4}$ in. secondary spars. While these are drying out, the trailing edge pieces from $\frac{1}{16}$ in. sheet are cut out and pinned over the plan.

Half the ribs are slid in place on the spars and finally fixed in position. The L.E. of $\frac{1}{2}$ in. sq. is now added, together with the upper trailing edge strip and tip. This half of the wing must now be supported whilst the remaining half is completed. Leading edge sheeting, gussets and capping strips complete the assembly, which should be carefully sanded to section.

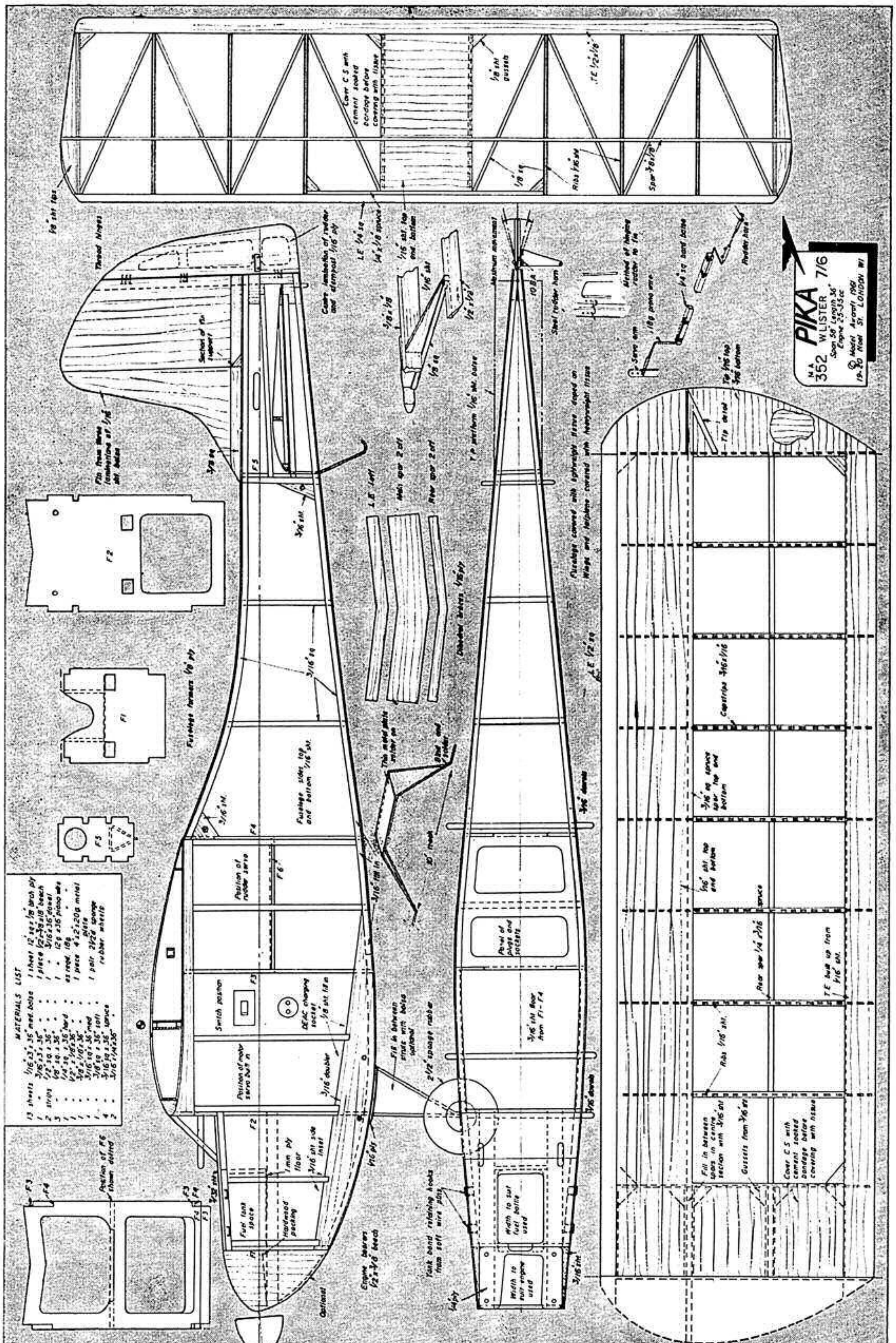
A strip of cement soaked bandage, 20 × 5 in. is wound round the centre section, to take landing shocks and the space between the L.E. and mainspars may be filled in with block balsa as an extra precaution. Finally cover with heavyweight tissue, give two coats of dope and one of fuel proofer.

Tailplane

The trailing and leading edges are sanded to shape prior to assembly, and any induced warps removed by back sanding. The $\frac{1}{8}$ in. basic framework is then built up between them, over the plan, and the $\frac{3}{8}$ × $\frac{1}{8}$ in. mainspar added, together with the $\frac{1}{4}$ × $\frac{1}{2}$ in. spruce leading edge strengthener. The ribs are then cut from $\frac{1}{16}$ in. strip and the centre section sheeting added. Finally bandage, as for the wings, and cover with heavyweight tissue, with two coats of dope and one of fuel proofer as before.

This completes the assembly and only the radio installation remains, which is a matter of common sense and will, of course, depend on the equipment used. The installation I have used is shown on the plan, but this is not of necessity the only, or best, arrangement.

General advice to the novice on first test flights, ground checks, etc., was given in the article "Airborne at Last" in the June issue of MODEL AIRCRAFT. Although specific checks will vary with the equipment used, the general advice should be closely followed.



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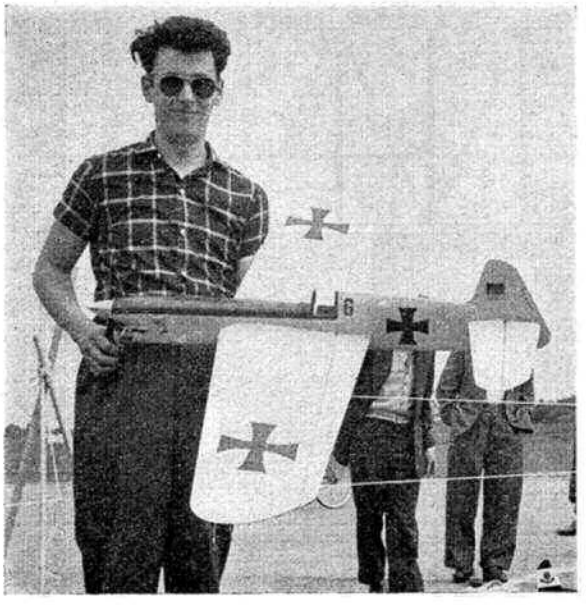
RECENT RALLIES



Tom Jolley who was fourth in Stunt at the Wharfedale Rally with his very attractively decorated "Nobler."

Wharfedale C/L Rally—*report and photographs by Ken Long*

THIS first C/L rally, organised by members of the Wharfedale Club, was held at Rufforth in good weather, with temperatures in the high 70s and only a very slight breeze.

All the entries in the three T/R events and combat, had been carefully arranged in heats the previous evening, so as to avoid the possibility of any entrant being required in two places at the same time. In effect, this meant that anyone could have safely entered all five events, with no fear of having to scratch one model due to pressure of time.

The "½A" team race was well supported, although a lack of experience was evident in some cases. The four-man final was very closely fought with only one incident, when a pitman entered the flight circle, and received a hefty blow between the shoulders from Nixon's model. The fastest time of the day was 4 : 40 by T. Ellis, who eventually won the event in 9 : 40 (200 laps), achieved with only two pit stops.

The "A" event was run very strictly to the full F.A.I. rules, every entrant being entitled to fly once in each of the two rounds. It was intended to fly the fastest three in the final, but, by the end of the second round, two entries had times which differed by only 0.4 sec., and it was considered foolish to split so fine a limit. As time would not allow a "re-run," it was mutually agreed that the final would be flown with four models. This probably affected the times, but it did not prevent a very interesting race.

The winner was G. Atkinson (Derby) whose Oliver Tiger powered model covered the 10 kilos in 5 : 46.8 which, under the circumstances, was a very good effort. Fastest time of the day was by A. Wallace (Novocastria) whose very impressive 4 : 33.2, reflects the positive increase in the standard of F.A.I. T/R flying in the North.

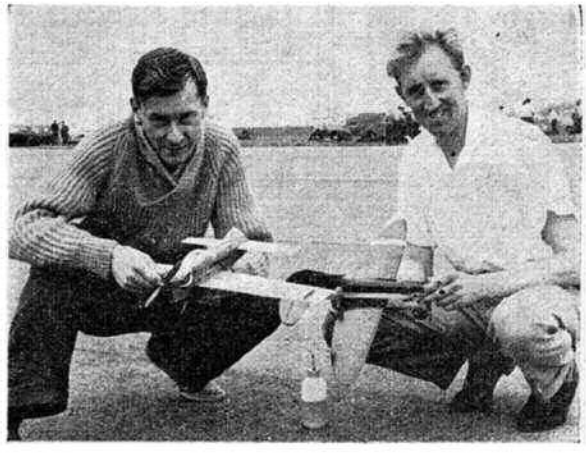
Class "B" was a little thin, as far as appearance on the starting grid was concerned. However, this, the most "hairy" of T/R events ran well and true to form. Fastest time of the day was 3 : 17.1 by Charley Taylor (West Essex), who also won the 140 lap final in 6 : 54 (with a little help from the local resident team). Charley's model was doing over 110 m.p.h. for more than 40 laps and re-starting was excellent (didn't blow the wick either—most surprising).

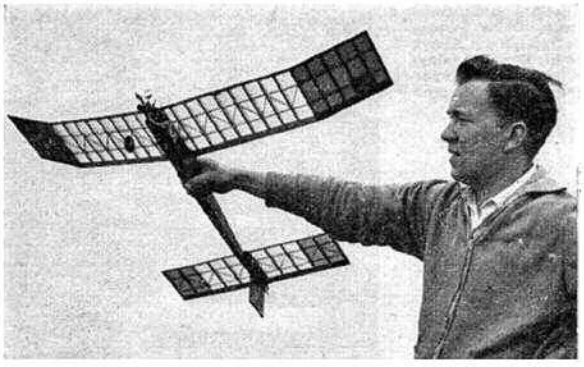
Combat was by far the best supported event of the rally, and we were very pleased to welcome such regular competitors as Kenton, Northwood and Derby. The eventual winner was Copeman (Kenton) who chopped his way through the field (and his own club mates) with some devastatingly accurate manoeuvres.

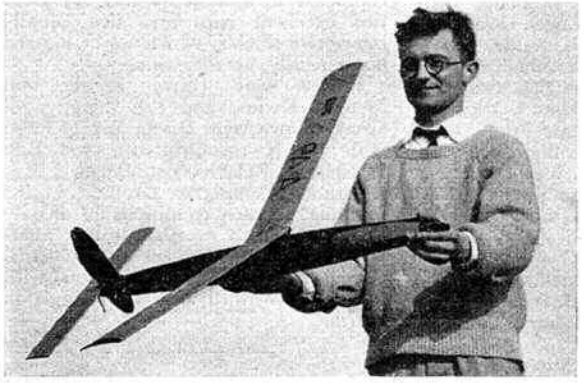
In the "Squares event" (Stunt) our "Red Rose" comrades from Bolton, had it all their own way. Lee Warburton's hours of practice flying, prior to the start of the contest, was amply rewarded by two immaculate flights, which gained him first place. G. A. Higgs also from Bolton, placed second evoking some very complimentary remarks from the experienced battery of judges in so doing.

Taken altogehter, this first Wharfedale Rally was definitely an unqualified success and far exceeded the wildest dreams of the organisers. The club would also like to offer a word of thanks to everyone who made it possible, including our three stunt judges, Sam Messom, Norman Butcher and Brian

Left : A. Wallace (Novocastria) second in F.A.I., and below, Nixon and Ellis (Hinckley) second and first in ½A at the Wharfedale Rally.







Three photos from the P.A.A. Rally.
Top left : Unusual Cox .049 power layout by Massey of the Derry Club.

Top right : Bob Angel and John Done with their "Cargo" entries. They placed second and first in both Cargo and P.A.A. Gas.

Left : John Pool with second place "open" rubber model, lost in fly-off.

Horrocks, also the representative from "Frogs" for his most generous support.

RESULTS

Combat (38 entries)—1. Copeman, Kenton (Oliver Tiger) + 24; 2. Clipstone, Kenton (Oliver Tiger) + 13; 3. Weston, Chorlton + 3.

Stunt (6 entries)—1. F. L. Warburton, Bolton, 1,648 points; 2. G. A. Higgs, Bolton, 1,555 points; 3. D. Day, Wolves, 1,497 points.

F.A.I. T/R (27 entries)—1. G. Atkinson, Derby, 5 : 46.8; 2. A. Wallace, Novocastria, 6 : 10.2; 3. Cooper/Allen, Mill Hill, 6 : 26.4.

½A T/R (17 entries)—1. T. Ellis, Hinkley (Oliver T' Cub), 9 : 40; 2. D. Nixon, Hinkley (O.T.C.), 9 : 49.2; 3. G. Atkinson, Derby (O.T.C.), 10 : 31.1; 4. Newton, St. Helens, 10 : 37.1.

"B" T/R (15 entries)—1. C. Taylor, West Essex (McCoy 29), 6 : 53.9; 2. J. C. McNess, West Essex (McCoy 29), 8.32.6; 3. Pasco/Haley, Thornaby (Eta 29-6 c.), 8 : 41.

P.A.A. Rally—*report and photographs by J. O'Donnell*

The annual Pan American Airways sponsored rally was organised by the South of Scotland Area—and held, as usual, on the Royal Naval Air Station, Abbotsinch, Paisley. The attendance at this meeting must have been a disappointment to the officials. Since prizes are good, even generous, and few restrictions are imposed by the Navy, the poor participation by *Scottish* modellers is rather a mystery to the English "regulars." The latter form a good half of the fliers in F/F and P.A.A. Load, and obviously consider travelling over 200 miles each way worth it.

The Saturday's events were initially held up by rain, and interrupted by the flight of a Naval *Gannet*, but extension of flying until 8 p.m. proved quite an acceptable solution. The weather started calm and overcast, but brightened up to quite a sunny period before a dull and breezy evening. The P.A.A. events proved that "P.A.A. Gas" (Pee Wee size) is the most popular of the various categories, and should be considered by the S.M.A.E. as a very worthwhile alternative to their current and rather badly supported classes. This event was won by John Done, flying the same model with which he won last year, and demonstrating that a fast stable climb is achievable. Second was Bob Angel with a model built during the week preceeding the contest. It was lost trimming on the day and returned to the field by the finders.

Cargo Clipper saw the same two fliers in the same order. John Done had a second model of increased wing area, but Bob Angel used his normal P.A.A. load model with cargo added. Both managed only a single official flight.

The P.A.A. jet event was plagued with Jetex leakage troubles, especially on Payloader motors. Winner J. O'Donnell eventually reverted to a Jetmaster, but power available was rather marginal. R.O.G., surprisingly, seemed to give no trouble to any of the fliers.

Glider was also flown on the Saturday and the thermal/downdraught conditions existing at times resulted in only two trebles. The fly-off between Urwin Wannop and John Turner, both flying Nordics, saw the former win by a mere four seconds. Subsequently, the contest officials made a very courageous decision, and disqualified the winner for failing to carry P.A.A. markings.

Sunday started bright and breezy

At the Invitation R/C meeting. D. G.Walker with his Super Tigre 51 powered "Astro Hog" which is equipped with a Bramco Apollo 10 channel receiver. He uses an R.E.P. transmitter.

Invitation R/C competitor, Chris Sweetman (left), from Kenya with his Orbit 10 relayless equipped Super Tigre 51 powered "Orion."

Right : a line-up of some of the competitors' models.

and gradually calmed off as the day went on. Power on 10 sec. seems currently productive of low scores—mainly through lack of altitude. Winner J. O'Donnell flew an own design *Veco* 19 open model for a clear lead. Second place went to Ron Firth flying an Elfin powered *Dixielander* for two flights and a *Creep* for the third.

Rubber scores were higher and a fly-off was needed between J. Poole of Halifax and J. O'Donnell, both flying open models of roughly Wakefield area. J. Poole's model looked quite new and featured inset longerons, "union-jack" construction surfaces and a two-blade folder. J. O'Donnell's featherer *Maxie* was anything but new.

The radio event saw vastly improved flying, compared with that previously experienced at this meeting, and seemed very well received by the spectators.

Cadzow had quite a successful time in the C/L events. One of the T/R finalists had a model featuring a retractable and detractable u/c. Whilst it was reported to have given trouble in the final, it sounds as if the originators are on to a very good thing.

The proceedings terminated with a presentation of trophies (for P.A.A. events) and vouchers by P.A.A.'s Scottish representative. Plans for next year are already under way, and the English "regulars" can certainly recommend the meeting as one well worth better attendance by the *Scottish* modellers.

RESULTS

Glider—1. J. Turner, Chorlton, 9 : 00 + 2 : 26; 2. D. McQuillen, Kirkaldy, 7 : 06; 3. G. Tidewell, Baildon, 6 : 56.

P.A.A. Load Gas—1. J. Done, Wallasey, 7 : 54; 2. R. Angel, Wallasey, 5 : 28; 3. D. Wright, Kirkaldy, 5 : 02.

Senior Jet—1. J. O'Donnell, Whitefield, 3 : 11; 2. W. Douglas, Glasgow, 2 : 37; 3. J. Done, Wallasey, 0 : 48.

Clipper Cargo P.A.A. Load—1. J. Done, Wallasey, 10 oz. (one flight); 2. R. Angel, Wallasey, 7¾ oz. (one flight).

Power (10 sec. motor run)—1. J. O'Donnell, Whitefield, 8 : 45; 2. R. Firth, Sheffield, 7 : 46; 3. H. Tubbs, Baildon, 7 : 29.

Rubber—1. J. O'Donnell, Whitefield, 9 : 00 + 10 : 26; 2. J. B. Poole, Halifax 9 : 00 + 6 : 25; 3. G. Tidewell, Baildon, 8 : 54.

Radio Control—1. R. Fraser, Kircaldy, 81 pts. 2. J. Craig, Stirling, 66.25. 3. J. Axworthy, Paisley, 35.6.

Class "B" T/R. 1. D. Gordan, Dumbarton. 2. D. W. Mitchell, Prestwick. 3. H. Lorrimer, Prestwick.

F.A.I. T/R. 1. D. Barbour, Cadzow. 2. H. Lorrimer, Prestwick. 3. W. Swinburn, Cadzow.

Combat. 1. G. Neill, Glasgow Hornets. 2. B. Parkes, Cadzow.

Invitation R/C Rally—*photographs by Stewart Uwins*

This informal rally, organised by Harry Brooks of Southern Radio Control, was held to give the top fliers in England extra competition practice, which would stand them in good stead when flying at World Championships. Everyone competed in a most friendly spirit for two excellent cups and two equally impressive shields, which were retained permanently by the winners.

Judges were Harry Brooks and Stewart Uwins, and the majority of aircraft flown were *Orions*, largely fitted with Min-X 10, Orbit 10, or R.E.P. 10-Channel Relayless equipment.

Although somewhat doubtful in the morning, weather conditions fortunately improved to an excellent sunny afternoon. The eventual winner was Chris Olsen, followed by Ed. Johnson, with Paul Rogers third and John Singleton fourth.

Midland Area Rally—*R.A.F., Wellesbourne Mountford*

RESULTS

Open Power—1. P. Frost, Long Eaton; 2. G. Fuller, St. Albans; 3. M. Dilly, Croydon.

Open Glider—1. J. Phillips, Cardiff; 2. G. Illingworth, Baildon; 3. L. Barr, Hayes.

Open Rubber—1. N. Elliott, Croydon; 2. R. Leppard, Croydon; 3. H. Bunny, Bristol Aces.

½A Power—1. A. Young, St. Albans; 2. A. Wisher, Croydon; 3. A. Wisher, Croydon (re-entry).

Chuck Glider—1. A. Young, St. Albans; 2. A. Crisp, Oxford.

Radio Multi—1. E. Johnson, Larkhill; 2. P. Waters, Port Talbot; 3. J. Singleton, Larkhill.

Radio Single—1. S. Uwins; 2. R. Yates; 3. W. Bellinger.

Concours—Joint 1st A. C. Day, West Bromwich and P. G. Wheldon, Blackheath and Halesowen.

Stunt—1. F. Warburton, Bolton; 2. D. J. Day, Wolves; 3. D. Christopher, Weston.

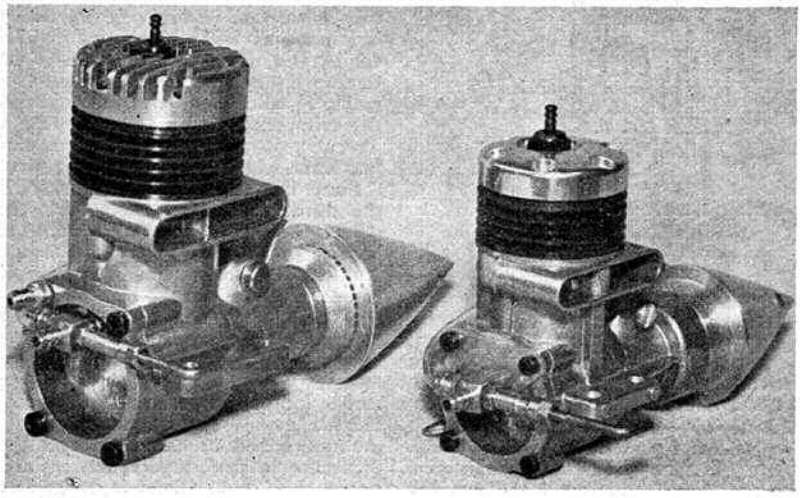
½A Team Race—1. Atkinson, Debdenairs; 2. Cornell, Croydon; 3. Pointing, Debdenairs.

F.A.I. Team Race—1. K. Long, Wharfedale; 2. J. Hall, West Essex; 3. Barnett, West Essex.

B. Team Race—1. C. McNess, West Essex; 2. A. Lucas, West Essex; 3. C. Taylor, West Essex.

Combat—1. Attwell, Chingford; 2. G. Copeman, Kenton; 3. P. Perry, Northwood.

PETER CHINN'S LATEST ENGINE NEWS



THE introduction of new models to the engine market seems to run in cycles: at least this appears to be the case in Britain and the U.S. For example, after a relatively inactive period, 1959-60 was marked by the appearance of a fair number of new British motors. Practically every manufacturer had a new engine to offer and some had two or more. This year, it is the U.S. that is, so far, setting the pace with a spate of new motors in the first six months: four from Cox, three from K & B and three from Fox—among them some remarkable products of very high performance.

New motors from other engine producing countries have not been too numerous of late. In Germany, after a lot of activity a few years ago, not very much of interest to British modellers has appeared during the last couple of years or so. France, for some strange reason, has lagged behind for years, despite her early lead with diesels. Several other European countries which, at one time produced small numbers of engines, such as Belgium, Switzerland, Denmark and Sweden, seem to have dropped out of the picture. Only in Italy and Japan has model engine design and production made real progress. Last year, a whole line of new Italian Super-Tigre motors was put into production and, in Japan, the leading manufacturers, O.S. and Enya are maintaining a steadily expanding production with the introduction of new models as needed. Five manufacturers are, at present, active in Japan, the other three being Kyowa, who make only the .45 and 45R/C model, Fuji who are continuing their range of seven "sport" type glow engines (0.049, 0.061, 0.09, 0.15, 0.19, 0.29 and 0.35) and K.O. who produce diesels exclusively in 0.049, 0.099 and 0.15 cu. in. displacements.

Frog 80 Mk. 2

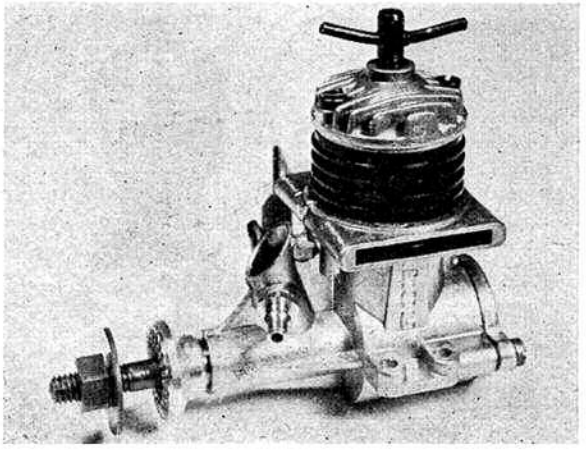
A revised version of the Frog "80" diesel, first introduced in December 1956, is now in production. The new model, known as the 80 Mk. II, has a new cylinder and contra-piston and revised porting for improved starting and power.

Externally, the Mk. II can be distinguished from the original by its cylinder which has fewer cooling fins (4) and a blued finish. Internally, the O-rings equipped contra-piston has been discarded in favour of a conventional lapped contra-piston and the exhaust and transfer port layout has been changed. The original 80 had two narrow exhaust ports positioned one on each side and, below them, placed fore and aft, two narrow transfer slits. In the Mk. II cylinder porting follows the pattern of the Frog 049 glowplug engine. The exhaust ports are much deeper and the transfer now consists of two pairs of inclined drilled ports, each pair entering the cylinder between the exhaust ports.

Forthcoming O.S. and Enya Motors

The latest news from Japan is of several new models from O.S. and Enya. Two entirely new O.S. Max engines, of sizes not previously featured in this manufacturer's range, are shortly to be put into production. These are the Max-19 (3.2 c.c.) and Max-6 (1 c.c.), three-view general arrangement drawings of which are reproduced here. The 19, it will be noted, follows the general outline of the current Max-III 29 and 35 engines and, if comparable with these latter models in specific output, should rate well against existing 0.19 cu. in. class motors.

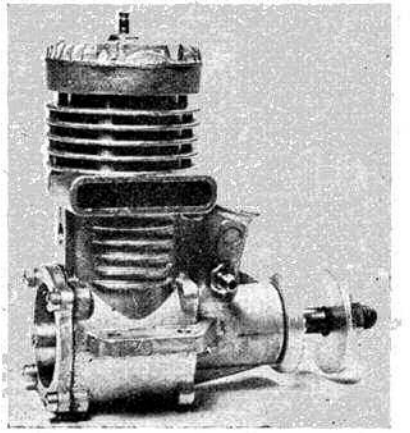
Also to be produced by O.S. in the near future is a "racing" version of the Max-III 29. This, like the Max-D 15 racing glow special, will have pressure feed into a wide open intake with the needle-valve mounted separately at the back. Unlike the Racing 15, however, it will not have twin ball-bearings and will use a low pressure take-off from the

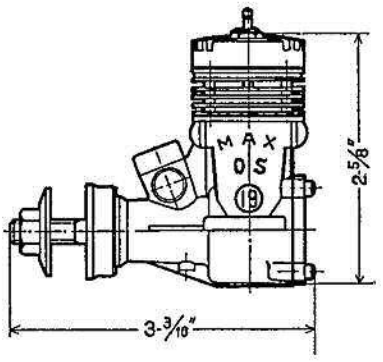


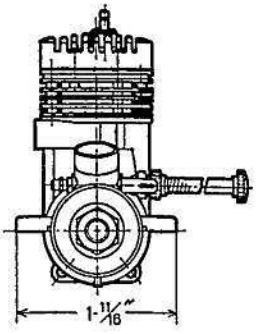
Our heading photo shows the new "racing" version of the O.S. Max-III 29 engine (left) shown for comparison, with the Max-D 15 Racing Glow motor.

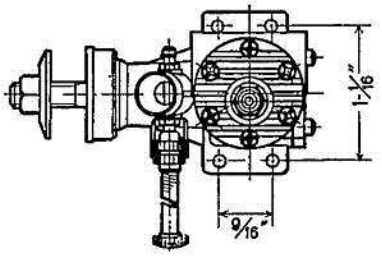
Left : the new Frog 80 Mk. II diesel which now has the 049 glow type cylinder and dispenses with the O-ring contra-piston.

Right : the Fox .40 engine. It uses a lengthened liner in a standard 35 casting with stroke increased from 0.700 in. to 0.790 in.









These drawings of the new 3.2 c.c. O.S. Max 19 engine, illustrate its similarity to the present 29 and 35 models.

rear of the crankcase instead of a rotary valve timed high-pressure tapping from the main bearing.

As mentioned last month, the new Enya .45 and .45R/C engines will be released shortly. An Enya 049 is in the offing and will be similar to the existing 06 model. We understand that new Mk. IV models of the Enya 19 and 29 are also under development.

New American Engines

We have run some tests on the new Wisniewski K & B Torpedo 15R engine described last month. The results, which will form part of a full Engine Test report in MODEL AIRCRAFT in due course, are most impressive. The engine needs to be turning very fast to give its best (the peak b.h.p. occurs in the region of 19,500-21,000 r.p.m. according to fuel and other conditions) but does become greedy on plugs at speeds above 18,000.

Incidentally, the KB-1S plug supplied with the engine quite definitely gives a higher performance—at least, on straight FAI regulatoin fuel. We tried four other types of plug in the engine and obtained r.p.m. readings 400 to 1,100 r.p.m. less when propped for 18,200 r.p.m. on the KB-1S plug. An old type KLG Miniglow gave 18,200 r.p.m. Another make survived several runs but dropped the speed to only 17,500 r.p.m., a reduction in power of nearly 20 per cent.

This problem of plug life with these new very high performance engines is one which K & B have in hand. It is a problem which seems to have caught most of us off-balance and, until plug development catches up with the sudden leap that has now been made in 2.5 c.c. glow engine performance, is one that we will have to live with, it seems.

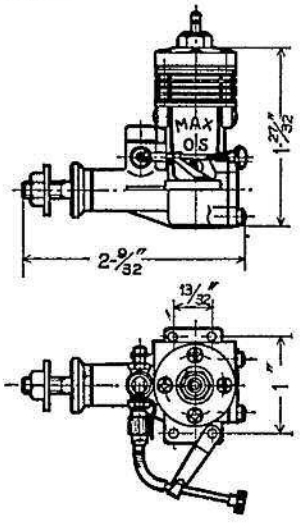
Hot fuels do not appear to be primarily to blame. In the course of some checks on the K & B 15R and O.S. Max-D Racing glow engines, we burned out a dozen plugs and found that with the sort of high speed performance of which these two engines are capable, there was little difference in plug life whether the engine was running on straight methanol and castor-oil or a mixture containing 50 per cent. nitromethane.

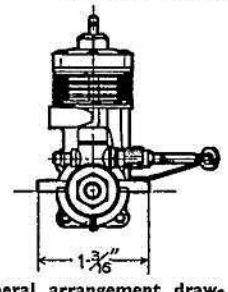
To get back to the 15R, however, this engine handles extremely well. We used a hard tank pressurised from the backplate fitting. Starting was extremely easy and restarts were practically instantaneous without priming. The engine also ran very smoothly and for those who delight in the song of a racing 2½ at its peak, we can recommend the crisp note of the 15R spinning a Trucut 7 × 3 at a steady 21,000—but find some wide open spaces for it first!

Since last month, we have received the third of the new Cox series, the 0.8 c.c. Tee-Dee 049. We have not yet had an opportunity to test the engine and, so far as performance is concerned, can only quote from the maker's claims which are for 18,500 r.p.m. on a 6 × 3 prop and 23,000 on a 5 × 3. These figures are, respectively, 1,000 r.p.m. and 2,000 r.p.m. higher than for the earlier (and highly successful) Thermal Hopper models but actual prop types are unspecified in each case and the difference in performance between the two engines could, therefore, be greater or less.

The 049 is closely modelled on the 15 model (featured in this month's M.A. Engine Tests) and, if it can get anywhere near the exceptional specific output of the larger engine, should prove outstanding in its class. Our test figures will, of course, be given in due course. The Tee-Dee retains the 0.406 × 0.386 in. bore and stroke measurement used for all Cox 049s since the original Space Bug engine of nearly 10 years ago, and weighs just 1½ oz.

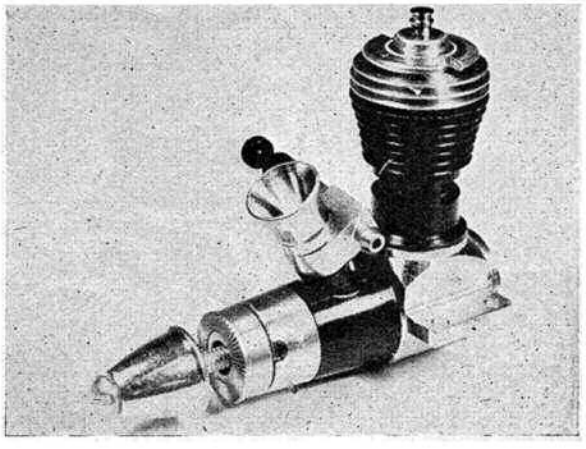
Few manufacturers have produced such a profusion of 0.35 cu. in. variants as has the Fox company during the past year or so. Stemming from the original black head Combat 35 model, there came the low-priced Rocket 35, then the needle-bearing Combat Special of such remarkable performance and now, hard on the latter's heels, the 0.40 and a new model of the Rocket 35. We have just received examples of these two latter engines and will be describing them in the next L.E.N. article.





General arrangement drawings of the entirely new O.S. Max-6, a 1 c.c. glow plug engine.

Right: the new Cox Tee-Dee 049, virtually a scaled down Tee-Dee 15 and claimed to be superior in output to all previous Cox 049 contest engines.



DRAG ANALYSIS of a TEAM RACER by H. MacDonald

WHILE most team race and speed men have firmly grasped the principle that the motor is all important, it is also quite obvious that considerable time and effort has been spent by the average modeller in building a model which he hopes will give the motor every chance. Unfortunately, however, many of them have little or no idea as to the effect various features have on the performance, so it is with this idea in mind that the following quantative analysis has been carried out.

Before I'm inundated with letters saying that a certain design feature has given someone 10 times as much as my estimate, I'd like to say that, unless the models are absolutely identical apart from this one feature and the tests carried out in the same atmospheric conditions, no discussion will be entered into. As will be seen from the analysis, anything that influences motor performance would mask any aerodynamic gains.

This analysis has been carried out for a team racer mainly because my own interest lies in this field. Anyone wishing to could repeat the calculations for a speed model by altering the initial assumptions.

(1) Data

Motor b.h.p. = 0.3
Model speed $V = 80$ m.p.h.
Propeller efficiency $\eta = 80$ per cent.
Model weight $W = 20$ oz.
Wing area $S = 144$ in.^{2}
Aspect ratio $A = 8$
Air density $\rho = .00238$ slugs/ft.^{3}

$C_L = \dfrac{L}{\frac{1}{2}\rho V^2 S}$ where L = lift of model

$C_D = \dfrac{D}{\frac{1}{2}\rho V^2 S}$ where D = drag of model

C_{D_L} = line drag coefficient based on wing area of model
C_{D_T} = total drag of system
$= C_D + C_{D_L}$
C_{D_0} = profile drag coefficient
C_{D_i} = induced drag coefficient

(2) Total Drag Coefficient

Motor work output = b.h.p. × prop. efficiency × 550 ft. lb./sec.

$= 0.3 \times 0.8 \times 550$
$= 132$ ft. lb./sec.
$=$ Drag × Velocity

$$\text{Hence Drag} = \frac{132}{\frac{80}{60} \times 88} = 1.125 \text{ lb.}$$

$= \frac{1}{2}\rho V^2 S C_{D_T}$

$$\text{Now } \tfrac{1}{2}\rho V^2 = q = \tfrac{1}{2} \times 0.00238 \times \left(\tfrac{4}{3} \times 88\right)^2$$

$= 16.4$ lb./ft.^{2}

$$\therefore C_{D_T} = \frac{1.125}{16.4} = 0.0686$$

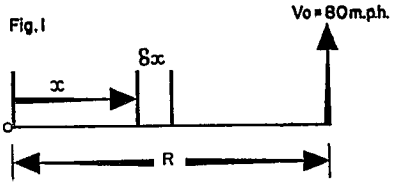
This is the drag coefficient of the complete system, i.e. model and lines.

(3) Line Drag Coefficient

The drag coefficient of unit length of wire is approximately 1.1. To obtain the drag of the lines we must integrate the drag per unit length across the radius. Drag of element δx feet, D, is given by $D = \frac{1}{2}\rho V^2 d_1 C_{D_1} \times \delta x$ where d_1 = dia. of wire

and $V = V_0 \times \dfrac{x}{R}$

Fig. 1



Hence drag of two lines

$$D_{TOT} = 2\int_0^R \tfrac{1}{2}\rho V^2 d_1 C_{D_1} dx$$
$$= 2 \times \tfrac{1}{2}\rho d_1 C_{D_1} \int_0^R V^2 dx$$
$$= 2\tfrac{1}{2}\rho d_1 C_{D_1} \frac{V_0^2}{R^2} \int_0^R x^2 dx$$
$$C_{D_{TOT}} = \frac{D_{TOT}}{\frac{1}{2}\rho V^2 S}$$
$$= 2\frac{d_1 C_{D_1}}{SR^2} \int_0^R x^2 dx$$
$$= \frac{2 d_1 R C_{D_1}}{3S}$$
$$= \frac{2 \times 0.01 \times 50 \times 1.1}{12 \times 3 \times 1}$$
$$= 0.0306$$

(4) Model Drag Coefficient

Model drag = total drag − line drag
$= 0.0686 - 0.0306$
$= 0.038$

This represents $\dfrac{0.038}{0.0686} \times 100 = 55.5$ per cent. of total drag and the lines represent 44.5 per cent.

(5) Drag Equation of the Model

The drag equation

$$C_D = C_{D_0} + \frac{K}{\pi A} C_L^2$$

may now be solved:

$$C_L = \frac{W}{\frac{1}{2}\rho V^2 S} \text{ for level flight}$$
$$= \frac{1.25}{16.4} = 0.0762$$

if we assume a k value of 1.2

$$\frac{K C_L^2}{\pi A} = \frac{1.2 \times 0.0762^2}{\pi \times 8}$$
$$= 0.00028$$
$$C_{D_0} = C_D - \frac{K C_L^2}{\pi A}$$
$$= 0.0380 - 0.00028$$
$$= 0.0373$$

Note: the induced drag $C_{D_i} = 0.74$ per cent. aircraft drag or 0.4 per cent. of the total drag, which is negligible. The drag equation is

$$C_D = 0.0373 + 0.0478\, C_L^2$$

(6) Effect of Weight on Model Speed

If the model weight is reduced from 20 oz. to 10 oz. the C_L is reduced from 0.076 to 0.038 and the new model drag is from (5)

$$C_D = 0.0373 + 0.0478 \times 0.038^2$$
$$= 0.0374$$

and the system drag becomes

$C_{D_T} = C_D$ lines $+ C_D$ model
$= 0.0306 + 0.0374$
$= 0.0680$

going through the reverse process of (2).

$$V = \frac{\text{motor work}}{\text{Drag}}$$

$$V^3 = \frac{132}{\frac{1}{2}\rho S C_D}$$

$$= \frac{132 \times 2}{0.068 \times 0.00238}$$

$$= 1.631 \times 10^6$$

$$V = 117.8 \text{ ft./sec.}$$

$$= 80.1 \text{ m.p.h.}$$

or, more simply,

$$V_{NEW} = V_{OLD} \sqrt[3]{\frac{C_{D(OLD)}}{C_{D(NEW)}}} \quad \ldots \quad \ldots \quad (a)$$

To assess the effect on acceleration a rather more complicated treatment is required, outside the scope of this article. A preliminary calculation has been carried out which indicates that a gain of approximately $\frac{1}{2}$ sec. per acceleration could be obtained from the lighter model.

(7) Effect of Elliptic Wings on Speed

Any text book will verify that a $K = 1.2$ is a reasonable, perhaps high, value for a slightly tapered rectangular wing. If we fit elliptic wings which have a K value of nearer unity (1.05) then the change in model speed is as follows:

$$C_D = 0.0373 + 0.0478 \times \frac{1.05}{1.2} \times 0.00581$$

$$= 0.0373 + 0.00025$$

$$= 0.03755$$

$$C_{D_T} = 0.03755 + 0.0306 = 0.06815$$

Hence by (a)

$$V_{NEW} = 80.1 \text{ m.p.h.}$$

(8) Effect of Increase in Model Size on Speed

Suppose we assume the model is scaled up so that the wing area is now 216 in.^{2}, i.e. 1.5 ft.^{2}

C_{D_0} remains the same and C_{D_I} is roughly halved

$$C_D = 0.0373 + 0.004 = 0.0377$$

$$C_{D \text{ LINES}} = 0.0306 \times \frac{1}{1.5}$$ (since we have now changed the area on which C_D lines is based)

$$132 = \tfrac{1}{2}\rho V^2 S C_D \times V$$

$$= \tfrac{1}{2}\rho V^3 \{1.5 \times 0.0377 + 0.0306\}$$

$$V^3 = \frac{132 \times 2}{0.0871 \times 0.00238} = 1.272 \times 10^6$$

$$V = 108.1 \text{ ft./sec.}$$

$$= 74 \text{ m.p.h.}$$

(9) Effect of Monoline on Speed

In (3) it was assumed that the drag of two lines was twice the drag of one line, i.e. no interference effect was assumed. It can be seen from the calculation that the drag is directly proportional to the diameter of the wire and on these premises the drag of a monoline of 0.014 in. is:

$$C_{D_{MONO}} = C_{D\ 2\text{-LINES}} \times \frac{0.014}{2 \times 0.01}$$

$$= 0.0306 \times 0.7$$

$$= 0.0214$$

giving a system drag of

$$C_D = 0.0214 + 0.038$$

$$= 0.0594$$

which by (a) gives

$$V = 123 \text{ ft./sec.}$$

$$= 84 \text{ m.p.h.}$$

which is a 5 per cent. gain.

(10) Effect of Monowheel on Speed

The drag coefficient of the wheels and strut based on cross-sectional area of the wheel is

$$C_D = 0.5$$

for a team racer with two $1\frac{1}{2} \times \frac{1}{4}$ in. wheels the drag coefficient based on the wing area is:

$$C_D = \frac{2 \times 1\frac{1}{2} \times \frac{1}{4}}{144} \times 0.5$$

$$= 0.0026$$

The reduction in drag due to deletion of one wheel and strut is therefore 0.0013 and the system drag becomes

$$C_D = 0.038 - 0.0013 + 0.0306$$

$$= 0.0673$$

and by (a)

$$V = 118.05 \text{ ft./sec.}$$

$$= 80.6 \text{ m.p.h.}$$

Note: if we delete both wheels

$$C_D = 0.0673 - 0.0013$$

$$= 0.0660$$

$$V = 119 \text{ ft./sec.}$$

$$= 81.1 \text{ m.p.h.}$$

(11) Effect of an Increase in Motor b.h.p. on Speed

Suppose the motor b.h.p. is stepped up from 0.3 to 0.33, i.e. a 10 per cent. increase in power.

$$\text{motor work output} = 132 \times 1.1$$

$$= 145 \text{ ft. lb./sec.}$$

$$= \text{Drag} \times \text{Velocity}$$

$$= \tfrac{1}{2}\rho V^2 S C_{D_T} \times V$$

$$V^3 = \frac{145}{\frac{1}{2}\rho S C_{D_T}}$$ or more simply

$$V = 80\sqrt[3]{1.1} \text{ m.p.h.}$$

$$= 82.6 \text{ m.p.h.}$$

thus we see a 10 per cent. increase in power results in a 3 per cent. increase in speed.

(12) Summary

Relative to a standard model weighing 20 oz., of wing area 1 sq. ft., a wing of aspect ratio 8, and having a motor developing 0.30 b.h.p. which allows it to reach an airspeed of 80 m.p.h. the following changes give the quoted increases in speed:

1. Reduction in model weight from 20 oz. down to 10 oz.—gain of 0.1 m.p.h. (0.125 per cent.)
2. Replacement of rectangular wings by wings of elliptic planform—gain of 0.1 m.p.h. (0.125 per cent.)
3. Increase of model scale by 1.225, i.e. wing area increased by 50 per cent.—loss of 6 m.p.h. (7.5 per cent.)
4. Use of monoline of 0.014 in. dia. in place of two 0.010 in. lines—gain of 4 m.p.h. 5 per cent.
5. Use of mono-wheel—gain of 0.6 m.p.h. (.75 per cent.)
6. Increase in motor b.h.p. of 10 per cent., i.e. from 0.3 to 0.33—gain of 2.6 m.p.h. (3 per cent.)

(13) Conclusions

Since the induced drag forms such a low proportion of the total drag, factors which affect the induced drag such as aspect ratio, weight, wing planform etc., will not affect the model performance to any noticeable degree. The converse is also true, that factors which affect the profile drag should have a measurable effect on performance. Unfortunately, much of the profile drag is simply frontal area and this is fixed by the rules. However, there appears to be some room for improvement, but as this is a competitive sphere I leave the rest up to you.

Anyone know where I can get an Oliver giving 0.45 b.h.p. ?

ROVING REPORT

brings you up to date on the latest world model news

From Brazil we have this photo, submitted by Adinoel Motta Maia of Jose Espinheira of the Club de Aeromodelismo da Bahia, with his " Thunderbird " stunter.

FROM the Academy of Model Aeronautics journal *Model Aviation* (U.S.A.) we learn of the first flight by a model powered by a motor of the Wankel rotary-piston or " epitrochoidal" type that is currently under development for full-size application by NSU in Germany and Curtiss-Wright in the United States.

So far as we know, Stanislaw Gorski, the well-known Polish modeller and engine designer, was the first to produce a working model Wankel type engine, but the American effort is probably the world's first occasion on which a Wankel type motor has been successfully flown in a model plane. Gorski's engine, which was first shown in Poland last autumn, was purely an experimental effort, was water cooled and weighed 30 oz., although he was reported to be working on a smaller, air-cooled version that would be suitable for model use.

The American engine is an air-cooled unit weighing 19 oz. and operates with glowplug ignition. It was built by Floyd Neal, a toolmaker of St. Louis, Missouri, and the first flight with the engine was made at the St. Louis Radio-Control Club's flying field on 23rd February this year. The model used as a test bed was a *Smog Hog* of 8 lb. all up weight which, it is reported, the Neal-Wankel engine flew with power to spare. Congratulations to Floyd Neal on a notable achievement.

* * *

On this page we show some photographs from the recent All-Japan meeting at Osaka. Especially worthy of note are the beautiful scale R/C multi-channel models. Masahiro Kato's remarkable twin-engined Cessna 310-D had the experimental O.S. 20-channel equipment mentioned in last month's Radio Topics.

* * *

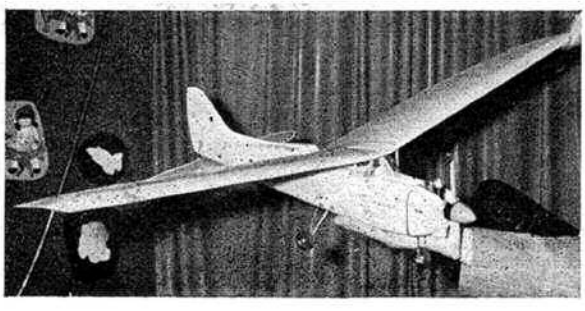
A strange cult has appeared in modelling circles in the U.S., namely, building " old time " models—mostly from pre-war F/F kits. Revivers of these memories of the past are not only the modellers of the older generation, some are people who never saw a spark-ignition engine. Devotees of these vintage models are combing the older model shops for long since forgotten stocks of kits and one Californian model firm, established in the 1930s, has even gone so far as to put back into production, one of its 1938 " gas model " designs. We even had an enquiry recently from an avid collector about the possibility of acquiring a certain " old time " British kit!

* * *

Foreign visits and world tours seem to be the order of the day for the V.I.P.s of the model industry. Current globe-trotters include John Maloney and wife Helen of World Engines Inc., Ohio, visiting the U.K. en route for Norway, O.S. president Shigeo Ogawa and his export manager, Seigi Kosaka, visiting the United States, Australia's Tony Farnan making a buying tour of America and Japan and, finally, our own Ed. Johnson flying in an R/C comp while in the U.S. to see about, quote, " American multi at British prices."

From the 1961 All-Japan Model Aircraft contests held at Yao airport, Osaka, the photos, right, show from top to bottom : Kato's latest R/C model, a scale Cessna 310-D with two Max Multispeed 35's and O.S. 20-channel equipment; three of the multi-channel entries, with the Kato Cessna in foreground, the low-wing fighter on the left is a Kawasaki " Hein," equipped with a prototype of the new O.S. .49 and 10-channel O.S. radio; seen in flight is another remarkable multi entry, a Douglas B-26 with 12-channel O.S. equipment and two Max 35's.

Below : new German ready-to-fly R/C model is the Schenk Tele-Kadett. Model is equipped with Graupner Mikrokombi R/C and Cox Babe-Bee motor.



Radio Topics

NEWS AND VIEWS FROM THE WORLD OF RADIO CONTROL

THE R.E.P. Mini-Reptone is making quite a hit with the single-channel enthusiasts. This fully transistorised receiver operates off three U12 pencells, which also supply the *total* power required to operate both the receiver and actuators (the compound type actuator supplied as a plug-in unit, plus a second actuator operated off " quick blip " signal). It does have to be a very quick blip, incidentally, to select this third control. The other two control positions are selective—e.g. press and hold for right rudder (or left); press-release-press and hold for left rudder (or right).

The pencells are doing a lot of work as current drain, with signal received and actuator operated, is of the order of 350-400 milliamps. Even with absolutely fresh batteries there is only about 2.75 volts available across the escapement coil, which is getting marginal. A pencell is nominally rated for a 1 to 30 milliamp drain, but it can give very much more at the expense of fairly rapid polarisation and thus increase in internal resistance. This means, basically, that holding on long signals will tend to flatten the receiver batteries quite rapidly.

A number of people have had trouble with the Mini-Reptone (including the Editor, it seems !) due to using direct metal wire couplings on the actuator(s). Under vibration such a linkage can cause lack of holding, due to self-generated interference. Coupling rods should be insulated—e.g. a metal crank fitted in the main actuator, should be insulated from metal linkage with a length of plastic tubing, or similar, to prevent direct electrical contact. The same also applies to the secondary actuator, so either insulate the actuator from the rod (if metal), or use a balsa push-pull rod.

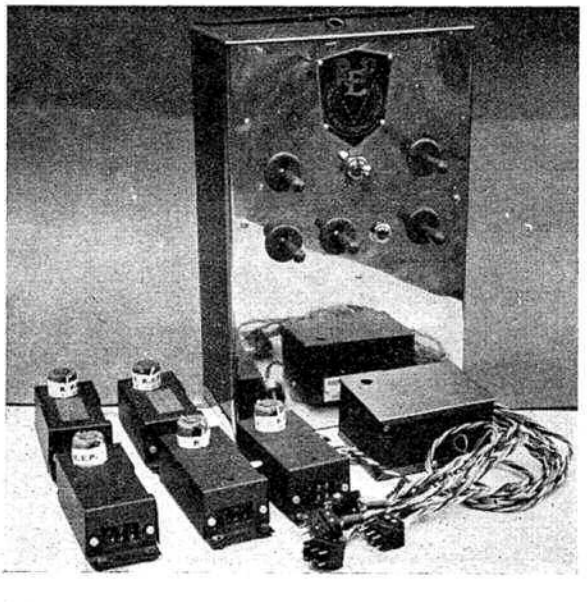
On the subject of second actuators, the choice is virtually limited to an escapement which will give positive results on 2.5 volts and the Elmic " Conquest " has proved particularly suitable.

Another possible trouble is a purely physical fault, which can occur in a hard landing, where the batteries are shot forward in the receiver case and bend the contact springs slightly. This can lead to poor or complete loss of contact, so it is well worth while to check the battery spring tension periodically—and check it every time, after a bad landing. Mounting the receiver sideways or the " wrong way round " (actuator socket facing forwards) could eliminate this trouble.

Despite the obvious attractions of a compact " all-in " unit with the batteries housed in the receiver case, we would be tempted ourselves to fit a heavier external battery (e.g. four DEACS) for continuous duty operation, picking up the necessary wiring connections directly on the top two tags of the socket (being sure to get the polarity the right way round !). From the circuit diagram (1) it does not appear that reversed pattern polarity would necessarily damage any of the transistors—but it would certainly not do the electrolytic condensers any good.

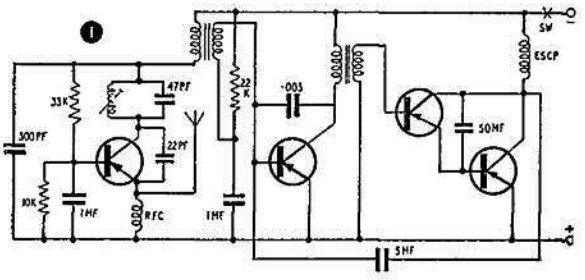
* * *

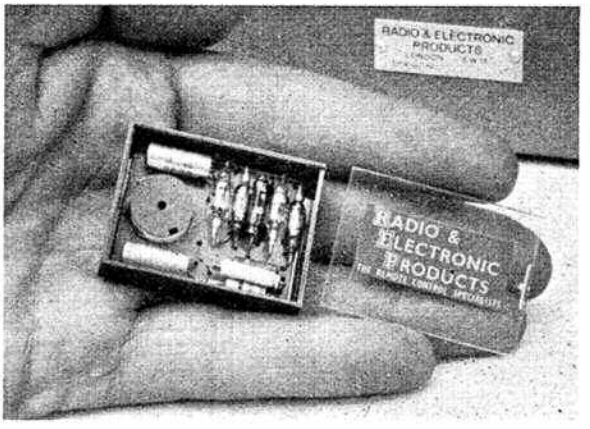
Extremely neat *receiver* power pack is shortly to be put out by R.E.P. Fully transistorised and mounted in a neat plastic case with clear plastic sliding cover, design input supply is 4.8 volts (four DEACS) with a nominal output of 33 volts at one milliamp. Output



Left : the R.E.P. 10-channel relayless " Dekatone " transmitter and receiver which is sold complete with five multi servos at an " all in " price of £90.

Right : the " Mini-Reptone " transmitter receiver and Rising escapement with back contact for motor control.





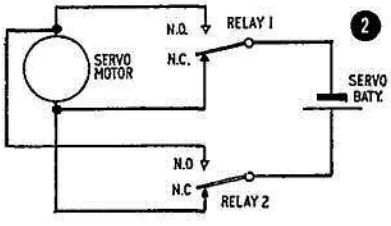
Above : circuit diagram for Mini Reptone.

Right : the R.E.P. receiver power pack.

voltage, of course, will depend on load and at maximum current rating, of 15 milliamps, output voltage is approximately 30 volts, to match standard 30 volt receiver requirements. The price is 82s.

* * *

A reader points out that we were a little unfair in our comments on the "Duomatic" clutch servo, since the necessary reversed polarity supply can readily be obtained by using the back contacts of the relays—Fig. 2. This will work as a circuit, provided one relay is *always* in the on position—thus with a continuous drain from the appropriate relay and from the servo battery. With neither relay operated, however, there is a direct short across the servo battery!



Just another example of the limitations of "paper circuits"—which is the reason for publishing this particular drawing.

* * *

Two other points raised on our comments on the "Duomatic" were that "hunting" is regarded as acceptable "as anyone who has used a compound escapement will know." We are not quite sure how the latter applies, but presumably refers to the slightly "off neutral" position held by the third switching position. Agreed this is not troublesome, and not usually noticed, but it is not "hunting" about the neutral, which implies an oscillating movement on either side of neutral. We simply regard hunting as bad, undesirable and unnecessary, since, from experience, it can be dealt with in the design of any motor-powered servo. Next time our compound actuator "hunts," we will sign the pledge!

* * *

Extremely neat sub-miniature hand-held carrier transmitter made by Rameco Products (New York, U.S.A.) and imported by Malcolm Douglass is shown right. Case size is $3\frac{1}{2} \times 2\frac{1}{2} \times 1$ in. leaving, incidentally, plenty of space inside, even after the 9 volt (Ever-Ready type 216 or equivalent) battery is fitted. Circuit is extremely simple, using a minimum of components—see Fig. 3—crystal controlled (obligatory in the United States, of course) and factory tuned. No adjustments are provided. A bottom loading coil screws into the aerial socket, into which fits a further 36-in. length of 16 s.w.g. piano wire for the aerial proper.

Nothing more than a "toy," really—but it could be the basis of interesting experiments or novelty applications. Range appears to be about 100 yd. maximum, and the poor little 9 volt battery is having a hard life with a 40 milliamp current drain. A PP4 battery is the largest British equivalent size, and even this is operating at four times its normal maximum rating. We cannot see any application to model aircraft, but as we said above—it could be fun!

* * *

Bonner Duramite multi-servo converted to relayless (fully transistorised) operation with the Manning type 1213 Servistor is shown overleaf. Unlike the standard American "Transimite," the Manning servistor amplifier is compactly packaged in a moulded plastic case and "potted" in paraffin wax. The Manning circuit, too, incorporates an additional transistor to ensure "preferential" switching, so that, in the event of two reeds operating together, the circuit cannot be damaged.

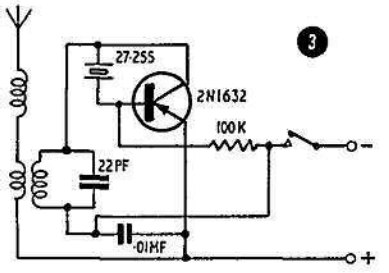
Duramite with Manning servistor amplifier was supplied by Ed Johnson, who quotes £10 19s. 6d. for the complete unit; or existing "Duramites" can be converted for £6 12s. 6d. (Duramites—with remittance—should be sent direct to J. Singleton, 34, Park Street, Salisbury, Wilts.)

* * *

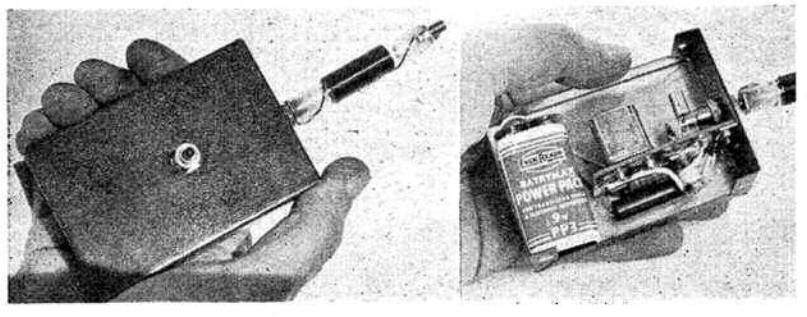
If you are interested in Orbit equipment—and who isn't!—then a new booklet they have just put out, giving details of all their standard receivers and transmitters, together with circuit diagrams and operating instructions, is the thing. A limited number of copies are available via Ed Johnson at 3s. each plus, Ed says, a self-addressed sticky label (the man does not appear to have bought himself a typewriter yet!).

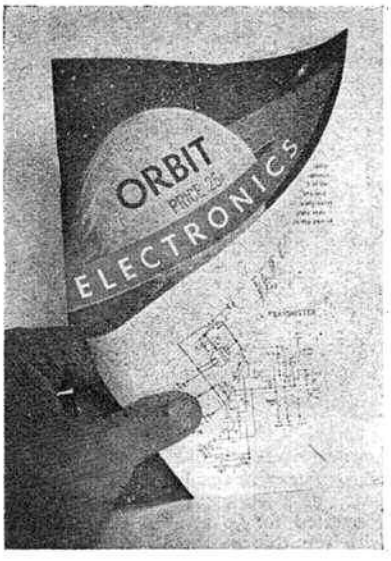
* * *

Looking through the Orbit booklet, reminded us of a couple of points of dissention regarding multi-channel reed equipment. We have always been taught—and it seemed only logical—never to



Below : the Rameco hand held transmitter with (right) its circuit diagram.





The Orbit booklet mentioned in the text.

employ adjacent reeds for the same control service. For example, given an eight-reed bank, rudder would be worked on Nos. 1 and 5 reeds, say, elevator on Nos. 2 and 6, and so on. Certainly Orbit and the others do not appear to think this important and directly "pair" the reeds—e.g. Nos. 1 and 2 for rudder, Nos. 3 and 4 for aileron, Nos. 5 and 6 for engine, and Nos. 7 and 8 for elevator.

The most likely source of interaction and receiver chatter with simultaneous operation, is in the middle range—e.g. Nos. 4 and 5 operated simultaneously. Allocating these to controls which are seldom, if ever, required simultaneously (aileron and engine) means that this is unlikely to occur in practice. No. 4 giving one rudder position and No. 5 one elevator position could, however, cause trouble.

On the basis that the manufacturer probably knows best anyway, this "pairing" of reeds must be accepted, even if it does appear contrary to good practice. But where we will get one back at the manufacturers, is that they have no overall standard as regards control switching positions. Thus if you change from one equipment to another, you may find that what you have become instinctively used to handling as the elevator control may now be rudder, ailerons engine control, and so on, which could write off an expensive model (ask Stewart Uwins, he knows !). For anything apart from joystick control, we would strongly recommend a common standard be adopted for switching control positions.

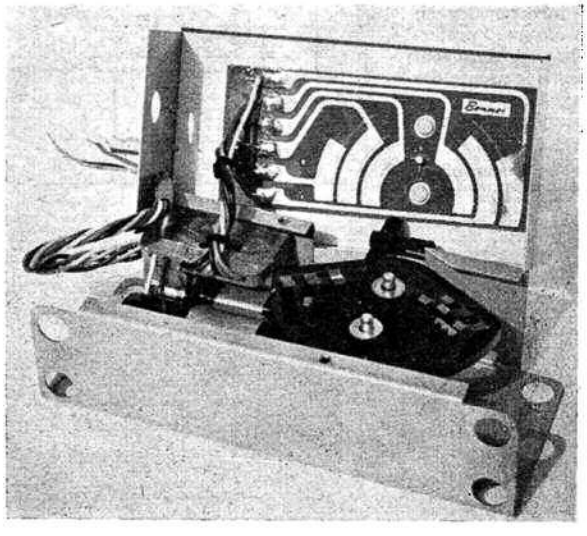
* * *

Tommy Ives designed "Ivistor" relay eliminator, is a simple transistorised D.C. amplifier to convert standard single channel receiver to "relayless" operation. Slight modification is, of course, necessary to the receiver, which may only be a case of replacing the relay with a resistor. The original unit was designed to match the Ivy-AM receiver, which has proved a popular kit type and here a current change of 2.5 milliamps is available. Typical performance figures quoted are—3.6 volts supply (three DEACS)—Fred Rising actuator—360 mA change; Mighty Midget servo—160 mA no load; 360 mA stalled.

The Ivy "Ivistor" is currently marketed in kit form, price 29s. 6d. by Macgregor Industries. Kit includes printed circuit panel, moulded case and additional components to modify the Ivy-AM receiver.

* * *

The Bonner "Duramite"—very much a world standard in multi-servos—is now being made in this country under licence agreement by E.D. The E.D.-Bonner "Duramites" will, in fact, be assembled in this country from standard American-made components. Retail price 90s.



The Bonner Duramite multi-servo converted to relayless, fully transistorised, operation with the Manning type 1213 Servistor. (See text for details.)

CONTEST CALENDAR

July	23rd	†Ashford C/L Rally, Victoria Park, Ashford, Kent. Combat and FAI. T/R.
Aug.	7th	**INDOOR WORLD CHAMPIONSHIPS.** R.A.F. Cardington.
,,	13th	SPEED. Centralised.
,,	,,	†Novocastria M.A.S. Rush Trophy Gala, Newcastle Town Moor. Open R/G/P, "½-A" Power, Combat.
,,	,,	†St. Albans Gala. Chobham Common. R/G/P, "½-A" Power, Slope Soaring, R/C single spot landing.
,,	20th	**SCOTTISH GALA.** U.K. CHALLENGE MATCH. Abbotsinch. KLM TROPHY. U/R Power. CMA TROPHY. U/R Rubber.
,,	,,	GLIDER. U/R Glider. TAPLIN TROPHY. R/C Rudder only. TEAM RACING. Class "A" and "B".
,,	,,	†C. H. ROBERTS CUP for Flying Boats. Dartford Heath. Full details from I. Bittle, 3, Spring Vale, Bexleyheath, Kent.
,,	,,	†Devon Rally, Woodbury Common. Open R/G/P, "½-A" Power, Combat.
,,	27th	I.R.C.M.S. Annual R/C Contest, Wellesbourne. Single, Multi and Scale.
Sept.	1-3rd	**WORLD CHAMPIONSHIPS, F/F.** Germany.
,,	3rd	Wanstead Combat Rally, Wanstead Flats, Classes "A" and "B." Pre-entry (2s. 6d.) by Aug. 27th to J. Franklin, 82, Grove Hill Road, South Woodford, Essex.
,,	10th	**NORTHERN GALA** GLIDER. U/R Glider. HAMLEY TROPHY. U/R Power. CATON TROPHY. U/R Rubber. RIPMAX TROPHY. R/C Rudder only. TEAM RACING. Class "½-A," "A" and "B."
,,	17th	†Croydon Gala, Chobham Common, R/G/P/½A.P.
,,	24th	*KEIL TROPHY (PLUGGE). U/R Team Power. Area.
,,	,,	FROG JUNIOR TROPHY. U/R Rubber/Glider. Area.
,,	,,	SPEED. Centralised.
Oct.	1st	†South Coast Gala. Venue to be announced.
,,	8th	"½-A" Power.
,,	,,	*FARROW SHIELD. U/R Team Rubber. Area.
,,	,,	TEAM RACING. Class "½-A" "A" and "B."
,,	15th	**AREA CHAMPIONSHIPS.**
,,	22nd	FROG SENIOR CUP. U/R Power. Decentralised.
,,	,,	CMA CUP. U/R Glider. Decentralised.

†SMAE sanctioned contests.
SMAE events in capitals.
*Plugge Cup events

CLUB NEWS

SIDCUP A.S.

Having successfully negotiated with the local authority for the use of a local school for our new headquarters, we now have a classroom and hall at our disposal. This has resulted in a renewed interest in indoor flying, and the start of club records for this type of model.

A party of eight visited the Nationals which was enjoyed by everyone. A. Greenland who came sixth in 5 c.c. Speed (Fox 29R), unluckily crashed his class "B" racer in the semi-finals. D. Vettergreen won his ½A heat, but was disqualified as his time was over 8 min., which was not surprising as the model had to be refuelled six times in 100 laps due to a cracked fuel line.

Meetings are held every Wednesday and anyone in the district interested in aeromodelling is asked to contact the secretary P. H. Noble, 32, Mottingham Road, Mottingham, London, S.E.9.

COSMO A.M.C.

Our Demonstration Team have recently given displays at Bowater Paper Mills, Hurst Fete and the Blue Circle Sports Association. All were quite successful and included a "Battle of Britain" type combat session between a F.W.190 and a *Spitfire*, flown by Fred Andrews and Stan Robinson. Both of these aircraft employ scale wing and tail areas, with slightly modded fuse's and much to everyone's surprise are both fully aerobatic.

Twelve-year-old Anthony Howard is now stunting with a Merco "35" *Cobra*. We can see this lad going far. Another young "35" flier is 16-year-old Bill Jeffrey with his Merco *Coy Kat*. It is a pity some of our older members do not take the hint! Their excuse is that their various masterpieces are still on the drawing board!

HALIFAX M.A.C.

The Nationals was attended by 13 members with, unfortunately, little success, although the rubber men put up quite a good show. The night was spent in the coach and many are the tales that will be told of cramped legs and aching backs!

At the Wharfedale C/L Rally, D. Piggin reached the semi-finals of the Combat with his O.D. *Fiend*, powered by an Oliver Tiger. With more experience, this combination of man and model should prove lethal.

Whilst giving a display at a local charity gala, six models pranged simultaneously as a result of a chaotic line tangle! This was followed by a Class "B" dem. with the model's wing-tips pruning the trees surrounding the C/L circle!

POULTON & D.M.A.C.

Combat seems to be gaining in popularity, and it is hoped to give a flying display at a nearby home for handicapped children in the near future.

Several members went to Woodford, and C. Copple placed 2nd in Glider with his *Topscore*. A fortnight later at the East Lancs Rally he placed first in Glider with Jeff Ashworth second, 8 sec. behind, with his four-year-old *Lucifer*.

Found, in the neighbourhood of Poulton-le-Fylde, and A.2 size glider of unknown design, with yellow wings and tail and black leading edges. Devoid of S.M.A.E. number and owner's name and address, it has piece of *unlit* D/T fuse in the rear end. Owner should contact: C. J. Copple, 46, Moorland Road, Poulton-le-Fylde, near Blackpool, Lancs.

WALLASEY M.A.C.

The competition record of the club is a great improvement this year on bygone seasons. John Hannay topped the Area A/2 eliminator results and placed fourth in Wakefield, whilst John Done placed fourth in power and fifth in glider. At the P.A.A. Festival, John Done and Bob Angell cleaned up the "Pee-Wee" classes as usual. They were first and second respectively in Clipper and P.A.A. load, and John came third in Jetex.

Great importance is attached to practice, and on most Sundays, contests permitting, we are to be found at Hooton aerodrome, trimming and then flying under trials conditions, all flights being recorded.

Cow trouble has recently been experienced by Stan Hinds and John Hanson. At the Nats, Stan's A/2 was well chewed, as was that of John's on our home ground.

Recently Hooton witnessed its most devasting prang yet when David Millichamp's 10 ft. radio glider met the runway. Launched from a 300 ft. line, the model climbed steadily for 4½ min. when it had reached approximately 700 ft. The model was put into a steep turn, but did not come down—until the wing tongue broke! The starboard wing went, followed by the port, and at 300 ft. the tailplane came apart leaving the fuselage to plunge vertically to the runway. After collecting the bits from a considerable area, the radio damage amounted to two 3ULs, whilst batteries were splattered everywhere! The nylon covering saved the model and only the front end requires rebuilding.

GLEVUM M.A.C.

Eight members made the trip to Barkston Heath, and yet another Nationals was thoroughly enjoyed by all. The well-organised, and reasonably quiet, camping site was much appreciated. We were, in general, out of luck in the contests as Stan Perry's fourth in the Knokke was our highest placing. Incidentally Stan flew the Hawker *Fury* with which he placed sixth last year.

Some of our hardy R/C types went to Wellesbourne for the Sutton Coldfield Club's R/C meeting, and Dennis Bannister braved the elements to place third in the scale event, with his Merco 29 powered Fokker *D.8*.

Dereck Harper's victory in the S.M.A.E. Cup came somewhat as a surprise—everyone having forgotten about the event. Dereck made 14 : 21 with his *Lucifer*. This model, with much hardwood employed, tips the scales at 18 oz., but performance apparently does not suffer on this account.

Members who went to the Midland Area Rally were very impressed by the organisation, but not by the weather, as the wind strength and direction deterred several from flying.

WEST BROMWICH M.A.C.

At the Nationals this year, Tony Day came first in the C/L scale event with a Fokker *D.7*. In the combat event Mike Kendrick came equal third. At the recent Midland Area Rally, Tony Day again won the concours event and another of the lads, Les Newman, came fourth in combat.

CROYDON & D.M.A.C.

Calm is returning after the Nationals, not conspicuously successful for the club, though Bob Leppard and Norman Elliot got into the Rubber fly-off, and Al Wisher and Martin Dilly were two of the thirteen in Power. Al's 220 sq. in. *Thermal Hopper* original ended up around fifth, while Martin's 18 oz. third generation *Dixielander* derivative, with reworked 11-year-old E.D. 2·46, disgraced itself to place tenth.

The hardier members who camped, would like to offer a pat on the back to the Springpark people who ran the site with frictionless efficiency.

Three weeks later at the Midland Area Rally, the Uwins-Fletcher-Walpole team took first place in the single channel radio event with the Frog 349 powered *Jackdaw* in very gusty conditions; the model seems to thrive on it though—this is its second win in two contests, both windy.

Gordon Cornell also had a good day as, in addition to a second place in ½A T/R with a *Super Fury*, his Dydesyne 0.049 diesel took first in ½A F/F in the hands of Tony Young. Al Wisher's *Hopper* models took second and third places after he had re-entered. Martin Dilly's E.D. model came third in the Open event.

In Rubber, Norman Elliot's four-year-old 200 sq. in. model, took first, with Bob Leppard in second with a 6 oz. 250 sq. in. model with 3½ oz. of rubber turning a 24 × 34 in. propeller.

The main problem on the minute airfield was to D/T the models over something they could be recovered from, with a choice of hangars, nissen huts, a large selection of heavy earth moving equipment, corn or strawberry fields all around two to three minutes downwind.

ANGLIA M.F.C.

During the last few weeks, two displays have been given consisting of Stunt, Combat and Balloon Bursting; the Combat going down very well with the crowd at a display at a local school fete.

Two van-loads of the lads went to the Nats. and although not winning anything, had a very good time. The highest placed was M. Willsmore in Thurston, who scored two maxs. and then caught a down-draught for 1 : 17.

The area F/F Gala was well attended, the only success being S. Jackson in Chuck Glider and M. Wellsmore third in Glider. Junior P. Squirrell started off well by getting a max. in power, but lost his model in the process.

BRIGHTON D.M.A.C.

A large contingent of members attended the Nationals at Barkston Heath for a thoroughly enjoyable meeting, but without achieving any success, although Fred Boxall once again reached the fly-off in the Model Aircraft Trophy.

NOVOCASTRIA M.A.S.

Although Billy Lee did get into the fly-off in the Sir John Shelley, eventually gaining a placing of around 5th or 6th, the Nats were not as kind to our other members. Tom Christer, who only a few weeks before lost all his models and equipment when his modelling hut was burnt to the ground, had the misfortune to crash three models in as many flights after having done about six or seven max's in succession the night before. Al Muse had the plug fly out of his pressurised tank, and cut the engine dead when his *Ramrod* was only about ten feet off the ground.

The team race boys did not have much luck either, in fact they had practically none at all! This surprised us because they had shown very good form for several weeks before, notably at High Wycombe, where Dugmore, Roughead and company took several high placings.

MARKET HARBOROUGH M.A.C.

During the course of the year since the club was formed, many competitions were held on a large field on the outskirts of the town. The farmer who owns the land, kindly gave us permission to erect a hut on the field, which now serves as a repair shop and shelter, and is constantly in use. During the winter months the Thursday night meetings took place in the local Youth Centre. Indoor R.T.P. flying, film shows, lectures and competitions kept the members occupied. Younger members built models in a constructional course, and flew them in a competition for beginners.

A few of the members who are keen on A/2 and power, flew in the eliminators. E. Vye, A. Simpkin and John Shiers (Jnr.) have qualified for the trials, which puts the club's name on the map.

NORWICH M.F.C.

This is one of our best seasons yet with A. Wharrie winning the Gamage Cup and Andy Anderton winning Wakefield and open rubber at the R.A.F. M.A.A. Championships, while Barry Halford came third in the S.M.A.E. Cup and cleaned the club open power competition up with a time of 11 min. 31 sec.

KENTON M.A.C.

First, may we congratulate and thank the organisers of the Nationals for a job well done, which made for the most enjoyable (and successful) rally visited in a long time. The winning F.A.I. speed entry, was a joint effort by Peter Tribe (Northwood) and George Copeman. The model was a *New Devil*, powered by a Copeman-Rossi modified Super Tigre G20V Jubilee 1960. This motor turns a Kevin Lindsey (Hayes) 6 × 8 in. special prop at 17,700 r.p.m. static on straight fuel, which a somewhat surprised Kevin tells us is 700 r.p.m. up on what Hayes' best G20V can do on 60 per cent. Nitro! The motor is now pickled in oil! The first run was the best at 108 m.p.h., although subsequent runs were more like 112 m.p.h., the motor slowed, and sometimes stopped altogether, due to a leak in the pressurised fuel system.

We were also represented, to good effect, at the Wharfedale Rally, where G. Copeman and A. Clipstone were 1st and 2nd in Combat. Four of us did all but 20 of the 200 miles on Saturday evening, slept the night in a Mini-Minor, did a day's rallying and didn't get home till 5 o'clock Monday morning! All to fly toy aeroplanes!

At the Midland Area "do," G. Copeman came second in Combat, while Ray Meekins shared equal fourth.

Any "free" aeromodellers in the Kenton area are always welcome alternate Wednesday evenings at Eastham School, North Wembley.

CAMBRIDGE M.A.C.

Our Slope Soaring Rally was a financial success for the club, although high winds marred the flying for the competitors, by forcing models over the back of Ivinghoe Beacon.

Having been presented with £10 by Mr. Reynolds of the local model shop, we have had difficulty in deciding how to spend it. As we have more trophies than we really need, discussions have been going on for weeks. It is now, more or less, settled that most of the money will go on a new stop-watch, and on cutting the cost of coaches to rallies. One suggestion was that we should buy material for a film of club activities, but the majority of the members did not seem to be interested.

At long last there has been a response to the offer to give free instruction to beginners on a C/L model. We have a list of eight juniors and the successes and snags in this venture will be passed on to Club News. A very easy starting engine is a must, because in the early stages it is stopped very often.

WANSTEAD A.C.

Like many other clubs, on May 20th we started the long trek by van to R.A.F. Barkston Heath and the 1961 Nats.

Our best turn-out was in combat, where a collision between Dave Gibbard and Norman Mears during a test flight sent Norman's Oliver powered *Razor Blade* on a bit of free-flight over the team race circles.

Michael Jupp had an entry in 5 c.c. speed with his Carter Dooling 29 speed model, which was unfortunately damaged by a flying dolly from another speed model and was, therefore, unable to compete.

We propose to hold an "A" and "B" Combat Rally on September 3rd at Wanstead Flats—see Contest Calendar for details.

CURZON CLUB

We have started a modelling section making mainly boats and aircraft. We have a total membership of 72 members, 64 of which are juniors, ranging between the ages of 8 and 15, and eight adults. Meetings are held on Mondays between 7 and 9 p.m. in the club hall, which is located in Bastable Avenue, Barking. We also go boating and flying on Sundays, mainly in the mornings, either at Wanstead Flats and Goodmayes Park and welcome any visitors along to our club night, or when we are trying our models out.

DEBDENAIRS M.F.C.

Glorious Whitsun indeed, as we gained our first major contest success for many years, by winning the ½A Team Race at the "Nats." Five of the seven models entered were our latest ½A design, *Laplander*, as was the winning model, flown by D. Galpin and pitted by J. Atkinson in a very fast and exciting final.

We are putting on a flying display at the Bank of England printing works at Debden. This should prove to be a most profitable show!

WHARFEDALE CLUB

Twenty-nine members attended the Nationals, and by the end of the second day a measurable degree of success was evident.

The Long/Davy F.A.I. team came through to win the Davis "A" Trophy after a rather hesitant first round. Their best time for the 10 kilos was 4 : 48, lappage was of the order of 40/tank and max. timed speed was 106 m.p.h. using the latest ETA 15 powered *Tigress VI*. *Tigress Vs* were flown by Les Davy and the Horton/Howarth team, who realised 4 : 57 and 5 : 17 respectively and proved remarkably consistent throughout the competition.

In Class "B" the Horton/Howarth (Frog 500) *Dalesman I* had to make a surprise pit-stop on the 69th lap, so robbing them of a time which would have qualified for the fastest second in round one. The Long/Davy team crashed their ETA 6c *Dalesman II* during practice, yet rebuilt the model on the field and still turned in the fastest heat time of the day—3 : 13, so equalling the all-time record for a Class "B" heat.

In ½A three of our entries reached the semi-finals, but lack of experience eventually got the better of them. However, the Moorehouse/Hughes team did put in a very good fastest second in the first round with 4 : 28. The possibilities of long-distance ½A racing was demonstrated during practice, when one model covered 100 laps in 4 : 15 with no pit-stop—could be quite a threat.

We would like to put on record our appreciation and thanks to Hayes M.A.C., the R.A.F. Model Aircraft Association, Mr. B. A. Messon and helpers, for their very excellent organisation of the three T/R events at the Nats. Also a "thank you" to Springfield M.A.C. for their organisation of the camping site, all of which helped to make the 1961 Nationals the finest we have ever attended.

Arrangements are in hand for the 1961 Rufforth 1,000 Lap Class "B" race, to be held at R.A.F. Rufforth on November 5th. Rules will be as last year, with 200 lap qualifying rounds and a maximum of four teams in each heat. Pre-entry is essential and should be sent to Don Howarth, 38, Lidgett Park Avenue, Roundhay, Leeds 8, and must be posted to arrive not later than October 28th.

NORTHWOOD M.A.C.

About 20 members went up to the Nats. this year and although this is less than previous years, we came away with our greatest successes so far.

After a disastrous first and second round in Combat, Jim Benoy fought through the huge entry in fine style, to take first place using his O/D Tigre powered *Squig*. John Simmance has at last come first in F/F Scale with his Sopwith *Snipe*. This model made two beautiful flights, the second being 31 sec., just qualifying, but a bit close for comfort. The other success was a joint effort by Pete Tribe and George Copeman of Kenton in F.A.I. Speed, with 108 m.p.h. on the first flight. Our thanks to all the organisers of the events, and especially to the camp control, who all contributed to a very pleasant weekend.

Pete Perry and Big Pete Freebrey travelled up to the Wharfedale Rally, to be beaten in the semi- and quarter-finals by members of nearby Kenton. The following week, however, they both went to the Midland Area Rally where Pete Perry managed to come third, his model being destroyed in a mid-air collision.

WOLVES M.A.C.

Following his first in 1959 and second in 1960, member Brian Horrocks has again won the Gold Trophy at the Nats., following which he has now retired from competitive stunt-flying—we will still be in stunt-flying, however, as Dave Day is going strong (fourth at the Nats. and a second at the Midland Area Rally).

At this rally we had no team race entries, as we were running Class "B," although after getting to the semi-finals at the Nats. we did have hopes for ½A.

B. Pittaway has now built a biplane ornithopter (bit of a change from a 44.3 m.p.h. rubber r.t.p. job). B. Horrocks is so affected by this that he is now building asymmetrical indoor chuck gliders. What is this modern world coming to?

ROTHERHAM & D.M.A.C.

Everyone enjoyed the Nationals, the only grouch being that the mixture of earth, rock and concrete, which formed the camping ground, was not exactly conducive to sweet dreams. Barkston Heath seems to be an ideal place for such a meeting, and all agreed that we were lucky to find such an airfield.

A party of "Wing an' a String" boys visited the Wharfedale C/L Rally and had a pleasant, if hectic, day. We would like to tender our congratulations to the Wharfedale boys for some really first-class organisation, and hope that this event is to become a yearly function.

E. S. Wisby recently surprised everyone by producing the most perfect Aeronca *Sedan* with full interior detail. After winning the Senior Scale Trophy at the Sheffield Modelmakers' Exhibition with it, he demonstrated how perfectly it flew on an elderly E.D. Comp. Special, despite an all-up weight of 3½ lb. All this *before* it was photographed for the local paper!

CHANGE OF SECRETARY

CHRISTCHURCH M.A.C. C. M. Bowden, 187, Harewood Avenue, Queen's Park, Bournemouth, Hants.

MARKET HARBOROUGH M.A.C. D. Boddington, Manor House, Newton Harcourt Leicestershire.

NEW CLUB

RUGELEY M.A.C. W. J. Parsons, 6, Colton Road, Rugeley Trent Valley, Rugeley.

RECENT RESULTS

GUTTERIDGE TROPHY

First Wakefield Eliminator

1.	Roberts, G.	Lincoln	14.04
2.	Monks, R.	Birmingham	12.47
3.	Nicholson	Canterbury	12.35
4.	Pool, D.	Birmingham	12.02
5.	Lefever, G.	C.M.	11.39
6.	Chambers, T.	Tees-side	11.33
7.	Wingate, J.	English Electric	11.10
8.	Picken, B.	Wigan	11.00
9.	Elliott, M.	C.M.	10.52
10.	Dixon, M.	Leamington	10.50
11.	Barnacle, E.	Leamington	10.27
12.	Tubbs, H.	Baildon	10.15
	O'Donnell, J.	Whitefield	10.15

47 *entries*, 5 *returned no score.*

K.M.A.A. CUP

First A2 Eliminator

1.	Dallimer, G.	Stevenage	13.08
2.	Hinds, S.	Wallasey	12.58
3.	Henshall, B.	Heswall	12.38
4.	Challen, T.	Northern Heights	12.26
5.	Burrows	St. Albans	12.05
6.	Wiggins, E.	Leamington	11.49
7.	Birks, J.	Chorlton	11.36
8.	Sulway, J.	Croydon	11.31
9.	Roberts, B.	Coventry	11.26
10.	Brain, J.	Smallheath	11.19
11.	West, J.	Brighton	11.12
12.	Cummins, R.	Bristol Aces	11.06
	Harvey, I.	Cardiff	11.06

206 *entries*, 25 *returned no score.*

WOMEN'S CUP

1.	Giggle, M. Mrs.	C.M.	5.57
2.	Picken, B. Mrs.	Wigan	5.52
3.	Scott, G. Mrs.	English Electric	5.18
4.	Roberts, G. Mrs.	Five Towns	4.16
5.	Allsopp, S. Miss	Cambridge	4.09
6.	Glynn, B. Mrs.	Surbiton	3.58
7.	Mosedale, Y. Miss	Essex	3.13
8.	Filtness, M. Mrs.	Chester	3.00
9.	King, P. Mrs.	Essex	1.25
10.	Willis, S. Mrs.	Essex	0.27

12 *entries*, 2 *returned no score.*

JETEX TROPHY

1.	Donnell, J.	Whitefield	37.35
2.	Wiggins, E.	Leamington	18.21
3.	Smeed, S.	Surbiton	16.60
4.	Dowling, B.	Watford W.	11.80
5.	Kent, G.	Watford W.	11.76
6.	Pressnell, M.	Essex	7.79

14 *entries*, 4 *returned no score.*

S.M.A.E. CUP

1.	Harper, D.	Glevum	14.21
2.	Cook, D.	Canterbury	13.51
3.	Halford, B.	Norwich	13.34
4.	Boxall, F.	Brighton	12.54
5.	Partridge, D.	Croydon	12.52
6.	Hiscock, F/O	R.A.F. Melksham	12.51
7.	Sleight	Hayes	12.49
8.	Spencer, B.	Chorlton	12.47
9.	Oliver, K.	Foresters	12.35
10.	Cooper, B.	N. Heights	12.12
11.	Bryd, G.	Melksham	12.09
12.	Jackson, C.	Surbiton	12.05

173 *entries*, 19 *returned no score.*

ASTRAL TROPHY

First Power Eliminator

1.	Posner, D.	Surbiton	15.00 + 3.30 + 2.49
2.	Fuller, G.	St. Albans	15.00 + 3.30 + 2.29
3.	Draper, R.	Coventry	14.49
4.	Monks, R.	Birmingham	14.18
5.	Gaster, M.	Surbiton	14.14
6.	Young, A.	St. Albans	14.06
7.	Buskell, P.	Surbiton	14.03
8.	Glynn, K.	Surbiton	13.59
9.	Parker, A.	Exmouth	13.55
10.	Jays, V.	Surbiton	13.49
11.	North, J.	Croydon	13.44
12.	O'Donnell, J.	Whitefield	12.29

86 *entries*, 10 *returned no score.*

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2.	St. Albans	480.35
3.	Birmingham	414.20
4.	Croydon	408.76
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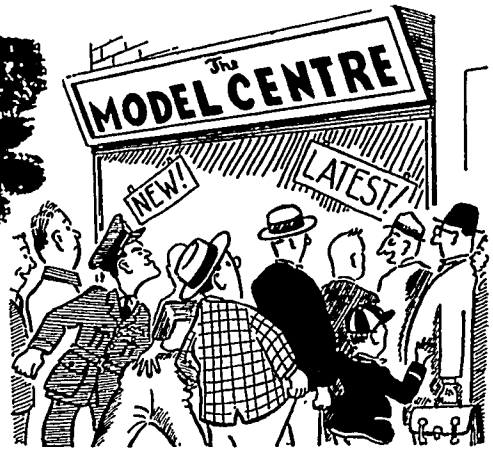

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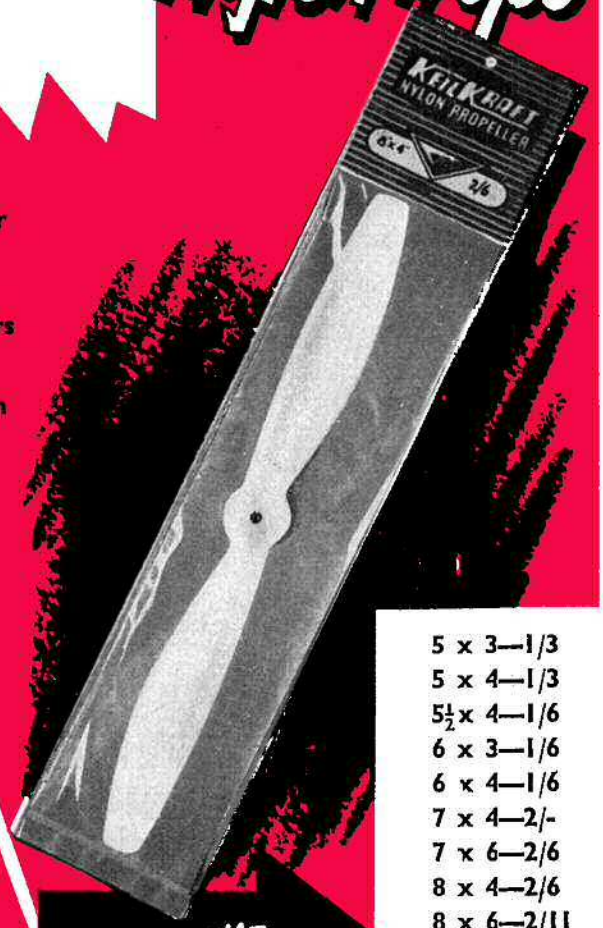

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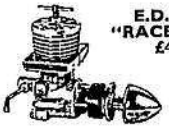

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