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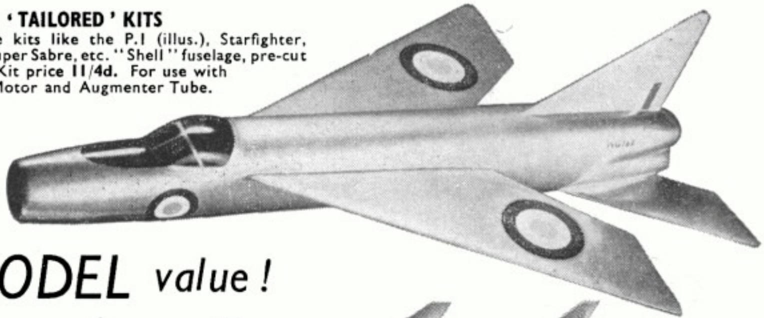

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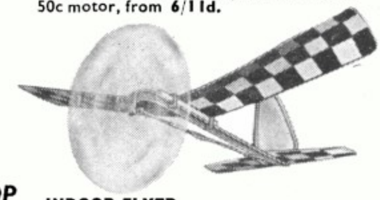

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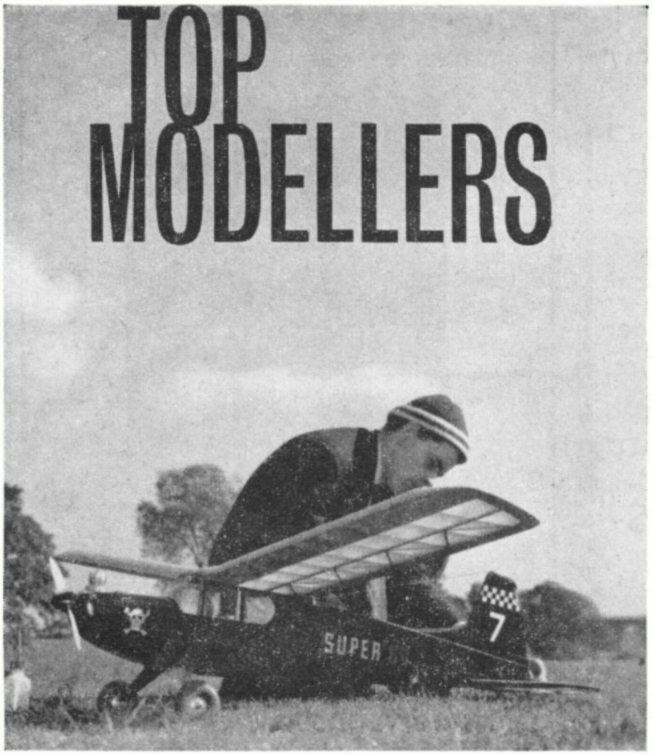

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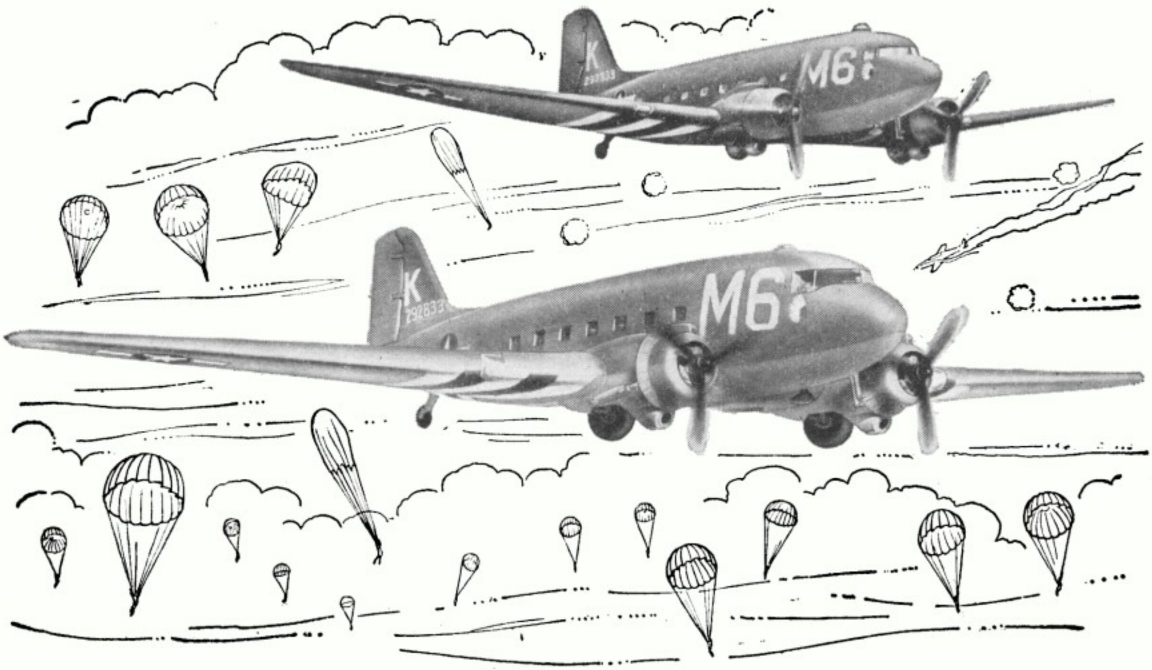

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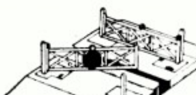

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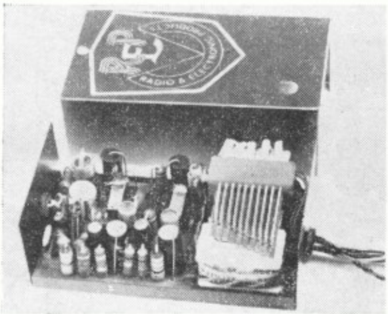

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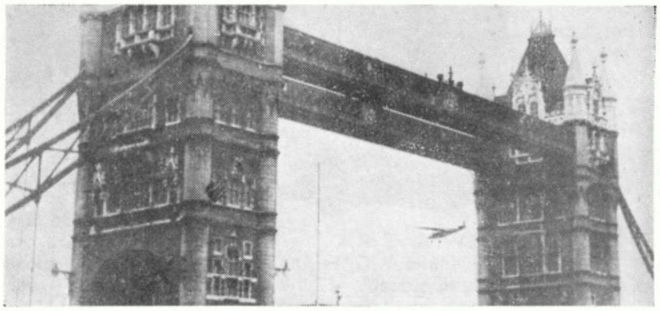

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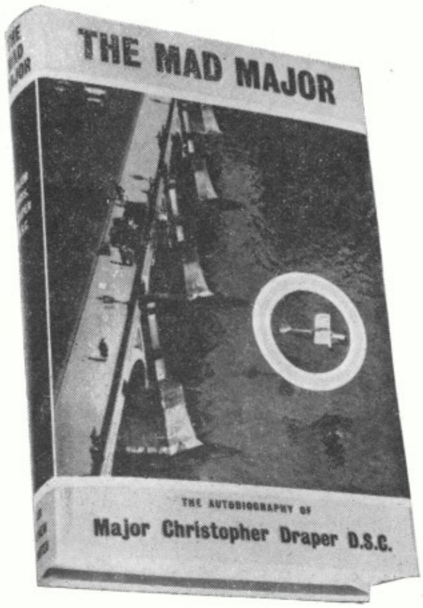

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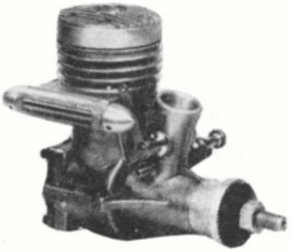

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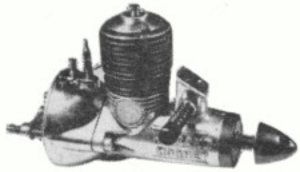

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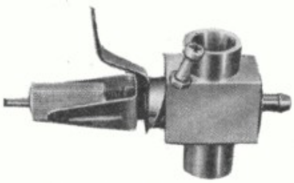

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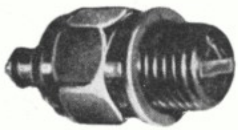

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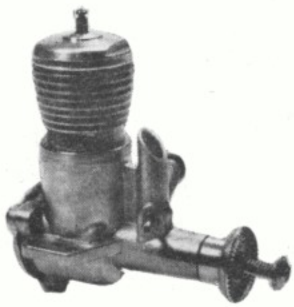

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MODEL aircraft

JUNE 1962

No. 252 VOLUME 21

The official Journal of the SOCIETY OF MODEL AERONAUTICAL ENGINEERS

IN THIS ISSUE

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Here and There

THE increasing general interest in consumer reports—popularly known as "Which Hunts"—is reflected in our postbag, where we have been taken to task for not stating in our Trade Reviews and Engine Tests, that product "X" is better than product "Y"—or vice versa. On the face of it this would seem to be fair criticism, but is it?

To take Engine Tests as an example, the performance figures speak for themselves and comparison with previous reports will immediately establish which is the most powerful motor in its class. However, the most *powerful* certainly need not be the *best* motor. For a contest flier who would use its power it would, without doubt, be the best buy, but for the average modeller it would probably be the worst buy. Many modellers buy the "Super XYZ Special" because it is the most powerful 2.5 produced, then proceed to put it in an unsuitable model with the wrong prop and fuel. This is akin to buying a Formula I racing car for shopping trips and equally as stupid.

We do our bit by stating the power of a motor, also whether it is well made, reliable, easy starting, etc., but we cannot recommend a "best buy"; only the intended user can decide this, because only he knows for what purpose the engine will be used.

Much the same also, of course, applies to reviews of kits. We can and do comment on the quality of the contents as applicable to the type of model, the retail price, etc., but any further comparison can only be misleading.

R/C equipment presents a rather different case. Here a "Which" type comparison would be of great interest, but must be ruled out on practical grounds. Even assuming the hundreds of pounds necessary to purchase the equipment were available, it would require a team of people employed full time, in order to complete the tests within a reasonable period. Before, in fact, with the constant influx of new equipment to the market, that purchased became out of date!

With our regular mentions of additions to the range of R/C equipment, accompanied, wherever possible, with technical specifications, we do our best to keep readers

NEXT MONTH IN MODEL AIRCRAFT you will find full-size fold-out plans for Ray Malmström's latest rubber powered scale model—a replica of the Bölkow MFI-9 *Junior* lightplane. Doug McHard concludes his Canards series, with a revue of some full size canards which make suitable subjects for scale models. There will also be the first ever detailed three-views of the interesting de Havilland T.K.5 canard. Peter Chinn will be testing the Merco 49 and Brian Horrocks writes about C/L stunt model design, accompanying his feature with a plan for an easy to build stunter that will "do the book." In addition there will, of course, be all the usual features, giving you the best value in model magazines anywhere.

abreast of new developments. Unfortunately, however (we'd just love to get our hands on some of the new multi gear !), any form of qualitative review is way out of reach at the moment.

More on Insurance

THERE has been a good deal of controversy this year about insurance matters, with the inevitable crop of misconstructions, misunderstandings and downright ill-informed comment. Suggestions that the cover provided to S.M.A.E. members is inadequate and could be improved by the simple expedient of taking out a new policy, have proved to be incorrect, as the vital clause in any policy is the term *liability at law*.

To put this term in its simplest form, liability at law means that if a claim can be maintained in the courts, then the insurance is effective. It is not, of course, necessary for every claim to go to court ; past decisions and rulings are well known and the vast majority of claims can be settled without such recourse. Moreover, if a person covered by insurance is involved in an accident, which the company does not have to meet because there is no liability at law, then the individual concerned is also immune from liability. However, it is vital to remember that this does not necessarily mean that, if an insurance company refuses to meet a claim because the individual concerned has infringed a condition of the policy, the individual cannot be held responsible. As an example, if someone, flying in an area where such activity was strictly forbidden were involved in an accident, the insurance company might well refuse to pay, but if the individual was held liable at law, he would have to pay the damages himself.

From all this it will be seen that the S.M.A.E. offers its members what is probably the best cover obtainable. Admittedly, by paying a higher premium, it might be possible to arrange a policy which did not carry an excess. However, the best " insurance " is for the members to be safety-conscious. Past exhortations have not had this effect, but a direct appeal to the pocket of the fools who launch in the middle of a crowd, or spray glow fuel over the paintwork of a car might, by making them pay hard cash for the damage they cause, well do so. Why should the bulk of the members, who show care and consideration in the pursuance of their hobby, have to pay a higher premium, so that a few morons can get away with their grossly irresponsible conduct scot-free ?

S.M.A.E. Membership

NEWS that the S.M.A.E. are considering a revised system of membership, has provoked serious discussion among all who have the welfare of the Society at heart. It has long been apparent that, due largely to ineffective communications with individual members, the Council have seemed an aloof, autocratic body making decisions without rhyme or reason.

This is certainly not true; we know that the S.M.A.E. is governed in a 100 per cent. democratic manner and the direct representatives of the members—the area delegates—can easily outvote the officers. However, it is in the dissemination of information back to individual members that things go wrong, for at the moment copies of the news-sheet, contest results, etc., often get no further than club secretaries.

If a revision of the present membership system is made, so that every member is kept more fully in touch with proceedings, we are sure this will whip up some of the enthusiasm for the work of the Society that has, of recent years, been so noticeable by its absence.

To pinpoint the present inadequacies some members have jumped to the conclusion that the changes, which are, at the moment, only in the early discussion stage, are in fact a *fait accompli*. We are surprised at this because, although out of touch they might be, we should have thought that it was general knowledge that *any* change affecting the constitution of the Society could only take place at an A.G.M., or E.G.M., at which all full members may voice their views before a vote is taken.

* * *

Due to current building development in the Park Lane area, Londonderry House is due for demolition. This means that the Society must find new office accommodation, the address of which we will publish as soon as possible.

Club Talk

WHAT makes for a successful club ? Well, people have different ideas on the subject. Some, for instance, see a large membership figure as the only true index of success, while others find more merit in contest achievement and putting the club on the map. Then there are those who think the answer lies in high pressure organisation and, least ambitious of all, is the chap who just believes in the casual get-together, with the minimum of official fuss.

Now, it is an unhappy fact that many clubs, which start out in high endeavour, come to grief, not through lack of zeal, but from a misplaced emphasis on a particular aspect of club life. This tends to obscure the purpose for which the club was formed, i.e. to provide a basis of common interest and activity for model flyers in the district. If there is too much emphasis on contest success, it is often to the neglect of the sport flyer, who may resent a disproportionate amount of his subscription being used to foster an interest he does not share. Or, if membership is allowed to grow without any cohesive force to unify the varied demands that come with increasing numbers, then, inevitably the club will split into dissident groups. Again, too much officialdom, involving ponderous resolutions, too numerous and impracticable to be translated into action, quickly puts the members to the wrong sort of flight.

Of course, it is desirable that a club should be keen to expand; to make its name on the contest field; and to run itself as efficiently as possible. But none of these things are worthwhile as ends in themselves. When a club becomes overstressed in one direction it ceases to be an effective modelling group, catering for all sorts and conditions of modeller, and either founders, or resolves into a specialist body. Clubs survive best that strive for a good all-round administration in an atmosphere of friendly co-operation.

Disastrous Fire at E.D's

A FIRE on Sunday, April 29th, 1962 at the Molesey factory of E.D. Engineering and Electronics Ltd. caused extensive damage to stocks and equipment. This has, of course, seriously affected production, but every effort is being made to meet outstanding orders with the minimum of delay. Anyone who had an engine or equipment at the factory for repair, is asked to write giving full details, in case the records relating to this are among those destroyed.

BREWSTER BUFFALO

by Peter Wheldor

A super-scale control-line model for 3.5-5 c.c. engines

THE Brewster F2A-1 *Buffalo* had the distinction of being the first monoplane shipboard single-seat fighter to enter service with the U.S. Navy. Flying for the first time in January, 1938, it was not a bad aeroplane but, due to the accelerated design development that was taking place at this period, it proved no match for the Japanese fighters it was eventually to meet in combat in the Pacific.

The *Buffalo* entered service in 1939 and was allocated to VF.3 based on the U.S.S. *Saratoga* (replacing the Grumman F3F-1s) and was painted in accordance with orders then prevailing. These colours are indicated on the plan and, for the builder who desires an out-of-the-rut scale model, with a splash of colour, this is it.

The model, although not suitable for the novice, is fairly easy to build, but requires patience and quite a bit of accurate work with the cowling, wheel wells, and undercarriage. The original is also fitted with motor control, operated by a third line, controlling an exhaust restrictor on the Veco 19.

Since the *Buffalo* is a very tubby design with rather a short nose, it is important to carefully select the wood used in the construction. Failure to do this will certainly result in the model requiring a large amount of ballast in the nose. All wood should, therefore, except where otherwise specified, be of a firm but light grade and particular care should be taken to save weight aft of the wing trailing edge.

The construction of the model falls logically into four stages—(1) the fuselage and tail assembly; (2) the wings; (3) the engine cowling and landing gear, and (4) the final finishing.

Fuselage

Commence construction by cutting out the parts for the laminated formers A, C and D. Note that the wing spars are not cut at this time and that when formers C and D are assembled, a slot is left in which the spar ends can be fitted later. Carefully cement the former parts together, using P.V.A. adhesive and clamp while drying. Cut former B from ¼ in. ply, bend the 10 s.w.g. landing gear and fasten in place using five "J" bolts. Cut the keel parts and cement them together over the plan, then cut out the remaining formers E to K.

Commence assembly of the fuselage by cementing formers C and D in position on the bearers. Bind the centre of the fuel tank with silk—well cemented—and cement it into the hole in former B. Slide former B into place on the bearers, followed by A. Set the assembly aside to dry.

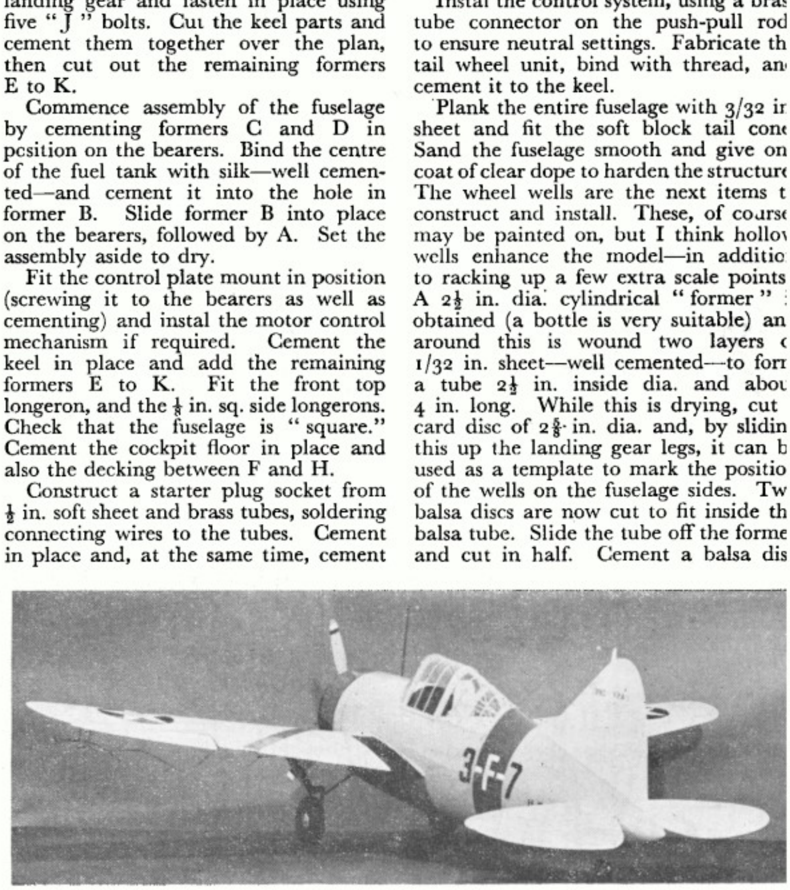
Fit the control plate mount in position (screwing it to the bearers as well as cementing) and instal the motor control mechanism if required. Cement the keel in place and add the remaining formers E to K. Fit the front top longeron, and the ⅛ in. sq. side longerons. Check that the fuselage is "square." Cement the cockpit floor in place and also the decking between F and H.

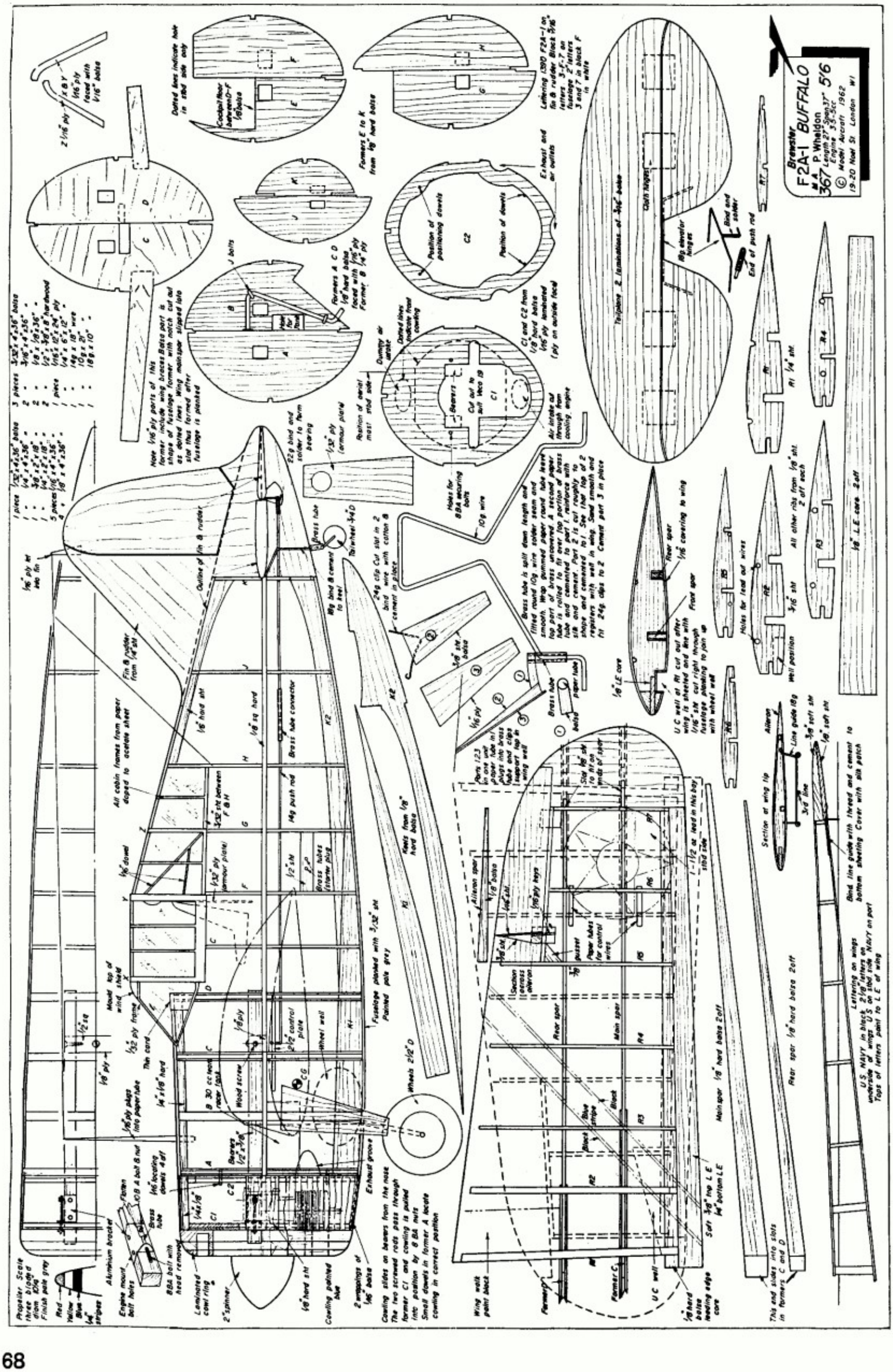
Construct a starter plug socket from ½ in. soft sheet and brass tubes, soldering connecting wires to the tubes. Cement in place and, at the same time, cement a piece of ½ in. soft sheet between A an B on the starboard side to take th wireless mast tube.

Construct the tailplane from tw laminations of $\frac{3}{16}$ in. sheet balsa sandwiching the cloth hinges and th elevator linkage (after binding wit thread) in between the layers. Cemen the tailplane in place—checking that i is sitting "square" on the fuselage an at zero incidence. Follow with the uppe rear longeron and the fin.

Instal the control system, using a bras tube connector on the push-pull rod to ensure neutral settings. Fabricate th tail wheel unit, bind with thread, an cement it to the keel.

Plank the entire fuselage with 3/32 ir sheet and fit the soft block tail con Sand the fuselage smooth and give on coat of clear dope to harden the structur The wheel wells are the next items t construct and install. These, of cours may be painted on, but I think hollo wells enhance the model—in additio to racking up a few extra scale points A 2½ in. dia. cylindrical "former" obtained (a bottle is very suitable) an around this is wound two layers 1/32 in. sheet—well cemented—to for a tube 2½ in. inside dia. and abo 4 in. long. While this is drying, cut card disc of 2⅝ in. dia. and, by slidin this up the landing gear legs, it can b used as a template to mark the positio of the wells on the fuselage sides. Tw balsa discs are now cut to fit inside th balsa tube. Slide the tube off the forme and cut in half. Cement a balsa dis





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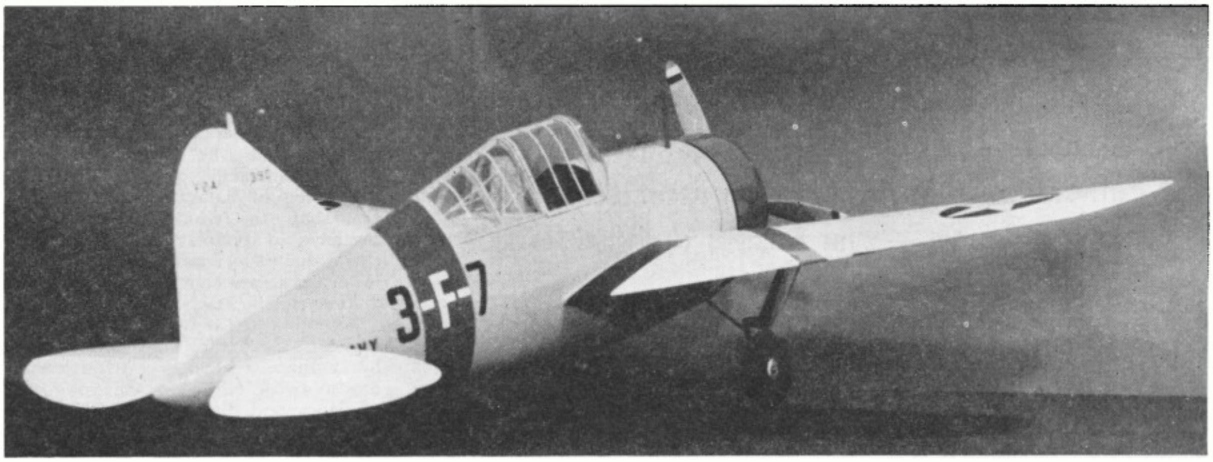


at the base of each half. Carefully cut holes in the fuselage sides, slide wells into position and cement well. When dry, trim and sand flush.

At this point the cockpit interior should be painted matt light grey and any cockpit details fitted.

Cut out and laminate canopy formers X and Y, and cut out Z. Notch the fuselage sheeting and cement the formers in place. Build up the remainder of the canopy framework from $\frac{1}{16}$ in. ply, notching all joints before cementing in place. Paint the framework matt light grey. Cover the canopy with heavy acetate sheet and carefully dope on the paper " frames."

Cut out the wireless mast and make a paper tube to fit the base. Cut a hole in the fuselage (through the $\frac{1}{2}$ in. sheet) and cement the tube in place. Ensure that the mast is a nice fit and is vertical.

Cement silk patches to all the tail/fuselage, and tailcone/fuselage joints to reinforce same. Use plenty of cement.

Wings

Construction is commenced by cutting the wing spars from very hard stock. These are cemented firmly into the slots left in formers C and D and to the $\frac{1}{16}$ in. ply wing braces (also parts of formers C and D). Check that the dihedral is the same on each side. Cut out all ribs and cement in position, followed by the $\frac{1}{8}$ in. leading edge " core " which butts against the fuselage sides and the aileron spars. Cement the upper and lower leading edge pieces in place, butting them against the fuselage sides. When dry, carve to conform to the contour of the ribs and sheet in the wing panel lower surfaces.

Construct the ailerons as shown on the plan and cut the slots in the aileron spars to accommodate the $\frac{1}{16}$ in. ply keys on the ailerons. Do not cement the ailerons in place until the model is completely finished. Add ballast to the starboard wing tip, and fit paper tubes in the port wing to take the lead-out wires.

Bind the control line guide with thread, cement it to the inside of the underwing sheeting and reinforce with a silk patch well soaked in cement. Cover the top surface of the wing panels, add the wing tips and, after carving the leading edge to airfoil section, sand the whole wing smooth. Fillet the wing/fuselage joints with silk—well soaked in cement.

Cut away the bottom wing sheeting and ribs where necessary to form the u/c wells. Line the wells with $\frac{1}{16}$ in. hard sheet. Note that the wells in the wings should join up with the wheel wells in the fuselage and part of the fuselage sheeting will have to be cut away to achieve this. Give the completed wing panels one coat of clear dope to harden.

Cowling and Landing Gear

The construction is clearly shown on the plan; however, there are two points that may be helpful. Before wrapping the $\frac{1}{16}$ in. sheet round the cowling formers, make and fit the cowling fixing brackets. These will have to be made on a trial and error basis and should hold the cowling snug and firm against bulkhead A.

The landing gear struts will also have to be made on a trial and error basis and are designed to unclip for normal flying. As there is a certain amount of " give " in their fixing, the model can be flown with the struts in place on " special " occasions—over smooth ground.

Finishing Touches

Cover the whole model with lightweight " Modelspan " (doped on) and then give one coat of clear dope. The method of obtaining a good foundation for the final finish is a matter of choice and much has been written on the subject. However, the final " base " finish is light grey and should, of course, be flawless.

We now come to the final painting of the model and any extra time spent here is always well rewarded. It is suggested that the tail unit should be finished first, using well thinned white dope and masking off the area to be covered in sections to avoid brushmarks. If photographs of the full-size aircraft are available, the individual " metal " panels can be masked off and—ensuring the surface is kept horizontal—the dope " floated " into the area thus formed. This gives a perfect brush-mark-free finish and when the masking tape is removed will leave genuine " panel " lines.

The fuselage and undersurface of wings should be finished next (light grey), and the undercarriage wells (dark grey). The method of obtaining panel lines mentioned above can, of course, be used on any of the surfaces to be painted. Follow by painting the upper surface of the wing (chrome yellow). The cowling, fuselage band and wing chevron are mid-blue. Using thinned down dope, two or three applications will be required on all surfaces. Finally, polish up with metal polish to obtain a fine finish.

The five-pointed star insignia is painted above and below each wing tip and here is a simple method of painting them. First, using a bit of $\frac{1}{16}$ in. ply and a broken razor blade, build a circular " cutter." Using this, cut a hole in a piece of " Contact " self adhesive covering material, to the size of the outside circle of the insignia. Press firmly into position. Now from thin card cut out a five pointed star and use this as a template to mark—in soft pencil—the position of the star within the circle. Mask off the star and paint white. Now cut another hole in another piece of " Contact " to the size of the centre spot. Press into position and paint the " hole " red. Now mask off white star and paint the remaining segments of the insignia dark (insignia) blue. Remove all " masks " and, lo, we have a perfect insignia !

Flying

Fly on 50 ft. lines over smooth ground —concrete or tarmac—for preference. Make sure that the control line fixings are in good condition before each flight as there is plenty of " pull " on this model. Wash model down with petrol after each flying session and re-polish with wax polish. Good flying !

½A TEAM RACING

Gordon Cornell designer of last month's full-size plan of the ½A team racer *Leveret III*, now discusses—"The Principles of Engine Tuning"

THE power factor is dependent on the b.h.p. of the engine and the efficiency of the propeller. Theoretically, the fastest speed will be obtained from the engine with the highest b.h.p., but in practice this does not always hold true because of variations in propeller efficiency. Also, due to the limited capacity of the fuel tank, we must consider the ratio of the fuel consumed per b.h.p. per hour, this factor is known as the Brake Thermal Efficiency.

No matter what price is paid for an engine, it must not be assumed that its performance cannot be improved. The majority of mass produced 1.5 c.c. motors can be modified to provide either more power, or lower fuel consumption, by the use of only a few hand tools. However, any modification will invalidate the manufacturer's guarantee; therefore it is essential to have a certain understanding of the likely effects before work is commenced.

The output of an engine is governed by three factors—the mechanical, thermal and volumetric efficiencies. Improving one may lower another, and how they interconnect and affect each other is shown in Fig. 1. The object of modifying and tuning a motor, is to alter these efficiencies to suit a particular requirement. For example, if sheer b.h.p. is required, thermal efficiency would be considered of lesser importance than the others, but if fuel consumption is important, then a compromise has to be made and volumetric efficiency would have to be lower.

Mechanical Efficiency

Basically this is a measure of losses due to friction, such losses being generally known as the "friction horsepower." Mechanical efficiency is usually fairly high—about 80 per cent. in full size engines.

The sources of power loss are: (1) the friction of the working parts; (2) the air resistance set up by the moving parts—commonly called "windage"; (3) power lost to induction, pumping charge from crankcase to cylinder and overcoming compression; (4) vibration.

Ballraces are frequently fitted to engines to improve the mechanical efficiency. The biggest advantage of these is that they have lower breakaway friction than a "plain" shaft, which improves starting properties. Because of the relatively large size of the bearings "windage" losses, due to revolving the balls, can be high.

Vibration is usually caused by excessively heavy reciprocating parts, the piston being the most serious offender, but it can also be caused by the fuel having insufficient nitrate content. The machining of balance weights on the crankshaft to reduce vibration often produces no apparent increase in power, this is due to increased "windage" and lower crankcase compression (see under volumetric efficiency).

Attention to items 1, 2 and 4 will increase the b.h.p. and improve the brake thermal efficiency, while item 3 has a direct effect on the volumetric efficiency and thermal efficiency, which are dealt with under their separate headings.

Volumetric Efficiency

This is the ratio between the volume swept by the piston and the volume of air and fuel vapour, sucked into the crankcase and pumped into the cylinder in one stroke, i.e. the percentage filling.

Volumetric efficiency is usually fairly high, in full size engines about 70-80 per cent., but is generally low in model engines. Partly due to the high r.p.m. involved and the scale factor, it is not possible by normal means to produce as high a pumping ratio as a full size engine, due to the comparatively large crankcase.

Typical methods of improving volumetric efficiencies are—(1) supercharging; (2) increasing pumping ratio; (3) enlarging inlet and exhaust ports; (4) enlarging transfer by-pass ports; (5) radiusing corners of the entry and exit of ports and polishing flow areas.

FIG. 1.

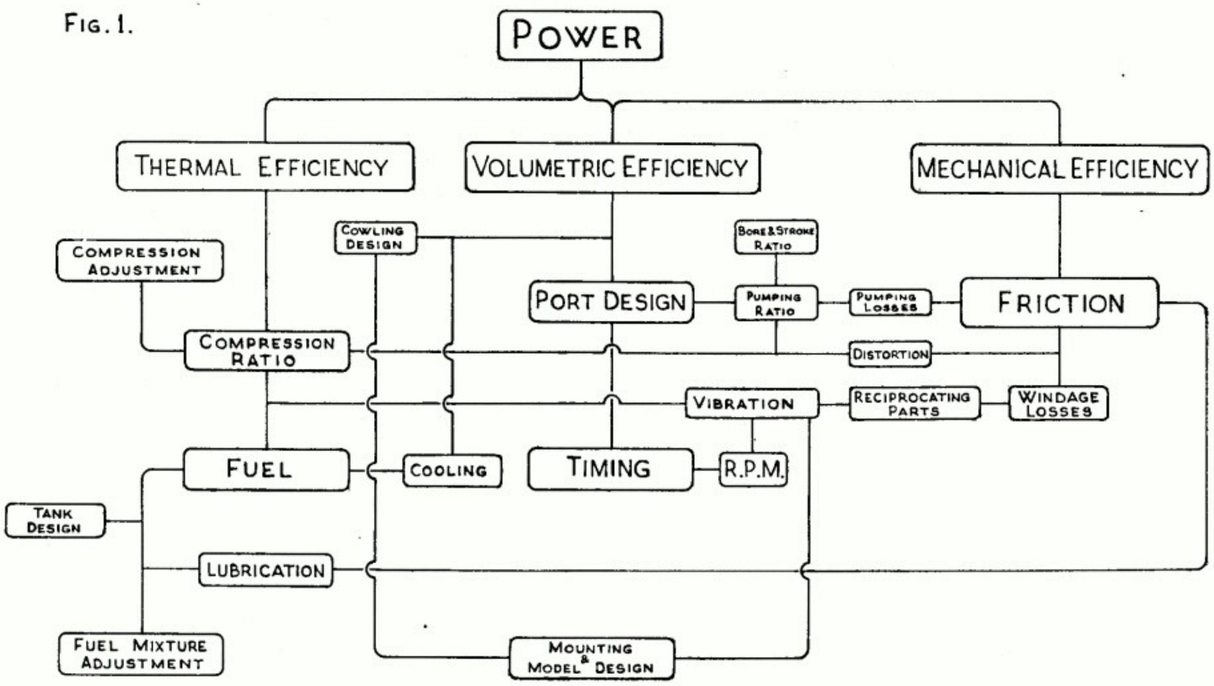
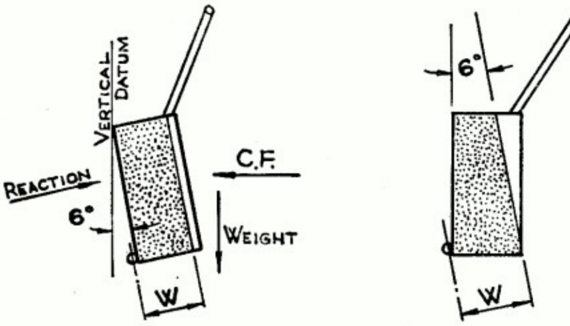


Fig. 2.

Fuel Position & Surface Level

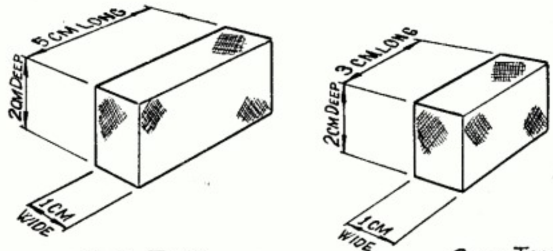


Theoretical Ideal at 80 MPH

Practical

Fig. 3.

Fuel Tank Dimensions



10 cc Tank
Leveret I & II

6 cc Tank
Leveret III

All of these increase fuel consumption, with the exception of items 4 and 5, where, although the fuel consumption will go up, the corresponding rise in b.h.p. is usually worthwhile. Item 2 tends to lower mechanical efficiency, but the actual compression ratio upon which the engine runs, is dependent upon this, which is important to thermal efficiency.

Thermal Efficiency

This is the ratio between the heat available in the fuel supplied and the heat equivalent of the i.h.p. or b.h.p. (i.h.p. is the indicated work done on the piston). These are known as the indicated thermal efficiency and the brake thermal efficiency and are usually about 30 per cent. in full size engines.

From the team racing point of view, the brake thermal efficiency is the important one, the limiting factors of thermal efficiency being the compression ratio and the fuel. The highest efficiency is obtained when excess air is supplied (weak mixture), but this does not correspond to maximum power. These conditions emphasise the importance of compression and mixture adjustment, in relation to economy (brake thermal efficiency).

Due to the thermal efficiency normally being relatively low, experiments under this classification can be extremely rewarding.

Fuels

Bench testing of fuels in relation to power and economy can be very misleading, as the thermal conditions are not the same as when the motor is installed in a model. We can, however, gain some information by this method.

The fuel can be subdivided—(1) base fuel—paraffin; (2) lubricant—oil; (3) starting agent—ether; (4) dope—ignition control additives, etc.—such as amyl nitrate or isopropyl nitrate.

Variations in the percentages of items 1, 2 and 3, will make a difference to fuel consumption, although this may not be as great as might be expected, due to the calorific values of these ingredients being very similar.

In a two-stroke engine the lubricating oil should be burnt to produce maximum power. The percentage, however, must be kept to a minimum, as its high viscosity will make atomisation difficult, this being a significant feature in extracting the power from a fuel. When higher than average percentages are required, an increase in the ether content can somewhat offset this (i.e. fuel No. 6, see Fig. 7 overleaf), normally, however, fuels with similar percentages to 1 to 4 give the highest brake thermal efficiency.

The dopes or ignition control additives speed up burning, which means that more complete combustion takes place, giving an increase in power, and, at the same time, lower fuel consumption. The easy way to prove this is to prepare an undoped mixture—test it, then repeat the tests after adding, say, 1, 2 and 3 per cent. nitrate (this becomes more significant under flight conditions as bench tests, on high nitrate fuels, tend to indicate overheating, attributed to an excess percentage). Here is the reason why some enthusiasts are baffled by lost lappage, a mere ½ per cent. of nitrate making an appreciable difference to the effective consumption. I have tested both nitro benzine and molybdenum disulphide as diesel fuel ingredients with no benefit, as both make for inconsistent running.

Fuel mixtures which can be used satisfactorily, depend to a large extent on the materials from which a motor is constructed and a fuel which suits one motor may not suit another.

Fuel Tank Design

Since fuel consumption and power have such a marked effect on performance the best possible fuel feed to the engine is essential. During flight there will be a change in fuel feed as the tank empties, so it must be designed to give the minimum variation. There are two basic systems in current use—(1) single cell; (2) two cell; and that chosen will depend on the sensitivity of the engine to fuel feed and the tank capacity. However, due to the capacity for ½A being only 6 c.c., there would be no practical advantage in using a two cell system.

Variation in fuel feed is due to the change in pressure head as the tank empties. Pressure at the feed connection (needle jet orifice) is directly proportional to the depth of fluid and is commonly called the pressure head. This is for static conditions, but for in-

Figs 4 & 5

Heats 5 Miles							
Secs per 9 Laps	Speed in M.P.H.	Critical Lappage					
		26	30	36	45	60	90
27·2	66	5-37	5-17	5-17	5-3	5-3	4-45
26·4	68	5-29	5-9	5-9	4-55	4-55	4-37
25·6	70	5-21	5-1	5-1	4-47	4-47	4-29
24·9	72	5-14	4-54	4-54	4-40	4-40	4-22
24·3	74	5-8	4-48	4-48	4-34	4-34	4-16
23·7	76	5-2	4-42	4-42	4-28	4-28	4-10
23·1	78	4-56	4-36	4-36	4-22	4-22	4-4
22·5	80	4-50	4-30	4-30	4-16	4-16	3-58
22·0	82	4-45	4-25	4-25	4-11	4-11	3-53
21·4	84	4-39	4-19	4-19	4-5	4-5	3-47
20·9	86	4-34	4-14	4-14	4-0	4-0	3-42
20·4	88	4-29	4-9	4-9	3-55	3-55	3-37
20·0	90	4-25	4-5	4-5	3-51	3-51	3-33
19·5	92	4-20	4-0	4-0	3-46	3-46	3-28
19·1	94	4-16	3-56	3-56	3-42	3-42	3-24

Finals 10 Miles					
Critical Lappage					
26	30	36	45	60	90
11-9	10-49	10-29	10-21	10-27	9-45
10-53	10-33	10-13	10-5	10-11	9-29
10-37	10-17	9-57	9-49	9-55	9-13
10-23	10-3	9-43	9-35	9-41	8-59
10-11	9-51	9-31	9-23	9-29	8-47
9-59	9-39	9-19	9-11	9-17	8-35
9-47	9-27	9-7	8-59	9-5	8-23
9-35	9-15	8-55	8-47	8-53	8-11
9-24	9-4	8-44	8-36	8-42	8-1
9-13	8-53	8-33	8-25	8-31	7-49
9-3	8-43	8-23	8-15	8-21	7-39
8-54	8-34	8-14	8-6	8-12	7-29
8-45	8-25	8-5	7-57	8-3	7-21
8-36	8-16	7-56	7-48	7-54	7-11
8-27	8-7	7-47	7-39	7-45	7-3

flight conditions it is necessary to take into account centrifugal force. Here the fuel moves to the outer extreme of the tank and the pressure head variation takes place across the width "W" (Fig. 2). The fuel never takes up a true vertical and at 80 m.p.h. the surface level makes an angle of 6 deg. to the vertical. However, if the tank were made and fitted in the model to suit this, it would be difficult to empty, so by fitting it vertically and with the feed pipe from the bottom rear corner, it will completely empty, provided the rear end of the tank is angled slightly outwards. Obviously, centrifugal force will increase the pressure at feed connection so, for minimum variation in pressure, the tank should be made as narrow as is practicable. The length and depth make no difference to feed in flight—however, a deep tank is an advantage to aid starting. Unfortunately a compromise is necessary, as an infinitely narrow tank would be difficult to fill and would be subject to syphoning and fuel frothing.

The fuel tanks fitted to *Leveret I* and *II* were 10 c.c., the dimensions being as in Fig. 3, feed for starting and flight were extremely good. The 6 c.c. tank fitted to *Leveret III* gives exactly the same feed for starting and flight as the original 10 c.c. tank, as only the length has been changed.

Positioning Fuel Tank in Relation to Engine

The tank is best fitted above the jet in the vertical plane, to provide gravity for starting when using an inverted motor. In the horizontal plane the centre line of the tank should be in line with the jet hole, for the mean conditions of feed throughout the tank run. Since the engine r.p.m. increases from static to flight conditions, in most cases it is an advantage to offset the tank slightly towards the centre of the circle. This gives an increased bias towards a richer mixture at the beginning of the flight, which will prevent the engine cutting out during take off and acceleration. Moving the tank outwards makes the engine run leaner and vice versa. On *Leveret I, II* and *III*, it is offset towards the centre of the circle.

Tank Filling Arrangement

There are three basic systems which can be employed—(1) single pipe—large bore; (2) two pipe—large filler—small vent; (3) single small vent and large bore non-return valve filler arrangement.

FIG. 7.

FUEL MIXTURE PERCENTAGES

No	Castor Oil	Castrol Two-Stroke Oil	Ether	Paraffin	Amyl Nitrate	Isopropyl Nitrate
1		15	25	60		+2½
2		15	25	60		+4
3	10	5	25	60	+4	
4	10	5	25	60		+4
5	15	5	25	55	+2½	
6	10	10	40	40		+2½
7	20	5	25	50	+4	

The idea behind all these systems is to minimise the syphoning of fuel from the tank during flight. However, they all, in fact, allow some syphoning to take place—the *only* system which will *completely* prevent this is a closed circuit pressurised system which, provided a quick filling arrangement can be made, is really worthwhile developing.

At present I prefer system 2, as this is the most foolproof and the fastest to fill, because a small pipe fitted to the squeeze bottle does not have to be inserted in a tube as in 1. Also a small pipe on the squeeze bottle is easily damaged or blocked if dropped. I do not feel that the results obtainable with system 3 justify the complication for ½A.

Care must be exercised to ensure that when filling, pressure is still applied while removing the squeeze bottle, otherwise fuel will be syphoned back from the tank.

Particular Points to Watch When Tuning

Ballraces—check for correct fitting and alignment. Ballraces are manufactured with three different radial clearances and are known as one dot, two dot and three dot bearings; the one dot having the smallest clearance. If the races are tight when the crankshaft is removed, fit a bearing with increased clearance, if they tighten up when the shaft is fitted, reduce the shaft diameter by polishing with emery cloth or paper. There is no magic about an expensive bearing, but steel cages are preferable to brass.

Choke size is extremely critical when tuning for minimum fuel consumption—reducing the diameter from 0.2 in. to 0.187 in. on the *Super Fury* improved the lappage from 40-60 (10 c.c. tank) and showed a slight increase in r.p.m. of 2-300 on a 7 × 6 in. prop.

Polishing flow areas other than the choke is a waste of time unless the ports are too small, in which case they should be enlarged, remembering that radiusing and blending is very important.

Disc motors—make sure that both surfaces are perfectly flat and no tight spots exist when the crankshaft is revolved.

Tactics, Operation and Propellers

Each individual employs tactics in some form, the most common and obvious being the choice between long or short range. I have prepared comparison performance tables (Figs. 4 and 5) which give m.p.h., lappage and possible race times. Earlier tables, prepared by Ken Long, did not take into account the heating up factor of a long range model, so exaggerated the advantages of this approach. For example, a model when set for maximum speed will not slow down significantly on the latter part of the tank, but the long range model does. Greater consistency is more easily obtained from a high speed model, the engine being easier to start and adjust.

To use tables 4 and 5, allow about 10

(*Continued on page 196*)

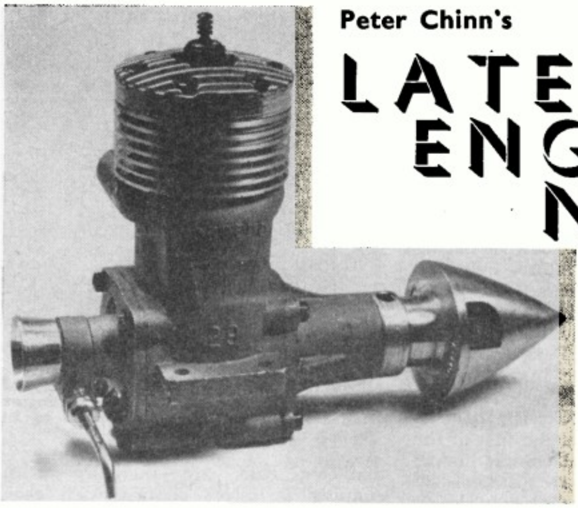
FIG. 6. COMPARISON R.P.M. & FUEL CONSUMPTION FIGURES

FROG 7 x 6 NYLON PROPELLOR. SMITHS TACHOMETER

Engine	Remarks	Fuel No 1		Fuel No 2		Fuel No 3		Fuel No 4		Fuel No 5		Fuel No 6		Fuel No 7	
		RPM	Secs per cc	RPM	Secs per cc	RPM	Secs per cc	RPM	Secs per cc	RPM	Secs per cc	RPM	Secs per cc	RPM	Secs per cc
AM 10	Good Piston Fit	10800	17·3	11000	16	11300	24	11200	18	11000	18	11400	17·6	10800	18·7
Frog 100 Mk II	Does not like low oil content.					10400	19·3			10600	16·5			10800	17·8
Frog 150R	Tuned									12200	16·8			11800	16
Frog 1500	* Part Modified	11600 *	23·6	11800	17·0			11800 *	27·8	12200	17·1	11900 *	24	11700	16·8
ED. Super Fury	Squeak Tight Piston					13200	13·5			13200	12·4	12800	11	12800	13
ED Super Fury	Modified intake etc squeak tight piston	13500	12	13400	14·2	13200	14·7	13100	12	13000	13·8	12800	12	12800	13·7
ED. Super Fury	Modified intake etc free piston fit	13900	14·7	14000	15			13700	14·1			13700	12·8	14200	15·5

Peter Chinn's

LATEST ENGINE NEWS



Left: now released, the K & B .29R Series 61 racing engine. Like its smaller brother, the .15R, it has ball-bearings, disc rotary-valve and a special three-piece crankshaft construction.

ELSEWHERE in this issue, Gordon Cornell deals with some of the factors affecting $\frac{1}{2}$A team-race performance. Not unnaturally, since he was responsible for the design of the much improved Super-Fury version of the earlier E.D. Fury 1.5 c.c. engine, Cornell favours a tuned version of this engine and, to give support to his claims for the tuned Super-Furies which he has been using, with some success, in $\frac{1}{2}$A T/R, he sent along an actual motor for us to try out.

We ran side-by-side tests on this engine and a stock Super-Fury. The latter proved to be somewhat less powerful than the Super-Fury tested in the Engine Test series, delivering 0.156 b.h.p. at between 14,000 and 14,500 r.p.m. as against the earlier test engine's 0.172 b.h.p. Cornell's special, however, was a vast improvement and recorded slightly over 0.23 b.h.p. at 17,500 r.p.m. This exceeded, by just over 10 per cent., the best-ever performance previously recorded for a 1.5 c.c. diesel (a good and well run-in Oliver Cub Mk. 2).

Static tests on the Cub and Cornell-Fury up to 13,000 r.p.m. revealed little difference in performance—in fact the Cub was slightly better at below 11,500 r.p.m. but, at speeds above 14,000 r.p.m., the Cornell-Fury began to pull away due to its exceptionally flat torque curve. This does, in fact, confirm the "in-flight" claims for the engine, as it would, of course, build up to higher r.p.m. in the air, as prop load was reduced and, to a greater extent, due to its higher b.h.p. and higher peaking speed.

In response to our enquiries, Gordon Cornell lists the following as responsible for the improved performance of his engines:

1. Lighter piston. This is machined to adjust the exhaust period to 166 deg. of crank angle and the transfer to 96 deg. Sub piston induction is 60 deg.
2. Exhaust and transfer ports are widened.
3. Carburettor choke diameter is reduced to 0.187 in. from 0.200 in. This takes a little off the peak performance of the engine, but improves consumption by 50 per cent. under flight conditions.
4. A special Tufnol valve disc replaces the original Bakelite moulding and amends the induction timing to 35 deg. ABDC—30 deg. ATDC.
5. To achieve these high performance levels, the engine must start life very tight and this generally means that the conrod needs replacing after about 10 hours. Performance, however, continues to improve until about 100 hours running is reached, when a new set of bearings is usually required. As compression goes, the engine loses power on big props but improves on small props.

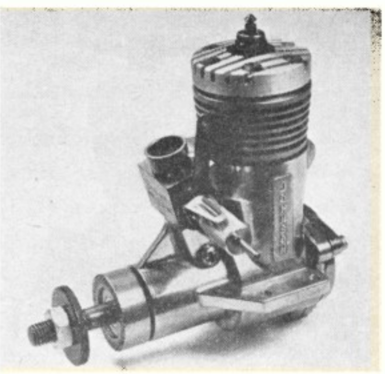
Apropos of the latter paragraph, various test figures for new and well run-in engines, both modified and unmodified, underline the fact that much improvement can come from careful lapping of the piston and subsequent running to achieve the ideal working fit, which both raises power and reduces fuel consumption, by reason of improved mechanical efficiency. This is understandable since piston friction accounts for the bulk of frictional losses in any engine resulting in a lowering of mechanical efficiency which further diminishes as engine speed is raised. Thus, if mechanical efficiency can be improved at high speed, the b.m.e.p. will benefit at such speeds, thereby flattening the torque curve and raising the peaking speed and maximum b.h.p. of the engine.

The results of Gordon Cornell's tuning of the Super-Fury clearly demonstrate how much can be gained by the right approach and also prove the basic soundness of this E.D. product which responds so well to such treatment.

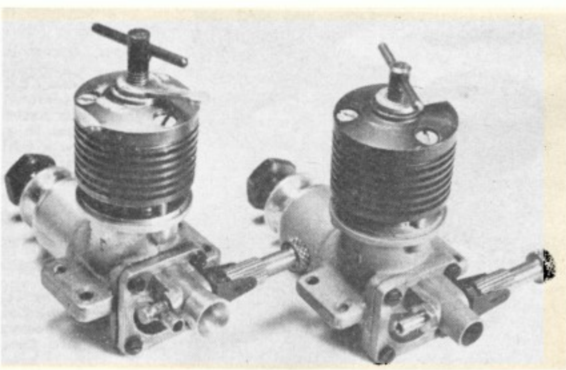
* * *

Improvement to "stock" performance takes a somewhat different course with the new 2.42 c.c. Fox 15X. As we mentioned earlier in this column, this engine, which, in standard form, sells for only \$6.95 (£2 9s. 8d.) and is now available in the U.K. at around £3 5s. inc. tax, is also being offered in the U.S.A. in a "15XX" contest version at \$15.00 and, to special order, will later appear in full factory modified form at \$30.

So far, we have handled this engine in only its standard 15X and special 15XX form, but the difference in performance between these two models is quite staggering. On ordinary low-nitro or non-nitro glow fuels, the 15X has quite a low performance. On a standard "sport flyer's" grade fuel, in fact, our two 15X's were well down on normal 2.5 c.c. glow engine levels of performance and reached no more than 0.17 b.h.p. at 14,000 r.p.m. The compression ratio of this engine is quite low and a sub-



Left: the Johnson J-R/C .36 engine. It has twin ball-bearings and the largest diameter crankshaft journal of any engine in current production. The throttle is a barrel type with compensated mixture control.



Right: Gordon Cornell's tuned Super Fury (left) alongside a standard production engine.

stantial improvement is obtainable with the use of medium-to-high nitromethane content fuels. Using around 20-25 per cent. nitro, pushes b.h.p. up to a maximum of about 0.23 which, however, is still inadequate for F.A.I. contest purposes, although acceptable for unrestricted F/F having regard to the light weight of the engine which, at just over $3\frac{1}{2}$ oz., is no more than that of the average diesel 1.5.

The 15XX model, on the other hand, is a very different proposition. This model has a higher compression ratio, a lightened piston, a machined (instead of diecast) conrod and a better quality main bearing. Over the most useful part of the speed range, it is 2,000 to 4,000 r.p.m. up in prop/r.p.m. performance on the cheapest types of fuels. Not very much is to be gained by using intermediate grade fuels containing up to 20 per cent. nitro, but if a really hot racing fuel (containing not less than 50 per cent. nitro) is used, prop speeds go up 1,000-1,500 r.p.m. and the engine will deliver around the 0.40 b.h.p. mark at 20,000 r.p.m.

One essential to the realisation of high performance with the 15XX is to allow it to run at upwards of 18,000 r.p.m. static and a prop no larger than about $7\frac{1}{2} \times 3\frac{1}{2}$ would seem to be indicated for contest F/F. This is suggested by the following prop/r.p.m. figures, which also give some idea of the respective performance of the 15X and 15XX on different fuels.

Prop	Fox 15X		Fox 15XX		
	5% nitro	20% nitro	5% nitro	20% nitro	50% nitro
8 x 4 Tornado	10,800	11,600	12,400	12,800	13,700
7 x 3 Trucut	14,800	16,300	18,400	18,900	19,800

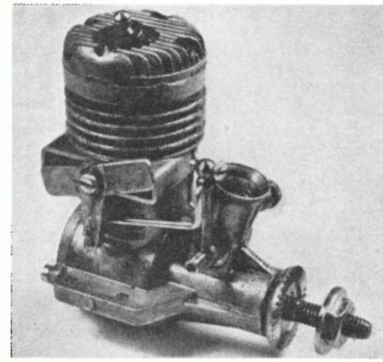
It is not known whether the 15XX model will be available in the U.K., so it is worth mentioning that improvement to the standard model can be effected (a) by removing the alloy decompression ring and replacing it with an extra 10 thou. gasket to raise compression and (b) by fitting a 15XX piston, cylinder and connecting-rod. These parts are available from the Fox company price \$6.00 for the piston and cylinder and \$4.50 for the connecting-rod.

In last month's issue we promised to deal, this month, with the Merco 49 R/C if it was available from the manufacturers in time. Unfortunately, this engine is still not quite ready at the time of writing, but we hope to put right this omission at the earliest opportunity.

Meanwhile, we have been looking over another R/C engine: the Johnson J-R/C 36. Johnson engines are not widely known in this country, although it is expected that we shall be seeing more of them in the future, following the appointment of Messrs. Holt Whitney & Co. Ltd. as U.K. agents for Dynamic Models Inc., manufacturers of Johnson and Holland engines.

The Johnson marque first appeared some seven years ago when "Hi" Johnson took over the Orwick range of engines. In June, 1960, the first of the present series of special contest motors was announced. These are distinguished mainly by a unique crankshaft design and comprise the models J-29R (high performance 5 c.c.), J-SS (0.35 cu. in. stunt) and J-CS (0.36 cu. in. combat, etc.). Just over a year ago, a ball-bearing version of this latter model was introduced, known as the J-BB. The J-R/C is this latter model with the addition of the Johnson "Automix" throttle-equipped carburettor.

As we have said, these Johnson models have a unique crankshaft. In the past, the majority of .35 engines used a $\frac{7}{16}$ in. (0.437 in.) dia. journal—a large number still do in fact. Four years ago, Fox and O.S. began the trend towards larger shafts with, respectively, 0.500 in. and 0.512 in. dia. journals. The Johnson shaft, however, uses a main journal of no less than $\frac{5}{8}$ in. (0.625 in.) dia. This has permitted a truly enormous gas passage through the shaft—so large, in fact, that a $\frac{7}{16}$ in. shaft will fit inside it, with room to spare! This has, of course, called for the use of a special type of bearing in the case of the ball-journal equipped J-BB and J-R/C, since the o.d. of a standard type ball journal bearing of this i.d. would be far too large to fit inside the crankcase. A large number (21) of relatively small diameter balls are therefore used, running in direct contact with each other, without a cage. At the front end, the shaft steps down to $\frac{1}{2}$ in. dia. and is supported by a small, five-ball Fafnir bearing.

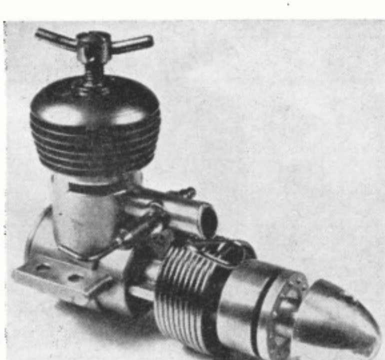


Above: the Fox 15X R/C, a throttle equipped version of the recently introduced 15X engine using a semi-rotary spraybar linked to an exhaust throttle.

* * *

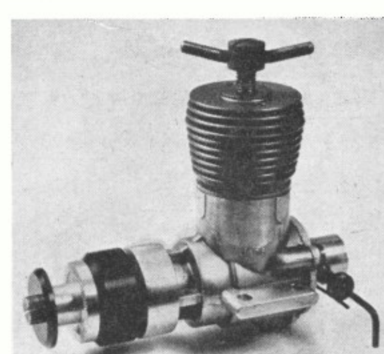
Announced last year at the same time as the 15R and 35 engines, the third of the K & B "Series 61" trio, the .29R, has recently been released in the U.S.A. Of the same general design as the smaller .15R engine, this fine 5 c.c. racing engine is identical in external appearance but has one or two minor internal modifications. A much shorter cylinder liner is used. The piston has skirt transfer ports like the 15R, but these clear the bottom of the liner at BDC instead of registering with matching ports in the liner. The crankshaft has the same unique three-piece construction, but is supported in one $\frac{3}{8}$ in. i.d. inner and one $\frac{1}{4}$ in. i.d. outer, ball-bearings, instead of using two bearings of the same size. Shaft diameter between the bearings is reduced by a gradual taper to provide maximum strength and rigidity. Other 15R features, including the special multiple jet carburettor, hard-chromed piston and crankpin, special spinner assembly and non-metallic valve disc are retained.

Later we hope to give more complete information on these Johnson and K & B engines as space permits.



Left: the Jena 1 c.c. diesel is of the three-port type now seldom used for model aircraft engines, but has the intake facing forward. Also unusual in so small an engine is the use of a twin ball-bearing mounted crankshaft. Distribution of these engines will shortly begin in the U.K.

Right: the Jena 2 c.c. diesel which is built by a section of the Zeiss works in East Germany. It features reed-valve induction and a ball-bearing shaft. Disc valve and 2.5 c.c. versions are also made.



LETTERS
to the Editor

Nationals F.A.I. Team Race

SIR,—The Nationals F.A.I. Team Race (Davies A) will be run by the Hayes & D.M.A.C. strictly to current F.A.I. rules. Two circles will be in operation continuously from 10 a.m. onwards. Heats will be run every 12 min. and will contain three models each. Each entrant will fly two heats, the fastest of these deciding who goes into the three-model final, which will take place at 5 p.m.

A clock maintained at B.S.T. will be in front of the control tent, heat times will be based on this and will be rigidly adhered to. Entrants (who will be limited to 100 this year) will be supplied with their heat times (rounds 1 and 2) as soon as possible. No late entries will be accepted on the day. It will be impossible to process 100 models completely, but all models will be liable to spot checks.

No whipping, high flying or other misconduct will be tolerated.

The timekeeper-lapcounter will be alongside the segment the entrant starts from. The entrant will be able to check his laps from him if so desired. As last year, the three finalists will have three timekeeper-lapcounters *each* to eliminate possible timing errors. A complete set of the current F.A.I. rules will be posted outside the control tent. Any queries should be sent, together with a S.A.E., to KEVIN LINDSEY, P.R.O., Hayes & D.M.A.C., 53, Guildford Avenue, Surbiton, Surrey.

Proof of the pudding!

SIR,—Mr. Balch's interesting comments (April) on my earlier note (February) and Mr. MacDonald's article (August, 1961) require an answer too bulky for these columns. However, a full analysis with particular reference to the lift-centrifugal force relationship, energy loss theory and boundary layer depths will show my first letter to be correct in all respects. My calculations clearly favour the highish aspect ratio, well-shaped wing, in a lightish model with a good finish. But I think the performance of such racers as the *Miss F.A.I.* will convince more fliers than any equation!

Yours faithfully,
R.A.F. Changi, Singapore. NOEL FALCONER.

Messrs. Gamages have asked us to draw the attention of readers to the omission in their advertisement on page vi. The A.C. motor is only suitable for 3-6 volts operation.

"Directory" support

SIR,—How true A. F. Marshall's letter in your May issue was. I used to live in Hounslow and for 20 years used the local Heath for my F/F scale flying. As the years progressed the Heath became smaller and smaller from the enlarging gravel pits and I became quite worried. I then moved to the country, thinking of the wonderful fields and open spaces that I would find all around me. But no such luck, so my interest grew less and less until I stopped modelling altogether.

As I used to spend quite a weekly sum of money on all my bits and pieces, the modelling trade became the losers and I'm only one of what must be thousands. If only we had a flying field directory—it would help so much. Being married I haven't any desire to join a local club, as time will not permit and they all seem to be control-line happy. Anyway, I am not interested in competition flying as I fly purely for the fun of it, or used to.

I feel also that C/L flying has done much harm to the modelling world, with noisy flying in one particular area causing annoyance to all and sundry, hence the loss of quite a few flying grounds. It is a sport enjoyed only by the pilot on the other end of the wires, whilst everybody enjoys a free flight by a model that looks like the real thing.

This loss of flying grounds is serious, some of the old model shops are just letting their stocks of modelling material dwindle and are displaying more and more plastic kits and trains. This is very sad as I can recall the time when every size of balsa was obtainable from the local shop, this is no longer the case and I think it will get worse.

If it were only possible to hire suitable fields for say six months a year, the modellers obtaining a permit, for say £2 or £3 a year from a controlling body, i.e. the S.M.A.E., to use them, it would do so much for everyone. This would put it on a par with the fishing fraternity and would stop undesirables from ruining the sport. £2 or £3 a year wouldn't be such a hardship for the average modeller these days either.

Yours faithfully,
South Heath, Buckinghamshire. C. BROWN.

A practical suggestion

SIR,—I was interested to see that your correspondent Mr. Marshall has brought light to bear upon what is a long felt want in our hobby. As a dealer I have, on two occasions, brought to the notice of the S.M.A.E. the fact that the general public have difficulty in finding the venues of area meetings and that a copy of these sent to the local model shop, would do a great deal to create interest and more important, understanding of a worthwhile pastime.

Unfortunately these suggestions were not acted upon, but perhaps through the publicity gained from your column something may be done. I am sure all those engaged in the trade would only be too pleased to display what need only be a small duplicated notice.

Yours faithfully,
N.W. DEALER.

This is hardly the province of the S.M.A.E. itself. The centralised contests for which it is directly responsible receive adequate publicity, but information of area events, being of purely local interest, must come from the area committee concerned. On this point attractive posters designed expressly for the purpose of advertising contests in model shops are obtainable from the secretary of the Model Trade Federation, 156, Marine Parade, Leigh-on-Sea, Essex.—Ed.

The other viewpoint!

SIR,—Mr. A. F. Marshall's letter in your May issue (page 151) is indicative of an all-too prevalent attitude by some aeromodellers. He freely admits in print that he does not support any club or organisation, yet has the colossal nerve to criticise the lack of information as to where he can gate-crash on a wider scale!

How does he justify his "visiting club grounds" with apparently no intention of making his own contribution towards such facilities? Does he realise that he is merely taking a parasitic advantage of the fees and work provided by other enthusiasts? I am certain the majority of clubs will welcome hordes of Sunday afternoon car owners descending on their hard-won grounds in an effort to entertain the family!

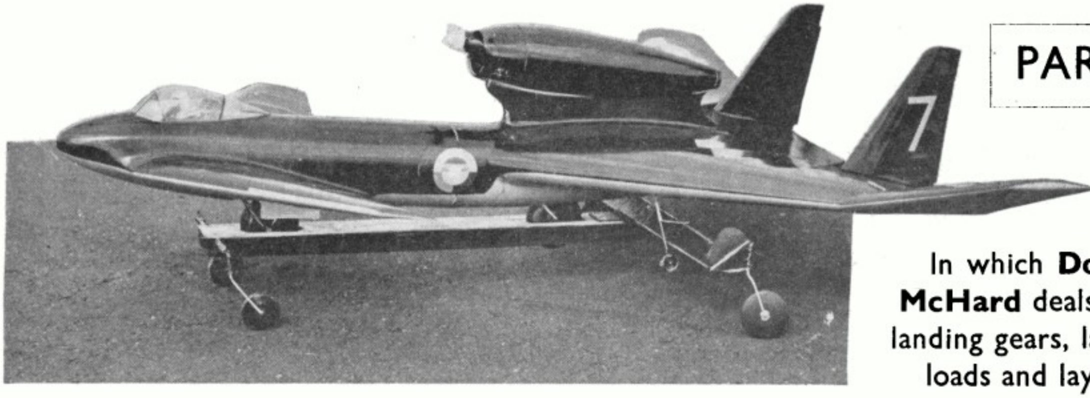
Such lack of appreciation leaves me (almost) speechless.

Yours faithfully,
"CAESER."

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.

THE "WRIGHT" WAY ROUND

PART 3



In which **Doug McHard** deals with landing gears, landing loads and layout

THE efficient stressing of a canard airframe is a most important factor and one which presents one or two pitfalls for the unwary. As we have already seen, the side area ahead of the C.G. should be kept to a minimum if the fin area is to be maintained within reasonable bounds. Since the C.G. is invariably well to the rear of the aircraft, this requirement often results in a long, boom-like, forward fuselage, which it is difficult to make sufficiently strong. A heavy landing can set up enormous local stresses just ahead of the mainplane, often resulting in structural failure at this point. Awareness of the problem, however, should enable the would-be designer to provide the necessary strength and distribute the concentrated load over as wide an area as possible.

The heading photograph shows the canard delta equipped with a tandem undercarriage and with the low-set leading plane. The model is resting on its experimental fully castoring take-off dolly. Below: " Macanard-8," the R/C canard described last month. The " two in front " wheel arrangement is clearly shown.

An alternative solution is the one adopted on my big canard deltas, one of the airframes of which was featured on our April cover. The fuselage was divided in two, just ahead of the mainplane, the respective sections being faced with ply and located in their correct relative positions by four short $\frac{1}{4}$ in. stub dowels. A recess was provided along each fuselage side in which further projecting dowels were arranged to accept powerful rubber bands, which held the two fuselage sections together. Detachable cover plates were then arranged to conceal the bands, and fixings. This divided fuselage conferred several advantages. It allowed the somewhat bulky model to be more easily transported and, in a heavy landing, the " expanding joint " also absorbed much of the shock.

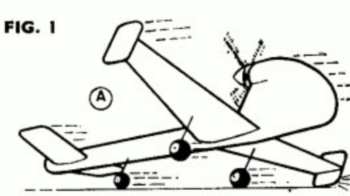
Altogether three alternative forward fuselages were built in order to experiment with different moment arms and leading plane positions. The results of these experiments proved interesting. For instance, moving the leading plane from a high to low position in relation to the mainplane, made little difference to the general flight pattern, providing that the incidence setting was increased as the setting was lowered. However, with the low-set leading plane it was impossible to persuade the model to climb straight from the launch. This characteristic has been observed on other canards of similar configuration, the model either gently descending, or at best, flying level for some considerable distance before getting away, the speed of the launch making very little difference.

A low-set leading plane, despite its higher incidence, also seems to produce a higher flying speed, which may well be useful for R/C models. Following a very rough landing the low-set plane invariably came off better than the high set one, which always seemed to find its way into the propeller !

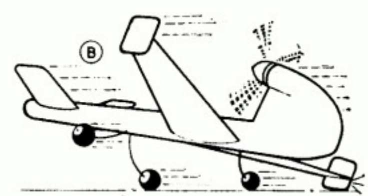
I have been unable to completely eliminate all the snags associated with canard undercarriage design and this seemingly elementary item presents one of the most frustrating problems of all. The vertical C.G. location of a canard is usually higher than that of an " orthodox " aircraft and if advantage is to be taken of the high thrust-line possibilities described earlier, then a stable undercarriage, giving good ground handling, is imperative.

The apparently logical solution (and the one adopted by many full size

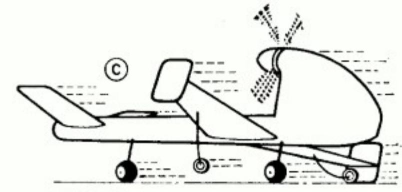
FIG. 1



NOSEWHEEL U/C
Angle of attack decreases and prevents takeoff



TAILWHEEL U/C
Angle of attack increases and assists takeoff



TANDEM U/C
Angle of attack constant, (providing that outriggers are sufficiently "springy")

designers) of a nosewheel and two rear wheels leaves much to be desired, as a glance at Fig. 1A will show. Take-off characteristics with such an undercarriage are, to say the least, hazardous and torque from a high-set motor will immediately tend to lift one of the rear wheels. This, in turn, decreases the wing angle of attack and before you know it the model is trying to plough a furrow in the runway! Under these circumstances the likelihood of getting off the ground at all is extremely remote.

In an attempt to make the gear acceptable I have tried many variations such as extending the main wheels forward to a point almost under the C.G.—broadening the wheel track—varying the wheelbase, etc., but it seems that this wheel arrangement will only work given ideal wind and runway conditions, which, for the average flyer, are so rare as to be almost *freak* conditions!

The two other wheel arrangements shown in Fig. 1 offer some advantages, the "two in front" set-up in 1B being the better from a ground stability standpoint. Its disadvantages lie in the extra unwanted side area forward, presented by two wheels, and the fact that it looks extremely ugly. It does, however, greatly assist reliable take-off and landing, especially if a castoring rear wheel is employed.

This rear wheel, incidentally, must not be treated as a tailwheel since it is just behind the C.G. and carries a lot of weight. Ideally it should be at least as large as the front wheels and very strongly mounted. For Multi R/C it will provide effective braking, with the need for only one brake and no danger of nosing over. It is far less vulnerable than a nosewheel and it should be possible to design a very reliable, steerable wheel, without the stressing problems involved in steerable nosewheel design. This type of undercarriage has been used on the very functional *Macanard* 8, illustrated last month and on the facing page.

In an attempt to prevent the "nosing-in" tendency of 1A, without the ungainly appearance of 1B, I carried out tests with a tandem wheel arrangement as shown in 1C and used this on *Number Nine*—plans of which were featured last month. The success of this undercarriage depends upon achieving exactly the right degree of flexibility in the stabilising outriggers. If they are too rigid, the undercarriage will behave as 1A and if they are too weak, they will be inadequate to "steady" the model on the ground. Some form of adjustable springing of the outriggers is really called for and is not difficult to arrange, since the stresses involved are very small.

Instability on the ground is caused mainly by the influence of wind and torque trying to take the model in a direction other than that in which the wheels are pointing. If, therefore, one arranges to have the wheels castoring, so that they can point in any direction, the problem should be solved! To test the feasibility of this theory I built a take-off "dolly" and arranged four wheels on fully castoring mountings. One of the canard deltas is shown on this dolly in the photo on the facing page.

When this photo was taken the model was fitted with the tandem undercarriage. The two main wheels were cradled in slots in the dolly and the outriggers were fitted with steadying extensions, which rested on the dolly crossbar. On take-off the model would crab sideways until the rudders became effective, when it would straighten up and fly out of the dolly quite smoothly. The castoring system has considerable possibilities and built into a suitable design, such an undercarriage, could well solve all the problems.

The question of where to put the engine is an intriguing one which will affect the whole aircraft design, and some possible layouts are suggested in Fig. 2.

Although I have seen a successful canard featuring a nose mounted engine (2A), the layout is not recommended as on most such designs, the slipstream from the propeller usually produces so much additional lift beneath the leading plane, that the machine becomes highly unstable. Torque is excessive owing to the distance of the engine ahead of the C.G. and this also introduces balance problems.

A mid-mounted engine (2B), with the motor over the C.G., is probably the best of all, resulting in minimum torque and simplifying balancing problems. A pusher installation with C.G. mounted engine is shown in 2C and is a promising layout for a contest model. A slight disadvantage is that a centre-mounted fin will be adversely affected by the propeller slipstream and potentially vulnerable tip fins, or a central underfin, will be necessary.

A pusher engine at the extreme rear enables the centre fin to be used, but introduces balancing problems. Noseweight being almost certainly required

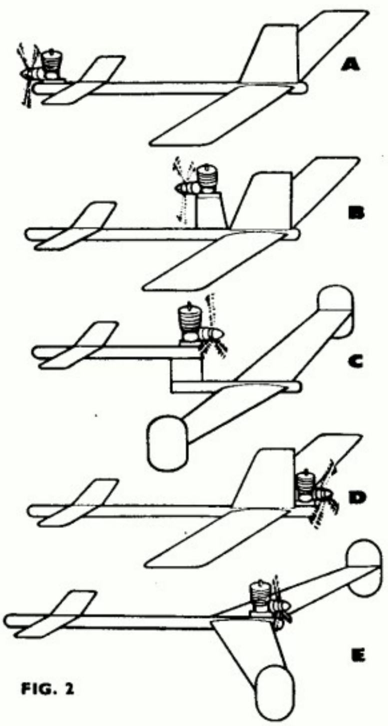


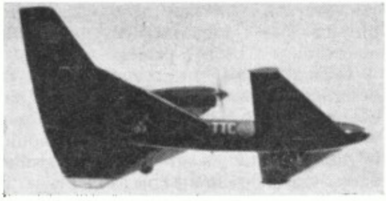
FIG. 2

(2D). (For a rubber powered model, however, this is the ideal arrangement since the motor weight is not concentrated at the rear.)

The engine can be moved nearer to the C.G. by sweeping back the wings (2E). This also enables a shorter, and therefore potentially stronger, fuselage to be used and reduces torque effects, since the engine/C.G. distance is shortened. Tip fins are again necessary for adequate directional stability.

There are, of course, many other possible lay-outs—twin boom jobs—tandem mounted motors, etc., providing endless food for the experimenter.

This month's article was to have dealt with scale canards, but unfortunately some data which was counted upon did not materialise in time for its inclusion on one of the drawings. This will, therefore, now form the subject of the last part of this series next month.



Above: a flying photograph of one of the canard deltas, fitted with standard tricycle landing gear.

Right: fitted with tandem landing gear as in the heading photograph, but now equipped with a new "front end," featuring a high-set leading plane.

radio topics

HAVING handled three of the new miniature relayless receivers—the American C & S and Otarion and a pre-production version of the Remote Controls "Mini-Pathfinder" (or "Petite," the name seems undecided yet), we found we were getting quite complacent about these "fit and forget" units. After a tuning check at range, the receiver gets bundled up in foam rubber in a suitable compartment in the fuselage and all you have to worry about is keeping the battery voltage up to scratch. If you do have trouble, it is more likely to be the escapement than anything else.

To check how far radio has progressed, we dug out an "old reliable" receiver of at least a decade ago. Ninety volt high tension battery, plus LT battery and an escapement battery (we used a 4½ volt flat battery in those days to be sure!). The receiver as big and more bulky than a present multi-channel unit, the Siemens high-speed relay alone weighing more than *complete* modern gear. Total weight of the installation (less actuator) for rudder only, well over 16 oz. But it *was* reliable gear and really *looked* like a radio set with everything, including the valve, standing up on a massive chassis plate.

We are in for more of the relayless miniatures and they should do a lot to popularise inexpensive single-channel flying. The receivers themselves are on the expensive side, but model size and engine cost can be reduced to a minimum, as is building time—you can literally knock up a model, complete, in a single evening to fly next day. Remember, though, small models are "for fun and fine weather"—they become little more than "radio assisted" F/F models in a wind.

* * *

Tuning to the brightness of a suitable bulb in the escapement circuit, instead of the "mean" position where the escapement pulls in and drops out, seems such a practical set-up with a single-channel relayless receiver, that we looked around for a suitable source of sub-miniature bulbs with the necessary low consumption. Unfortunately, there just do not seem to be any available in this country at reasonable prices. "Vitality" do one, but it costs 30s. However, if you can accept a larger physical size there are plenty available at ordinary "bulb" prices.

Typically, for the relayless receiver designed to match a 8-10 ohm nominal escapement coil operating on 3 to 4.5 volts, a 6 volt 60 milliamp bulb should be about right. Connected in parallel across the escapement coil as in Fig. 1, it is only reducing the effective 300-400 mA through the coil by about 10 per cent.; and you can mount the bulb at any convenient point on the model instead of having it on the receiver chassis. Tuning is then simply adjusted for maximum brightness of the bulb and a 6 volt bulb will have quite enough brightness on 3-4.5 volts.

* * *

It just needs three chaps in your club, each with £100 or so to spend on superhet radio gear and all the thrills of formation flying are yours to behold! That lifts R/C flying just one step further out of the "model" stage and nearer to full size club flying. Next thing we need is a private flying field complete with clubhouse and bar! Our heading photo shows Mike Barnett's (*Kyowa* o/d), Ed. Johnson's (*Big Daddy*) and John Mardon's (*G-String*), demonstrating at the Bristol R/C Club show at Keevil on March 11th—and most impressively, too. All were using Orbit superhet receivers.

Big Daddy—6 ft. span, McCoy 60 powered and all-up weight 8½ lb.—was designed by John Singleton and features all-sheet covered wing and full span narrow chord ailerons—a "trend" amongst the advanced "multi" flyers these days which originated, as far as

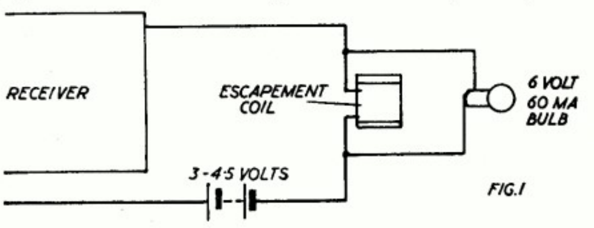


FIG. 1

Heading shows formation flying by the Bristol R/C club.

Right: REP sub-miniature relay, weight only 1/3 oz. Palladium-silver contacts and solid silver contact plates.

we are aware, with Harold de Bolt. The high-mounted tailplane is also interesting—presumably to carry it clear of the "wake" from the inboard sections of the ailerons. Looking at the model in plan view, another interesting point is that the proportions and layout are not very much different from those of a large stunt C/L model.

* * *

Practically all the new equipment, accessories, etc., produced by British manufacturers have that touch of class about them these days. It has taken a long time—and the customer has been at fault in expecting low prices—to appreciate that reliable R/C gear cannot be produced cheaply. To make a good actuator or relay, for example, *demands* a lot of accurate tooling. Since demand does not run into tens of thousands, each unit has to carry a sensible proportion of the tooling cost. Lots of would-be manufacturers have come unstuck trying to produce too cheaply.

The new Radio and Electronic Products one-third oz. miniature relay is a case in point of *good* tooling. A very nice little relay it is, too, with a sensible armature design, good spring tension, palladium-silver contact points (about the best "non-sticking" type for "model" voltages and currents) and solid hard silver contact plates. Contacts are fixed, but you could adjust "pull in" and "pull out" by bending the contact arm, and the top plate.

The relays are used on all the new R.E.P. "multi" sets (relay type receivers), with a considerable saving in weight and bulk and better reliability, than the original type used. Size is such that 10 relays can actually be accommodated on a panel 2⅜ in. × 2 in. The R.E.P. miniature relay is available in three coil resistances—3,000 ohms for high voltage receivers; 250 ohms for 9 volt receivers; and 75 ohms for 3 to 4.5 volt receivers. All are the same price—28s.

* * *

Graupner R/C production is to be concentrated on the Grundig "Variophon," the "Bellaphon" range being discontinued. The "Variophon" (illustrated last month in "Roving Report") has been engineered entirely from

Big Daddy R/C design by John Singleton, full span narrow chord ailerons.

scratch by Grundig in the form of a fully transistorised tone transmitter, available either as a four-channel or eight-channel version, with matching superhet receiver and separate plug-in filter circuits. Receiver and filter circuits are "matchbox" size. Each filter circuit "pack" embraces two filter circuits controlling Gruner relays. Thus one filter "pack" plugged into the receiver gives a two-channel outfit; two filter "packs" a four-channel outfit; and so on up to eight channels. Output at each stage is via a socket with plug connection for the actuators. Battery connections are also via plugs and sockets, with no wiring at all to do; also, the radio side comes tuned with, as far as we can gather, absolutely no necessity for subsequent tuning. It just works—if not, it is covered by a year's guarantee!

The Grundig name carries a lot of weight in the electronic world, so this should be first class equipment. It will be a little bit on the pricey side—roughly comparable with imported top-quality American multi equipment—but it is undoubtedly a quality production. Ripmax Models and Accessories are sole agents for this country and expect first supplies in early July.

Apart from the fact that this is a quality-engineered design aiming at complete simplicity of installation, it is also the first tone filter receiver, which has got more than two or three channels, down to a size and weight comparable with the present standard reed receiver. Tone filter, instead of reeds for eight-channel multi, is quite an innovation, so strongly has the reed receiver become established and it remains to be seen if Grundig have achieved comparable separation of individual tone response.

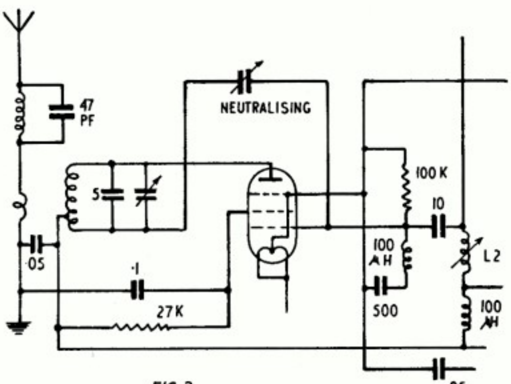


FIG. 2

* * *

The C.G. "Hercules" transmitter circuit published in our March issue (page 76) unfortunately included a small, but rather important error. The HT supply is marked as connecting to the valve filament! The error is that the two battery positions, as marked, should be transposed. The original circuit has also been modified somewhat, with a new front end as shown in Fig. 2.

* * *

A reader query on the MODEL AIRCRAFT power-converter design (July, 1960, issue) speaks of trouble in obtaining the specified output. There could be several reasons, so we will mention these in case other constructors have had similar trouble.

(i) If the transistors used give low current gain (a gain of 30 or less), then almost certainly the value of R1 specified will be too high. In such cases, decrease the value of R1 to 82 ohms.

(ii) Be sure that in measuring current output under load the *meter* used is not drawing an excessive proportion of the current and so giving a false indication of *actual* current output. The meter, for example, could well be taking 10 milliamps and show only 15 milliamps apparently flowing through the load where *actual* current is 10 plus 15 = 25 milliamps.

(iii) Check that the input battery is staying up at 6 volts. If that drops under load, output may be way down as a consequence.

(iv) Check the transformer. If you have a means of checking the frequency of the "hum," this should be about 300 cps. If the transformer is defective the pitch of the "hum" will change with load (increasing the load will cause the pitch to rise and vice versa). Switch off immediately if this fault is detected. It could lead to damaged transistors.

Right: puzzle picture—a mosaic? abstract picture? No—just printed circuit panels under production at the new REP factory at Weybridge.

SWEEP

by

LEN RANSON

A simple rubber powered tailless model

Wings Club members see page 197 for Special Plans Offer

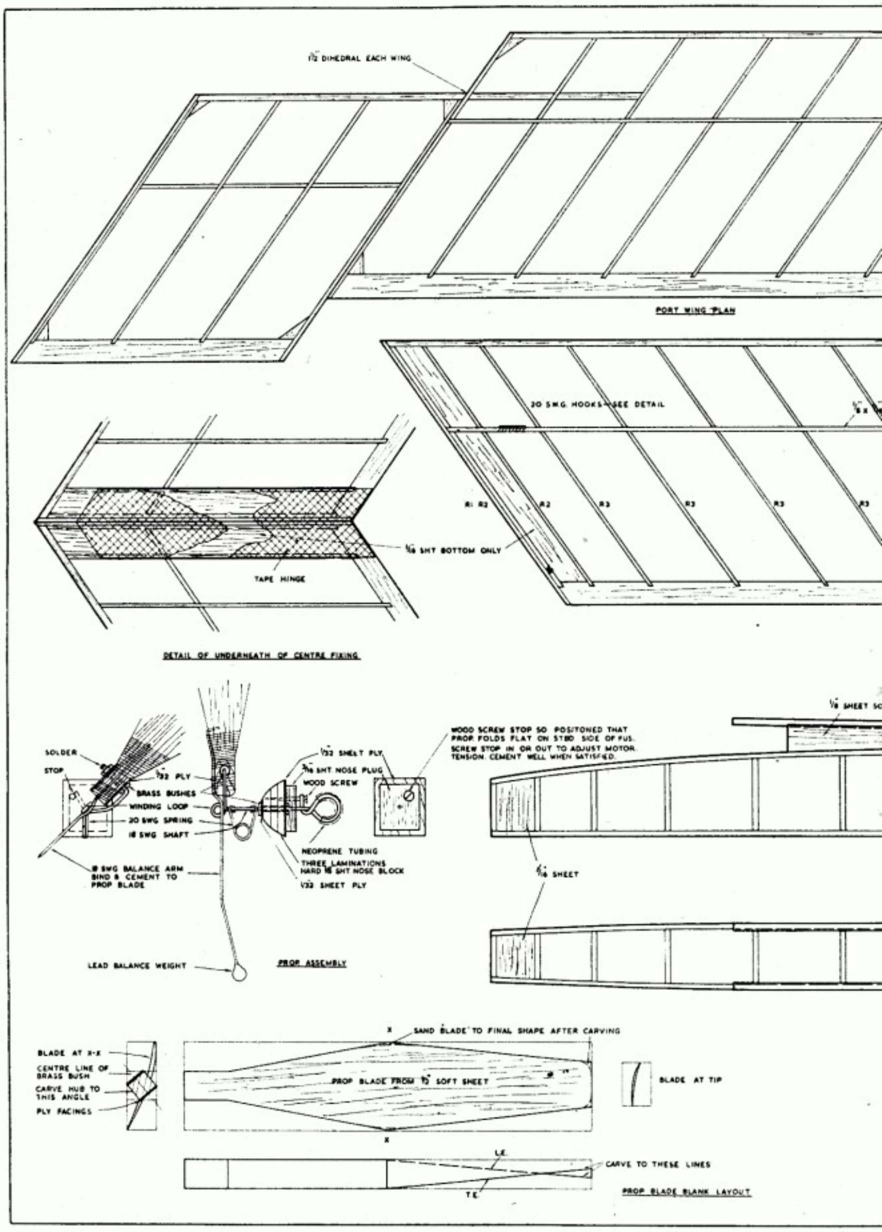
THIS is one in a series of tailless rubber designs which has been developed mainly for sport flying, but also for the occasional contest. In this design, as in the others, the aim has been to produce a model that is structurally simple, easy to trim and handy to transport; all features more usually associated with the conventional, rather than the unorthodox, design.

Obviously the swept planform makes a one piece wing impracticable; it would require something outsize in model boxes to take it. The usual answer is to make the wing in two halves and secure them either by dowel and tube or tongue and box; types of fixing which are complex and vulnerable. In *Sweep* the problem is overcome simply by hinging the wing at the centre section, so that the two halves fold together. This makes for a shock-proof fixing and ease of transporting.

Construction

The building of the fuselage follows standard practice and should present no difficulty to anyone who has built one or two models. See, however, that the wing mount supports are slightly hollowed out to take the dowel runners, and also that the rear peg anchor plates are cut from hard balsa.

Build the wing in two halves, using a template made from thin ply or metal for producing the ribs. The rib notches should be chamfered slightly to suit the angle of sweep. Note that each rib is notched into the trailing edge and also that each end rib is doubled up. A $\frac{1}{16}$ in. sheet platform is fitted at each root rib to take the linen hinge. The latter is a strip of adhesive tape cemented to the wing halves, to enable them to be folded back on each other. The stabilisers are built separately, then carefully



cemented on to give the correct negative angle.

Use only thinned out dope for flying surfaces. Pin down to avoid warps.

The fin needs no explanation beyond pointing out that the bottom spar is notched to key into the fuselage spacers.

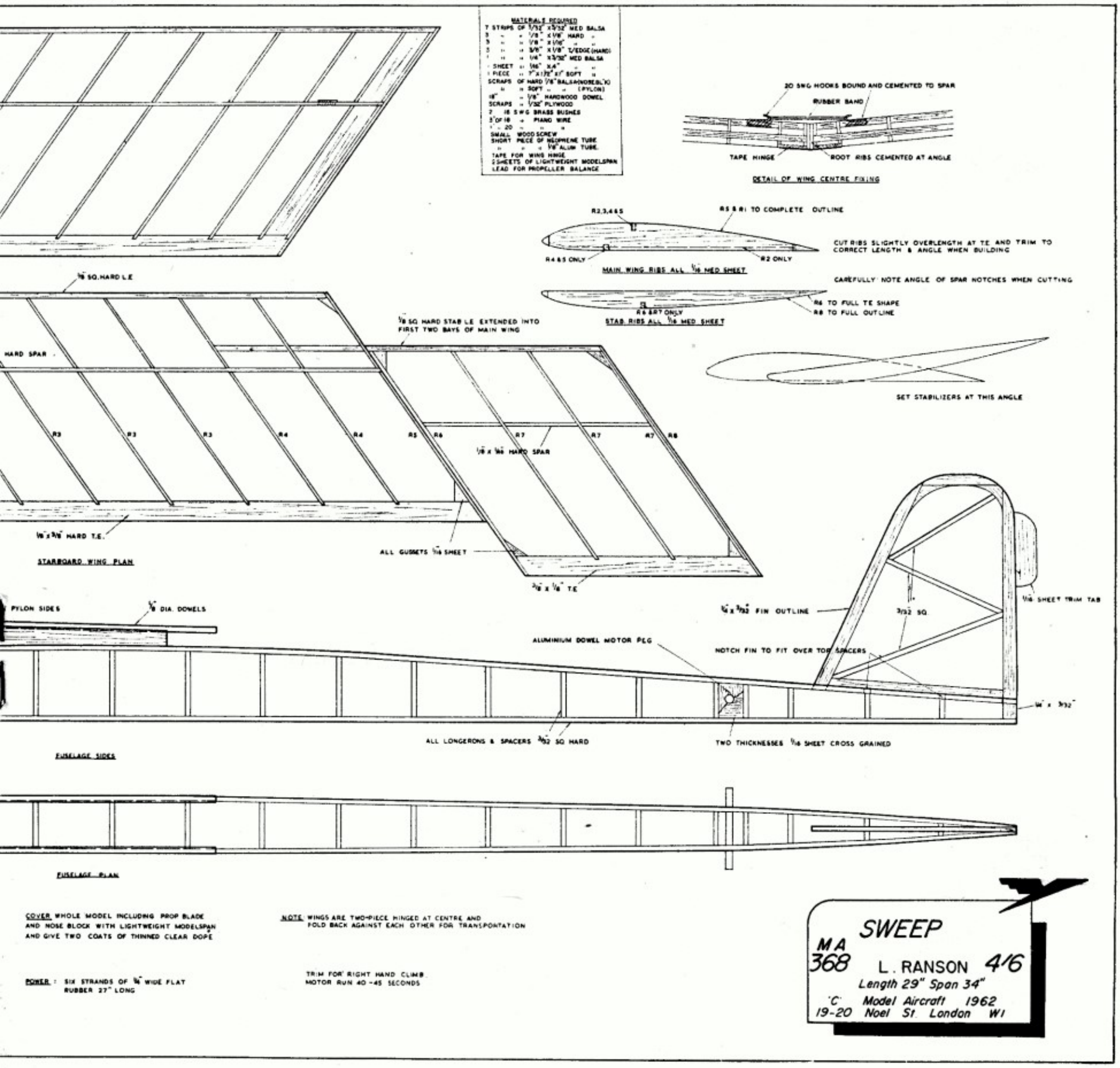
Use hard balsa for the noseblock lamination and medium to soft balsa for the prop blade. The blank for the latter is cut from ½ in. sheet, and, after marking to the carving lines shown, the upper face is carved to give the requisite amount of camber. The undersurface is then carved away and the hub cut diagonally to the required pitch angle. Finally cement on the ply hub facing and drill to take the 18 s.w.g. bush. Dope and sandpaper before covering with tissue. Incidentally, the propeller is of the compensating folder type, folding on the right hand side of the fuselage.

Flying

A small variation of fore and aft trim can be effected by moving the wing along the mount. If anything, tailless models of this type come out slightly nose heavy and the remedy, if wing shift is insufficient, is either to add ballast to the tail, or to fit small elevons to the stabilisers. Remember, however, that tailless models glide fast and hand launch tests are usually deceptively nose down.

As far as stalling is concerned, the tailless model is all or nothing and a slight variation in trim can be critical. However, the stalling tendency is considerably reduced if the model is flown in fairly tight circles, both on power and glide. In fact, with this type of tractor type tailless, a spiral climb is essential. See, therefore, that the model has sufficient side thrust and trim tab offset.

Provided that you are trimming out over a fairly soft decking, the model should be "bounceable" enough to take quite a heavy prang without damage. Even initial flights can be made with a fair number of turns on the six strand motor.



MODEL aircraft ENGINE TESTS

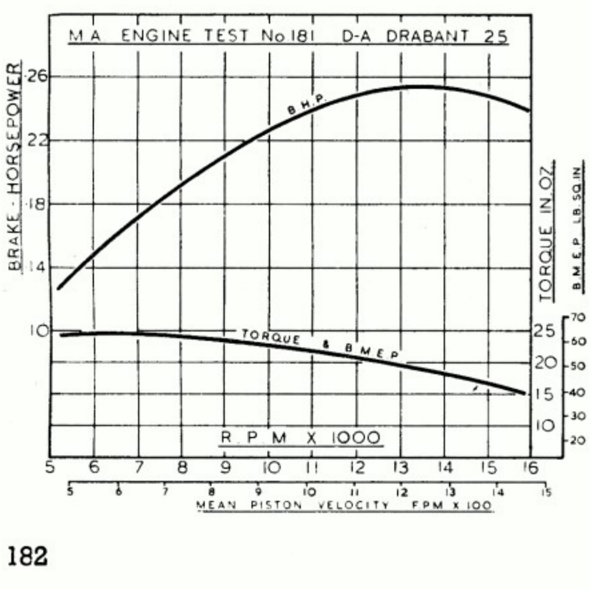
The D-A DRABANT

2·47 c.c. Diesel Motor

THE Norwegian David-Andersen Drabant was first introduced in December, 1958, as a successor to the original long-stroke plain bearing D-A motor. Later the Drabant was extensively modified internally, including a new cylinder, larger crankshaft and new ball-bearings. It is with this latest model that our present report deals. This engine is sold in the U.K. by Messrs. Performance Kits of Sandy, Bedfordshire.

David-Andersen engines have always been of high quality construction and the latest Drabant is no exception. Not only is the engine well made and finely finished, it has a number of small but valuable refinements which lift it above ordinary run-of-the-mill production engines. Typical of these are the compression screw and needle-valve assemblies. Thus, instead of the compression screw operating direct in threads cut in the alloy head, a steel insert is used. Additionally, to maintain precisely the right amount of stiffness in the adjustment, the insert extends above the head, where it is split and externally threaded to take a gland nut. The grip of the insert thread on the compression screw can thus be adjusted to suit the requirements of the operator and the screw cannot wear loose and/or slacken off—or become detached in flight.

Similar attention to detail is evident in the needle valve assembly. The spraybar is machined from brass, is closely fitted in large bosses cast in the carburettor intake and is relieved at the centre to avoid undue venturi restriction. A special brass nut, with a reduced bore sleeve extension, locks the spraybar in position and the sleeve section, which is bifurcated, carries the needle in a fine thread with an external gland nut to hold the needle firmly at any setting.



Essentially, the D-A Drabant is a twin ball-bearing, shaft induction, reverse-flow scavenged diesel. It is built around a robust and well finished diecasting comprising crankcase and bearing housing. The bearings are British Hoffmann and support a $\frac{3}{8}$ in. dia. hardened crankshaft. The shaft is unusual in that it has a $1\frac{1}{2}$ turn spiral oil groove, just ahead of the valve port, to throw lubricant forward to the front race. The shaft is a tap fit in the races, but is restrained against being knocked back (as in a crash) by a substantial circlip which engages a groove in the shaft immediately forward of the front bearing. The prop driver is taper fitted to the shaft and is partly surrounded by the extended front bearing housing. Because of this and the circlip, the driver is best removed (should this become necessary) by heating to the point where it will drop off after a light tap on the shaft end with a copper or lead faced mallet.

The cylinder of the latest Drabant is of leaded steel with a hard chromed bore. It has a deep flange by which it is vertically located in the main casting and the twin opposed exhaust ports are cut through this. The transfer system consists of four ports arranged in two pairs, fore and aft, between the exhaust ports. The ports are elliptical, produced by drilling at 45 deg. to the cylinder axis and each is fed by a channel cut in the outer wall of the liner which registers with a similar channel in the casting.

Porting, in general, is fairly conservative. According to our measurement, the exhaust ports remain open for 136 deg. of shaft rotation, while the transfer period is 120 deg. On the induction side, the shaft has a small oval port, bored to correspond with the angle of the carburettor intake and giving the quite modest timing of 75 deg. ABDC to 40 deg. ATDC. The gas passage through the shaft is quite small—only 5 mm. bore or 0.197 in.

The piston is of Meehanite and relatively heavy, due to a very thick skirt section. It couples to a machined conrod via a fully-floating 4 mm. gudgeon-pin. The piston has a shallow coned crown to which the contra piston is matched. The upper part of the cylinder is encased in a machined alloy cooling barrel and head unit and the complete cylinder assembly is tied to the main casting with two 3 mm. screws.

Specification

Type: Single cylinder, air-cooled, reverse-flow scavenged two-stroke cycle, compression ignition. Crankshaft type rotary-valve induction.

Bore: 15 mm. (0.5905 in.). Stroke: 14 mm. (0.5512 in.).

Swept Volume: 2.474 c.c. = 0.151 cu. in.

Weight: 5.9 oz.

General Structural Data

Pressure diecast aluminium alloy crankcase and main bearing housing with screw-in machined alloy rear cover. Hardened, non-counterbalanced, disc-web crankshaft, with 0.375 in. dia. journal and 0.236 in. dia. crankpin and running in two Hoffmann $\frac{3}{8}$ in. i.d. eight-ball journal bearings. Leadloy steel cylinder with hard chromed bore. Meehanite piston with fully-floating

4 mm. solid gudgeon-pin and machined alloy connecting-rod. Machined aluminium alloy finned cylinder jacket with steel thread insert and gland nut for compression screw. Machined alloy prop driver fitted on shaft taper. Prop retained by $\frac{5}{16}$ in. o.d. sleeve nut on 6 mm. threaded crankshaft extension. Reversible brass spraybar assembly. Beam mounting lugs.

Test Engine Data

Running time prior to test: see text.
Fuel used: Mercury RD diesel fuel.
Air temperature: 50 deg. F. (10 deg. C.).
Barometer: 29.6 in. Hg.

Performance

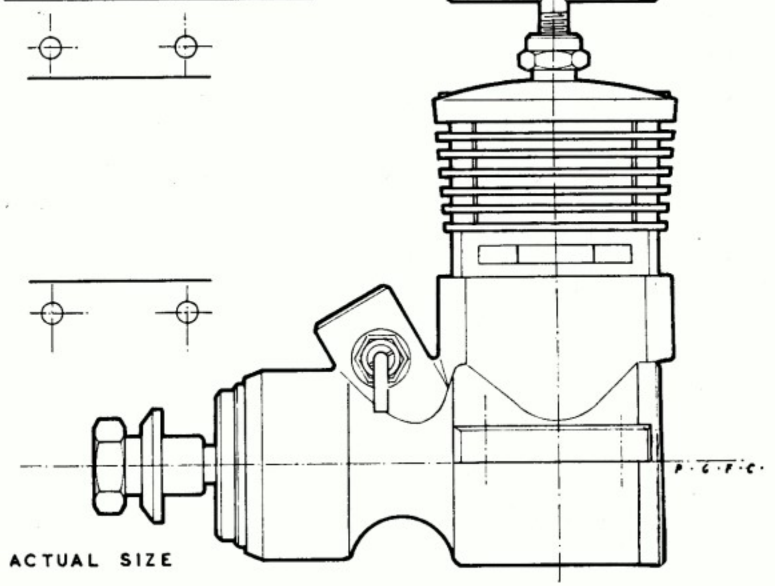
Our test Drabant was received direct from the manufacturers and examination indicated that it had had some previous running; probably not less than one hour. The engine, in fact, appeared to be adequately run in as received but, to check this, it was given a series of runs on 9 × 4 and 8 × 4 props totalling a further one hour's duration and careful readings were taken at the beginning and end of this period. No difference in performance was, in fact, indicated and the engine was therefore judged ready for test.

Despite its modern appearance, the Drabant retains many of the good points of the old long stroke D-A. 2.5 engine tested nearly 10 years ago in this series—notably its easy starting and very good low-speed torque.

Starting was very straightforward. Hot or cold, the Drabant started readily after choking the intake and we found it quite unnecessary to resort to port priming at any time. Only when props of under 8 × $3\frac{1}{2}$ were used, was there any marked deterioration in starting qualities. There was then a tendency for the prop to "bite," but since operating r.p.m. under such loads appreciably exceeds the b.h.p. peaking speed, there is little point in using such a prop in practice.

The low to medium speed pulling power of the Drabant was demonstrated by the way in which it handled 10, 11, 12 and even 13 in. dia. props. For example, the engine ran steadily and smoothly on a Top-Flite 13 × $5\frac{1}{2}$ prop at 5,100 r.p.m. It turned a 12 × 5 Power-Prop at 6,300 and an 11 × 5 Power at 7,400. In the medium speed range, 8,200 r.p.m. were recorded on a 10 × 6 H.S. Rislan prop, 9,550 on a

D-A DRABANT 25



10 × $3\frac{1}{2}$ Top-Flite wood, 10,000 on a 9 × 7 D-A nylon, 10,600 on a 9 × 4 Top-Flite nylon and 11,500 on an 8 × 6 H.S. Rislan.

Higher up the speed range, prop performance was not quite so good as one might expect of a "racing diesel" type motor and the Drabant turned up 13,600 on an 8 × 4 Strato prop, 14,100 on an 8 × $3\frac{1}{2}$ Top-Flite and 15,900 on a 7 × 4 Power-Prop.

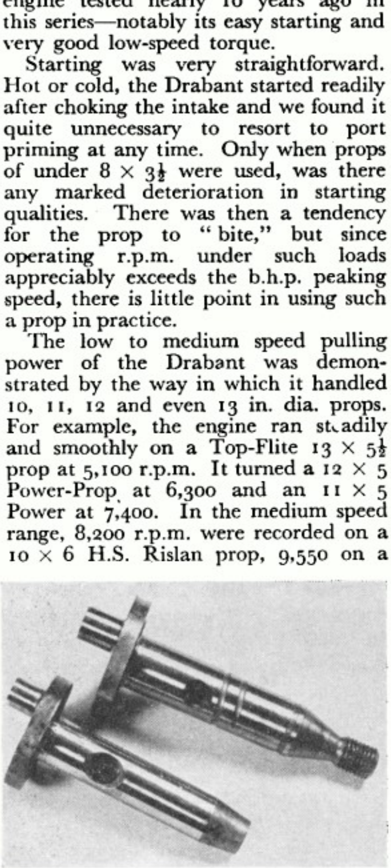
Confirming the impression gained from prop/r.p.m. tests, torque tests of the Drabant revealed that maximum torque was developed at the relatively modest speed of 6,000 r.p.m. (where a very good figure of 24.5 oz. in. equivalent to a b.m.e.p. of 63 lb./sq. in. was recorded) with a steady drop over the next 10,000 r.p.m., resulting in the peak h.p. occuring at approximately 13,500 r.p.m., actual output being slightly over 0.25 b.h.p. Since an output in the 0.28-0.30 b.h.p. bracket would not be unreasonable for an engine of this class, it seems probable that the Drabant could be tuned to give a somewhat higher top end power and the induction system immediately suggests itself as a starting point. As we have mentioned, crankshaft porting is quite modest and it is conceivable that an enlarged crankshaft port and gas passage, to give less restricted gas flow to the crankcase, might prove profitable. However, we hasten to add that the average user will find the Drabant's performance fully adequate for most installations and the few hundred extra r.p.m. necessary to bring the engine up to top class competition diesel standards can really only be of interest to FAI free-flight experts.

Handling and running qualities of the Drabant could be faulted in only one respect: namely, a vibration period in the 9,000-9,500 r.p.m. bracket. At speeds above and below this range, the engine ran steadily and much more smoothly. The controls were admirable in all respects. The needle-valve was non-critical, yet responsive, and therefore easy to adjust to the optimum setting. It was easy to turn and comfortable to use, yet held its settings firmly. The same can be said of the compression adjustment which was aided by a beautifully smooth working contra-piston that remained totally unaffected by temperature—a pleasant contrast to contra-pistons, still all too common, which become firmly seized in the bore when the engine warms up.

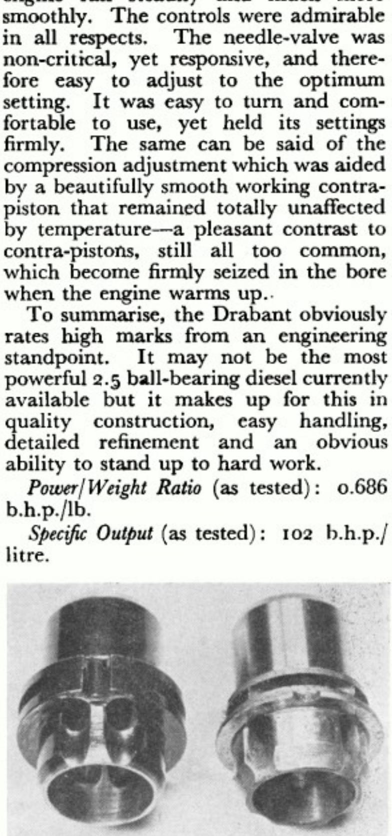
To summarise, the Drabant obviously rates high marks from an engineering standpoint. It may not be the most powerful 2.5 ball-bearing diesel currently available but it makes up for this in quality construction, easy handling, detailed refinement and an obvious ability to stand up to hard work.

Power/Weight Ratio (as tested): 0.686 b.h.p./lb.

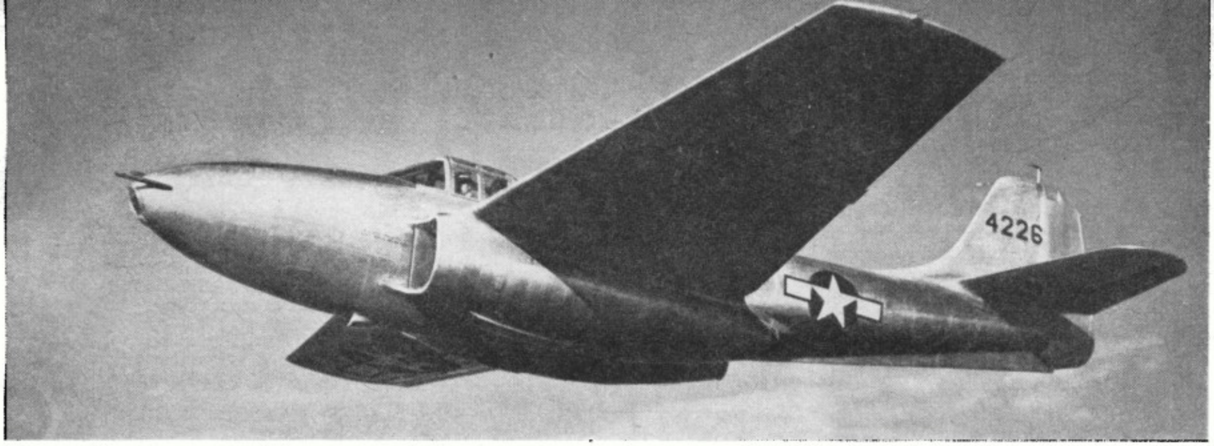
Specific Output (as tested): 102 b.h.p./litre.



Left: new enlarged crankshaft with spiral oilway (top) compared with original Drabant shaft.



Right: new type Drabant cylinder (left) compared with original type.



John W. R. Taylor's Plane of the month

The BELL P-59A AIRACOMET

ON September 5th, 1941, the Bell Aircraft Corporation was awarded a contract for three prototype fighters with the designation XP-59A. This was a deliberate attempt to confuse America's potential enemies, for the new project bore no resemblance to the original, defunct XP-59, which had been designed as a twin-boom pusher fighter with a Pratt & Whitney R-2800 engine.

A few miles from the Bell works, General Electric were already working on the power plants for the new fighters. These had an even more confusing designation, being known as "exhaust turbo-blowers Type I." In fact they were turbojets, based on the Whittle W.2B but fitted with U.S. accessories, and the XP-59A was to be America's first jet aircraft.

Four months had already passed since the first flight of the Gloster-Whittle E.28/39, Britain's pioneer jet-plane. We did not know then that Germany had flown the jet-powered Heinkel He.178 more than two years earlier, in August, 1939, but it was clear that America was a late starter. The U.S. aircraft industry set to work with tremendous zest to remedy this.

General Electric had the first Type I-A engine running by April 22nd, 1942, a month ahead of schedule. Soon afterwards, two were delivered to Bell to power the first XP-59A, and this aircraft flew on October 2nd, 1942, only 13 months after it was ordered. As each engine delivered only 1,400 lb.s.t., it is hardly surprising in retrospect that the maximum speed of the XP-59A proved to be 404 m.p.h., which was no faster than the contemporary *Spitfire* IX; but it was a start.

Installation of the engines in ducts under the wing roots was a major cause of the disappointing performance, as this layout produced high drag. Even worse was a tendency for the aircraft to "snake" in flight, which made it a poor gun platform. Nevertheless, the U.S.A.A.F. decided to press on with manufacture of the 13 pre-production YP-59As which had been ordered in March, 1942, and it is some tribute to the Bell designers that no *Airacomet* was ever lost during test flying.

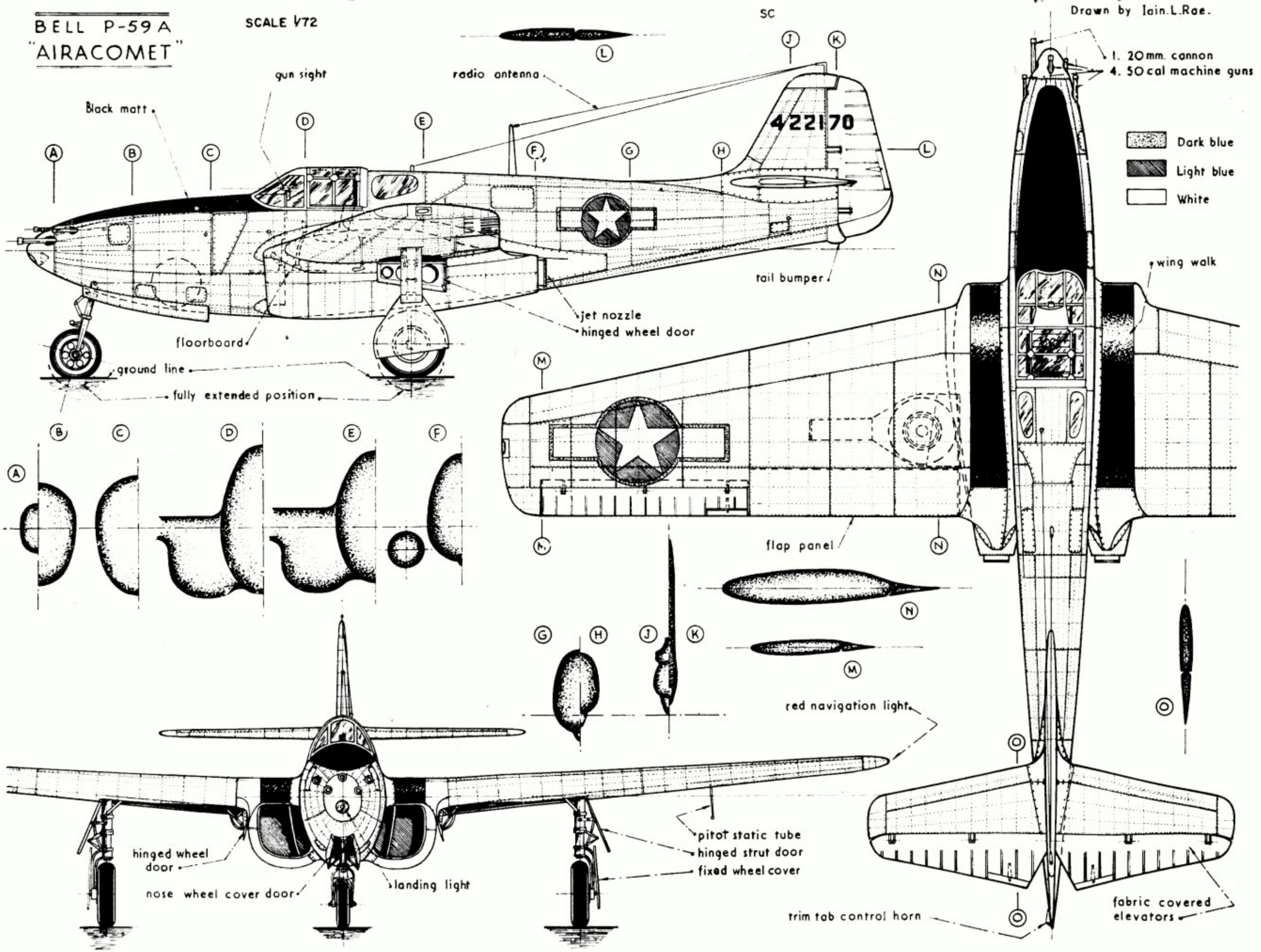
The first YP-59A, with 1,650 lb.s.t. General Electric I-16 (later J31) engines, flew in August, 1943. Its maximum speed of 409 m.p.h. at 35,000 ft. was little better than that of the prototypes, but it had a ceiling of 43,200 ft. and could cruise at 314 m.p.h. Its armament was also quite heavy, comprising two 37 mm. guns in the fuselage nose, each with 44 rounds. This was changed to one 37 mm. gun and three 0.50 in. machine-guns in the last few YP-59As, which were intended to be followed by 100 similar production-type P-59As.

All 13 YP-59As were delivered by June, 1944, including two to the U.S. Navy, under the designation XF2L-1, and one to Britain in exchange for a *Meteor*. By then it was obvious that the *Airacomet* would never be suitable for operational use, and the order for P-59As had been cut to 50. In the event only 20 were completed, with 1,650 lb.s.t. J31-GE-3s. The remaining 30 production aircraft were fitted with 2,000 lb.s.t. J31-GE-5s and extra fuel, and became P-59Bs. Deliveries were completed by May, 1945.

No *Airacomet* ever fired its guns in anger; but many of the pre-production and production machines put in good service as trainers. Others were used in a joint Bell/U.S.A.A.F. Air Technical Service Command remotely-controlled aircraft programme, which involved controlling a drone P-59 by radio from a P-59 mother-plane. Few details of this programme have ever been published, but some photos show the mother-plane with underwing pods. Another reveals, surprisingly, that aircraft No. 2108783 (named *Mystic Mistress*) had a second seat in the nose, for the drone operator, under a shallow blister canopy.

More important still is that, as a result of experience with the *Airacomet*, Bell started work on a follow-up jet-plane powered by a single fuselage-mounted engine. Because they were so busy, the project was taken away from them and given to Lockheed, becoming eventually the famous P-80 *Shooting Star*, examples of which still fly with some South American air forces.

Data (P-59B): Span 45 ft. 6 in.; length 38 ft. 10 in.; height 12 ft. 4 in.; wing area 386 sq. ft.; weights, empty 8,165 lb. loaded 13,700 lb.; max. speed 413 m.p.h. at 30,000 ft.; max. cruising speed 375 m.p.h.; service ceiling 46,000 ft.; max. range 950 miles.


BELL P-59A
"AIRACOMET"
SCALE 1/72
SC
Drawn by Iain.L.Rae.
1. 20mm. cannon
4. 50 cal machine guns
Dark blue
Light blue
White
gun sight
radio antenna
Black matt
4221 70
tail bumper
jet nozzle
hinged wheel door
floorboard
ground line
fully extended position
wing walk
flap panel
red navigation light
pitot static tube
hinged strut door
fixed wheel cover
hinged wheel door
nose wheel cover door
landing light
trim tab control horn
fabric covered elevators
A
B
C
D
E
F
G
H
J
K
L
M
N
O

Topical Twists

by PYLONIUS

Phantom Fields

Some joker has written in to complain that, while the model books are full of instructions on how to build (and where to buy) model planes, no direction is ever given on where to fly them. Now, on the face of things, with the model trade booming as never before and half the population smitten with the model bug, such a complaint does seem rather cheeky. It should be obvious to anyone that flying fields are as thick on the ground as parking meters. And, in any case, the modeller of today is cosseted enough, with little more than final assembly to worry about, and it seems a bit much to expect a flying field laid on with the kit instructions.

Of course, if our correspondent is an old hand at the modelling game, then we can take his letter to be just a leg pull. If, however, he is a starry eyed novice, then he has yet to learn about the Grand Illusion; the Conspiracy of Consent under which we loyal types carry on designing, building and discussing models, just as if there was actually somewhere to fly them. Out of patriotic regard for the hobby that was, no mention is made of the flying fields that were.

Such acreage that is now available to our peculiar pursuits is confined to the margins of the marginal land, and anyone who can find an unguarded rod or two within 15 miles of his doorstep is either a Highland Crofter or a wealthy landowner. Anyone who has the courage and tenacity of purpose to sally forth with a model knows only too well the sort of opposition he is likely to meet. Nothing arouses dormant officials to wrathful and immediate action quicker than the sight and sound of a model plane, and before you can locate an uncensored plot you might well be nudging the coastline.

Like other forms of wild life, model flying has ended up in the sanctuary. Such a site is apt to be rugged, but usable if you have the dedication to suffer in a good cause. Possibly a Directory of Sanctuaries could be compiled as a help to our correspondent. A useful start could be made with the flying fields in and around the London area. It would read something like this:

North London: Chobham Common.
South London: Chobham Common.
West London: Chobham Common.
East London: Chobham Common.

Armchair Flying

When you see a model, powered only by rubber bands, nip up into the clouds as if jet propelled, it might occur to the detached mind that the elastic they produce nowadays is pretty phenomenal stuff; all that the rubber boys could hope for, or so you'd think. But you know what human nature is—never satisfied. If, somewhere among the bric-a-bac of modern life, there lies a bit of twisty stuff that can do the job better than the commercial product, then you can be sure that some restless, questing type will ferret it out.

Many of us will remember that wonder discovery of a few years ago: surgical tubing. This was expected to transfuse new life into rubber flying. Just what the doctor ordered, in fact. However, it proved difficult to obtain, possibly as it was reserved for other more urgent applications than prop rotating. Also it was tricky to use. So, whether it was a case of losing patience or losing patients, this clinical comp. winner has not been heard of since.

Yet we must not run away with the idea that the wonder rubber seekers have been sitting down on the job. Quite the reverse, in fact, for up north they have even been stripping away the bottoms of the very chairs in search of a bit more zip. This can be said to be a fundamental discovery, particularly to the unfortunate who tries to use the cannibalised seat.

Still, at least the causes of rubber fatigue will no longer be a mystery. If the rubber shows signs of strain you can always blame it onto an overweight grandad.

Flat Season

It is an unspoken truism that all the best rally flying—F/F style—is done outside the airfield. In fact, any comp. effort that lands inside the airfield boundary is regarded as a boob, and the keener contest flyer judges the success of his day on how little he sees of the airfield during his bucolic perambulations.

Thus, if we rationalise the situation, we see the airfield merely as a v.t.o. launching pad cum administrative centre with most of its broad acres going to waste. Now, all this gubbins could be comfortably accommodated on the roof of a block of flats. And just think of the wonderful benefits of such an arrangement. You wouldn't have to run a coach to the rally; you would only need to press the lift button. Then, too, model retrieving could be done by road—a far more comfortable proposition than charging through ditch and hedgerow. And, if the model did finish up on a clothes line, at least it would be more get-atable than at the top of a tree.

Perhaps when organising your next rally you might give this idea a thought—make such a change from the dreary old Chobham Common routine.

Titled Titles

Collectors of curious club titles will welcome the newest odd name out to their lists as the most enigmatic to date: the Rolls-Royce Welfare M.A.C. The title is full of the most glorious connotations, one of which hints that the Affluent Society and the Welfare State may have found common ground on the model flying field. Of course, it might just mean that those who have tired of exercising their altruism on old people, orphans and such, have taken pity on the desperate plight of the elderly status car, which may, at one time have carried the Dowager Duchesses to the opera, but is now reduced to mobile muck spreading operations. Though, what this has got to do with model flying is anybody's guess.

Another possibility is that the limousines in the multi radio car park are getting more than their due share of bashing about, and well wishers have formed a society for their protection and renovation.

The Flung Ones

Seemingly, whatever it is that fortifies the over forties, it is certainly not a chuck glider scramble. Or, so we understand from the experience of a northern club, where a hectic spate of chucking around the clock unscrambled the muscle tone of all but the very Young Ones. Obviously this figures, since the chuck gliding motion combines the grace of rock and roll with the charm of the Twist, and it's only the young ones who get in enough all night practice.

From all this there might emerge a new dance sensation. We can already hear the incantation of the M.C.; One, Two, Three—and Chuck!

Tail Twists

A mysterious interloper at a recent club auction was, of all things, a Noddy Egg Cup. That this nursery *objet d'art* came to be flogged along with the beat up Combat models and half finished airframes will not surprise those cynics with a toytown view of model planes, but I am charitable enough to believe that it was intended as the first prize in a chuck glider scramble.

* * *

The threat of the ready-to-fly plastic radio model is getting nearer to home, and already the insurance companies are training new staff for the expected rush. Up till now we have had the comforting expanse of the Atlantic Ocean between us and this ultimate flying field deterrent, but with Germany getting into production, we will at least have one Common Market blessing to look forward to.

The model itself, we are told, is made from expanded polystyrene. No doubt, when it gets into the unskilled hands of Dad and Sonny, it will become even more expanded polystyrene.

ROVING REPORT

WORLD-WIDE Radio Control, that enterprising and helpful American concern which publishes "Quick Blips" and the "R/C Equipment Guide," has a plan to get interested American modellers across the Atlantic to the U.K. for the World R/C Championships in August.

After ruling out the feasibility of a charter flight (the minimum requirement would have been 86 passengers at $300 per ticket) World Wide have put forward a proposal to take advantage of the airlines' Travel Group Plan, under which a minimum of 25 members would be able to do the round trip, Detroit-London-Detroit, for $347 (£125) instead of the usual $535. They would probably travel via BOAC Boeing 707 and it is also suggested that the departure and return dates should be spaced out to enable the travellers to do some sightseeing, visit friends and, perhaps, take in a tour of Western Europe as well.

* * *

Speaking of American R/C, one of our spies was at the Toledo R/C Conference a couple of months back and sent us some colour shots of the remarkable models on display there. Included was Harold de Bolt's new low-wing, trike-geared, Super-Tigre powered Twin and, at the other end of the scale, a modified version of the stick type parasol model with which Chester Lanzo won the world's first R/C model contest in 1937. Also dating back in design to pre-war days, were a couple of beautiful 7 ft. Stinson *Reliant* scale models modified from the Cleveland kit design of that time, one powered by a Fox 59 and the other by an Anderson Spitfire .65.

Other scale models included one of the many P.51D *Mustangs* now so widely seen in American scale multi events, a fine model of Wiley Post's Lockheed "Winnie Mae" and a finely finished Waco biplane powered by a Spitfire 65. Practically every model seems to have had an exhibition finish, although this was not simply a static display and many flights were made on both days of the meeting despite a snowstorm the day before. One of the more exciting moments came when, in the course of a dog-fight between two multis, the prop of one sliced into the fuselage of the other, leaving a couple of pieces of prop blade planted neatly in the rear decking.

Richard Metz of Kladno, with his highly successful A/I class glider "Tomik," recent winner of two A/I contests in Czechoslovakia.

* * *

Australia's Tony Farnan has been on one of his jaunts again, flying R/C multi with the Osaka Club in Japan, then on to the LARKS at Los Angeles, where he saw Nationals winner Doug Spreng and other leading flyers perform and, subsequently to New York and to New Jersey, where Don Brown put on a demonstration which, we hear, left him limp. Don is, of course, one of the U.S. team members for the World R/C Championships.

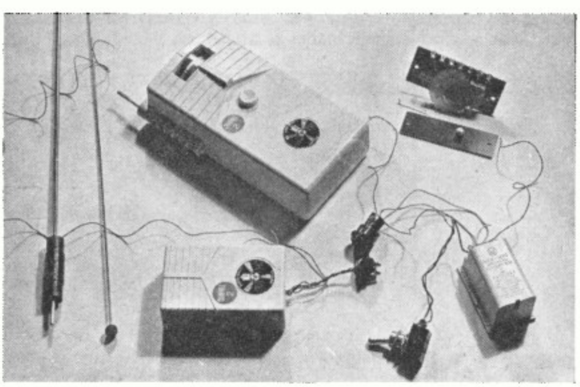
* * *

From our correspondent in Marseilles, Jean Mouttet, we learn that parts of France are now also suffering from the flying-field problem. Recently, the Marseilles club flying field was sold and put under the plough. A new flying ground has now been found, although this means a 60 mile round trip for most members.

Incidentally, M. Mouttet's firm A. Mouttet et Cie, have recently entered the wholesale model business. Established over 50 years, Mouttet & Co. are planning a nationwide coverage with domestic and imported model equipment. This could be an important factor in helping model flying in France, which now shows signs of regaining some of the vigour it had in the immediate post-war period.

* * *

An interesting comment comes from a very experienced engine designer and radio flyer. Explaining the reason for the simplicity of the throttle design favoured for his R/C engines, he says that the average R/C multi flyer is clueless about engines and the fewer adjustments (air bleeds, variable low speed jets, etc.) that he has to fiddle with, the better! What says Mr. Average Multi-Flyer? Does he get into a muddle trying to adjust for an 1,800 r.p.m. tick-over and would he be better off with an every-time 3,000-3,500 r.p.m. instead?



Left: Wen-Mac all-transistor single-channel tone-modulated R/C gear which we mentioned in this column some months ago. Without the Bonner Varicomp escapement shown, the outfit costs some £25 in the U.S. but is of advanced design.

Right: the new O.S. Minitron TX-II "pocket" transmitter ($5\frac{5}{8} \times 3\frac{7}{16} \times 1\frac{1}{2}$ in.) an all-transistor tone single-channel Tx which cuts battery costs to the minimum by operating from 8 pencells.

MODEL AIRCRAFT WINGS CLUB

FLY SAFELY

NOW that the flying season is really under way, my postbag is becoming increasingly full of letters from Wings Club members, who often include photos of their models. I am always pleased to receive these and when the photos are sufficiently good, I do my best to find a place for them on this page.

The best way to begin modelling is undoubtedly with one of the simple glider or rubber powered duration models—*not* with a scale model. It is far better to have a simple model that really flies than a complicated model that doesn't!

When you have learned to fly a simple model, you will want to progress to an engine-powered design, but correct engine operation is an important technique that must be learned. In order to help you better to understand the exciting business of running an engine, Peter Chinn, our engine expert, has written a very informative article which we are featuring this month as a Wings Club " extra." After reading it, you will have a greater appreciation of the wonderful piece of precision engineering that powers your model.

Without doubt the best way to improve your own modelling is to study experts in action. Those of you who live near Grantham, Lincs., will have a wonderful opportunity to do this by visiting the Nationals (see also advertisement, page vi) at R.A.F. Barkston Heath on Whit Sunday and Monday. I can promise you that it will be a thrilling experience. I know I look forward to the " Nats " every year!

ALAN WINTERTON.

Wingmen write . . . .

As I have recently become a member of the Wings Club I thought I would write and tell you about my aeromodelling career.

My first model was the Keilkraft *Attacker*, a small scale job, powered by a Jetex 50. I then built a small model boat and the plane on my work bench now is the Keilkraft *Topper*, a tow-line glider with a 40 in. span. My older brother, also a member of the Wings Club, has nearly completed his Veron *Cardinal*, for which he has acquired a Mills .75.

I do not care greatly what appears on the Wings Club pages but I enjoy reading fellow members' letters and a tip is always useful.

I enjoy every bit of MODEL AIRCRAFT and wait anxiously for the day when it appears at my local newsagent's, even though it is six or seven weeks after the publishing date in England.

Yours faithfully,

Timaru, New Zealand. DAVID MCBRIDE.

* * *

I thought you might be interested to see this photograph of my sister holding my Keilkraft *Halo*. It was very easy to

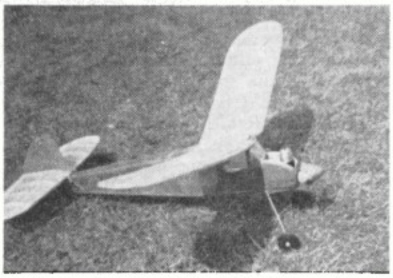
build and, considering that its power is only an Allbon Dart, it flies beautifully. I have also built many other planes, including a *Skystreak* 26, a *Ranger*, a Nordic *Chief* and a Frog *Diana*, all of which fly very well.

Yours sincerely,

Tadcaster, Yorks. ROGER MILLS.

* * *

I recently took this photograph of my K.K. *Pirate* powered by a very reliable



Mills .75. It is red and yellow with Wings Club transfers displayed on either side.

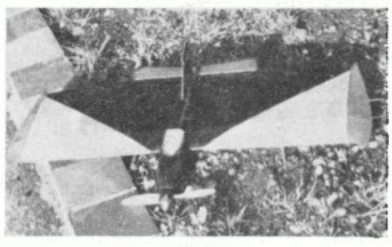
In building it I have employed many of the hints and tips given in MODEL AIRCRAFT and am more than pleased I joined the Wings Club.

Yours faithfully,

Birmingham 34. ROY J. LANE.

* * *

My *Talon* with an E.D. Racer 2.5 c.c. engine performs extremely well, although the Racer is about six years' old. I find



it is exceptionally powerful on an 8 × 6 prop with 48 ft. lines for Combat. The

Continued on page 195

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..

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.

TAILLESS MODELS

Len Ranson describes the fun of experimenting with unorthodox layouts

See his design **SWEEP** on page 180.

THE flying wing model is not a very familiar sight on our airfields and, when one does appear, it is often regarded as a piece of airborne magic; an illusionist trick of levitation. In fact, we get so used to the idea of " prop up front, wing in middle and tail behind " that we come to think of this set-up as something in the natural order of things, whereas it is but one—albeit the most popular and practical—of a number of design variations open to the curiosity of the progressive modeller.

In the model world flying wings are never referred to as such. They are listed as tailless; a term which is about as modern as the horseless carriage but which, in a predominantly tail equipped world, makes its point only too well.

Again, the term tailless comes in useful in describing the way in which a " wing " model functions, because before we can fly a model without a tail, we need to know just why it normally requires one. To get our terms even more basic, we can substitute for " tailplane " the more correct American equivalent, " stabiliser."

Simply, then, the purpose of the tailplane is to stabilise the wing. Forget about the fuselage and all the other components. When you fly a model you are flying an elaborately equipped wing, with the stabiliser as its number one assistant. Even he would not be necessary, were it not for a shifty little gremlin called the centre of lift.

Now the centre of lift, or C.L., is the little joker you try to appease when you carry out the elementary trimming operation of moving the wing backwards and forwards. In doing this, you are in fact endeavouring to locate the centre of gravity (the point at which the model balances) under the C.L. When you hit the right spot the model can be said to be aerodynamically balanced and the function of the tailplane is to keep the two forces—C.L. and C.G.—in close harmony.

I referred to the C.L. as shifty and, if we think of it as the point at which the lift of the wing is concentrated, then we can imagine it moving forwards, towards the leading edge, when the wing rears up and moving backwards, towards the trailing edge, when the wing dips down. These wing movements are caused by the turbulent nature of free flowing air and can only be dampened out by the corrective action of a stabiliser.

The stabiliser works rather like a lever. It is rigged, usually at zero degrees, so that when the model is balanced (C.G. under C.L.), its role is quite neutral. However, as soon as the nose dips the stabiliser takes on a negative angle and pulls the model back to level flight. In the same way, if the nose rears up the stabiliser puts in a swift dose of positive lift and the *status quo* is restored.

You must not run away with the idea that level flight necessarily means a path parallel to the ground below. If the model is climbing or gliding in a stable manner it can be said to be in a balanced attitude, with the tailplane working out the differences as described.

We should now have some idea why a wing needs a stabiliser and we can now explore some methods by which the stabiliser can be embodied in the wing itself, instead of trailing behind in the form of a tailplane.

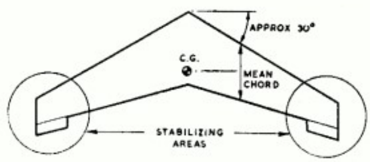
One way is to limit the C.L. movement by using an aerofoil with a reflex section. In effect, this is like fitting the stabiliser into the trailing edge of the wing and is the method used on " Flying Plank " models. At one time it was the standard type section on all tailless models but, being a poor lift provider, it has been largely abandoned.

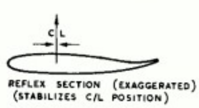
A more popular method is to use a conventional aerofoil on a swept back wing and to stabilise by means of elevons, located at the wingtips. Sweepback in itself gives a certain measure of fore and aft stability, but there is a limit to the amount that can reasonably be used. Too much can lead to structural weakness or, at least, an overweight framework, while the span-wise reduction of excessive sweep makes for lateral instability. About 30 deg. is the safe limit for rubber and power models, with gliders requiring no more than 15 deg.

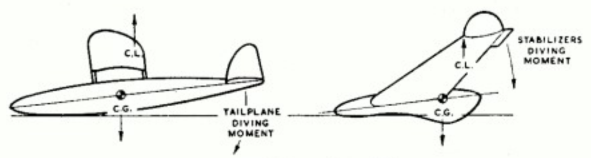
Yet another stabilising gimmick is to wash out the wing tips so that they have a negative set. This device reduces the need for large elevons, but such warping should always be built into the wing rather than steamed in afterwards. How much negative incidence is required depends on other design factors, such as the size of the elevons, the degree of sweepback etc., but about 5 deg. for gliders and 10 deg. for rubber and power seems to work out quite well in practice.

This brings us back to the first law of trimming; getting the C.G. under the C.L., and rigging the tailplane to suit. On a swept wing the C.G. should lie about a third of the way along the mean chord (see diagram). This is only

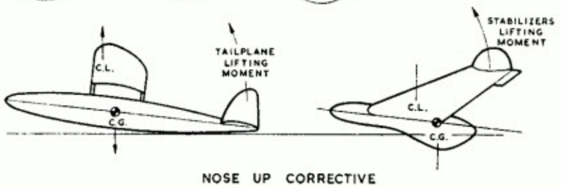
Continued on page 196







NOSE DOWN CORRECTIVE



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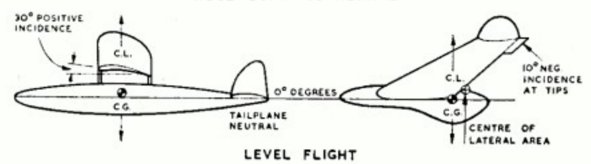
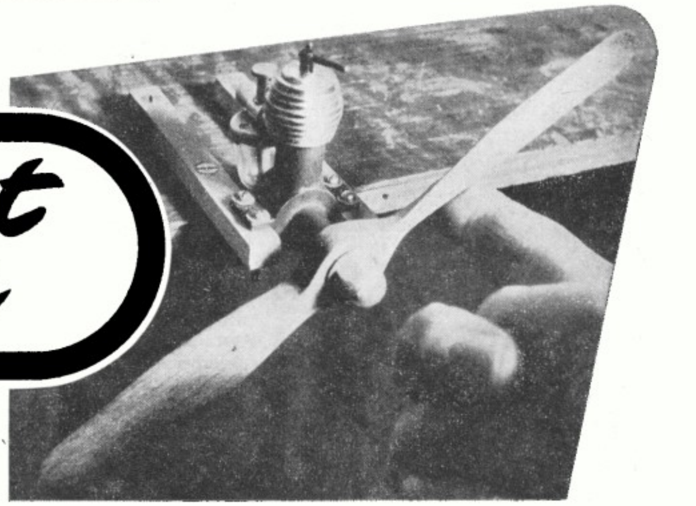


LEVEL FLIGHT

A Beginner's guide to . . . .

Your First Engine



IN the early days of model aircraft engines, power models were considered to be beyond the capabilities of younger and less experienced modellers. Nowadays this is not the case at all, for power modelling, in general, has become so greatly simplified that the smaller types of internal combustion engined models can be tackled after only a brief apprenticeship in more elementary types. In fact, not a few people have, of recent years, actually begun their modelling careers by building and flying power driven models—particularly control-line types.

A good deal of this is due, of course, to the excellent small power units, now available, which have enabled much smaller, cheaper and more easily constructed models to be built and which, in themselves, have done much to simplify the operation of a powered model aeroplane by great improvements in starting qualities and reliability.

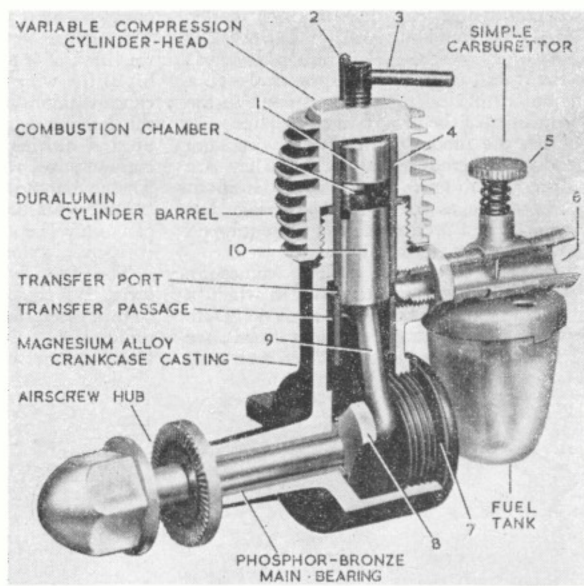
It should not be assumed from this that every modern model engine is suitable for the beginner. This is far from the case. The requirements of modern contests have led to the introduction of some very high-performance model engines which are often either too big and powerful, or too tricky, for the inexperienced to handle.

The requirements of a beginner's engine are easy starting, reliability, moderate price and a size and performance suited to the types of models he will be building.

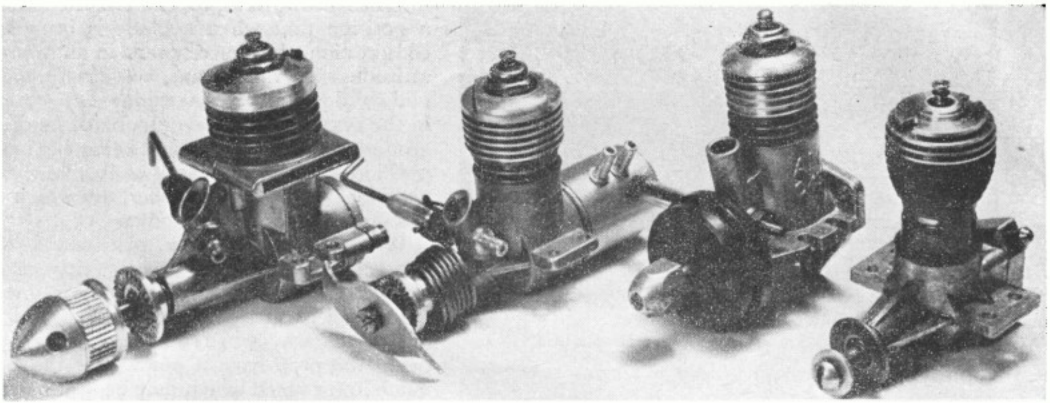
Beginner type engines are mostly to be found in the up to 1 c.c. size group, and include both diesel and glowplug types. Among the diesels, the Mills .75 deserves a special mention as, for over a dozen years, it has been acknowledged as being as near to the perfect beginner's diesel as anything yet offered. Another long-established beginner's diesel is the E.D. Bee. Probably more modellers have started with a Bee than any other motor—although, in its latest version, the Bee has been very considerably pepped-up in performance and, is perhaps just a little less foolproof to handle than hitherto. Other easy handling British-made small diesels include the D-C Merlin, M.E. Heron and A-S 55. If a glow engine is preferred, there is currently a choice of three British made engines of around the 0.8 c.c. size, namely the D-C Bantam, the Cobra .049 and the Frog .049, plus a good se'ection of imported American types.

Our following comments in this article apply primarily to model diesels, as the diesel is the type of model motor most widely used in Britain. We shall, however, conclude with some remarks on the operation of glowplug motors. Glowplug engines are fitted with a special ignition plug in the cylinder head, somewhat resembling the sparking plug in a full-size petrol engine but having a small electric element to ignite the fuel charge. (Sometimes the element is built in as part of the cylinder head.) One simply connects the plug to a 1.5 volt battery and after the engine has been started, the plug lead is disconnected and the engine continues to fire by means of the heat retained by the element. The model diesel, on the other hand, has no separate ignition system. Instead, it has a very high compression cylinder which automatically ignites the fuel charge when it is compressed by the rising piston. The compression ratio, about twice as high as for a glowplug engine, is adjustable by means of a lever on the cylinder head which lowers a contra-piston in the top of the cylinder. (See cutaway drawing.)

The purpose of this control is to adjust the timing of the



A MODEL AIRCRAFT cutaway drawing of the British Mills .75 diesel motor. In addition to the main features indicated, parts are as follows: 1—contra-piston, 2—compression stops, 3—compression lever, 4—cylinder liner, 5—needle-valve control, 6—air intake, 7—crankcase backplate, 8—crankshaft web, 9—connecting-rod, 10—piston.



Four British small glow-plug engines. Left to right: Frog 049, D-C Bantam, A-M 049, Cobra 049. The A-M 049 is now out of production, but it is included in this 'current' group because so many are in use.

ignition of the fuel charge. This is necessary in order that different propellers (which cause the engine to run at different speeds) can be used, and also so that the natural warming up of the cylinder (which will tend to ignite the fuel vapour sooner) can be compensated by reducing compression. A third use for this control comes in when it is desired to run the engine on a small propeller at high speed. For easy starting, we then adjust to low compression, after which the lever is turned to increase speed once the motor is running.

The only other control we have to bother with is the carburettor needle-valve. This simple device controls the amount of fuel admitted and thus the strength of the air/fuel mixture reaching the cylinder. If this mixture is either much too weak or much too strong, the engine will not work. Therefore we adjust the needle-valve to get the correct mixture.

The fuel we use in our diesel is a special blend containing ether, which has a low ignition temperature and ensures easy starting. Many good branded fuels are available, usually costing about 3s. 3d. per ½-pint can, but if you are some way from a model shop and cannot get a proprietary blend, a good substitute can be made up, which will operate any model diesel, with equal parts paraffin, ether and castor-oil. The latter two substances you can get from a chemist. There are various kinds of ether, but if you specify either "anaesthetic ether" or "technical ether, BSS 579," you will be using the right grade.

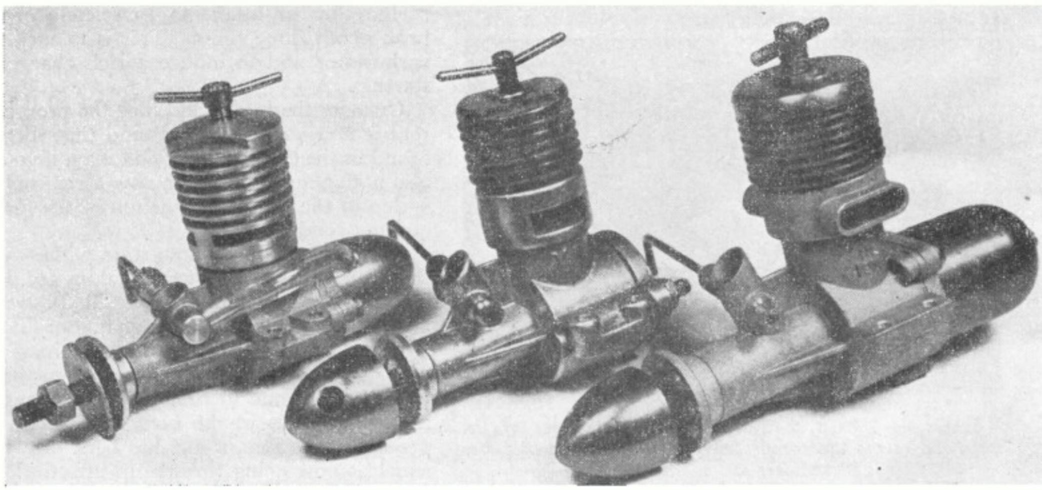
Every modeller finds his first engine an absorbing interest in itself, quite apart from the interest attaching to its future use as a means of propelling models, and it is natural to try out the engine before building a model for it. In fact, this is a good idea in any case, since by first running the engine on a bench, the modeller will soon learn how to handle it.

For bench running, a suitable mounting must be made up. Most model engines are of the beam mount type, with flat lugs on either side of the crankcase, permitting them to be bolted down on to two wooden bearers extending back into the fuselage structure. For bench running, these bearers, which should be of hardwood and not less than ⅜ in. square in section, may be screwed to a bench. Make sure that they are quite flat and parallel, otherwise the crankcase of the engine will tend to be distorted.

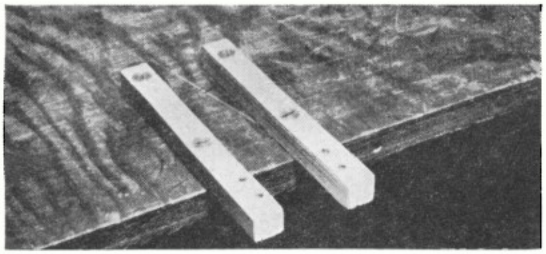
In the photograph showing the Mills .75 mounted in this manner, 6 B.A. machine screws are used, with flat washers under the heads of the screws and also under the nuts. To ensure that the nuts do not later loosen with vibration, it is a good idea to make a practice of fitting a second nut on each screw in the form of a locknut.

An alternative method of bench mounting is to use a flat piece of wood, say, 5 in. × 3 in. and ⅜ in. thick, in which a U-shaped cut-out is made in one end to fit the crankcase of the engine. Whatever type you use, make sure that you drill the bearers to line up with the mounting holes accurately. This can best be achieved by drilling one hole only, fitting the engine with a screw through this and then carefully marking the remaining holes through the engine lugs.

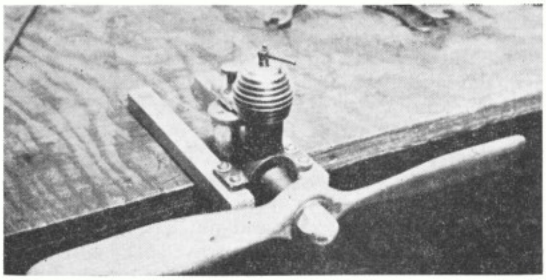
Although, perhaps, of less interest to the beginner than to those who already possess more than one engine, there are available very useful cast aluminium mountings (Hales and Davies-Charlton) which are adjustable to take many different sizes of engine. Engines can be fitted in a matter of seconds.



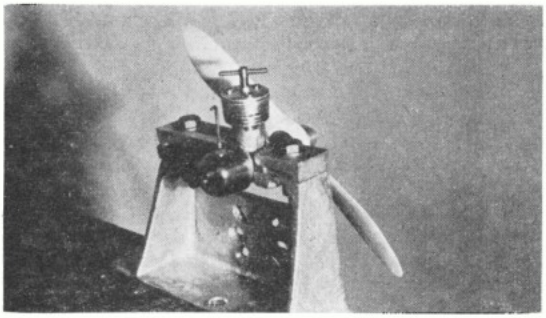
Three small diesels suitable for the beginner. Left to right: A-S 55, D-C Merlin, M.E. Heron.



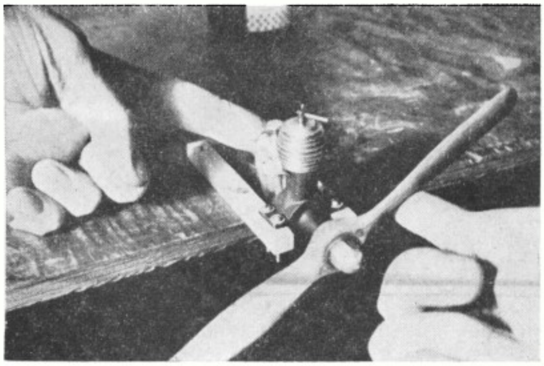
A simple bench mounting made from ⅜ in. sq. hardwood screwed to the bench, as recommended for practising engine starting and handling.



The Mills .75 mounted and ready for starting. Note the horizontal position of the airscrew so that the "flick" is upwards, bringing the fingers clear should the motor fire.



An early type E.D. Bee, mounted in a commercially made cast metal test stand, ready for running.



"Sucking-in" prior to starting. The forefinger of the left hand covers the carburettor intake, while the propeller is flicked over two or three times.

When fitting the propeller, tighten it on the shaft in such a position that when a blade is brought gently up against compression, the airscrew rests in an approximately horizontal attitude. By this means, we ensure that when a model is gliding down after the engine has stopped, the airscrew is in the best position to avoid a blade being broken off on rough ground, or the engine shaft being bent. This is also a good position to aid starting, since it allows a good strong swing, or "flick," to the propeller, in which the hand "follows through" towards the body.

When flicking the prop, place the forefinger (or forefinger and middle finger if you wish) fairly close up to the boss or hub of the airscrew. In this position one gets the fastest and most efficient flick for a quick start and the fingers are well out of the way when the engine starts. If we attempt to swing the prop from a point near the tip, it is rotated at a much lower speed which may be insufficient to start the engine or, alternatively, if it does fire, may cause the following blade to strike the hand before it can be withdrawn. Remember that, when running, your engine may be turning at a rate of 150 times per second and these small engines are into such a stride almost immediately upon starting. However, you need have no fear of getting your fingers rapped if you follow the rules.

As regards the actual size of the prop to be used, let the maker's instructions be your guide but, remember that, for easiest starting, it is always better to err slightly on the large side with a diesel.

The actual procedure for starting a model diesel varies slightly from one make to another but once you have become practised, you will have no difficulty in starting any other engine of a similar type.

At first you may not be very well encouraged by the results of your efforts, but don't let this worry you. The more you persevere with your engine, the quicker you will acquire that "engine sense" by which you will automatically begin to do the correct thing. By touch and ear alone, you will then be unconsciously guided into making the right movements. This is worth far more than any amount of words and the following instructions are therefore intended only as a guide to setting you on the right course, by which you may learn for yourself the art of correct handling of a model diesel.

First, check that the control settings (needle-valve and compression adjustment) are in accordance with the maker's recommendation.

Flick the engine over several times. Take notice of how the engine feels and sounds while you are doing this.

Now fill the fuel tank, place a finger over the end of the carburettor air intake to completely choke it and flick the prop about three times. This is to suck the fuel up into the carburettor and to induce a rich charge into the engine for starting.

Uncover the intake and flick the prop again. You will note that it now sounds "wet" and that there is a slight sucking sound in the carburettor. You may, if you are very observant, also notice that the engine now turns very slightly more freely —due to the lubricating action of the fuel which loosens any gummy residual oil.

The engine should now start within a few smart flicks of the prop. If it does not fire within, say, twenty flicks (we are tending to err on the generous side to avoid any risk of flooding), choke the intake for a couple of flicks and try again.

If the engine still does not fire, increase the compression very gradually until it does. If, when the engine fires, it will not now continue to run, reduce the compression slowly. It is possible that, in the process of finding the starting compression, an excess of fuel has been drawn into the crankcase which is now being thrown up into the combustion chamber each time the engine fires. As it is used up, so the lever can be screwed down again until the engine is running fast and smoothly.

The best performance is obtained with a relatively weak mixture and high compression. Therefore we close the needle-valve gradually to obtain this. It is less likely that an increase in compression will be required because as the engine warms up, so the ignition point becomes automatically advanced for higher speed. It may, in fact, be necessary to slacken off the compression slightly. The necessity for this is indicated when the engine begins to slow up. Reduce the compression until a slight misfire is heard, then increase it again until the miss just disappears. Running the engine with excessive compression should be avoided.

In general it should be remembered that the critical needle setting hardly alters with speed or load (i.e. propeller used) but that the compression adjustment does depend on these factors. Also, to get the engine to run slowly on any prop all we have to do is to slacken off the compression.

Briefly, the most common handling errors can be summarised as follows:

1. Engine starts but peters out again after a brief run. Cause: mixture too weak. Remedy: open needle-valve about ¼-turn more, choke intake for a couple of flicks and re-start.

2. Engine slows down and oscillates back and forth or stops. Cause: mixture too rich and/or compression too high. Remedy: close needle-valve, reduce compression, flick prop to work off excess fuel, open needle-valve to lower setting and re-start.

3. Engine runs but misfires. Cause: inadequate compression. Remedy: increase compression.

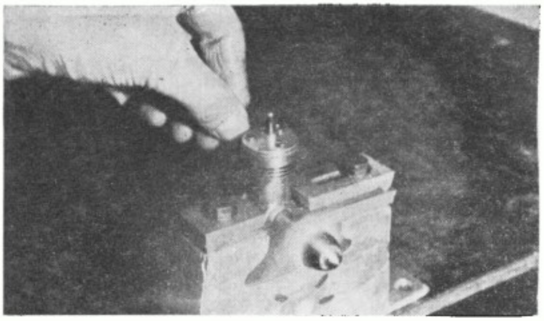
4. Engine runs but with smoky and oily exhaust, irregularly and with reduced power. Cause: mixture too rich. Remedy: close needle-valve slowly until running improves.

If, instead of a diesel you chose a glow motor for your first engine, you will, of course, require a starting battery. This can be either (*a*) a heavy duty 1.5 volt dry cell such as a bell cell (torch batteries are quite useless) or two such cells connected *in parallel*, or (*b*) a 2 volt accumulator (rather more expensive but, of course, rechargeable) with thin plug leads of sufficient length to drop the voltage at the plug element to approximately 1.5. The "glow" produced should be bright red, not dull red, or bright orange.

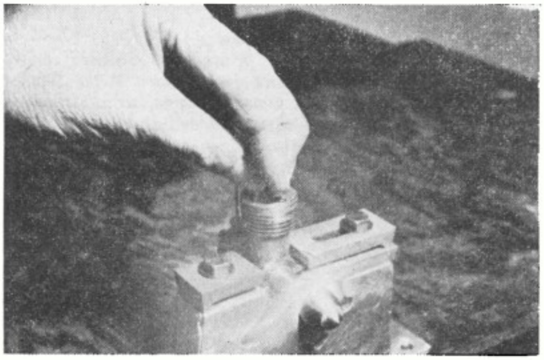
Fuel must be a proper glowplug blend as recommended for the engine and, in contrast to the diesel, the engine should not be overloaded with too large a prop. A typical size for .049 (0.8 c.c.) engines is 6 in. × 3 in.

Most glow engines respond best to port-priming for an initial start from cold. This is effected by injecting a few drops of fuel into the cylinder through the exhaust port prior to connecting the battery lead. Note the maker's instructions here, as individual types of engines react differently to the exact technique used. Generally speaking, the glow engine requires to be rather more "wet" for starting than a diesel and if your glow engine fails to fire, this will usually be due to insufficient, rather than too much, fuel. If the engine has too much fuel in the cylinder, however, this is easily detected since you will hear a sizzling sound caused by the raw fuel coming into contact with the hot plug element.

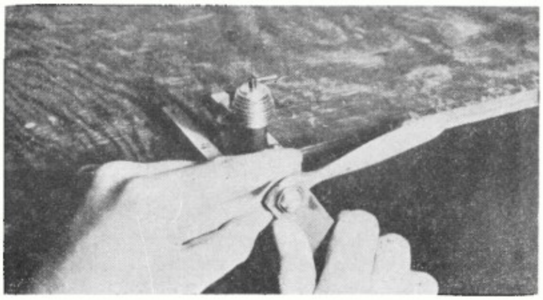
As soon as the engine is running, disconnect the plug lead. As the glow engine has no compression lever, there is only the needle-valve to worry about. As in a diesel, the fastest and smoothest running is achieved when the needle valve is closed down almost to the point where the engine cuts out. With a new engine, however, it is advisable to use a slightly "rich" needle-valve setting until the motor is "run-in." Again, follow the maker's instructions applying to your particular engine.



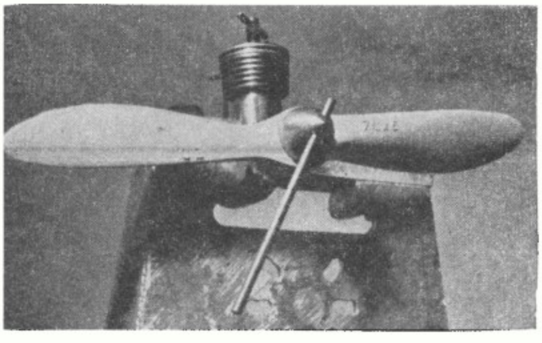
Best performance is obtained with a relatively fine needle-valve opening.



A degree of speed adjustment is obtainable by turning the compression-lever.

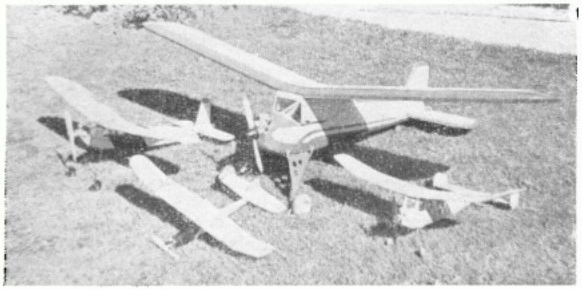


A short spanner, or special airscrew wrench should be used for tightening hexagonal prop nuts. Never use pliers.



Where a "tommy-bar" is required for the spinner-nut, this should be short and should fit closely in the spinner hole as shown.

PHOTONEWS— *brings you a selection of readers' photographs*



Four O/D models by A. S. Harris of Edenbridge. From left to right are a 41 in. wingspan sportster (now five years old) for the A.M.15, a 25 in. wingspan pylon design for the Cox "Pee Wee" and another "sportster," this time of 27 in. wingspan for the D.C. Bantam. Big boy at the back is Mr. Harris's latest, an 80 in. wingspan R/C model fitted with E.D.6 channel equipment and powered by a Merco Multi-speed 35.

Exotic holiday background for a semi-scale Spitfire *stunt model. Photo shows Robert Bardou of Menton in the South of France with his extremely practical design, which is constructed from fibreglass and Styrofoam and is thus virtually crashproof.*

Popular presentation. This superb Grumman F7F-1 Tiger Cat *was given to Captain R. D. Willoughby, U.S. Marine Corps, after he acted as Contest Director in a three-sided contest between members of the Hiroshima, Iwakuni and Marine Corps model clubs, and typifies the friendly relationship existing between Japanese and American modellers. Constructed mainly of hardwood (Japanese kiri wood) the model, which has now been fitted with two O.S. 35's, flies at 55 m.p.h., weighs some 5 lb., and has brakes actuated by the down line.*

Four months' work was required by R. A. Hutchinson of Leicester to complete this R/C Fairchild P.T.19. Photo by D. H. Print.

Italian team race enthusiast Giovanni Scuderi with his 35 in. wingspan F.A.I. model, which is powered with a Webra Mach 1 and has a consistent airspeed of 78 m.p.h.

AVIATION BOOKSHELF

FRANCIS K. MASON'S already published work on Hawker aircraft effectively whetted our appetite for his latest work, which is entitled **The Hawker Hurricane** and is devoted entirely to this immortal fighter. The complete *Hurricane* development story is told for the first time and the excellent printing does full justice to the wonderful photographs, many of which have not before appeared in print.

A comprehensive index immeasurably increases the value of this excellent book and it is nice to see a full colour three-view in the series of tone drawings which, incidentally, include some useful underside views. MACDONALD—35s.

* * *

Combat Aircraft of the World, by F. G. Swanborough, is a useful source of reference for the aerophile who specialises in modern aircraft. Within its 122 pages the book covers most of the major types of combat machine now in service with the world's air forces and also gives specification details.

The reproduction of the hundreds of photographs is not all that it might be but despite this, the book makes interesting reading. It is the sort of book that one likes to have on one's bookshelf and which will increase in value with the passage of time.

TEMPLE PRESS BOOKS—21s.

* * *

The Observer's World Aircraft Directory, by William Green, deals with no fewer than 500 aircraft types, which are classified according to their layout. Reference to any particular type is simplified by a novel coding system of silhouette symbols which, on flicking through the pages, immediately identifies the various sections.

Missiles are dealt with and there is a mine of miscellaneous aeronautical information including a glossary of terms, international civil markings and an airlines directory. A brief, but comprehensive summary of the aircraft types used by each of the world's air forces is also given. The book is very good value.

FREDERICK WARNE—15s.

* * *

The same author and publisher provide us with **The Observer's Book of Aircraft.** This is the latest edition of this already well established publication and is entirely revised with new photos and silhouettes. These silhouettes are very crisply reproduced and, unlike some we have seen, are not at all " lumpy." Two pages are devoted to each of the 122 fixed wing aircraft dealt with and one each to the helicopter section, which includes no silhouettes.

A useful little book, especially for the recognition enthusiast.

FREDERICK WARNE—5s.

WINGS CLUB

continued from page 188

Talon is the best 2.5-3.5 stunt and combat model I have ever had.

Previously I had a Frog " 80 " in a *President.* This was one of the examples of what a F/F model could do ! Several wing and tailplane panels were missing and I was not expecting it to fly. After " so-called " trimming I launched it and much to the delight of my friends, it circled in approximately 100 ft. circles, climbing continually. At first I felt very proud but then as the engine didn't stop the pride changed to worry. The last I saw it was still going strong at about 300 ft. Has anybody seen a 'plane about so big ? After this experience I decided C/L flying would be less costly and so saved for the *Talon.*

Hoping we can continue to have plenty of Ray Malmström's Tips in MODEL AIRCRAFT.

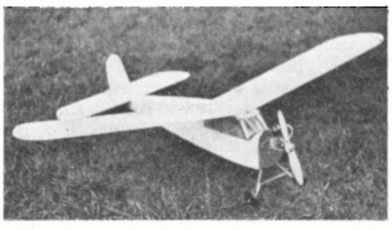
Yours faithfully,
Burton-on-Trent, Staffs. KEITH MALIN.

* * *

My Mercury *Magna,* which is powered by Davies-Charlton Dart, has made only three flights up to now. The first two lasted about 10 sec., but on the third flight, on a full tank of fuel, it flew out of sight.

The engine should have been mounted inverted, but on the flying field I found that the cylinder flooded on choking, so I took out the engine and mounted it right way up. This resulted in a very rapid rate of climb with the engine at maximum revs. The photograph shows my *Magna* after the engine had been remounted.

Yours faithfully,
Scunthorpe, Lincs. JOHN KEY.



International Pen Pals

Peter Farrant Hill is nearly 13 years old and is interested in gliders and C/L models. He is studying German at school and would like to correspond with a fellow modeller in Germany. Peter's address is 10, Shaw Street, Biddulph, Stoke-on-Trent, Staffordshire.

* * *

Burmese Wingman *Tin Htut* would like to correspond with fellow enthusiasts in all parts of the world. His address is: No. 38/84th Street, Kyawktwedan Dr., Mandalay, Burma.

* * *

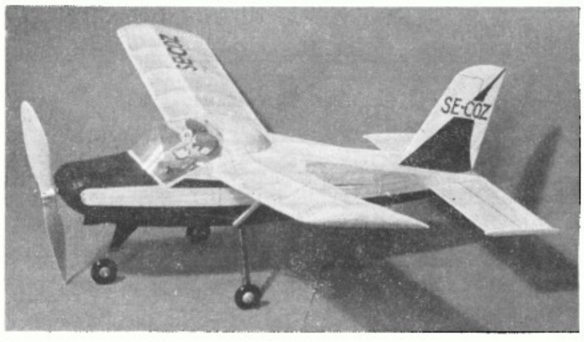
Australian Wingman *Peter Van de Waterblemd* is 15 and builds mainly stunt and T/R. He would like to hear from British modellers, who can write to him at: 11, Westmore Road, Warrnamboal, Victoria, Australia.

* * *

Southern Rhodesian Wingman *Nigel Westwood* is interested in C/L stunt and combat models and would like to correspond with fellow modellers. He lives at: 4, Antrim Road, Hillside, Bulawayo, S. Rhodesia.

NEXT MONTH'S FULL SIZE PLAN—OF SPECIAL INTEREST TO WINGMEN . . .

Ray Malmström's **attractive rubber-powered replica of the Bölkow *Junior* makes an ideal introduction to scale free-flight. Easy to build and fun to fly.**



OVER the COUNTER

THE **Keilkraft** *Ranger* has been a familiar sight on the flying fields for many years. Now, Keilkraft have completely revised the design and this popular 26 in. span control liner looks like being all set for a new lease of life. Unfortunately the re-design was carried out before the new S.M.A.E. ½A specification was announced and therefore, despite what it says on the box, the *Ranger* does *not* conform to the current rules. The kit is fully prefabbed and the undercarriage is preformed, making it a good T/R trainer for anyone past the beginner's stage.

* * *

Mercury Kits are now manufactured by Keilkraft, and the first two productions are the *Mamba*, a beginner's C/L profile stunt model and the F.A.I. *Team Racer*. The *Mamba* is a tough little 19 in. span trainer, of very basic construction and ideal for the novice, being fully pre-fabricated and of rugged construction. The F.A.I. *Team Racer*, on the other hand, is a *real* contest model, but despite this, the assembly is surprisingly simple, thanks to the simple yet sound design and extensive use of precut parts. Span is a full 33 in. and the model uses a 2.5 c.c. motor. There is no tissue covering to worry about and the kit we examined contained first class balsa—an important point this, where over-hard timber can knock off m.p.h. because of excess weight. Particularly nice are the spindle turned fuselage parts and the design lends itself to the addition of personal little "mods," which many modellers like to give.

The F.A.I. *Team Racer* kit costs 32s. 6d. and the *Mamba* 15s. 9d. and together with the K.K. *Ranger* these kits form a perfectly graded trio—in fact a complete C/L "course."

* * *

A beautiful kit for the Westland *Whirlwind* helicopter comes this month from **Revell.** We were impressed by the very neat mouldings and the accurate fit of the various parts. The nose "clam shell" doors open to reveal the fully equipped engine room and the model is large enough to encourage the more ambitious modeller to furnish the cabin interior. The cockpit is, of course, already "fitted out" with crew, instrument panel, etc. A comprehensive set of R.N. transfers, including all those little instructional panels, completes the *Whirlwind* which would do justice to any plastics collection. Cost is 7s. 6d.

½A TEAM RACING

Continued from page 172

laps for the model to accelerate and then time for nine laps, note total number of laps, compare with table and read off possible race times.

Personally, I employ definite tactics by timing the other competitor's models and assessing their heat or finals times. Having summed this up, I decide which propeller to use and the range to go for, at the same time taking into account the weather conditions. The quickest way to get knocked out is by attempting to produce a faster time than is necessary to win, or at least to get into the next round—one is far more likely to make errors, when trying too hard. For instance, if the opposition had to pull something out of the bag to better 4-40 in a heat, I would use a 7 × 6 Frog nylon prop, as this will give a time of between 4-15 and 4-10 and, on most occasions, would be 4-30 with two refuelling stops. If, on the other hand, I was fairly certain they would better 4-20 then I would use a 6 × 8 Tornado Plasticote, which can give a time of between 4-0 and 4-30 with the same number of stops.

I have tested countless numbers of propellers and found that the stated pitch bears little relation to airspeed and engine r.p.m. For instance, a 7 × 6 Frog nylon, turning at approximately 14,400 r.p.m. static, can produce 85 m.p.h. allowing for 10 per cent. r.p.m. increase in the air—an indicated efficiency of 95 per cent.! In windy weather this prop can give a higher speed than the 6 × 8 Tornado.

FIG. 8.

PERFORMANCE REQUIREMENT

LAPS	MPH	STATIC RPM 7x6 NYLON	MIN SECS PER CC	HEAT TIME
26	94	15500	9·2	4-15
30	85	14400	11·9	4-15
36	85	14400	14·0	4-15
45	80	13800	19·0	4-15
60	80	13800	25·0	4-15
90	74	13200	42·0	4-15

Power Requirement

An indication of possible propeller r.p.m. and fuel consumption is given in Fig. 6. The propeller r.p.m. figures quoted in Fig. 8 are based on actual tests during engine development, the upper figure of 15,500 was, however, obtained by using a 2.5 c.c. motor. The highest figure I have obtained so far with a 1.5 c.c. engine being 14,400 r.p.m. The lowest r.p.m. figure to provide sufficient speed to give winning potential is about 13,000. In fact, the new rules have made the b.h.p. of the engine more important than before, the exact opposite I would suggest, of the original intention!

(For further information on the performance of Mr. Cornell's modified *Super Fury* see "Latest Engine News" on page 173.)

TAILLESS MODELS

Continued from page 189

approximate, but gives a good guide to the correct rigging of the elevons.

Theoretically, a swept wing should require less dihedral than a straight wing and gliders will perform quite well with virtually none, but with power models, extra dihedral is sometimes used to hold the model on a straight climb path. Owing to its short overall length, the tailless model has not the good "weathercock" stability that is a feature of the long fuselage, orthodox model. To keep it on course, as it were, the directional trim should be made as efficient as possible.

If we take the C.G. to be the pivot point of our weathercock, we should so arrange our side areas as to bring the centre of the mass just a little behind and above the C.G. On a swept wing model the C.G. lies well back. This means that a fin, or fins, to be effective, are better sited on the wing tips than on the fuselage, unless the model is rubber powered, or is equipped with a rearward boom.

Trim tabs or rudders should always be worked independently on tip fins. Tip rudders work by producing drag at the wing tips and, if used simultaneously, they merely cancel each other out.

In operation, the tailless model flies in similar style to the "safe" sports model. Being short coupled around its moments, it is quick to recover from an unstable attitude. It will readily turn out of a stall and any spiralling tendencies usually resolve into a safe, tight bank. This manoeuvrability helps to offset some difficulties of trimming out a model with a marginal degree of inherent stability.

CLUB NEWS

HORNCHURCH M.A.C.

Just at a time when the club's fortunes are riding high, with a large, keen membership and increasing success on the contest field, we have had the misfortune to lose the use of Hornchurch aerodrome. However, we are fortunate in having an alternative field for F/F, and arrangements are in hand for accommodating the C/L boys.

Following up his A1 glider win at Chobham, our star performer, A. Wells, came out top in the London Area F.A.I. Wakefield comp. R. Pavely, however, was dogged by the gremlins, which creatures did diabolical things to his beautifully finished machine.

BRIGHTON D.M.A.C.

The first meeting of the year at Ashdown was very windy, but out of an Area entry of 18 in the K.M.A. Cup, we provided seven entries, including the first four in the Area placings. The best score was Ken Winstanley, a new member, flying a *Pelican* with 6:34, Dennis Latter was second with 6:10 flying a new open job, and Tony Clark was third with 5:33. For the Astral conditions were even worse and John West, after a hard struggle, managed 7:5 with his *Dixielander*, to be the only Area member to fly. Dennis Latter attempted to fly in the Rubber event but lost his model on the first flight.

F.A.S.T.E. CLUB

Owing to an unfortunate misunderstanding in the advertising, fewer entries were received for the second of a series of Rat Race Meets which we held on March 25th at Oakington, in conjunction with the R.A.F.M.A.A. Despite only 25 entries, the meet was a success, and the ultimate winner of the Senior event was R. Gould who returned a time of 8.05, with Taylor second in 11.50. The Junior event was won by B. V. Waterland with a time of 13.05.

CHEADLE & D.M.A.S.

Permission to use a new flying field in Cheadle Hulme has been obtained, also a club room on the field is being negotiated for. Flying meetings are held on Tuesday and Friday evenings, also Sundays. New members are welcome especially S.M.A.E. contest types to join the contest group. For details write to—B. Faulkner, 3, Burns Avenue, Cheadle, Cheshire.

WHITEFIELD M.A.C.

We are investigating the possibility of obtaining a hard surfaced C/L circuit, *a la* Esher. Progress has been favourable inasmuch as we have the interest and support of our local council, so we hope to be able to give news of the first circuit in the north in the near future. Wish us luck.

URMSTON & D.M.A.C.

A number of competitions for indoor R.T.P., using the rules and models published in Model Aircraft, have led us to suggest some small alterations and experiments, which may interest other clubs. Firstly, the rule change we made was regarding winding drills etc., with a ratio of 4: 1. We altered this to 5: 1, as by far the majority of commercial drills have a 4¼: 1 or 4½: 1 ratio.

Changes to model outline and arrangement (i.e. canard layout) seem to have little effect, but changes of rubber and prop can make a great deal of difference. A reasonable motor would seem to be the four-strand suggested, but we have been able to record times of 1 min. 30 sec. with a six-strand motor. This was originally coupled to a four-bladed high-pitch prop, giving almost the full distance on one winding, with a time of almost about 2 min. On changing to a two-blader, duration was 17 laps and the time 30 sec. better. Remember, however, that although model, prop, etc., must be developed, a great deal of skill must rest in the pitmen !

CHRISTCHURCH M.A.C.

We are only a small club at present, but we have one of the best C/L flying fields in the area at Stanpit Marsh Playing Fields, which is big enough to take 15 or more circles at once. It seems a shame to waste such good facilities on such a small number of people, so new members will be welcome on club evenings at the annexe at the back of the Christchurch British Legion Hall every Tuesday at 8.15.

CHICHESTER & D.M.A.C.

A biting cold wind did not deter members from turning out in force to attend a radio slope soaring meeting. Southern Television's interviewing personality John Baguley and cameramen were present to film and record the flying for inclusion in their " Day by Day " programme. Some seven radio slope soarers took the air and the cameraman was able to get some excellent shots. Ron Biggs with his well-tried model gave his usual very good display in the suitable conditions prevailing, the steep slopes of Trundle Hill at Goodwood being ideal for this kind of flying.

HIGH WYCOMBE M.A.C.

A reminder that at our C/L Rally on July 8th, at R.A.F. Booker, there can be *no spectators*. Each competitor may bring two assistants, but that is all—sorry. Pre-entry must be sent, together with an S.A.E., to J. Elphick, 102, Suffield Road, High Wycombe, Bucks., by June 25th. S.M.A.E. full members 2s. 6d. associates 3s. 6d.—the extra 1s. being to cover insurance.

CHANGE OF SECRETARY

STOCKPORT & D.M.A.C. G. Thomson, 44, Churchill Street, Heaton Norris, Stockport, Cheshire.

LINCOLN AEROMODELLERS. J. Hewitt, 33, High Meadow, Fiskerton, Lincoln.

LONDON AREA S.M.A.E. N. P. Elliott, 21, Powns Road, Luton, Beds.

SUTTON COLDFIELD R/C M.A.C. R. Masters, 30, Western Road, Wylde Green, Sutton Coldfield, Warwicks.

RECENT RESULTS

FIRST R/C AND C/L TRIALS

T/R

Edmunds/Smith	4.36
Long/Davy	4.43
Davy/Long	4.49
Steward/Taylor	5.15

Stunt

Warburton	2,372
Brown	2,074
Higgs	2,058
Day, D.	1,932

Speed

Drewell	120.4
Copeman	114.7
Butcher	114.2
Gibbs	113.0

Radio

Johnson	
van den Bergh	
Olsen	
Brookes	
Rogers	

Astral Trophy. U/R Power

1. Castell, G.	Stevenage	9.00	+ 3.42
2. Spencer, D. B.	Chester	8.52	
3. Savini, S.	Liverpool	8.25	
4. Green, M.	Foresters	8.23	
5. England D.	Grantham	7.23	
6. Picken, B.	Wigan	7.08	

50 entries, 14 returned no score

Flight Cup. U/R Rubber

1. O'Donnell, J.	Whitefield	11.37
2. Wolstenholme, D.	East Lancs.	9.14
3. Fletcher, D.	Timperley	7.10
4. Anderton, A.	R.A.F.	6.07
5. Thorpe, E.	Littleover	5.50
6. Whittaker, J.	Tunbridge Wells	4.25

21 entries, 9 returned no score

F.A.I. Glider

1. Hannay, J.	Wallasey	12.54
2. Williamson, D.	Timperley	12.12
3. Perry, P.	Birmingham	11.00
4. Wiggins, E.	Leamington	10.39
5. Worthington, H.	Wallasey	10.13
6. Moore, L.	Leamington	9.55

47 entries, 7 returned no score

K.M.A.A. Cup

1. Halford, B.	Norwich	9.00	+ 0.49
2. Burrows, M.	St. Albans	8.33	
3. Giggle, P.	Stevenage	7.59	
4. Spencer, D. B.	Chester	7.57	
5. Sladden, T.	Canterbury	7.54	
6. Hughes, B.	Hornchurch	7.44	

106 entries, 19 returned no score.

Frog Senior Cup

1. Price, J.	Norwich	9.00	+ 1.45
2. Petrie, D. L.	Montrose	7.50	
3. Fuller, G.	St. Albans	7.47	
4. Payne, T.	Northampton	7.25	
5. Harper, D.	Glevum	7.11	
6. Dilly, M.	Croydon	6.51	

58 entries, 21 returned no score

F.A.I. Rubber

1. Wells, A. R.	Hornchurch	12.34
2. Anderton, A.	R.A.F.	10.56
3. O'Donnell, J.	Whitefield	9.31
4. Nelson, W.	Sheffield	9.14
5. Godden, R. I.	Cambridge	9.08
6. Willmott, D.	Essex	8.57

21 entries, 2 returned no score

CONTEST CALENDAR

Additions to complete programme published last month.

July 1st	Northern Heights Gala, Halton.
,, 8th	Sutton Coldfield R/C Rally, R.A.F. Wellesbourne, details from A. Thomas, 791, Chester Road, Erdington, Birmingham.
,, 29th	Surbiton Gala, Chobham Common. R/G/P and ½AP.
Oct. 7th	South Coast Gala, F/F, C/L and R/C. Venue to be announced.

MODEL aircraft PLANS and PUBLICATIONS

Last month's "M.A." Plan

M.A. 366 NUMBER NINE
by J. D. McHard (right)

A feast for out-of-rut enthusiasts. This attractive canard biplane gives an outstanding performance with the absolute minimum of trimming troubles. Extremely detailed plan, with list of materials, eliminates possibility of building errors. Wingspan 28 in., length 24½ in. For 0.75 c.c. engines (May 1962).

4s. 6d.—*post free*

Plus
FOLD-OUT PLAN
for C/L team racer

This **full-size** plan presents Gordon Cornell's *Leveret III*, a contest-winning ½A team racer which conforms to the new specification for this class.

THE LATEST AMERICAN PLANS

Published by *Model Airplane News*
sold in U.K. by MODEL AIRCRAFT

We very much regret that in last month's issue the "Model Airplane News" plan sheet featuring CAROUSEL, NERVOUS NELLIE and XD-7 HUSTLER was listed incorrectly as M.A.N. 3-A. It should have been M.A.N. 5-A. Details of M.A.N. 3-A (and also M.A.N. 4-A) appear below:

M.A.N. 3-A HOWARD "IKE." A 35 in. span scale C/L model for .23 to .35 engines.

PRONTO. A very practical and easily built 56 in. span R/C model for rudder only or multi. Suitable for .15 to .19 engines.

M.A.N. 4-A LADY LUCK. A semi-scale 54 in. span C/L stunter for .25 to .35 engines by Paul Del Gotto.

GEE BEE. A 28 in. span scale C/L model of the famous racer for .25 to .35 engines.

Each number costs **7s. 6d.** post free.

At last, a really comprehensive reference book

MODEL AIRCRAFT HANDBOOK and Plans Catalogue

In addition to listing all *Model Aircraft* plans, this entirely new handbook gives modellers all the useful facts, figures, sizes, conversions, etc., that a modeller commonly uses. Also complete listing of current British kits, R/C equipment etc., and over 300 addresses of model shops. Contents include:

- Full illustrated list of all Model Aircraft plans available through the M.A. Plans Service.
- Addresses of over 300 leading model shops.
- Complete survey of all current British kits, giving comprehensive details of type, size, construction, suitable engines, etc.
- Complete tables of all current British R/C equipment with selected list of certain American items.
- Conversion tables (square inches to square centimetres) with details for determining power loadings, etc.

(*Continuing over*)

- Weight data for all popular balsa sheet, strip, block, leading edge and trailing edge, with comparative volume tables. PLUS tables on batteries, accumulators, S.W.G. wire sizes, B.A. thread sizes etc.

Price **2s.** (postage 5d. extra)

ORDER TODAY

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19-20 NOEL STREET, LONDON, W.1

Please supply the following:

Model Aircraft Handbook (2s. 5d. post paid)............ Please tick

Model Aircraft Plan M.A. 366 (4s. 6d. post free).......... Please tick

Back number of May issue (1s. 6d. post free)............ Please tick

Model Airplane News Plan No. 3-A (7s. 6d. post free)...... (The sheet containing HOWARD "IKE" and PRONTO). Please tick

Model Airplane News Plan No 4-A (7s. 6d. post free)...... Please tick

I enclose cheque/P.O to cover the above.
(Please write in block letters)

NAME..

ADDRESS.......................................

....

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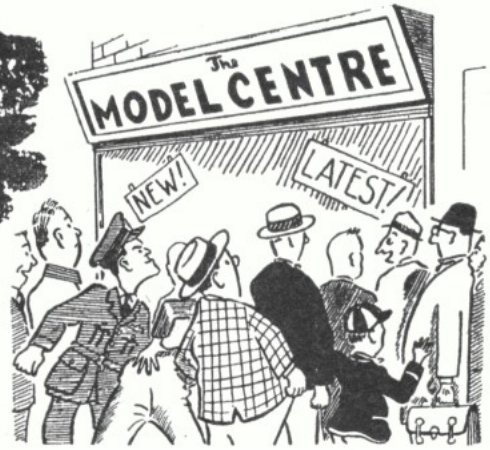

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