JANUARY 1961

1'6

MODEL aircraft

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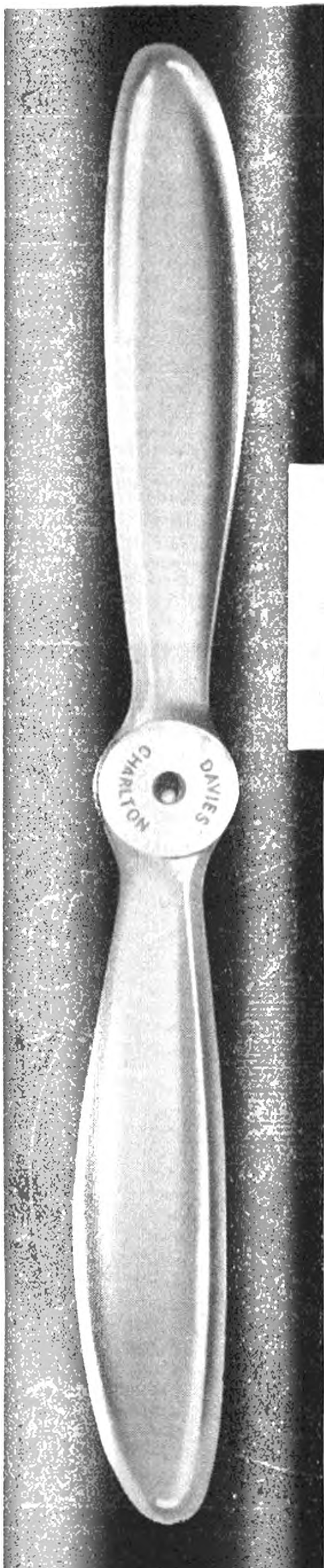
WINGS CLUB FOR BOYS - *see inside*



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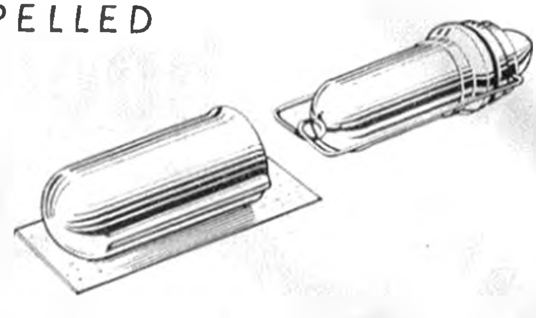

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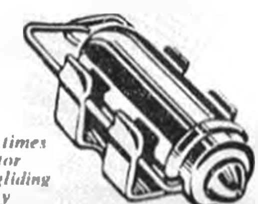

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MODEL aircraft

JANUARY 1961

No. 235 VOLUME 20

The official Journal of the SOCIETY OF MODEL AERONAUTICAL ENGINEERS

IN THIS ISSUE

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Here and There

Model Aircraft at the Schoolboy's Exhibition

VISITORS to the Schoolboy's Own Exhibition, which is being held at Olympia from December 27th to January 7th, will be able to see the finest display of indoor power model flying yet seen in this country. Normally the scope of round the pole and C/L flying at any exhibition is severely limited by questions of space, but at Olympia this hardly arises.

The flying "cage" is 50 ft. in diameter and the models, which are all standard F/F designs, will be flown tethered by a sliding ring to a central wire which extends to the ceiling. Thus they will climb under power high into the hall, and then when the motor cuts glide back down to the take-off area, while, as an added attraction, timers fitted to certain of the models will release parachutes, etc. The demonstrations will not, however, be limited to R.T.P. flying as it is hoped that the size of the cage will permit "live" demonstrations of C/L flying to be staged.

Now what of the models you can see flying? Firstly, of course, the plane on the cover—*Wee Snifter*—which has been designed by our assistant editor, Doug McHard, especially to introduce beginners to power flying with a design which is out of the rut, yet as simple to build and fly as more orthodox designs. (See page 16 for further details of this model.) Kit models are well represented with new designs as well as established favourites from Keilkraft, Veron, Frog, Mercury, Yeoman, Dux and Hobbies, and these will be powered with Mills, E.D., Allen Mercury, Davies Charlton and Frog engines.

Invaluable New Booklet

"Model Aircraft and How to Fly Them" is the title of a new booklet which we have prepared especially for the benefit of the thousands of visitors to the exhibition who will be seeing model flying for the first time. It explains in simple everyday language the scope and benefits of our hobby, with especial emphasis on how to get started and advice on suitable models and basic flying techniques. This makes it invaluable even to those who have already built one or two models and the modest 1s. it costs, can save all beginners £'s and pounds in wasted effort on unsuitable models.

* * *

Remember this flying demonstration is run by MODEL AIRCRAFT and we will be pleased to meet our readers, and especially Wings Club members, at the circle where a member of our staff will be permanently available to answer your queries and give advice.

Wings Club Plans

THE two designs *Wee Snifter* and *Plover* which are featured in this issue are ideal for beginners and as such strongly recommended to Wings Club members.

One of the benefits of joining the Model Aircraft Wings Club is that members can obtain specially selected plans at reduced rates so these plans, which normally cost 4s. 6d. each, are being made available to Wingmen at 3s. each, or 5s. for the two, provided they are both ordered at the same time.

Just one point, all orders must be on the special form on page 21.

Pen Pal request

WE often publish requests for pen-pals in our Club News and Wings Club pages, but the request we have from H. Hart, 143, Rydens Road, Walton-on-Thames, Surrey, is rather different.

Mr. Hart is in touch with Guy Perdhe, a keen 16-year-old Swedish lad who is blind, but would like to correspond with a model enthusiast of about his own age in Surrey. Letters, which must be clearly written, should be sent to Mr. Hart who will translate them into Braille and the replies into English.

Gathered in Brussels for the recent F.A.I. meeting the officials, delegates and advisers of the 15 nations. Only person missing is Stewart Uwins, who took the photo.

Window Displays

LOCAL retailers will often co-operate with cinemas, etc., in providing a display of models to coincide with suitable films, but we have often thought that there are many more publicity tie-ups that could be exploited. An excellent example of this is shown in the accompanying photograph which shows how Harry Welch Ltd., of Preston, provided an attractive window display for the Provincial Building Society and gained some useful publicity for themselves.

This is quite an unusual combination, and we must confess that we don't quite see how one could effect a suitable tie-up with, say, the local butcher.

However, we would be interested to hear of similar enterprising displays, which are not, of course, the sole prerogative of model shops—local clubs could equally benefit by such publicity.

F.A.I. meeting

THE meeting of the F.A.I. Models Commission (C.I.A.M.) in Brussels recently was attended by 15 delegates, many of whom were accompanied by one or more technical advisers, Great Britain sending Stewart Uwins (R/C), Dave Posner (F/F) and Ron Moulton (C/L) to assist the delegate H. J. Nicholls. This emphasises the importance that member countries (especially Great Britain) attached to the meeting, which was to discuss, among other things, the question of fly-offs, the speeds set up using monoline at the World Championships (which were ratified) and various proposed rule changes.

We have obviously insufficient space to publish a full report of the meeting, especially as long discussions often resulted in a decision to leave things as they are, but we are including here some main points and details of all major changes to rules and specifications that were made.

General

Election of Officers—President: H. Meier, Germany. Vice-President: H. J. Nicholls, Great Britain. Secretary: R. Beck, Hungary.

Sub-committees—Following the success of the sub-committees (Uwins, Moulton and Posner were appointed to the committee dealing with their respective specialities) which were appointed in Brussels to consider the various technical proposals, and all of whose recommendations were adopted by the C.I.A.M., it was decided to appoint permanent sub-committees. These would deal, by correspondence, with all technical problems and submit their recommendations to the annual C.I.A.M. meeting. The sub-committees are composed of:

Free-flight—Jaaskelainen, Finland (Chairman). Ehling, U.S.A. Derantz, Sweden. Czepa, Austria

Control-line—Beck, Hungary, (Chairman). Aarts, Holland. Barthel, Italy. Moulton, Great Britain. Czerny, Czechoslovakia.

Radio—Good, U.S.A. (Chairman). Degan, Switzerland. Meier, Germany. Goyvaerts, Holland. Nicholls, Great Britain.

Past Presidents—A. F. Houlberg and A. Roussel, the past Presidents of the C.I.A.M. were elected Honorary Vice Presidents.

Protests—In future protests must be lodged in writing and be accompanied by a deposit (fixed annually) which will be refunded if the protest is upheld and against return of receipt issued by the jury. Current deposit 10 Swiss Francs (approximately £1).

Rule Changes—*GENERAL*

Fly-offs—For all F/F classes these will now be on the "30 sec. step" system, i.e. sixth flight 3½ min., seventh 4 min, etc. Present 3 min. max. remains.

Third Models—If, after being processed, a model is lost, a third model may be produced for checking, up until one hour before the official starting time of the contest.

Control-line—*SPEED*

Fuel—Only glo-plug fuel issued by the organisers can be used at future speed meetings. There is a choice of two formulae: (a) 20 per cent. oil, 80 per cent. methyl alcohol, (b) 25 per cent. oil, 75 per cent. methyl alcohol, both to international standards of purity. No restriction on diesel fuels. Effective 1962.

Handles—Special handles (single and two line) have been designed. Effective 1962. (*Details are not yet available but we will publish these as early as possible—Ed.*)

Whipping—The rule effecting this will now read: "Any pilot applying physical effort to increase the speed of his model will be disqualified."

TEAM RACE

Line Dia.—Minimum increased to 0.3 mm. (0.0124 in. 30 s.w.g.).

Handles—"Swivel lug" or "rigid" handle permitted, but distance from centre line of handle to line attachment point not to exceed 40 mm. (1.57 in.).

Whipping—Prohibited (see under speed) and the handle must be held to the centre of the chest except when overtaking.

Cross Section—In addition to the height and width requirements the fuselage must also have a minimum cross sectional area of 39 sq. cms. (6.045 sq. in.) excluding wing fillets. Pilots not essential as new rule is to eliminate unreal cockpits.

Wheels—Minimum size 25 mm. (1 in.) dia. Monowheel undercarriages permitted.

Conduct—A mechanic is deemed to have entered the circle when *both* feet cross the 19 m. line. A pilot must not cross the 3 m. line with *either* foot.

STUNT

1962—Two flights to current F.A.I. schedule, then all contestants scoring more than 1,600 points to have further flight to A.M.A. schedule. Best of F.A.I. flights plus A.M.A. flight to count for final score.

1964—Two flights to A.M.A. schedule with third flight to a "free" pattern, chosen by the flyer from approx 24 manoeuvres (previously nominated), to be completed within 7 min.

Free Flight

Power—Motor run reduced to 10 sec. No other change.

Wakefield—No change.

A/2—Tow lines must not exceed 50 m. in length when subjected to a pull of 5 kg. (11 lb.). It is permissible to cut the tow line at the winch to release the model. No specification changes.

Radio Control

Revised manoeuvres, schedule sequence and K factors.

1. (English language edition). Flight in straight line should read: "for minimum time of 10 sec," *not* "at a minimum height of 10 m."
2. Turn at 90 deg. left and 270 deg. right.
3. Return straight flight, over same flight path.
5. English language edition should read: "Stall Turn" instead of "Immelmann Turn."
7. Outside loops. K = 6, 8 and 10.
8. Split S. K = 10.

9 and 10 will now be combined, i.e. a roll followed immediately by a roll in the opposite direction. K = 8 and 10.

11. Stall. K = 15.
12. Inverted flight now flown as manoeuvre 15.

12 and 13 now combined as manoeuvre 16 to form inverted eight over landing circle.

15. (Horizontal eight). 16. (Cuban eight). 17. (Vertical eight), now manoeuvres 12, 13 and 14 all with K = 12.

18. Spin (three turns only, recover same heading as entry). K = 12.

New Manoeuvre

17. Vertical upward roll, K = 12.

1961 Championships

Free Flight—Germany has offered to run this year's Championships for Wakefield, A/2 and Power with the co-operation of the A.M.A. The meeting will be held at an aerodrome near either Munich or Coblenz on September 1st-3rd.

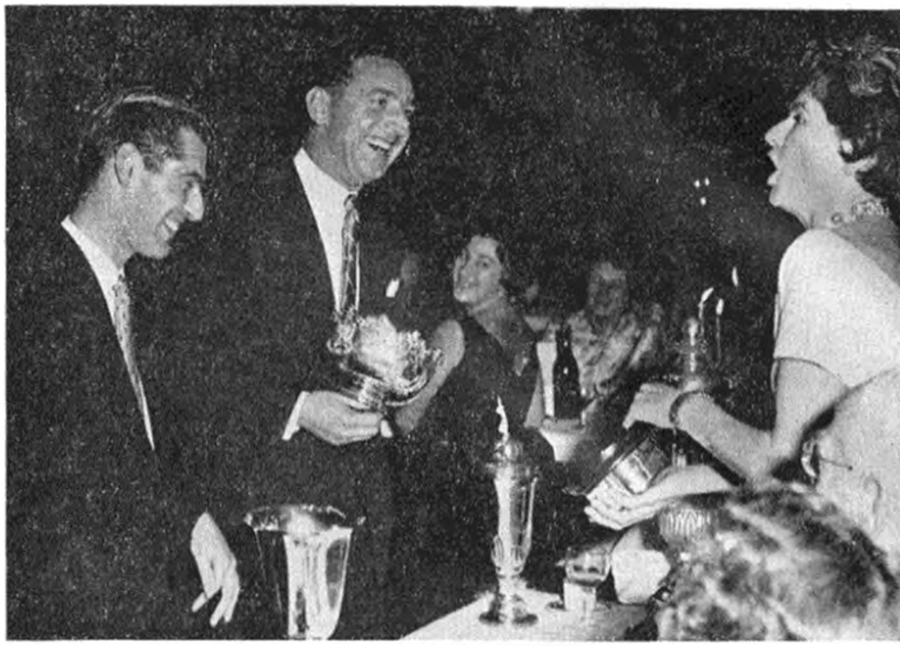
Indoor—Hungary is unable to organise this meeting due to the heavy expenses involved in running last year's C/L meeting. The S.M.A.E. is therefore investigating the possibility of staging the event in Great Britain.

THE 1960 S.M.A.E. DINNER and DANCE

THE venue for this year's function was the Fellows' Restaurant, Regents Park Zoo, where the guests were welcomed on arrival by some of the regular inhabitants including an orang-utan and two playful chimpanzees.

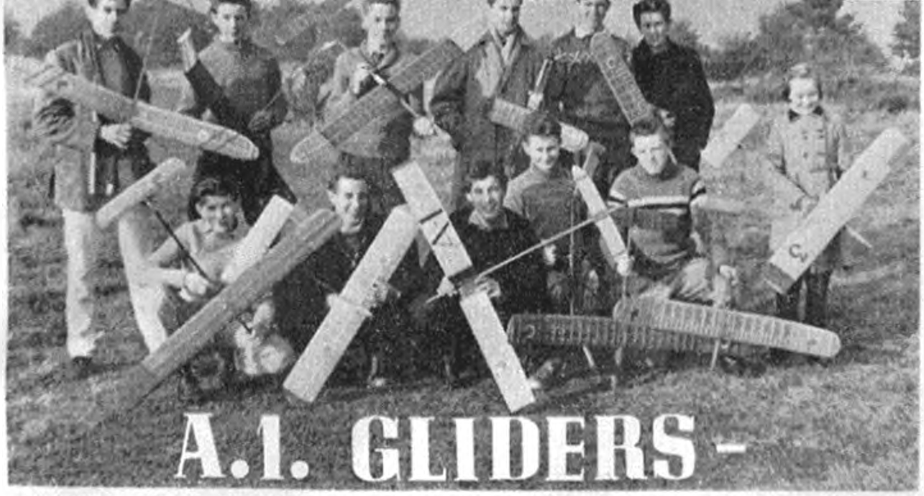
The Guest of Honour was B. S. Shenstone, Vice-President of the Royal Aeronautical Society and Chief Engineer to B.E.A., who will surely go on record as making the shortest speech ever heard at this dinner—a feat which we hope is emulated in future years. The prizes were presented by Mrs. Shenstone, after which the rest of the evening passed far too quickly.

This must rank as one of the most popular and enjoyable S.M.A.E. Dinners yet held.



Above: Dave Posner, George Fuller and Mrs. Shenstone obviously found the situation amusing, while below, looking pleased with their awards, are:

1. *Ron Draper: " Model Aircraft " Trophy.*
2. *Ray Brown: Gold Trophy.*
3. *George Fletcher: Knokke No. 2 Trophy (C/L scale).*
4. *B. Dowling: Pilcher Cup.*
5. *Chris Olsen: Sid Allen Memorial Trophy and " Aeromodeller " Cup.*
6. *M. Turner: " Model Engineer " Cup.*
7. *Frank van den Bergh: S.M.A.E. Cup.*
8. *Just to reverse the process, instead of handing out, Mrs. Shenstone receives a bouquet from Mrs. Ken Glynn.*



A.1. GLIDERS –

are ideal to keep club interest lively and terrific fun to fly says CYRIL WEST

Wings Club members will want to build PLOVER— see page 21 for special plans offer

ANYONE who has been a member of a club for a number of years will have noticed that every so often a horde of juniors descends upon the group and proceed to demand attention.

The problem arising from this intermittent phenomenon is how to occupy these youngsters without making them feel out of things, and thus losing their interest? Many promising newcomers are discouraged by the apparent aloofness of the club "experts" and drift off in pursuit of some other activity.

In the Godalming M.F.C. we have, for some time, recognised the need for stimulating the budding enthusiast and, from the beginning, making him feel part of the movement. The direct entry of new senior members is never sufficient, so we must look to the growing experience of the younger element, to fill the gaps in the ranks and, eventually, take their place on the committee and similar essential positions.

Our most recent idea, to create and hold interest, is a series of A.1 Glider contests, and a keener domestic activity than this has resulted in, is difficult to imagine. This type of competition is an effective leveller of ability and because of the limited size and performance of the models, flying can take place in a comparatively small area. Another advantage is that the models are cheaper and less time consuming to produce, which pleases the juniors, with their shallow pockets and limited patience at the building board. On the other hand the senior can produce a model which, while not being too simple to warrant his interest, can be fitted in with his other more serious competitive activities, without being too much of a distraction.

There is no doubt among our membership that the A.1 has brought new stimulus to everyone, even those who like to hold stopwatches and generally run things. Yes, we still have some of this type of aeromodeller, thank goodness!

The general incentive scheme is to round up a few donors of prize money (30s. is adequate), and offer this to the three highest placed juniors in a proportion of 15s., 10s., and 5s., for first, second, and third, respectively, or as appropriate. Prizes are unnecessary for senior members as the fun derived is more than adequate recompense for the effort involved, especially as one can keep ones hand in with trimming and general contest procedure, without fear of losing or damaging an important and more expensive model.

An amusing reflection on the last two contests is that they were both won by juniors, mainly due to the fact that the more "experienced" element were climbing trees all day retrieving their models, and were thus short of flying time at the end of the day. This only goes to show that one can easily come unstuck by being over confident when flying against juniors.

In the hope that other clubs will follow our example and perhaps, who knows, even spread the disease to an extent where inter-club contests become possible, I have drawn up the plans of my model *Plover*. This has been "treed" in the last two contests but in spite of this has taken second place with only two flights so I hope, by braving the elements and wearing shorts at the next contest, to get into the prize money. (P.S. Since writing the above the model has won two club contests, but still no prize money. The judges saw through my dark glasses!)

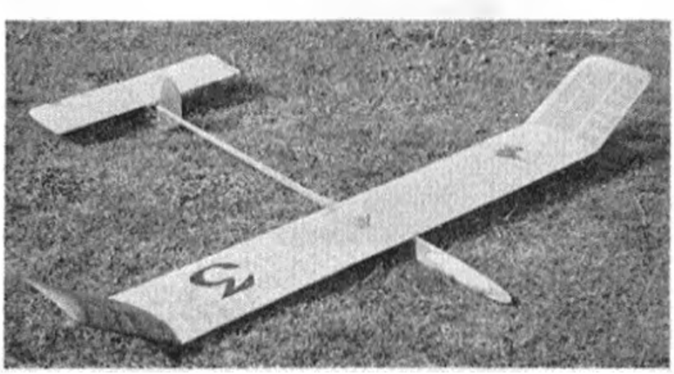
Now read how to build Cyril's design—PLOVER

THIS model is a simple two-evening job for the experienced modeller and is quite within the scope of the tyro or junior given a little help and advice.

The fuselage is cut from $\frac{3}{16}$ in. sheet spruce or hard obeechi and smoothed off with glass paper. Wing and tail mounting plates, made from scraps of $\frac{1}{16}$ in. plywood, are glued and screwed with small brass woodscrews in the positions shown, the fin and sub-rudder are glued on, and fittings for the auto rudder added.

The first step in the construction of the wing is to cut a rib template, with all spar notches, etc., from $\frac{1}{16}$ in. ply. It is also advisable to make an extra template as a guide. A medium grade (but stiff) $\frac{1}{16}$ in. sheet balsa should be chosen for the ribs and these should now be cut using the plywood templates.

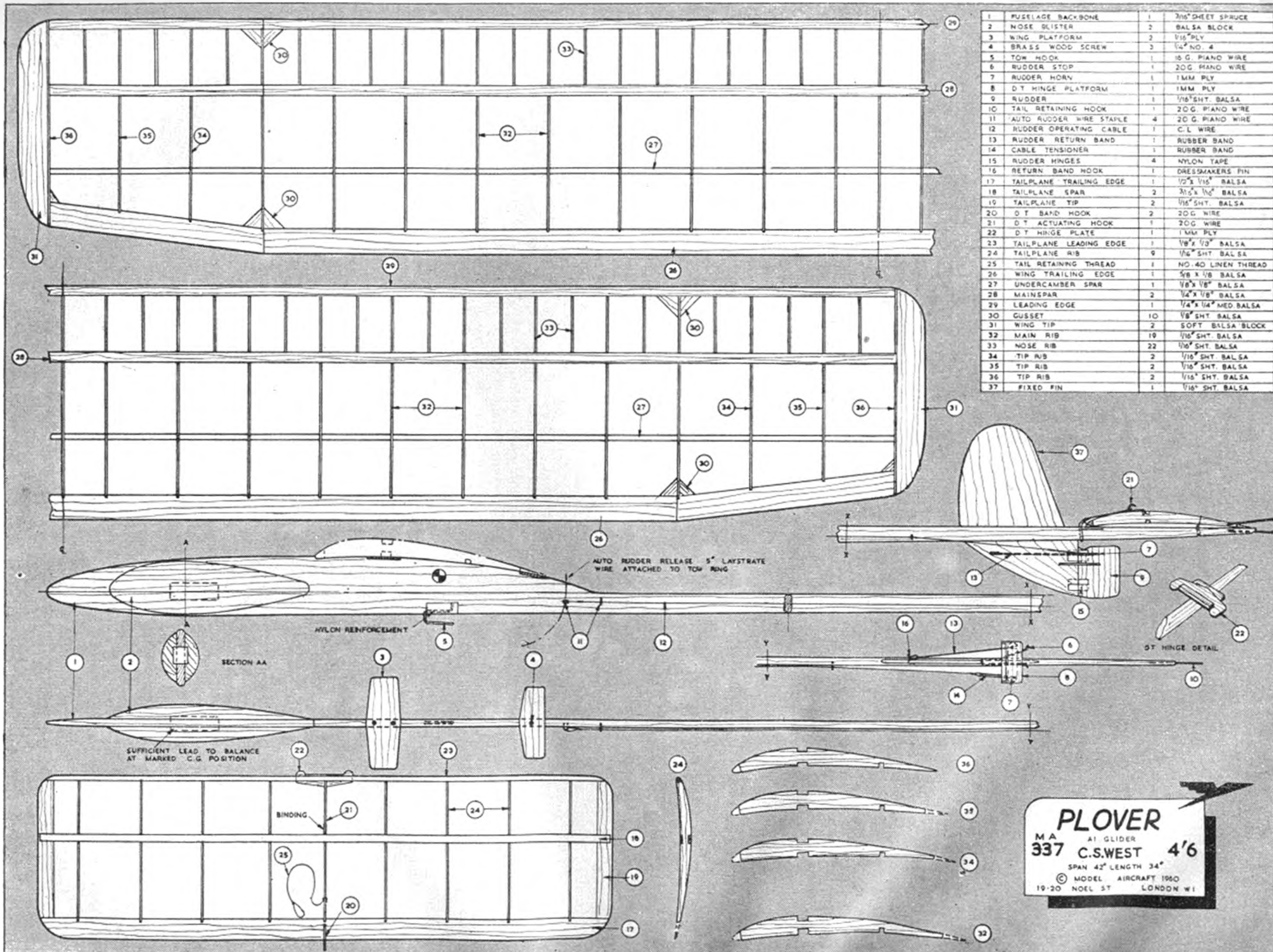
Choose hard, straight grained, balsa for the spars and trailing edge, and medium grade for the leading edge. Assembly follows normal practice with a strip of scrap balsa blocking up the front of the trailing edge. Notch the trailing edge with a piece of hacksaw blade to receive the rear ends of the ribs. No special spar bracing is necessary at the dihedral break, but a good spar joint is essential. Use two coats of cement before finally making the joint.



The tips are made from soft block and finally shaped with glass paper when in position, also a slight reflex trailing edge is given to the tips when glass papering The leading and trailing edges can be shaped when in position with a sharp blade and a glass paper block. Much the same instructions apply to the tailplane which is also under-cambered.

The dethermaliser hinge on the tailplane leading edge should be given careful attention, as successful dethermalised descent is largely dependent on a well-aligned hinge. The auto rudder is operated by a piece of C/L wire on a plywood rudder horn. Rubber bands of different tensions apply "on and off" loads, while the travel is limited by 20 s.w.g. stops. The rudder is released to circling trim by withdrawal of a piece of multi-strand C/L wire attached to the towing ring. A finishing touch is given by the scrap balsa "cheeks" which cover and streamline the lead weight in the nose.

When the model is covered and doped it should balance just aft of the wing centre chord. Lead must be added to the nose to achieve this. One last word to beginners; don't forget your D/T fuse when you fly *Plover*.



1	FUSELAGE BACKBONE	1	3/16" SHEET SPRUCE
2	NOSE BLISTER	2	BALSA BLOCK
3	WING PLATFORM	2	1/16" PLY
4	BRASS WOOD SCREW	3	1/4" NO. 4
5	TOW HOOK	1	16 G. PIANO WIRE
6	RUDDER STOP	1	20G. PIANO WIRE
7	RUDDER HORN	1	1MM PLY
8	D T HINGE PLATFORM	1	1MM PLY
9	RUDDER	1	1/16" SHT. BALSA
10	TAIL RETAINING HOOK	1	20G. PIANO WIRE
11	AUTO RUDDER WIRE STAPLE	4	20 G. PIANO WIRE
12	RUDDER OPERATING CABLE	1	C.L WIRE
13	RUDDER RETURN BAND	1	RUBBER BAND
14	CABLE TENSIONER	1	RUBBER BAND
15	RUDDER HINGES	4	NYLON TAPE
16	RETURN BAND HOOK	1	DRESSMAKERS PIN
17	TAILPLANE TRAILING EDGE	1	1/2" x 1/16" BALSA
18	TAILPLANE SPAR	2	3/16" x 1/16" BALSA
19	TAILPLANE TIP	2	1/16" SHT. BALSA
20	D T BAND HOOK	2	20G WIRE
21	D T ACTUATING HOOK	1	20G WIRE
22	D T HINGE PLATE	1	1MM PLY
23	TAILPLANE LEADING EDGE	1	1/8" x 1/3" BALSA
24	TAILPLANE RIB	9	1/16" SHT BALSA
25	TAIL RETAINING THREAD	1	NO. 40 LINEN THREAD
26	WING TRAILING EDGE	1	5/8 x 1/8 BALSA
27	UNDERCAMBER SPAR	1	1/8" x 1/8" BALSA
28	MAINSPAR	2	1/4" x 1/8" BALSA
29	LEADING EDGE	1	1/4" x 1/4" MED. BALSA
30	GUSSET	10	1/8" SHT BALSA
31	WING TIP	2	SOFT BALSA BLOCK
32	MAIN RIB	19	1/16" SHT. BALSA
33	NOSE RIB	22	1/16" SHT. BALSA
34	TIP RIB	2	1/16" SHT. BALSA
35	TIP RIB	2	1/16" SHT. BALSA
36	TIP RIB	2	1/16" SHT. BALSA
37	FIXED FIN	1	1/16" SHT. BALSA

FULL SIZE WORKING DRAWINGS ARE OBTAINABLE FROM YOUR LOCAL DEALER, OR BY POST FROM THE "MODEL AIRCRAFT" PLANS DEPARTMENT 19-20, NOEL STREET, LONDON, W.1, PRICE 4s. 6d., POST FREE

PETER CHINN'S

LATEST ENGINE NEWS

THE year 1960 was a bumper one for new engines. On average, we were testing one every ten days. Twenty-six of them are illustrated opposite. There were also a few tests on specials and on others yet to appear on the market. Excluding these latter, but with the addition of the re-tests on those old favourites, the Mills .75 and 1.3, published last month, the score includes 11 British engines, 10 American, four Japanese and one each from Italy, Germany and Czechoslovakia.

Smallest tested was the glowplug Herkimer O.K. Cub 024 (photo No. 10) of 0.408 c.c. from the United States. Easy handling, a little heavier than Cox's Pee-Wee 020, with similar power but developed at lower revs, it marked a breakaway from previous Cub design in favour of the Cox trend—reed valve, dual opposed ports, ball and socket small ends, etc. We wait to see whether other makers will join Cox and Herkimer in establishing a "Quarter-A" class.

Next up in size was the 0.499 c.c. Krick-Schlosser Tomboy (photo 8) from West Germany. Finely made, compact and light at only 1¼ oz., our example fell down somewhat in both power output and handling and was not to be compared, in this respect, with Alan Allbon's A-S "55" (6) of only slightly greater capacity. Our favourable verdict on the latter was shared by many others. The engine's generous shaft journal earned a comment that it should be proof against breakage: to which sundry 55's forthwith replied by breaking their shafts across the web instead. This weakness corrected, the 55 ought to establish itself as the best ½ c.c. engine yet offered.

Davies-Charlton's Bantam (16) 0.75 c.c. glow has a link with the above since it uses the same crankcase as the Dart diesel, designed, in its original form, by Allbon, 11 years ago. A record low-price, easy handling and a 12-months guarantee are features of the Bantam. A tendency for conflict between the spraybar, and the starter spring which uses it as an anchorage, was the only complaint we could make about this otherwise excellent value in a beginner's engine.

The Holland Hornet .049 Mk. II (2) came to us direct from Bob Holland in California and was one of the special factory "hop-ups" which (before the Holland Engineering Co. became part of Dynamic Models Inc.) Bob was wont to supply to competition enthusiasts for an extra $5 over the standard $6.95 price. $11.95 is "Cadillac dough" for a Half-A in a country where engines prices start at $2.49. So one has a right to expect something special but certainly not the incredible power that this little 0.8 c.c. glow motor actually gives. Ours delivered a fantastic 0.145 b.h.p. at 21,500 . . . smooth and clean with starting like a beginner's job. We pushed it still harder. At 25,000 it tore both blades off one well-known nylon prop and, later, at somewhere somewhere between 26,000 and 28,000, the tortured conrod could stand it no longer.

Closest rivals of the Hornets are the Hoppers. We haven't tried a stock Hornet Mk. II but a stock Cox Space-Hopper (13) was the best off-the-shelf 049 yet to pass through our hands. A figure of 17,800 r.p.m. on a 6 × 3 nylon prop, superb starting and delightfully smooth running distinguished an engine that was virtually beyond criticism.

The K & B Aurora Tornado 049 (5) was intended to be the ultimate in easy starting. K. & B designed and built it originally for Aurora's entry into the ready-to-fly plastic field. Without a starter, it had to start as quickly and easily as any starter equipped engine—and it does. Ours, cold, at the first attempt, started first flick of the prop. Engine has unique diaphragm intake valve, convenient large integral tank and is no sluggard either.

Allen Mercury's 049 (7), distinctive as an American engine built in England under licence, was also noted for excellent starting, aided by its neat, fully enclosed, starter with automatic clutch. Slight bother with spring breakages has been experienced but, fortunately, the motor starts well by hand. By our findings, just about the most powerful of the British glow 049's. Easy starting was also the aim of the 0.97 c.c. M.E. Heron (26) manufacturers. No potential record breaker, the Heron is a well-built, pleasant handling engine well suited to the beginner and should last a lifetime.

E.D.'s 1.49 c.c. Super Fury (19) was an immense improvement, performance-wise, on the earlier Fury which was rather lacking in "go," yet it retains the standard Fury's excellent handling characteristics. Special factory-prepared F/F and T/R competition versions are now available at increased cost. Slightly bigger than the Fury, the low-priced Fox Rocket 09 (1) glow engine failed to approach the diesels' power but equalled it for ease of starting. The Enya 09 Series 2 (3) on the other hand emerged as the most powerful .09 class engine yet handled, with an output of 0.176 b.h.p. at 16,000 r.p.m. on suitable fuel, plus very pleasant handling and sound construction.

Another low-priced Fox, the 2.42 c.c. Rocket 15 (24) failed to make the grade as a contender in the F.A.I. contest class, but, selling at under 50s. in the U.S., scored on a basis of power-per-dollar. Cox's Sportsman .15 (4) in marked contrast to its ball-bearing equipped contest brother, the Olympic, fared worse, with a modest maximum b.h.p. of only 0.192 at 12,000 r.p.m. However, the Sportsman is intended purely for "sport" flying. It is an unfailing starter and has no pretensions to contest performance.

One of the highlights of the year was the prototype O.S. Max 15 Racing Glow engine (11) which more than made up for the somewhat disappointing performance of the Max 15 diesel. With outputs approaching 0.45 b.h.p. on 50 per cent. nitro, high pressure fed, this is by far the most powerful 2.5 c.c. engine we have ever handled. Moreover, it starts with remarkable ease and consistency and runs as sweet as a nut.

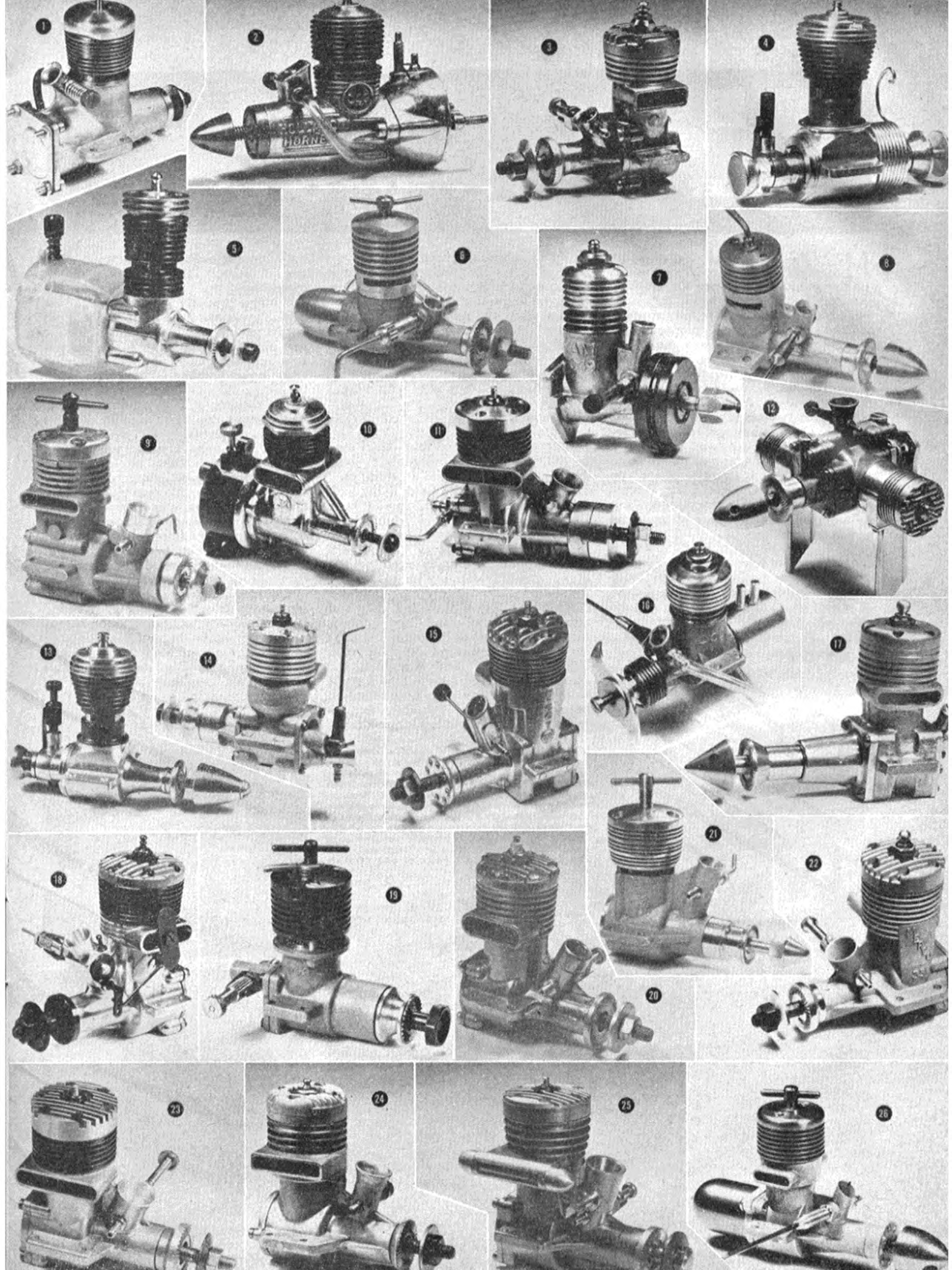
Of classic racing engine design, the MVVS 2.5/1959 (14) and the Fred Carter designed and built C.C.S. (17) had lower performance, but also handled excellently. The C.C.S, still under development, was one of three built for British speed fliers. It has a sandcast McCoy type case and block, twin ball-bearing shaft in machined housing, Tufnol disc valve giving 45-45 timing, six port 180 deg. exhaust, four port transfer plus a skirt port, alloy piston with bronze rings and beautiful workmanship throughout.

The new Super-Tigre Jubilee diesel (9) with its revolutionary port timing turned out to be the most powerful stock diesel 2.5 yet tested with nearly 0.34 b.h.p. at 16,000, but fell short slightly as regards quick-starting qualities. It remains to be seen whether the Eta 15 or Mk. II Rivers can equal or surpass this outstanding Italian engine's performance.

The Rivers Silver Arrow (21) showed itself to be the most powerful 3.5 c.c. diesel yet and clearly set new standards for "big" diesels. The high power, (nearly 0.4 b.h.p.) high r.p.m., easy starting and sweet running of this roller-bearing engine disproved, decisively, the widely accepted view that no diesel of this size can compete with a glow engine.

Davies-Charlton's long promised 4.87 c.c. Tornado Twin (12) was well worth waiting for. In many respects in a class of its own among twins, far too many of which have been failures, the complicated, yet sensibly designed and finely built Tornado was easy to handle,

Continued on page 31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RADIO TOPICS

HAVING been taken to task by several rudder only enthusiasts for our obvious preference for multi in previous "Topics," we feel it only right and proper to add that we fully appreciate the cash reason why single-channel is the only practical form for many enthusiasts—and also that you can get a lot of fun and satisfaction out of it. What we are mainly advising against is attempting to do *too much* with single-channel, via cascaded escapements and the like. Cascaded escapements certainly work all right, but there really is a practical limit to what you can hope to get away with on aircraft, where you need quick reactions. Four control positions (left and right rudder, and up and down elevator) are about as far as you dare go.

* * *

On the other side of the story, we get asked how *can* you do loops and rolls with just rudder only? Loops are easy, or should be. You need enough altitude to start with—and we really mean altitude, something like 500 ft. to be on the safe side—and then hold on right or left rudder to complete up to three turns in a spiral dive. Neutralise the rudder when the model is turning into wind so that it straightens out dead into wind—and hope! The speed built up in the spiral dive should take the model over into a complete loop, sometimes more than one—but this will depend on the trim.

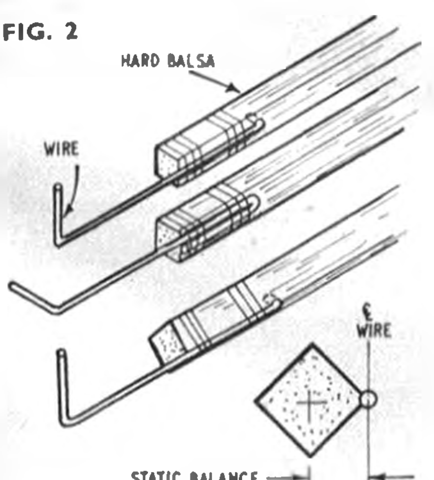
A model which is trimmed slightly tail down in normal flight will loop readily. One trimmed nose-down may be difficult, or even impossible to loop. The former corresponds to a "duration" F/F trim; the latter to faster flying with better penetration. You cannot have it both ways. A model trimmed for easy loops (rudder only) will always have that nosing up tendency coming out of turns and continually need a little opposite rudder tapping on to prevent a stall.

Rolls are not so easy, but they can come with practice—and here timing is more important than for loops. Build up speed with three turns of a spiral dive, as before, but this time straighten out crosswind. As soon as the model starts to zoom (immediately the nose comes up past the horizontal in fact), tap on rudder and then follow immediately with opposite rudder held on for perhaps a second or so. It's a matter of practice to get the "tap" one way and "hold" the other properly timed to flick the model over into a complete roll. First results are usually "'orrible"! But it can be done—just make sure that you have enough height in hand in case anything goes wrong.

* * *

The Bonner R.E. Varicomp escapement, now readily available in this country, is probably the simplest and one of the most reliable methods of adding "another control" to selective rudder-only. Wipe contacts sweeping over a printed circuit provide switching for cascading with other Varicomps, or quick-blip switching of a separate simple escapement for engine control. But for our money the best bet for aircraft use is selective rudder and trip elevator, operated off the single escapement.

Elevator action is provided by a separate drive arm—Fig. 1—and holding the third control position (press-press-hold) holds the crank against the elevator drive arm with the drive arm picked up and displaced a positive amount, i.e. to hold on "up" or



Min-X R/C equipment is rapidly becoming accepted in U.S.A. as amongst the most reliable and comprehensive available. Photos, right, show Jim Northmore (with glasses), head of Min-X, and John Krauer. In the top photo they are seen in very wintry surroundings doing what many other manufacturers should do—testing their products in the air and under extreme temperature conditions. Below they are seen at work checking the printed circuit of one of their Min-X transmitters.

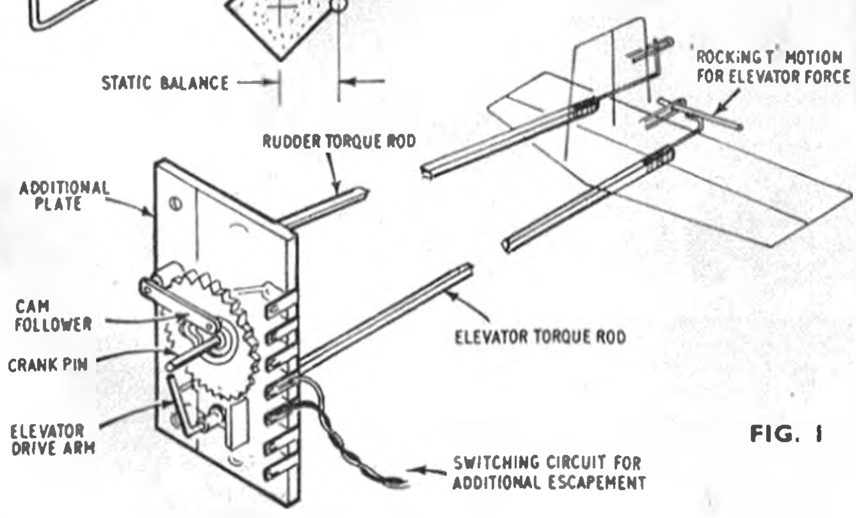
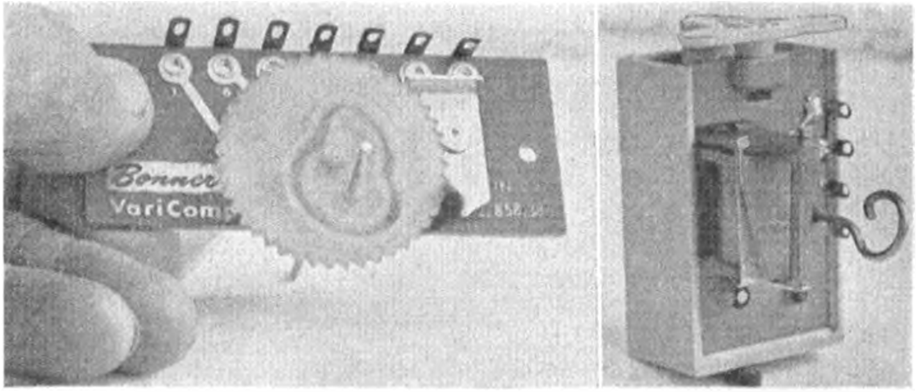


FIG. 1



Left: The Bonner Varicomp. Right: The Graupner servo-relay.

" down " elevator, depending on which way round the rear end is rigged. The rudder control shaft drive, in this case, utilises a cam follower working in the channel in the gear, the rudder shaft soldered to the cam follower lever and acting as its pivot. A separate Paxolin plate is mounted alongside the escapement baseplate, which is supplied fitted with a suitable, properly located, bush. The whole set-up needs careful installation but it is essentially practical and basically foolproof (virtually as foolproof as the installation linkage). If you want to use the switching controls, connect to a separate actuator (e.g. for motor control).

* * *

One silly point regarding Bonner and similar escapements mounted on a fairly large rectangular base—several people have mentioned to us that they are too wide to fit inside a small fuselage. No prize for the answer which is, simply, mount the thing vertically !

* * *

Another trade item recently received for comment is the Graupner servo-relay —which in " English English," as opposed to " German English " is simply a rubber-driven self-neutralising escapement with ratchet damping. The latter is there for the purpose of providing contact switching only (one very short pulse) for connection to a further servo for motor control. Mechanical operation is sequential (left-centre-right-centre).

Instead of the usual cranked arm a bellcrank is fitted at the top of the unit for two-wire connection to a conventional rudder horn (not a half horn, unless one side only of the control bellcrank is used operating through a rigid push rod). This bellcrank moulding can be detached and a wire push rod connected directly to the crankpin on the wheel, to convert to a motor servo. Operating voltage is specified as 4 to 6 volts, and current consumption only 50 milliamps.

Frankly we were not enamoured with the unit, despite its light weight (only 7/8 oz.) and low current consumption. It has no satisfactory provision for mounting; there is far too much slack movement on the bellcrank (about 10 deg. or so); and mounted horizontally to utilise the push-pull action for a motor servo the available length for the rubber motor is virtually nil. The gear wheel and ratchet mouldings, too, seem unnecessarily clumsy.

* * *

Plea from Moses Huang in Malaya is for building instructions for a " fully transistorised receiver that can follow fast pulsing . . ." Now to design a circuit on paper is one thing. To *prove* it is quite another. So as a general rule we are against publishing any designs, etc., unless we know from practical experience that the circuit is sound and will not present unexpected snags. We have, in fact, just run some tests on such a circuit as Moses Huang wants, and found some room for improvements. When we have worked these out we will include it as a " do-it-yourself " unit. So if you can wait, Moses . . .

* * *

Three American reed banks received for evaluation make interesting comparison—all well made, compact and, incidentally, all " packaged " in clear plastic boxes. The Deans 10-reed unit, the latest from that source, appears to continue his original practice of cadmium plating the reeds and has individual adjustment by screw. The Bramco 10-reed unit employs silver wire contacts and reeds are cropped in a curve to " logarithmic " lengths. The Min-X 8-reed unit, far smaller than the other two, is designed for lower voltage operation and has only a 60 ohm coil.

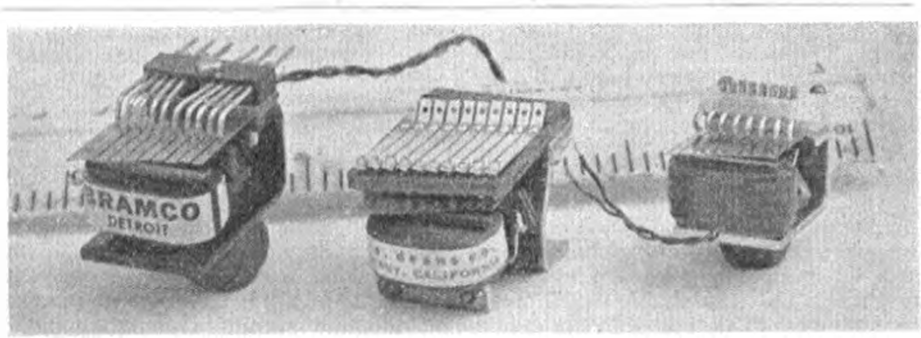
Comparative figures for these units are given in the table below.

* * *

Argument we had recently concerns the mechanical hook-up between actuator (or servo) and elevator or rudder control surfaces. We have always used balsa strip with bound on wire end fittings (except where a lightweight rubber escapement can be mounted in the tail end of the fuselage), and this system has always proved foolproof, rigid and light in weight. It has been more or less standard practice for years, yet people still regard it with suspicion. Long lengths of stiff wire (C/L push rod style) are definitely out because of weight, as well as being more difficult to install. Light metal tubing is quite unnecessary, and hardwood dowel is just as heavy—just stick to hard balsa strip (except possibly for aileron linkage where space is restricted). Nor does the wire end fitting have to be located symmetrically. It is better, actually, to bind it to one side, or one diagonal edge (Fig. 2). In the latter case the weight of the balsa push rod can act as a static balance on the control surface, if arranged on the right side.

(*Continued on page* 24)

	DEANS	BRAMCO	MIN-X
No. of reeds	10	10	8
Weight (oz.)	1	1 1/16	11/16
Coil resistance	3,000 ohms	3,000 ohms	60 ohms
Coil impedance at 400 c/s	10,000 ohms	7,000 ohms	200 ohms
Min. R.M.S. voltage to work all reeds	5 volts	10 volts	2.2 volts
Min. coil power to work all reeds	0.75 milliwatts	6.1 milliwatts	7.2 milliwatts
Bottom frequency	240 c/s	290 c/s	310 c/s
Top frequency	450 c/s	520 c/s	545 c/s
Separation	Excellent	Some beating on adjacent reeds overcome at drive voltages greater than 12 volts R.M.S.	Excellent
Comments	—	Reeds are rather slow in building up to full amplitude	—



TOPICAL TWISTS

by PYLONIUS

Open Air

Of interest to all non-modelling modellers is an armchair organisation known as Air Britain. Though, no doubt, we have one or two musty corners, here and there, this title is not meant to be taken verbally. The object of the society is the discussion of all those interesting craft which battle their way over our windy island, and which might be seen with the naked telescope if it wasn't for the cloud base in between.

These discussions, it can be seen, differ radically from the club meetings we are all so familiar with, in that they are devoted exclusively to aviation topics. Now, most clubs consider it bad form to talk shop on fun and games night, as many a hoarse chairman knows to his cost. Cars and motor-bikes, yes—after the girl friend gossip has exhausted itself, but never aeroplanes.

Still, it might not hurt, as an experiment, to introduce a spot of organised discussion into our festive clubrooms. An Air Britain type Brains Trust should make a suitable opening. Most clubs could rustle up a few tame experts at a pinch, and the lads would only be too pleased to have a dig at them. The resulting uproar (multi-throated) might drown the noise of the juniors, and send a few of the more mechanically minded members scuttling to the sanctuary of the car park.

Questions could be on similar lines to those aired by the Air Britain boys, but the answers might well be briefer. For instance, to the question, " What is the future of the fully automatic model ?," the prompt answer would be " Bigger armchairs." While to the question, " What is the most useless model you have ever flown ? " the answer would be even briefer, " It didn't."

Non-Stop Flying

Most activities seem to have a Season; grouse shooting, fresh water tiddling, trout tickling, and silly. I suppose the idea of the season limit is to stop the thing being flogged to death through over indulgence. In the more exuberent days of our hobby we, too, had our season. It made for a tidy sort of existence; building during the winter and flying in the summer. At the same time it was a very necessary institution. After a hectic summer there were too few models, or contest organisers, in good enough condition to face the rigours of the winter. It wasn't much fun trying to mount a competition for less than 500 entries; just wasn't worth the effort.

Now the pressure isn't quite the same, we have had to ditch our Season in favour of all the year round flying. This is largely a question of tactics. As soon as the word gets round that more than half a dozen models are available, all at the same time, the contest organisers clear the flying decks for action. Whether this burst of activity coincides with Boxing Day or August Bank Holiday is quite irrelevant—the show must go on.

I must say I don't share the ecstasy with which these winter meetings are greeted. It smacks too much of bravado. To present yourself on the bleak, mid-January flying field with your spirits full of high summer is asking too much. By the time you've summoned up sufficient enthusiasm to open up the model box, fumbled all the fiddly bits together with frost bitten fingers and got yourself lost in the fog, it's time to go home. And if it isn't you jolly well wish it were.

I'm all for reclaiming our flying season. At least you would have the summer to look forward to—even if you didn't get one.

Under-Cover Flyers

The threatened increase in insurance rates is causing some perplexity among the gently-does-it-boys. Lots of modellers who never fly out-of-the-common-rut, including all the stick-in-the-Chobham-muds, have never seen a model flown in anger. The only vice to which they are given is to lend a trembling ear to all those wild stories of the bad old days, when it was not unknown for a well aimed power model to dent the bonnet of a parked jalopy, or for some skittish glider to scratch the paintwork of a motor bike.

But, somewhere beyond the pale, the fly-for-cover boys are cutting it up something chronic. We don't know what sort of devastation they are wreaking upon the innocent citizenry, or what sort of weapons they might be using. We can only suppose they are flying oversized models on undersized air-fields. Failing that, they may have found some legal loophole which extends the model insurance to flood, fire and stock car racing.

Perhaps we might even localise the trouble to an off-trim character who keeps testing his missiles up wind of a market garden, or a multi-radio type who has gone berserk. And, talking of multi radio going berserk, it seems from Club News that a group of wild northerners are getting up to the sort of tricks that give Insurance Brokers ulcers. Strafing grounded aircraft and small girls might be all good clean fun, but places a premium on safe flying.

Constructive Criticism

Gone are the days when the raw beginner grabbed a handful of raw balsa and got stuck into his first model with both elbows flailing. The modern way is more refined and much less exhausting. Possibly the hardest part of the job is getting the wrapping off the carton. After that it should be all plain sailing. Anything that would tax the dexterity of a four-year-old is prefabricated, and the various parts almost jump together under the persuasive, any-kid-can-do-it, chatter of the instruction leaflet. In fact, the modern kit is so novice proof that it is almost impossible not to produce the perfect model.

Anyone want to bet ?

All this technical refinement in building processes goes hand in hand with educational advancement. Higher education for all is reflected in the youthful approach. The lad who was the butcher boy of yesterday is today's sixth former, who is not expected to advance beyond the plastic stage until his education is completed. Our butcher boy, in his ignorance, would have produced his first, crude hand made flying machine sometime during his fifteenth year. His modern counterpart, on the other hand, is, at this age, grappling with the basic theory of R/C. The next few years are spent developing ideas and producing plans. By the time he's ready to pin down the first stick of balsa he's married, and too involved with his family and career to carry on his boyish pursuits.

This explains why junior club members never build models, and why all the active flyers are ageing butcher's boys.

There are exceptions, of course. We did hear once of a club which boasted a boy phenomenon: a junior member who actually built and flew his own models.

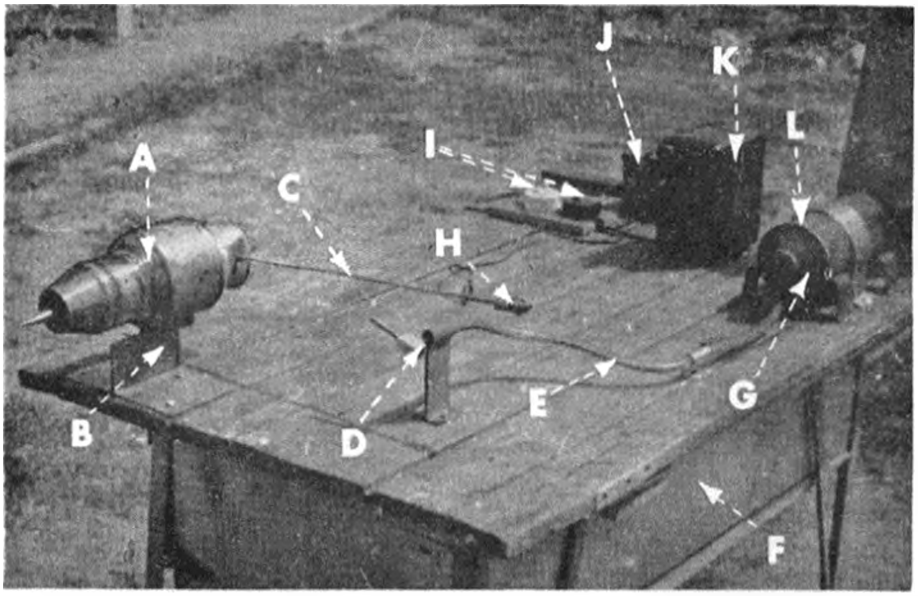
Naturally his fame soon spread. Other clubs became interested, with take over bids the order of the day. A few disgruntled concerns alleged the whole thing to be a publicity stunt, but their voices were drowned amid the tumult of acclamation.

Suddenly, however, he disappeared from the modelling scene. It was subsequently learnt that he had taken up fishing. Just another story of the one that got away.

Ruling Passion

If I were an F.A.I. official (all right, I know you think me daft enough) I'd open up the visor of my suit of armour, or whip off my disguise, and plead for a simplification of the F/F rules. Why fight progress ? I would ask. Trying to keep a rampant power model inside a small airfield is like stuffing an elephant into a bird cage. The obvious answer is to run our contests on the lines of the highly successful toy balloon formula. Forget about motor run limits, flight maximums and d/t's. Give the models their head, each with a full tank and a large luggage label and we can forget contest worries.

And just think of the excitement as the results pour in from the far flung quarters of the globe. Will the British entry which landed in Vladivostok hold its lead, or is there any truth of an American model landing in Peking ? It wouldn't dare, we say hopefully, keeping our fingers crossed the while that our other entries hadn't gone into orbit.



W. Benson-Ball concludes his series of articles by describing his

ROCKET, PULSE and TURBO JET UNITS

ABOUT THE WRITER

Occupation

Test pilot, including most aspects of test and other flying, also concerned with engine development, engineering design (aero and engine).

Hobbies

Aeromodelling—mainly in model aero/engineering research and design. Motor racing, chemistry and rocket research.

THERE has been considerable interest shown in the first two parts of my series, which dealt with model delta design, and advanced ducted fan units and I hope that this, the final part, in which I will cover the development of the more complex of my power units, will be of equal interest. I must emphasise that this is not a step-by-step constructional article but simply an account of my own experiments, which may perhaps inspire those of you possessing the necessary ingenuity and facilities, to further investigate this fascinating, but necessarily complex, branch of our hobby.

Solid fuel rocket motors

(This section is only included for the sake of completeness since solid fuel motors were an important part of the writer's experiments. However, readers are reminded that not only are experimental motors of this type extremely dangerous, but the Explosives Act makes it illegal to experiment with home-made rockets, to modify firework rockets (i.e. to install them in models) or to use any propellant in a commercial or home-made engine which is not specifically manufactured for that purpose.—Ed.)

Although the most dangerous in experimental form, these are the simplest form of model jet power. My early rockets were all cardboard cased, designed to last six to ten times before being scrapped, but I soon started on the metal case, charge loaded type of motor.

The rocket motor illustrated is a powerful and comparatively safe design which works extremely well in a duct, with a thrust augmentor tube, or mounted externally. I must point out, however, that ALL rocket motors are dangerous, and despite years of perfect operation and every precaution they can, and do, explode even when they have safety factors built in. So once a rocket of any kind is alight it must be treated with extreme caution.

The aerothermodynamic duct or ram jet

This is the simplest form of power unit in existence, as there are no moving parts—operation depends upon the ram pressure of air combining with fuel and creating a highly inflammable mixture. After initial ignition it burns continuously, and provides a very high thrust/weight ratio, but the snag for model purposes is that it has to be moving quite fast for the ram pressure to be initially induced. There are several ways of overcoming this problem, i.e. a powerful catapult, rocket booster, etc., however one method I used was to combine a ram jet with a normal jet unit—in effect an engine within an engine.

The pulse jet was mounted in a specially designed stainless steel chamber, pressure fuel supply and flame stabilisers were added, then when the aircraft reached 80-100 m.p.h. on the pulse/turbo jet the ram jet fuel was pressure sprayed into the outer chamber, i.e. the space between the outer case of the pulse jet and the stainless steel casing. The jet, glowing almost white hot, naturally ignited the fuel/ram air mixture, whereupon the pulse unit was switched off and the aircraft accelerated away on the ram jet power.

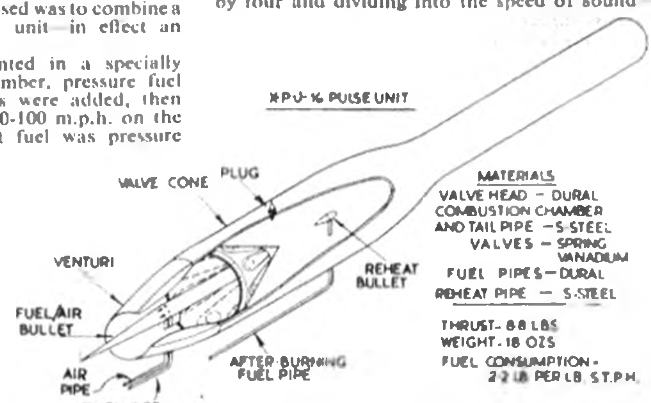
Unfortunately at model altitudes ram jets are very thirsty, but against this, as they generate terrific power, they can be appreciably smaller and thus more economic than some other types of jet.

The impulse duct or pulse jet

Apart from the ram jet this is one of the simplest of engines, there being only one moving part—the valves. (Certain types of pulse jets do in fact operate without valves, but their design is too critical for model use.) Pulse jets have, of course, been used experimentally since 1908 but it was not until 1928, when Paul Schmidt designed his motor, that a practical application of this power system was feasible. However, little was heard of the system until the Second World War, when the Germans "introduced" the pulse jet to the general public in the form of the V.1 *Flying Bomb* or *Doodlebug*.

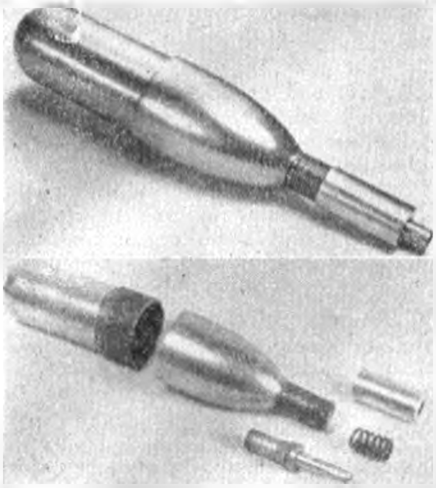
This "aircraft" used the Schmidt Argus unit, but the Marquardt principle, on which nearly all my units are based, is more suitable for model use, although alterations to the valve design were found necessary. A further modification was a venturi type inlet, to draw the fuel through the valves and eliminate the necessity for a pressurised fuel feed. This modification made it necessary to provide an initial blast of air to get things going, so with several units I reverted to pressure feed which also overcame the venturi "dead cut" characteristic. Unlike an i.c. or turbo engine a pulse jet has no flywheel inertia, therefore if a break in the cycle occurs it stops dead, but the advantage of pressure feed is that you can switch off and relight in the air. Another important modification was a coned valve head, which greatly improved the fuel/air mixture and combustion characteristics.

Although simple in layout the impulse engine is far from simple in design. The pulse jet does not produce a continuous combustion like a ram jet or turbine unit—it goes "bang" many times a minute, each "bang" being the result of a fresh charge of fuel/air being sucked in and ignited. The V.1 unit ran at about 140 cycles (bangs) per second, whereas my units range from 250 c.p.s. to about 1,200 c.p.s. This is known as the resonant frequency, and is calculated by multiplying the length of the tail pipe by four and dividing into the speed of sound—

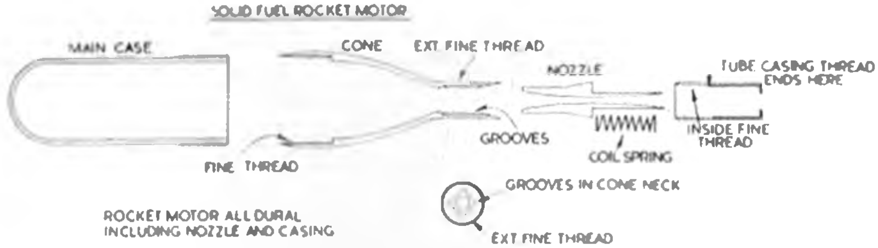


Type	lb thrust	c.p.s.	wt. oz.	length in inches	max. dia. in inches	tail pipe dia. (in.)
X.P.J.8	3	182	18.5	25	2.52	1.2
X.P.J.11	4.7	202	17.3	24	2.5	1.3
X.P.J.12	4.8	230	12.5	22	2.6	1.26
X.P.J.14	5.9	280	14.7	28	3.17	1.58
X.P.J.17	2.2	260	7.0	17.75	1.75	0.88
X.P.J.18	3.8	245	12.5	20.0	2.51	1.25

Our heading photo shows one of the writer's units on the test bench. Key: (a) turbo jet unit; (b) engine test stand; (c) fuel line; (d) fuel control valve; (e) plastic fuel pipe; (f) test bench; (g) fuel tank; (h) pressure head; (i) switch panel; (j) coil; (k) battery; (l) fuel tank pressure point.



The solid fuel rocket motor.



for our purposes 762.0 m.p.h. and is the most important design factor. It will be seen from this that model units operate at much higher frequencies than full size units and this is desirable as the higher the frequency or pulses per second, the higher the thrust/weight ratio.

The cycle of operations is quite straightforward. Following the initial explosion, the only escape for the expanding gases is via the tail pipe, since the valves are one way only, thus back pressure, due to rapid expansion of the gases, closes the valves, the gas accelerates down the tail pipe, and the inertia of these gases causes a negative pressure (i.e. below atmospheric pressure) inside the combustion chamber. The normal atmospheric pressure in the venturi tube now opens the valves allowing the fuel/air mixture to enter and the whole process to be repeated. The number of times per second that this cycle of operations is repeated is therefore the cycles per second frequency (c.p.s.) of the engine. There is a definite optimum ratio of combustion tube length to maximum dia. for any given size of unit, the ratio increasing as dia. decreases. As a result our model size unit must be longer in relation to dia. than a full size unit.

The biggest unit I built powered a jet trolley on which I used to lie on my stomach with my legs spread each side of the engine. This unit had a maximum dia. of 6.27 in., a length of 50 in., weighed 12½ lb. and gave a static thrust of 42.2 lb., while fuel consumption was 1.87 lb. per pound thrust (static) per hour at full throttle. I safely achieved quite high speeds on the beach, but making a run down the lane one day I hit a rut at high speed which threw me straight through some bushes and into the garden where my father was quietly digging. He poured his bucket of weed killer over my smouldering clothing and that was the end of my trolley.

Construction

The basic layout of a pulse jet consists of an alloy valve head with machined venturi and ducts leading to eight to fourteen valve ports, a combustion chamber and tail pipe and a fuel "bullet" which is mounted centrally in the venturi throat. Stainless or nimonic steel is essential for the body of the unit, but the valve head may be turned from dural (not aluminium).

The general dia. of the multiple inlet ports should be between 0.332 in. and 0.438 in. for the average model size of unit. Blued and tempered Swedish steel of between 0.005 and 0.009 in. is suitable for the valves of a 3½-4½ lb. thrust motor. These valves are first cut to shape and then treated. Great care must be taken to ensure a gas-tight seal between valves and ports which should both be highly polished. A hole must be left in the centre of the valve petal assembly and a convex shield is bolted against the valves as a heat deflector.

Form the combustion chamber from sheet and weld it to a steel tube of the correct dia. for the tail pipe which should have a divergent rear end. The valve head can either be screwed into place or made a tight push fit and bolted or clamped in position.

Data for six of my units is contained in the table (p 11) and fuel consumption figures for these range from 0.98 lb. per pound thrust per hour to 1.86 lb. per pound thrust per hour. The X.P.J. 14, however, consumes approximately 5 oz. per min.

The gas turbine unit (turbojet)

This is the most difficult engine to design and construct in model sizes and it took me quite a few years to develop units that were completely safe, reliable, and of a suitable size and weight.

The principal data I had initially were early reports on German research in the pre-war years, but when the war finished I obtained much more data and was fortunate in being able to assist in the operation of early British full size units.

I was now able to build two centrifugal flow units, one of which reached 41,000 r.p.m. before disintegrating! After various parts of the engine had been dug out of me, and several hundred yards of bandages removed, I decided that there was no future in model centrifugal units so continued experiments with the axial layout.

When designing a turbine unit many factors other than thermodynamics must be taken into account. The choice of materials is limited, and for the "hot" parts, expansion rates, etc., are a complication, so past experience with pulse jets indicated that stainless steel, nimonic, and dural, would be satisfactory.

For the bearings I used high temperature ball and roller races in which ran a hollow shaft, the front end of which was an oil container. The oil lubricated the forward bearings, then flowed through the shaft to the rear bearings, eventually vapourising into the tail cones to exit with the exhaust. The heat in the rear part of the motor was normally sufficient to draw the oil through the shaft, although in some units I did use a pressurised oil tank.

To test my compressor I rewired an electric motor to give exceptionally high r.p.m., and coupled it, by flexible drive, to the rotor shaft. This enabled me to test each compressor stage, check the pressure pattern, and by smoke, wool tufts and perspex inspection panels, observe what was happening inside. The next stage was to subject the bearings to the heat of a blowlamp and iron out any snags, then carry out a practical test of the all important fuel flow, atomisation and combustion, first, of course, replacing the Perspex panels with steel plates.

The turbine was rotated by the electric motor which was disengaged as soon as combustion took place. After initial troubles due to turbine flow problems the unit started, and although a rather smoking jet stream resulted, the unit ran and produced thrust. Further experiment with combustion chamber design resulted in much cleaner burning, and changing the fuel from petrol to paraffin improved things generally.

Practical theoretical considerations

At all model speeds performance figures can be worked out by ordinary analytical means, by assuming that: (a) the thrust is constant at all flight speeds at any given height and constant engine r.p.m., and (b) that the total drag coefficient can be written as:

$$C_D = C_{Dz}\ \text{(PROFILE)} + K\frac{C_L^2}{\pi A}\ \text{(INDUCED)}$$

and wing profile drag coefficient as a constant (C_{Dz})

The max. speed therefore is

THRUST = DRAG

$$T = \frac{1}{2} P V^2 S \left(C_{Dz} + \frac{KC_L^2}{\pi A}\right)$$

$$q = \frac{1}{2} P V^2 \qquad L = W = C_L q S \quad \therefore C_L = \frac{W}{qS}$$

$$\therefore \frac{T}{S} = C_{Dz} q + \frac{K W^2}{q S^2 \pi A}$$

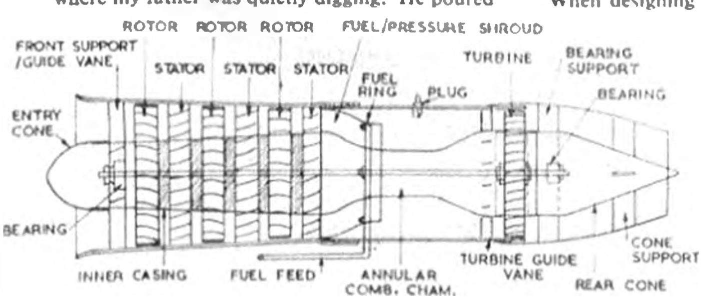
$$= C_{Dz} q + \frac{K W^2}{q \pi A} \qquad W = \frac{W}{S}$$

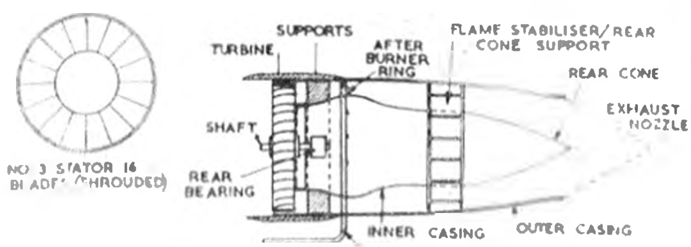
q = lb/ft^2 $\qquad$ V = ft/sec

Of course ram effect does increase thrust to a certain extent but this can be assessed during flight testing.

As it is impossible to calculate by theory how the aerofoil of a compressor blade would react in the airflow alone, this is done by measuring the air deflection and loss of total haul over a wide range of incidences on a cascade of blades, the results being compiled on a graph (Fig. 1). The blade configuration is defined by the stagger angle and pitch/chord ratio, the profile itself being defined relative to its camber line, combined with data on thickness/chord ratio, and leading edge/trailing edge ratio of curvature. As incidence increases the air deflection is also increased until the blade stalls, due to flow breakaway from the upper convex surface. A similar effect is evident at negative incidences, breakaway occurring naturally on the concave surface.

Incidence is measured at the mid point of the blades, but due to changes in peripheral velocity along the blades for a given axial velocity, the velocity triangles will change from root to tip and this must be taken into account. A number of principles can be used when fixing the blade incidence variation, the most applicable for our purpose being the free vortex. In the annular space between the stages a free vortex is designed, the principle utilised being the absolute whirl





REAR TURBINE / ENGINE SECTION WHEN FITTED FOR RE-HEAT

XJE 40

velocity of a free vortex which is inversely proportional to the radius, on the assumption that with constant axial velocity at all radii, the outlet air angles at all radii can be fixed.

Bearing in mind the ducted principle, and the use of larger dia. rotors of a less number of blades, the following should be carefully considered:

A = area of rotor $\frac{\pi D^2}{x}$

V^1 added ducting velocity in ft/sec

Thrust $T = A\rho r\left(V + \frac{V_1}{2}\right)$ lb. wt

Efficiency $\eta = \frac{1}{1+\frac{V_1}{2V}}$ or $\frac{1}{1+a}$

where $a = 1\frac{\frac{V_1}{2}}{V}$ axial inflow factor

Relative velocity of air ahead in duct $= V$.

Relative velocity of air moving through rotor $= V + \frac{V1}{2}$

Relative velocity in flow/ducted area $= V + V1$

Resultant flow

The resultant x in the sum of the axial velocity $V(1 + a)$ and the rotational velocity $xr\,(1-a')$ where a' is the corrective factor, is derived from the rotation imparted by torque, called the rotational inflow factor —

$\therefore \tan\phi = \frac{V}{xr}\,\frac{1+a}{1-a}$

where x = rotational speed in radians / second

Angle of incidence $a = \Theta - \phi$

Element of thrust given by blade plan area $C\delta r$

$\delta T = (C_L\cos\phi - C_D\sin\phi\,\tfrac{1}{2}\rho)$ $(^2C\delta r$

Element of torque =

$\delta Q = (C_L\sin\phi + C_D\cos\phi\,\tfrac{1}{2}\rho)$ $(^2C\delta r x r$

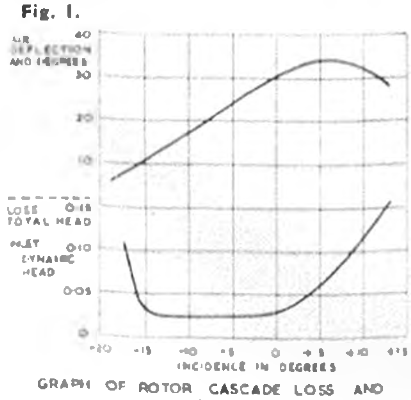
Efficiency of blade

$\eta = \frac{\delta TV}{\delta Qx} = \frac{1-a'}{1+a}\tan\phi\,\frac{(C_L\cos\phi - C_D\sin\phi)}{(C_L\sin\phi + C_D\cos\phi)}$

or

$\eta = \frac{1-a'}{1+a}\,\frac{\tan\phi}{\tan(\phi+\gamma)}$ where $\tan\gamma = \frac{C_D}{C_L}$

Fig. 1.

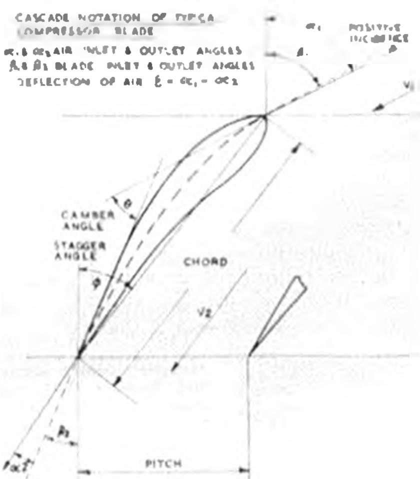


GRAPH OF ROTOR CASCADE LOSS AND DEFLECTION CURVES

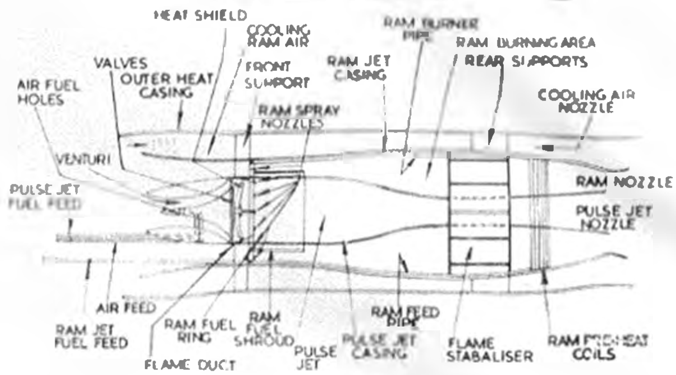
When the more exact equation for efficiency is compared with the ideal efficiency of propulsion, i.e., $\eta = \frac{1}{1+a}$ it is apparent that the efficiency is reduced by the small rotational inflow factor a', but to a greater effect by V which expresses profile drag in the blades. $CLCD$ are the coefficient for the two dimensional flow, but act independently of each other.

Construction

A well-equipped workshop is essential if turbojets are to be produced. You will need a lathe, welding outfit, accurate flow meters, pressure measuring equipment, a really good tachometer and pressure gauges, V blocks, and ball bearing balance blocks, in addition to a good range of more orthodox engineering workshop tools, and a careful selection of the required materials. Patience and enthusiasm are also required in abundance for you may have to spend several hundred hours on very accurate marking out, building and balancing. However, the results of all your labours should have a fairly long working life as the only moving parts affected by frictional wear are the shaft and bearings, which are the simplest items to replace. The compressor will last for many years if treated properly, but the turbine, subjected as it is to such extreme temperature, eventually requires replacement.



The compressor housing can be built as a dural casting and machined on the lathe, a stainless steel liner is afterwards fitted in the aft section, to which the stators may be attached in several ways. The rotors are dural or stainless steel, but in all cases the last stage must be stainless steel or nimonic. The combustion chamber, stack pipe, inner casing, turbine, rear cone, supports, and shaft are all of steel. The fuel tubing can be made of copper or stainless steel.



It must be remembered that these units run at high temperature, and it is advisable when bench running to run the unit in a duct; this induces a flow of cooling air round the engine and helps to prevent overheating which would seriously shorten the turbine life.

There are various ways of measuring thrust and static h.p. but one of the simplest, if you do not possess or cannot build complicated equipment, is merely to mount the unit on a trolley with an attachment to an accurate spring balance. This will give you the approximate thrust in pounds, but there are far more accurate methods of thrust measurement. A flow meter can be very useful remembering that volume is inversely proportional to pressure, also that s.h.p. varies directly as the cube of the speed

thrust N × static thrust $\left(N = \frac{th}{v}\right)$

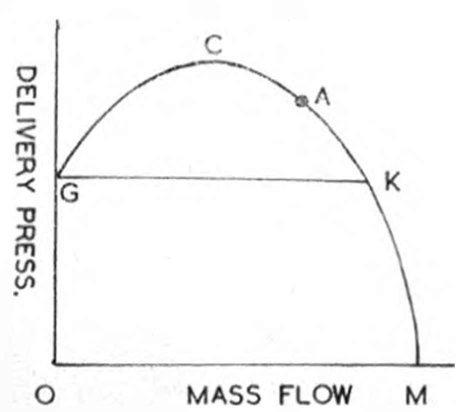
(available) ST × $\frac{33{,}000}{2}$ in ft. per min.

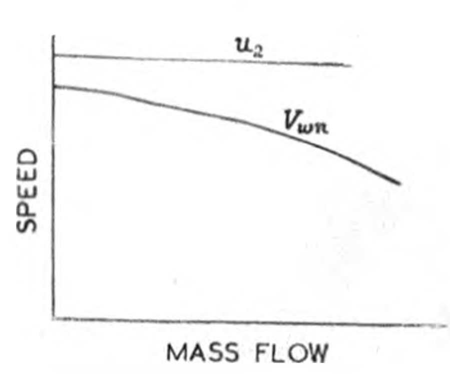
It is important to have a very well laid out test bench, with your instruments wired and piped to a separate panel well clear of the bench. Initial ignition is by sparking plug or a special glow rod; once the engine is running this is switched off as in a full size unit, the heat of combustion providing continuous burning while the fuel lasts.

Very interesting experiments can be carried out with these engines, and even if you do not intend to fly them their application to boats and racing cars is quite straightforward. One of the biggest thrills for me was, after all the years of research, work and disappointments, I achieved what everyone else thought was impossible—a powerful and reliable gas turbine engine that was of a size and weight completely suitable for flying model aircraft. Only full size commitments and earning a living have prevented me from developing these power plants further, and my personal time is limited these days. However, I hope, within the next two years, to build my X-D-107 and power it with my latest engine, which is quite a cert.

• • •

This concludes this series in which I have tried to explain things as simply as possible, and yet include enough data for you to get started with jets. I will be pleased to advise anyone through Model Aircraft in any way I can and look forward to hearing from you. I do hope that 1961 will see a few new shapes over the flying field, although they will not be new to me.





AVIATION NEWSPAGE

IN CASE YOU THINK all this business about automatic landings for airliners is new, an extract from a recent issue of *Air BP* magazine will soon put you right. Reminiscing about early efforts with a Boeing 247D at R.A.F. Defford, way back in 1944, Group Captain J. A. McDonald records: "We were able to home the Boeing from 50 miles, orbit the field at a selected range, line up with the runway and land, all on the auto-approach system—results not previously achieved in any sphere of aviation . . ."—and still not being achieved 16 years later as an answer to safe operation in bad weather.

* * *

A NEW PIPER PRODUCT is always worth studying, because this company has produced more civil-type aeroplanes than any other company in the world—well over 50,000—and knows what the customer wants.

If he wants a good, safe, sturdy, easy-to-fly, all-metal cabin monoplane for under $10,000 there is little doubt that the Piper *Cherokee* will take some beating. Unveiled in November, it looks like a fixed-undercarriage *Comanche* at first glance. In fact it is entirely new, with a constant-chord wing, set at a very marked dihedral angle for good stability. And it is made up of only 1,200 components, compared with more than 1,600 in the high-wing *Tri-Pacer*.

Powered by a 160 h.p. Lycoming engine, the *Cherokee* will haul four people around in comfort at better than 130 m.p.h. when it starts rolling off the assembly line at Piper's new Vero Beach, Florida, plant in February. So it should be a small plane with a big future.

* * *

NOT CONTENT with having triggered off the spending spree for some £800 million worth of "big jets" back in the mid-fifties, Boeing's 707 prototype (above) is finding new ways of getting money out of the airlines.

For well over two years its successors have given air travellers the fastest, smoothest, safest flying ever experienced. Latest figures for the 707s alone, up to November 18th, showed totals of 10,038,000 passengers and 186,000,000 miles flown in 418,400 hours. But the biggest "big jets" are still very much trunk-liners, needing up to 10,700 ft. of concrete for a full-weight take-off.

The old Model 367-80 prototype of the 707/KC-135 *Stratotanker* family is being used therefore to develop high-lift devices to shorten take-off and landing runs. In addition to its double-slotted flaps, it now has an extended and cambered leading-edge on its inner wings, plus full-span leading-edge flaps. This could lead to either bigger payloads for the airlines or a quieter life for folks living around airports. It's your guess which is the more likely!

* * *

FLEAS, of the Mignet *Pou-du-Ciel* species, are beginning to breed again in many parts of the world, from the United States to Japan, and especially in France where their originator is back in business.

The trouble with the pre-war *Flying Fleas,* which didn't, was that their amateur builders thought they knew better than Henri Mignet and introduced all kinds of clever mods of their own design. The result was usually either too heavy to get off the ground or dangerous when it did.

Typical of the new generation of *Fleas* inspired by the Mignet prototypes is the EC-1-02 (below) built by Emilien Croses of Macon in France. It is a sturdy little side-by-side two-seater, powered by a 65 h.p. Continental flat-four and featuring the usual pivoted forward wing, which dispenses with the need for ailerons and elevators. Span is 25 ft. 7 in., length 17 ft. 1 in. and loaded weight 1,150 lb.

According to its maker, the EC-1-02 cruises at 87 m.p.h. But the real attraction is that it will remain airborne at a forward speed of 15.5 m.p.h., although Monsieur Croses notes that it does so in a nose up attitude. This should be worth seeing.

* * *

STRATEGIC AIR COMMAND has a suggestion for pilots whose aeroplanes won't fit into small airfields—buy a couple of GAM-77 *Hound Dog* H-bomb-carrying missiles and hang them under the wings.

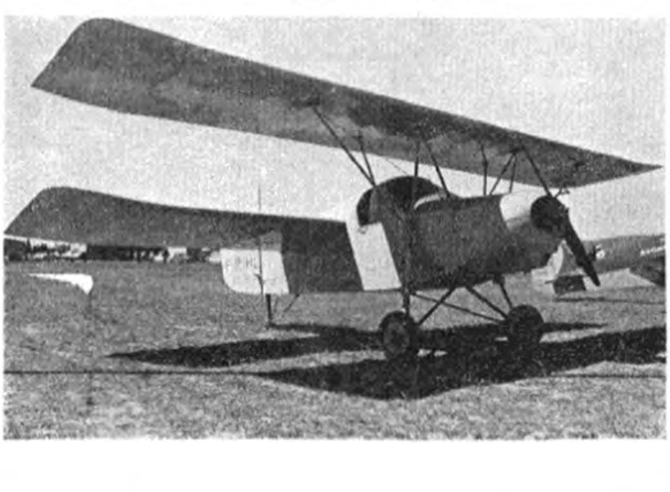
By the time SAC has loaded a B-52G *Stratofortress* with a pair of *Hound Dogs,*

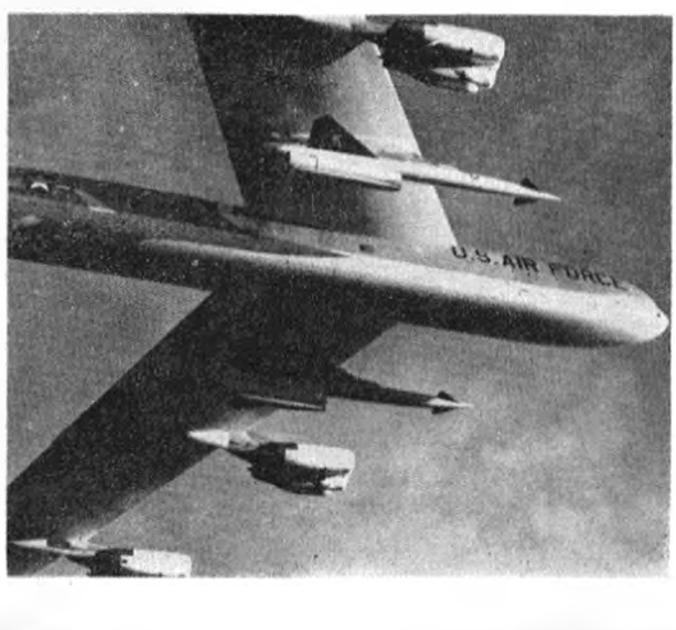
Concluded foot column 3 opposite

Heading photo shows the Boeing 707 mentioned in the text. Left: the Piper "Cherokee."

Below, left: A recent version of the "Flying Flea."

Below, right: "Hound Dogs" slung beneath a "Stratofortress."





THE McDONNELL F4H-1 *PHANTOM II*

ON September 25th, Cdr. John F. Davis of the U.S. Navy took off from Edwards Air Force Base, California, in an F4H-1 *Phantom* II interceptor, climbed to 4,500 ft. above the Mojave Desert, levelled out and opened up his two afterburning J79 turbojets to full throttle.

Seventy-five miles later he passed through the gate of an invisible speed course, put the F4H-1 into a 70-75 deg. bank and felt the "G" thrusting him down into his seat as the aircraft began streaking around in a 100-km. (62.1 mile) circle. On the ground a radar operator watched the fighter's blip racing round his scope and passed instructions by radio to keep its pilot on course. One wingtip inside the marked-out circuit on the screen would have nullified the whole operation. Deviation of half-a-mile off course the other way would have reduced the calculated air speed by 60 m.p.h.

All went well. The 62.1 miles were covered in 2 min. 40.3 sec. and the U.S. Navy was able to ask the F.A.I. to confirm a new 100-km. closed-circuit speed record of 1,390.21 m.p.h. Cdr. Davis got a Distinguished Flying Cross for beating by nearly 92 m.p.h. the former record, set up by a Russian T-405 fighter last May, and the world had further proof of the capabilities of the remarkable F4H-1. Twenty days earlier, another F4H-1 had broken the 500-km. record at 1,216.78 m.p.h. Earlier still it had held the world height record for a while, with a climb to 98,557 ft.

Even its designers, the McDonnell Aircraft Corporation, would hardly claim that it is the most beautiful aeroplane in the sky. But, like so many carrier-based aircraft, its shape belies its efficiency.

The specification to which it was designed, in competition with the Chance Vought F8U-3 *Crusader* III, called for just about the impossible, including a longer range than current fighters, coupled with a Mach 2 performance, all-weather capabilities and a primary armament of at least four *Sparrow* III radar-homing missiles. Flight had to be virtually automatic and, of course, the aircraft had to fit into a carrier, performance and space-wise.

Chance Vought settled for a single-seater and got a fine fighter. McDonnell decided on two men and a vast amount of fuel, got a much larger aircraft and the production contract.

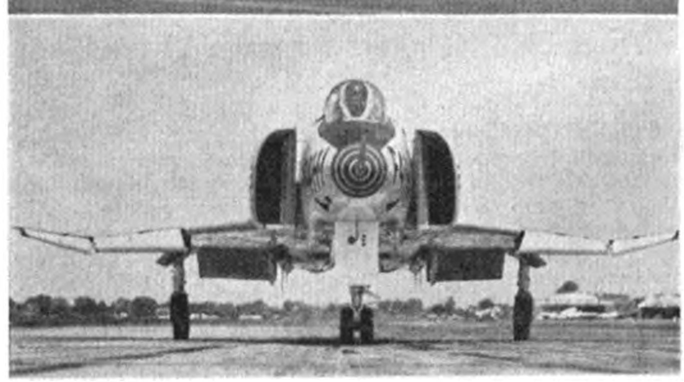
The prototype XF4H-1 flew on May 27th, 1958, powered by two 16,150 lb.s.t. General Electric J79-GE-2A afterburning turbojets, with which it has flown at Mach 2.6 during its flight trials. The first 40 of the 192 production F4H-1s ordered to date are also having J79-GE-2As, but the remainder will have more powerful J79-GE-8s.

Aerodynamically, these aircraft have everything. The wings are swept at 45 deg., have a dog-tooth leading-edge, with extended chord and considerable dihedral on the outer panels. The outboard half of the leading-edge of the inner wings can be drooped to supplement the large trailing-edge flaps and there are 23 deg. of dihedral on the all-moving tailplane. Flap-blowing is used to shorten take-off and landing runs.

In addition to its vast internal tankage, the F4H can carry two 300 gal. underwing tanks and a 500 gal. tank under its fuselage; and can also be refuelled in flight. Armament can include two more *Sparrows*, nuclear weapons or rockets under the wings, as well as the four *Sparrows* carried semi-submerged in the bottom of the fuselage and wings.

That is about all we know at present about the F4H-1, but it adds up to quite an aeroplane.

Data: Span 38 ft. 5 in.; length 56 ft.; loaded weight over 40,000 lb.



These revealing photos show many interesting details of the F4H—2. Top: in the take-off attitude with landing gear just retracting. Next, an almost perfect plan view clearly showing the "Coke bottle fuselage," control surfaces, etc. Third photo emphasises the anhedral all-flying tailplane and also shows the re-fuelling probe extended. Bottom photo is a unique shot showing the fine pilot-vision and wing tip dihedral.

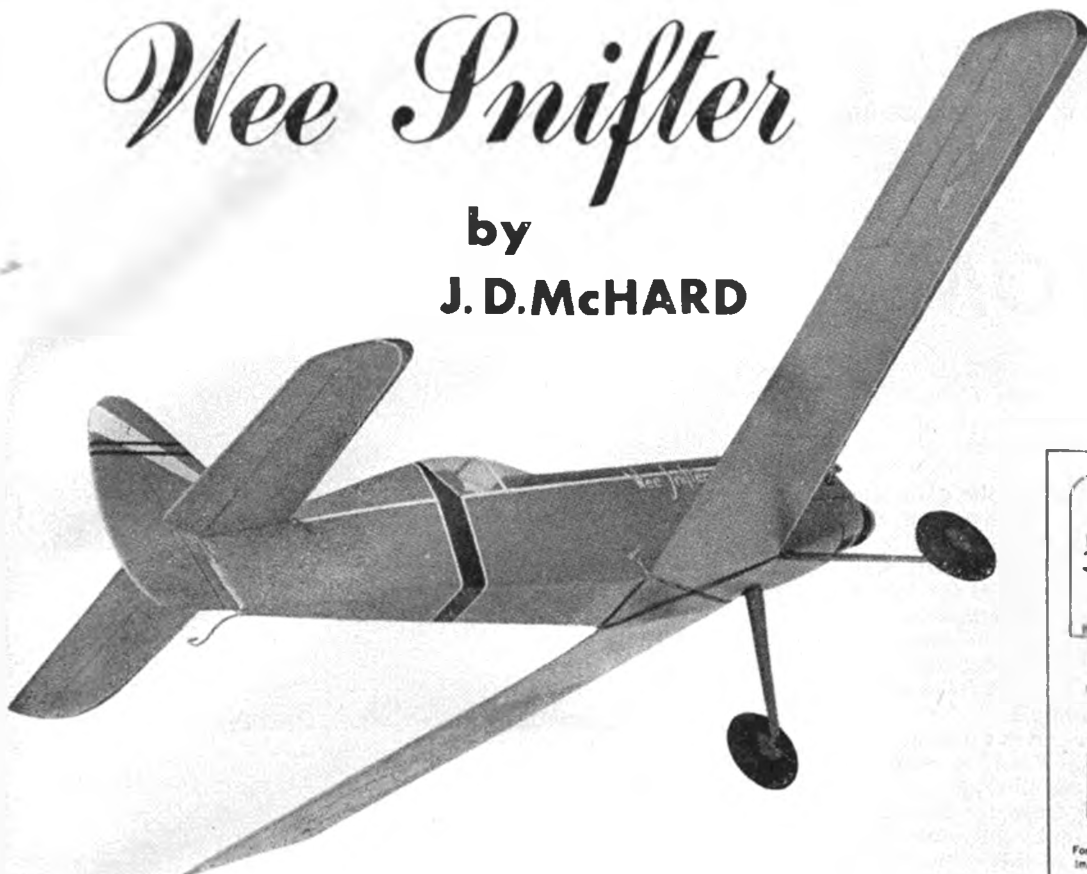
Aviation News Page—*Continued*

a belly-full of assorted H-bombs, Quail decoy missiles and other devices, and sufficient fuel for an unrefuelled range of around 10,000 miles, it works out at a loaded weight of 480,000 lb. and needs a lot of runway. However, somebody had the bright idea of running the *Hound Dogs*' turbojets during take-off to boost the bomber's eight J57's. The result was a considerably shortened run and is to be standard practice in future.

Nor does this reduce the range of the *Hound Dogs*, because they can be topped up with fuel from the bomber's tanks right up to the moment of release.

Wee Snifter

by J. D. McHARD



- **Scalish Appearance but Easy to Build and Fly**
- **Rugged Construction Endures Hours of Flying Fun**
- **Cheap to Build for any ½A Motor**
- **Wings Club Members see page 21 for Plans Special Offer**

MODELS built purely for "sports" flying greatly outnumber the specialist contest types, and this month we present a really sharp F/F sportster, especially designed for M.A. readers, that will attract attention wherever it is flown!

Despite its good looks and racy lines it is very easy to build, especially as the plan is completely self-explanatory, incorporating, as you can see, a number of helpful "how to do it" drawings. In addition, you will find overleaf, a series of photographs taken during the building of one of our original models, and which show the complete construction in step-by-step stages.

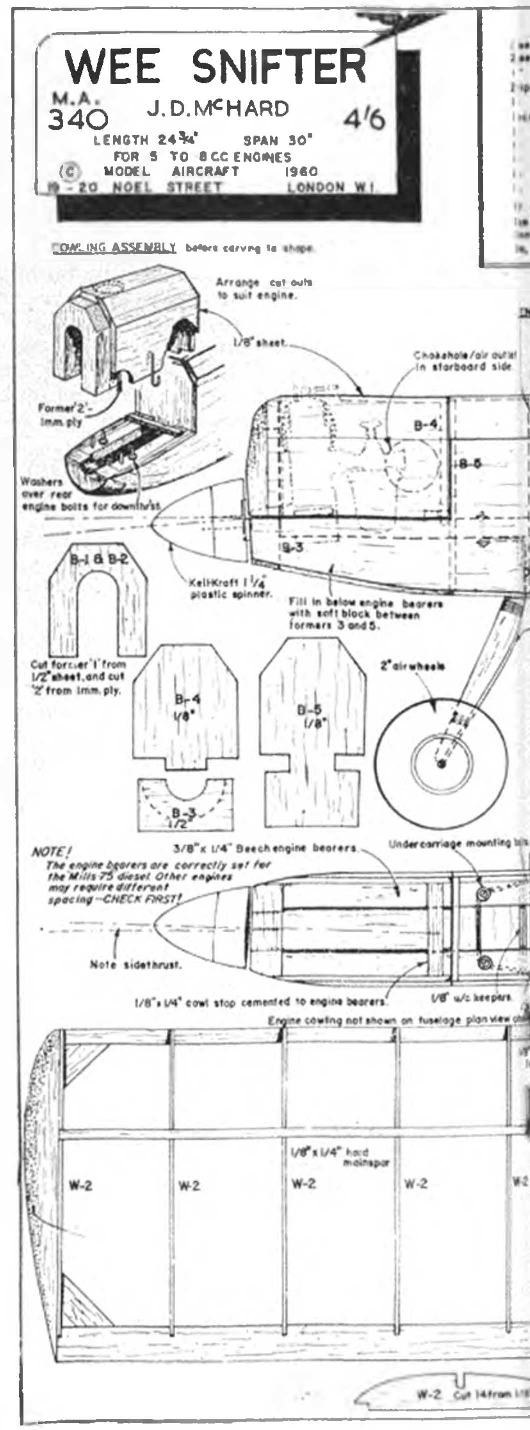
Many people shy away from the low wing layout believing it to be difficult to fly; however, *Wee Snifter* has had all its vices ironed out during development and is just as easy to trim as a cabin job For those who are still a little mystified by the trimming process, we have devoted our "Wings Club Workbench" (page 21) this month to explaining the correct way to safely trim the model to give its best performance.

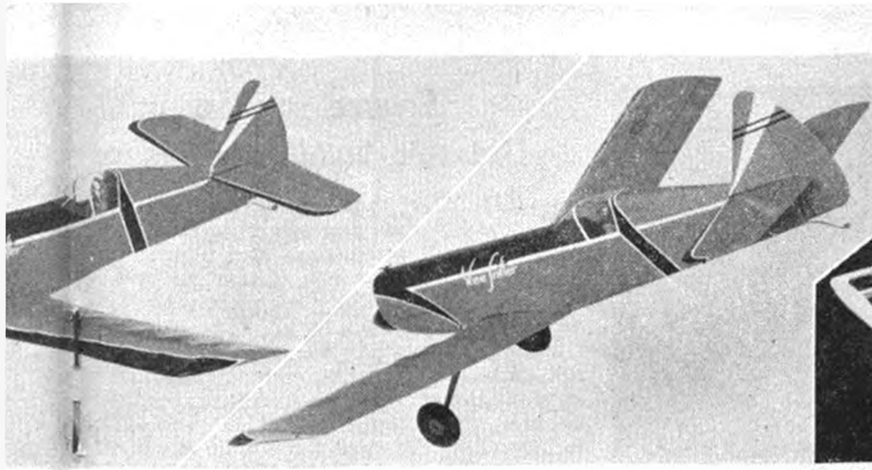
Wee Snifter is very tough and will take rough handling in its stride. It will accept a wide variety of engines between 0.5 and 0.8 c.c. which, of course, includes the new ½A glow motors, for which it is ideally suited.

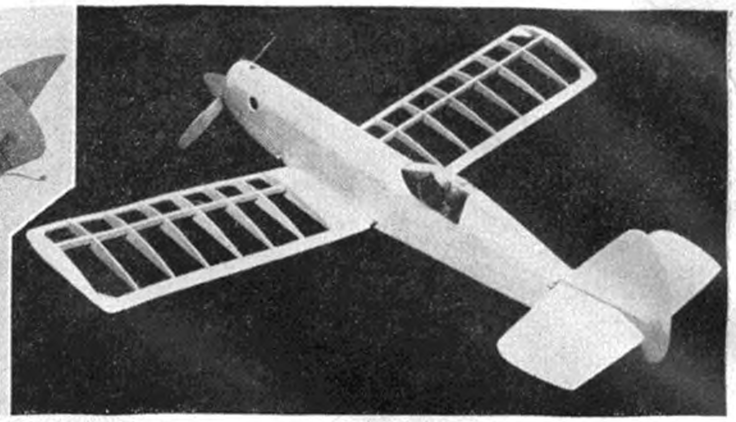
Colour schemes are, of course, a matter of individual choice, but we think you will agree that the orange, black and white trim shown on the cover photo is most attractive. *Wee Snifter* has been chosen for demonstration in the MODEL AIRCRAFT enclosure at the Schoolboys' Exhibition in January, and those of you who visit the exhibition will be able to see one of our original models actually being flown.

Members of the MODEL AIRCRAFT Wings Club can buy the *Wee Snifter* plan at a specially reduced price and we hope that you will send us a photograph of your own model which, we know, will give you many hours of exciting flying.

FULL SIZE WORKING DRAWINGS ARE OBTAINABLE FROM YOUR LOCAL DEALER, OR BY POST FROM THE "MODEL AIRCRAFT" PLANS DEPARTMENT, 19-20, NOEL STREET, LONDON, W.1, PRICE 4s. 6d., POST FREE

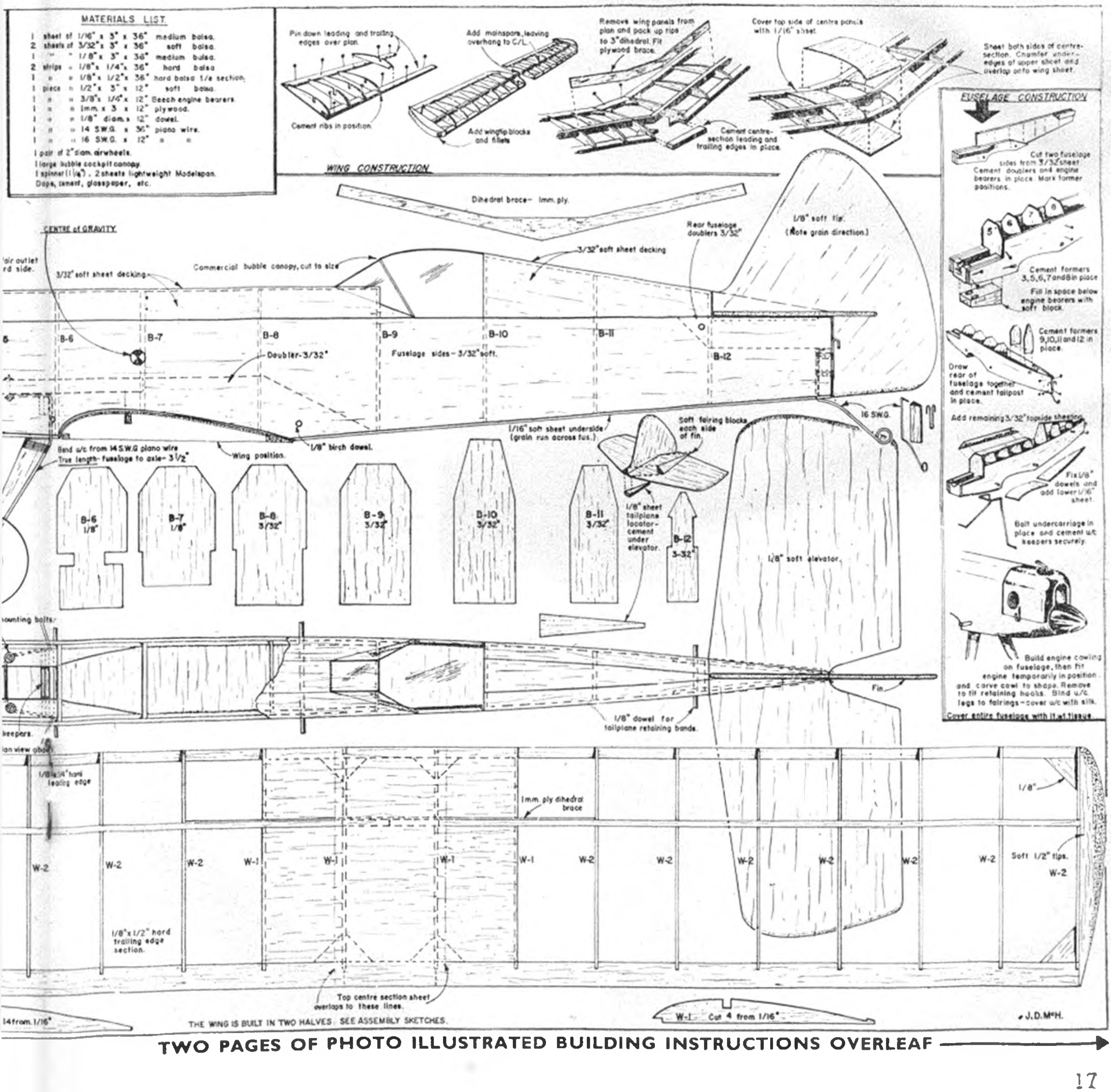






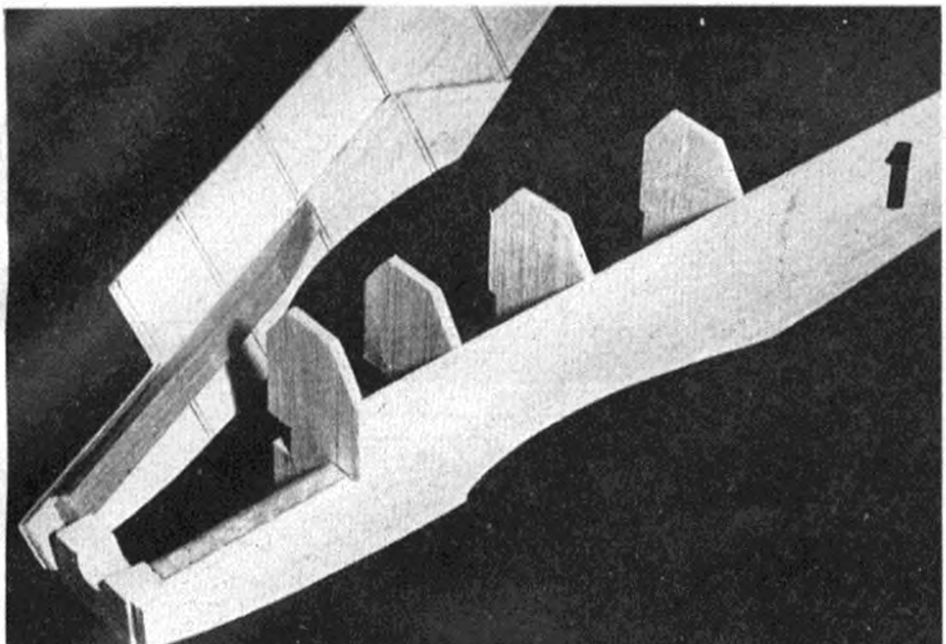
MATERIALS LIST

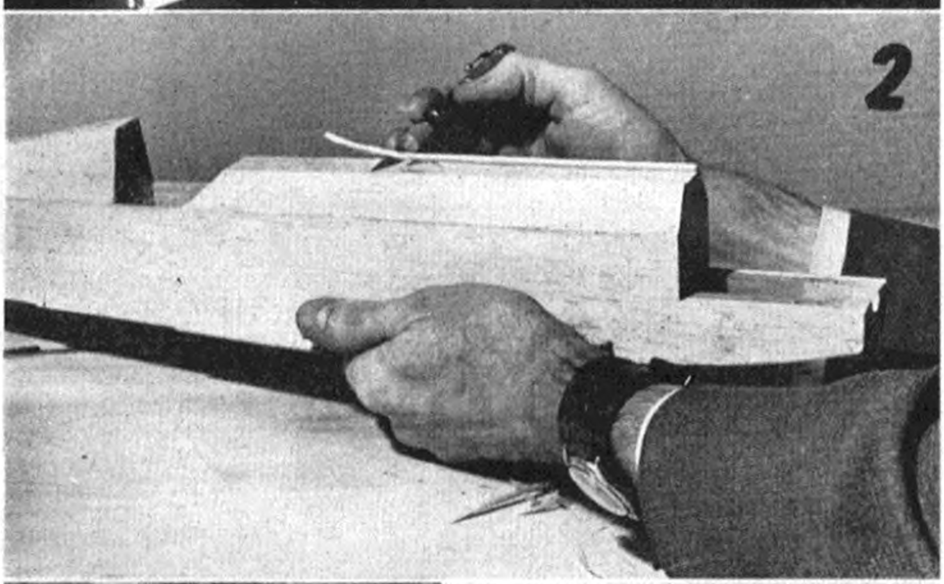
1 sheet of 1/16" x 3" x 36" medium balsa.
2 sheets of 3/32" x 3" x 36" soft balsa.
1 " " 1/8" x 3" x 36" medium balsa.
2 strips " 1/8" x 1/4" x 36" hard balsa
1 " " 1/8" x 1/2" x 36" hard balsa t/e section.
1 piece " 1/2" x 3" x 12" soft balsa.
1 " " 3/8" x 1/4" x 12" Beech engine bearers.
1 " " 1mm. x 3 x 12" plywood.
1 " " 1/8" diam. x 12" dowel.
1 " " 14 S.W.G. x 36" piano wire.
1 " " 16 S.W.G. x 12" " "
1 pair of 2" diam. airwheels.
1 large bubble cockpit canopy.
1 spinner (1 1/4"), 2 sheets lightweight Modelspan.
Dope, cement, glasspaper, etc.



TWO PAGES OF PHOTO ILLUSTRATED BUILDING INSTRUCTIONS OVERLEAF →

Ensure success with
Use this building sequence





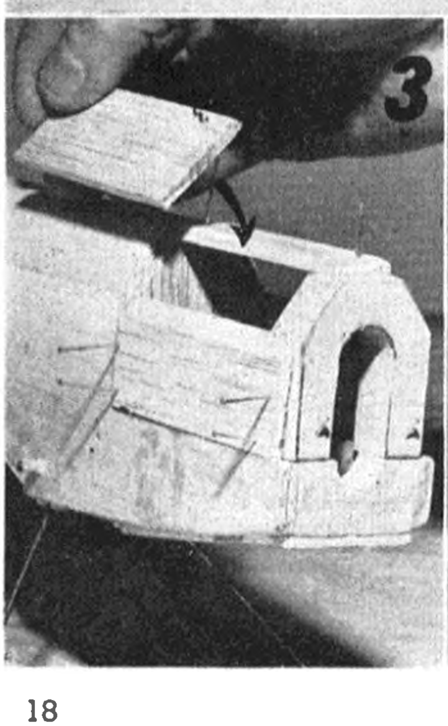
ALTHOUGH the building notes on the full size plan are quite comprehensive, the instructions and photographs on this page will further assist beginners to successfully complete their own *Wee Snifter*.

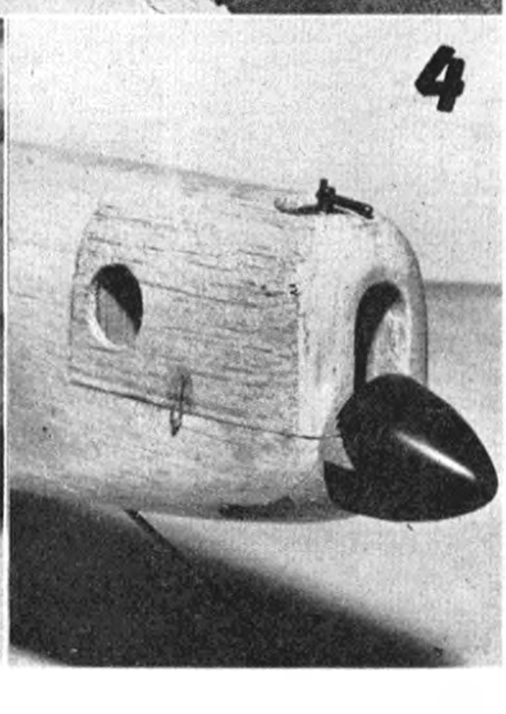
Photo 1 shows how the two 3/32 in. soft balsa fuselage sides, complete with engine bearers and strengthening doublers, are first assembled with formers F.5, F.7 and F.8. The nose former (F.3) and the under-bearer block (built up from soft ½ in. sheet) are also fitted. A slot should be cut in each side of the block to allow access to the engine mounting bolts. Hold these parts in place with pins until dry. The tailskid and tailplane fixing hooks are bound to the ⅛ × ¼ in. tailpost, and this is sandwiched between the rear ends of the fuselage sides which are drawn together and pinned until the cement has set.

Bend the undercarriage from 14 S.W.G. piano wire and bolt it to the engine bearers as shown. "J" bolts are useful here, but large washers under the heads of ordinary 6 B.A. bolts will do the job almost as well. A spot of solder under the washers will hold the undercarriage securely. The ½ in. undercarriage keeper will hold everything firmly, but use plenty of cement!

The remaining formers are now cemented in position, and the 3/32 in. sheet upper decking and 1/16 in. undersheeting fixed in place. Leave this sheet covering slightly oversize so that it can be neatly trimmed to size when set as shown in photo 2. Fit the ⅛ in. dowels for the wing and tail-retaining bands.

To ensure a perfect fit, the removable cowling is assembled on the model. Photo 3 shows the best method of doing





your Wee Snifter—
in conjunction with the plan

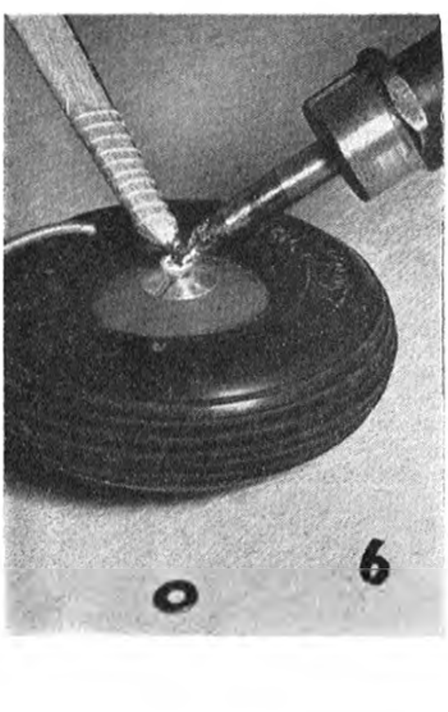
this. Formers B.1 and B.2 are cemented together and like former B.4 are temporarily held in place with pins. Check, at this stage, whether your engine can be fitted *with the correct downthrust angle*. It may be necessary to cut away part of the rear face of B.2 in order to allow the cylinder head to tilt forward. Remove the engine and cover the cowling with ⅛ in. sheet. When dry sand it to shape and separate from the fuselage and fit former B.2 A, and the retaining hooks.

Bolt the engine in place again, and cut out the openings for the cylinder head, needle valve and the choke hole. If a short stroke diesel such as a Frog 80 is used (photo 10), a long compression lever will be needed. The Mills .75 is a long stroke engine and so does not need this item, but adjustment will be made easier if a piece of wire is soldered to the needle valve to extend it outside the cowling (photo 5).

The wheels are retained on the axles with soldered washers and one soldered to the shaft each side of the wheel will make for reliable, easy running (photo 6). Be sure to use a lightweight pair of wheels such as Keilkraft airwheels, soft sorbo wheels or plastic wheels, but don't use the harder type of sorbo wheel which is very heavy. If you use plastic wheels be very careful not to melt them with the soldering iron, in fact, it may be easier to retain the wheels with tightly bound thread, well cemented around the axle ends. The u/c leg fairing should be bound to the wire with strong thread well cemented, and then the entire undercarriage leg is covered with silk or nylon. Don't cement the top of the leg to the fuselage.

Now paint the cockpit and pilot, if

Continued on page 22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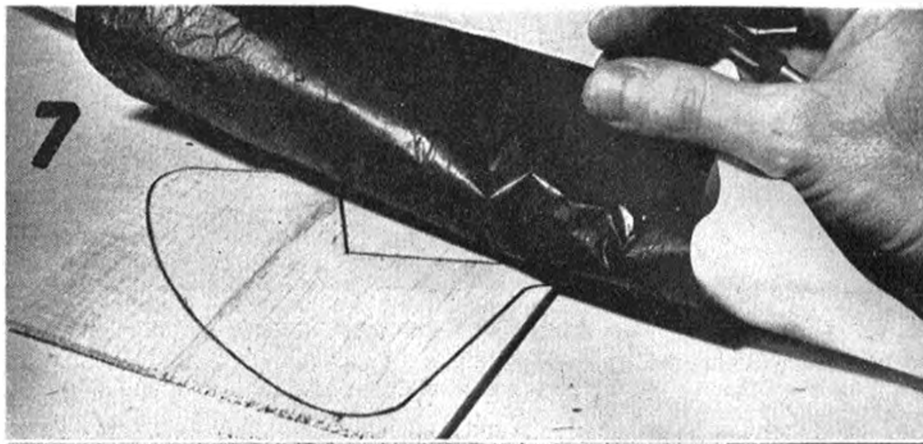
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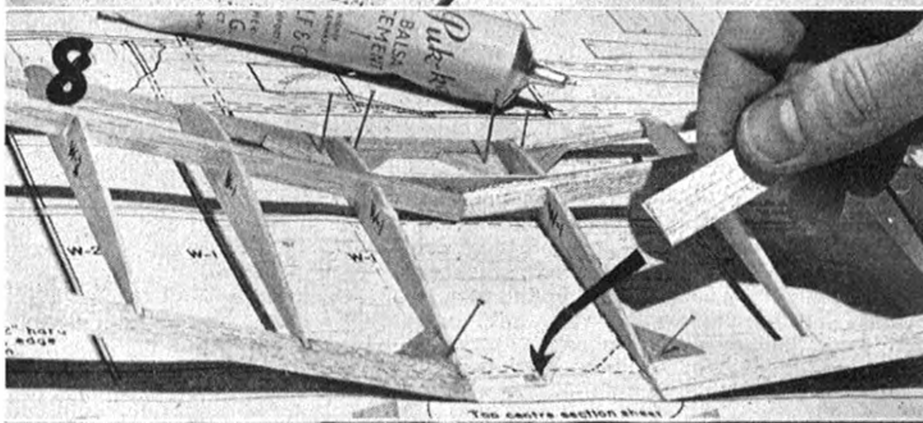
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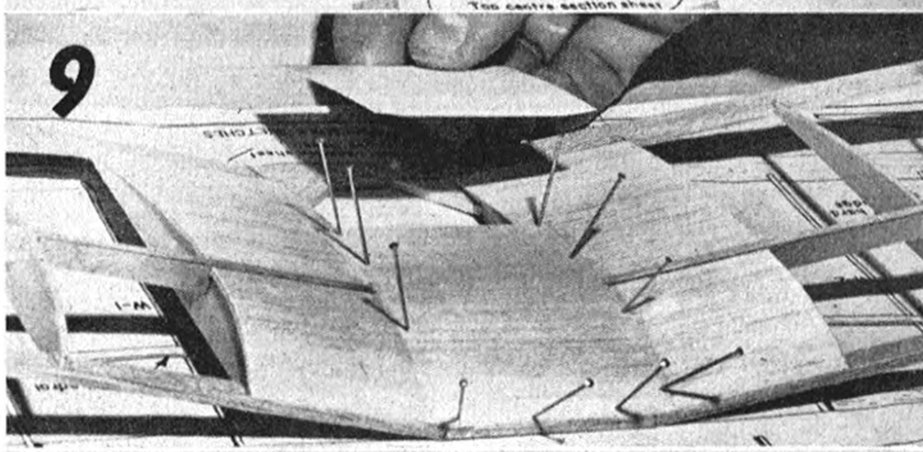
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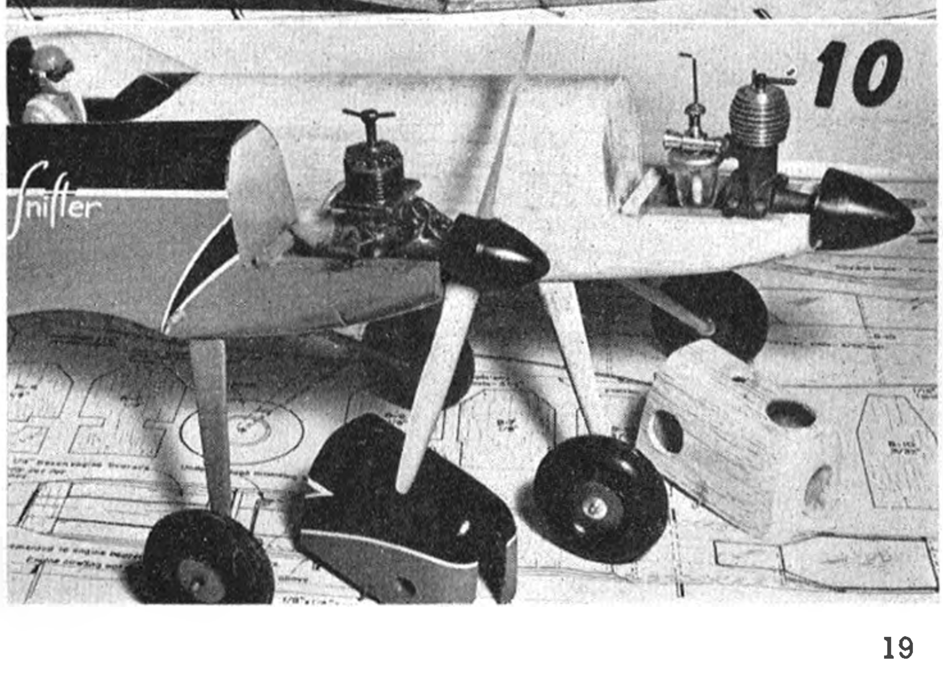

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MODEL AIRCRAFT WINGS CLUB

We begin our Second Year

IS it really 1961? Sometimes when I look at the calendar, or subtract one date from another, I almost persuade myself that in this age of speed, time is quickening its rate!

You young ones will not be so conscious of how swiftly the years seem to pass, though you may feel that the days move at unnatural speed during the holidays. When you are older you will understand my surprise, for instance, on discovering that the jet aircraft is now 20 years old.

Frank Whittle made his first jet flight in 1941, and every time that I take 41 from 61, I still get 20. The anniversary helps to remind us that the aeroplane is no longer the comparatively new thing that it was to the boys and girls who grew up to be your parents. Half a century has passed since the great cross-country races for which the *Daily Mail* offered £10,000 prizes. They were run in 1911, and the competing aircraft were, of course, very simple compared with the machines of today. I wonder whether, in another 50 years, the models which are built now, of more or less contemporary aircraft, will seem equally picturesque?

Our Wings Club will be 50 years old in 2010, which looks like a date in H. G. Wells. Its first year has been successful enough to promise a great future; already we have thousands of members, all proud to wear our distinctive badge. There are, of course, great numbers of young enthusiasts who have not discovered the club or realised properly what it offers to them. Here, you, the Wingmen, can help by explaining the advantages conferred by membership. The sense of belonging to an international group, the opportunities to share ideas and correspond with each other, the special privileges, and above all, the knowledge that you belong to an association whose members are recognised as sensible people, because they build good models and fly them with regard for their own safety and for the convenience of others.

You will have begun the New Year well if you persuade a friend to join the Wings Club; and he, in turn, will be more gratefully your friend. Tell him that, as a member of the club he can get the *Wee Snifter* and *Plover* plans, featured in this issue, at special prices.

Did you try the problem in our Christmas Number about the airman who flies 34 miles east, 34 miles north, and then 20 miles north-west? If you did and now want to check your answer, his distance from the starting point is 52 miles.

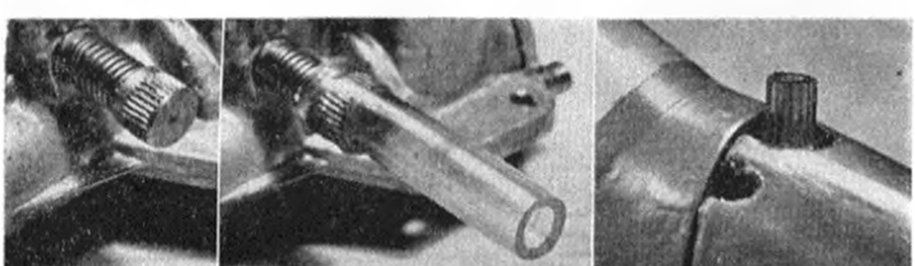
ALAN WINTERTON.

Peter Chinn's ENGINE TIP for Wingmen

MANY model engines have lengthy needle-valve extensions to facilitate easy adjustment. There are, however, some motors which have only a very short control knob by which the needle-valve can be turned. This may mean that, to make adjustments while the engine is running, the fingers must be brought uncomfortably close to the propeller if the engine is of the shaft rotary valve type, or alternatively or additionally, the control knob may be too short to extend to the outside if the engine is cowled in.

One solution to this is to solder a wire extension to the control knob. A simpler and in some ways more satisfactory alternative, however, is the solution offered here. This consists of using a piece of large diameter flexible fuel pipe, forced over the control knob. Ripmax ribbed tube is particularly suitable. Warm the control knob in a lighter flame until it is just too hot to hold with the bare fingers and force the tube over the knob. Push it over the largest diameter of the knob so that it closes again on the other side. If any difficulty is experienced in getting the tube over the knob, bell out the mouth of the tube first with a suitable pointed tool, heated.

It will be found that the extension will hold quite securely—the usual knurling on the knob helping here—even when the engine is well warmed up.



Wingmen Write . . .

I thought you might be interested in the two photographs of my Veron *Colt*. One shows me starting the model and the other is of it in flight. It is powered with a Mills .75, and is the

first model that I have managed to get to fly well, although I like stunt models best.

I started making model aircraft when I was five years old, after finding a heap of very old MODEL AIRCRAFT books, and I am now 11.

Yours faithfully,
Harrow-on-the-Hill, Middx. WILLIAM GREGG.

• • •

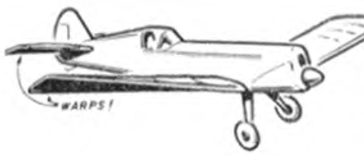
The photograph shows my own design B.E.B. Mk. II rocket which is powered by twin Jetex 50 units. Balsa longerons ⅛ in. sq., a ¼ in. sq. centre spar and ⅛ in. thick round formers, combine to make the light framework, which is covered with heavyweight tissue, while the fins are made from ⅛ in. sheet.

After a successful and realistic launch from a ramp the model rose to about 15 ft., it then heeled over on to its side and as the engines cut it glided for a good 100 yd. before landing.

Yours faithfully,
JOHN BLACKWELL.
Sheffield 8.

TRIMMING FOR FLIGHT— *'Workbench' moves to the flying field to trim Wee Snifter*

Although these instructions apply directly to *Wee Snifter* the general trimming principles apply to all sports models.



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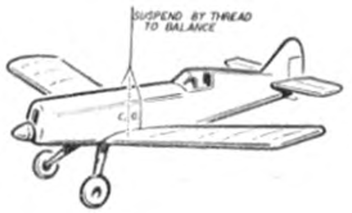

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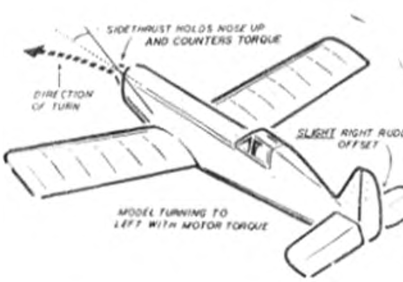

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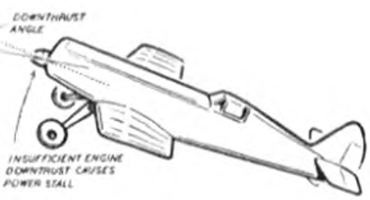

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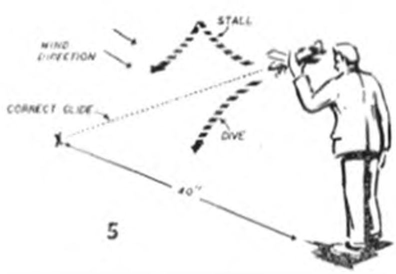

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WE often hear people say, when shown a F/F model—"Oh, yes, it's very nice, but I wouldn't dare to fly it, in case it crashed." This remark, although understandable when it comes from a non-model builder, should never be voiced by a Wings Club member! A carefully built model, of sound design will always fly—provided it is *trimmed* properly.

Unfortunately, this is where many a beginner comes unstuck, and thereafter loses interest when his model fails to survive its first flight. Don't be over-anxious to get the model into the air, follow these instructions to the letter and your model will be successful.

The first essential is to make sure that there are no warps in the wings or tail (1) that shouldn't be there, a warped model will *never* fly properly. Now loop a piece of string around the fuselage (2) at the position marked on the plan c.g., (centre of gravity), and add weights to the nose or tail until the fuselage remains exactly horizontal when suspended by the string. Use pieces of old cement tubes for weights and fix them securely in position inside the fuselage (either in the space below the tailplane or between the engine bearers).

Be sure to check that the tailplane is not tilted to either side and that both wing and tail are seated firmly, and at their correct angles as shown on the plan (fuselage side view). Ensure also that the engine is mounted securely and that it is tilted down, and to the right by the correct amount (3 & 4). This point is very important, but it is often overlooked.

That completes the ground checks and we now come to the really exciting bit—actually flying the model, however there may still be several adjustments to be made, so proceed carefully.

The most important thing to remember is to wait for a calm day before test flying. The first test flights must be made in as little wind as possible, although when properly adjusted, the model will fly in quite windy weather. The evenings and early mornings often provide ideal testing conditions, and at these times the wind speed frequently drops to an almost flat calm.

For initial testing, choose a part of the flying field where the grass is longest and, facing *into* the breeze, launch the model at what you judge will be its flying speed. Carry out this first test-glide from about shoulder height, and point the nose of the model slightly *down*, aim it at an imaginary point on the ground about 40 ft. in front of you (5). If the trim is correct, the model should glide gently to earth, without any violent aerobatics, the chief thing is not to hurl the model but to launch it gently—you will very soon get the hang of it.

If, instead of a gentle descent, your model dives, then add a little weight to the tail. If, on the other hand, it first rears up on its tail and *then* dives into the ground, (this is called stalling), the model is tail-heavy and requires a little weight in the nose. This latter point is often misunderstood by the novice, who, seeing his plane dive to earth, thinks that it is nose heavy. Remember though that if this had been so, the model would not have climbed first! The rudder should be very *slightly* warped (if necessary) to give a very gentle turn to the right.

When you have achieved a satisfactory glide start the engine and run it at the lowest possible speed. This will mean slackening off the compression screw, and opening the needle valve in the case of a diesel. With a glow-plug motor it will, of course, only be necessary to open the needle valve a little wider to slow down the propeller.

Launch the model, just as you did for the first glide tests, and if the engine is running very slowly, the model should gradually lose height and turn slightly to the *left*. This left turn is caused by the torque, or reaction, from the rotating propeller, trying to turn the model the opposite way; so providing it is a gentle turn, it will do no harm. When the model turns to the left, it tends to drop the left wing and lose height, but the right side thrust (sideways pointing engine) combined with the slight right turn on the rudder, keeps the nose up, and prevents a dive, providing the turn is not too sharp.

On the other hand, if the model turns to the right when the engine is running, it will almost certainly dive to earth, and before launching it again you must remove some of the engine side thrust which is producing the turn. *Do not alter the rudder.*

Concluded centre column overleaf

SPECIAL PLANS OFFER
TO WINGMEN

As the two designs "Plover" and "Wee Snifter," which are featured in this issue, are especially suitable for Wingmen to construct, we have arranged for the full size plans of the models to be available to all Wings Club Members at special prices. The usual price for the plans is 4s. 6d. each, but Wingmen need only pay 3s. for one and 5s. for the two.

This offer only applies to Wings Club Members, orders must be on this form, and you must give your membership number.

Please send me the plans of *Plover/Wee Snifter*. I enclose herewith postal order value 3s./5s. (cross out whichever does not apply).

Name in full..

Address..

....

Wings Club Membership No...............................

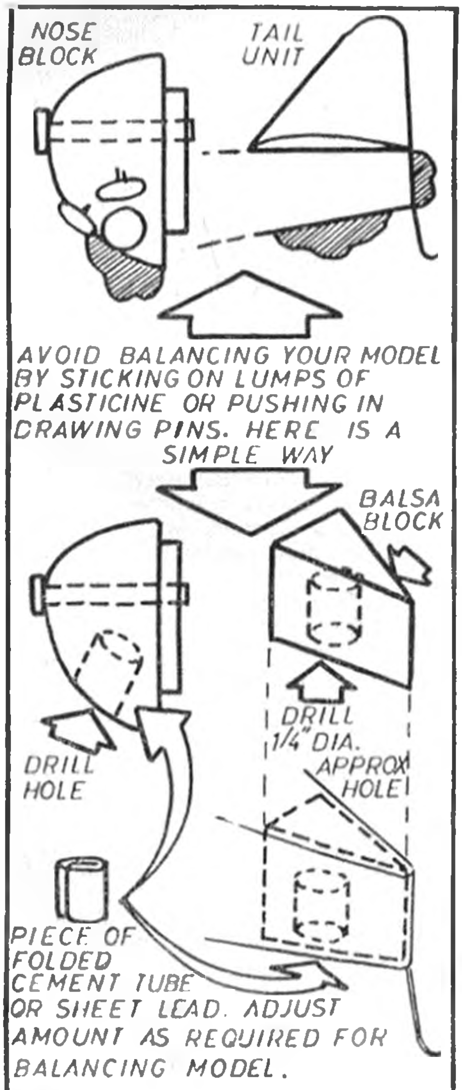
IMPROVE YOUR MODELLING

with this months Tip

BY RAY MALMSTRÖM

NOSE AND TAIL WEIGHTS

"BALANCE model by adding weight to nose or tail." Most trimming instructions contain these words and we gaily stick large lumps of plasticine around the nose-block and tail of our new rubber job. Perhaps the plasticine DOES balance the model, but how easily it gets knocked or smeared off and how UGLY it looks! Why not drill a hole in the noseblock, and fit a small wedged shape block of balsa, with a similar hole drilled in it, into the rear of the fuselage (the block adds strength too!). *Tightly* insert a neatly rolled piece of cement tube or sheet lead, adjusting quantity as needed. A scrap of tissue covers up the hole. *Voila!* Invisible balancing.



If a stall results when the model is flying under power, yet is not noticeable in the glide, it shows that the engine has not sufficient *downthrust*. A stall under high power can be very dangerous, so correct it now, even if it means removing the engine to adjust the setting. *Never* alter the nose and tail weights to correct a power stall, since it is the engine setting which is at fault, and not the airframe balance. A very *slight* stall can frequently be cured by increasing the left turn, but this should be done very carefully.

The power should be increased a little each flight, correcting any trimming faults as they appear, as some faults are only apparent when the engine is running at high speed.

Every model, even those built from the same plan, needs a slightly different trim, but if you go about trimming in a methodical way, making only one small adjustment at a time, you will be surprised how quickly the model responds.

The process of trimming a model is extremely interesting, and incidentally, highly instructive. You will learn more about simple aerodynamics from two hours of test flying than from two weeks of book study, and it's fun into the bargain!

When you fly your F/F power model, remember that the whirling propeller could injure anyone unfortunate enough to be struck by it. As a Wings Club member, you will of course, remember our motto "Fly Safely," and I hope you won't do anything foolish such as launching your model towards a group of spectators. Even with a properly trimmed model accidents can happen—a slightly out of position wing or tail could prevent the model from climbing and make it fly dangerously low for a while, so do please remember—FLY SAFELY.

PEN-PAL WANTED

Peter Sutcliffe, Rosemead, Alton, Stoke-on-Trent, Staffs., is mainly interested in C/L flying and would like a pen-pal with similar interests.

Wee Snifter building sequence

continued from page 19

fitted, and cement the cockpit cover in place (see photo 10).

The tailplane is simply cut to shape from soft ⅛ in. sheet—butt-joint the 3 in. wide sheet to give the necessary width. Photo 7 shows the fin pattern transferred to the balsa, using carbon paper under the plan. All the sheet parts can be marked out in this way. Cement the fin to the elevator making sure it is "square" and true both fore, aft and vertically. Use small scraps of ½ in. sheet to build up the fairing blocks and cement the locator under the elevator. This locator must be a good fit between the fuselage sides to prevent sideways movement of the tailplane, but should be tapered as shown, to allow the tail to knock off in a crash without damaging the model.

The wing construction is very straightforward and is clearly shown on the drawing. Photo 8 shows the centre section being built up after the ply dihedral brace has been fitted, note the hard balsa mainspars which are left "long" when the wing halves are built. Photo 9 indicates the correct way to sheet cover the centre of the wing, the $\frac{1}{16}$ in. sheet being chamfered where it overlaps the wing sheet.

Two engine installations are seen in photo 10, the Frog 80 in the foreground and the Mills 75 in the rear.

The entire model is covered with lightweight Modelspan and the wing covering first watershrunk before giving the whole model two coats of clear dope. Do not warp the flying surfaces by over shrinking the tissue. Colour dope (Butyrate for preference) should be thinly applied as an excessively thick coat adds considerable performance-destroying weight. Full flying instructions are given on page 21 of this issue.

Fuller notes on the finer points of covering were given in the Wings Club Workbench feature in our March, 1960, edition and finishing sheet balsa and soldering were described in Workbench for April, 1960. Both these copies are obtainable from our sales department.

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 for 1/- to help cover the cost of the badge, transfers and membership book. *All membership applications must be on this form.*

Name in full ....

(Underline christian name normally used)

Address ....

....

.... Date 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.

LETTERS to the Editor

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

Len Ranson replies

DEAR SIR,—Re my recent article on contest formula. As was to be expected in a very brief survey of a complex and controversial subject I left myself wide open to criticism on those points which I could not adequately cover. However, I am surprised that Mr. Burt should have interpreted the article to mean the exact opposite of that which was intended. I refer in particular to his remarks about the equal importance of duration and consistency. Other readers seem to be in no doubt of my advocacy of a happy co-existence of these elements, whereas Mr. Burt seems to imagine I stressed the importance of one to the neglect of the other, but he fails to say which.

Of course, I quite agree that the best type of contest model is a high performing one, but why flog the obvious? But perhaps what he means by a high performing model is one which gets up there quickly, as opposed to one with a more leisurely rate of ascent. If this is the case perhaps I should remind him that contest rules are not framed to suit the capabilities of a particular type of performer, but are devised to give scope to a variety of approaches. It is up to the modeller to find the winning solution.

Thus, if, in a rubber contest, an entrant takes advantage of exceptionally calm conditions to fly his long ranging, flop prop job to good effect, it would be hard to deny his success on the preposterous supposition that the model wouldn't have flown so well in a gale force wind. In an uncertain world of uncertain weather the contestant must be prepared for anything. For that reason the rational modeller will opt for the model which will function best in average conditions but which would also give a good account of itself in any weather. If, however, he wishes to take a gamble with a specialised type of model that surely is his own concern.

Just one last point. International events have a strong secondary team interest, which, in these days of heightened nationalistic feeling, must not be overlooked. Now, where fly-off times do not count in the team totals, the best models are given a score little better than that of quite mediocre performers. Moreover, if, say, 10 models reach the fly-off following a series of low maximum flights, there can still be a wide disparity of performance between the first and tenth model, yet the team points scored in each case are the same.

This is one of the factors I had in mind when suggesting that the consistency/performance variability must occur within the contest and not outside it. I think we should definitely break with the idea of using the contest proper as a last minute eliminator.

Yours faithfully,
L. RANSON.

Romford,
Essex.

R/C vibration

DEAR SIR,—May I take issue with the statement in the December Radio Topics that one cannot insulate an airframe against engine vibration. It is probably true that *complete* insulation is not possible, but I claim that the nuisance can be reduced to such small proportions that it ceases to have any effect on the radio equipment. Obviously one should take all the normal precautions, such as suspending or "foam-nesting" the receiver, but my method is first to minimise the vibration at its source.

For a long time now I have been completely free from radio faults and failures due to vibration, as every model I build has a separate engine-pod, insulated from the airframe by a pad of genuine Dunlopillo (the plastic type of foam is quite useless for the purpose, by the way). This is, in effect, taking a leaf out of the car designer's book, all car engines being mounted on rubber for similar reasons.

The engine pod should be robustly constructed (I use ⅜ in. or ¼ in. plywood for web and back, with 1/16 in. ply sides, all firmly glued and screwed together) to provide a firm mounting for the motor. The pod is attached to the fuselage with rubber bands, using either a single central dowel in both pod and fuselage, or, better still, dowels at top and bottom. Some experimentation with various thicknesses and densities of Dunlopillo is advisable, as individual motor and design set-ups vary widely, but an average thickness would be ¼ in., which compresses under tension to 3/16 in. It might be thought this would nullify the absorption qualities, but I have found this not to be so, and my airframes are so comparatively free of vibration, at all speeds, that the fact invariably calls forth surprised comment from modellers seeing it for the first time.

A further important point is that by so minimising the degree of vibration reaching the airframe, it is not only the receiver relay(s)/reeds which benefit but also the actuators, servos, and even the control surfaces themselves. Still another advantage is that, in the event of a heavy head-on impact, the Dunlopillo absorbs much of the shock, often saving the airframe and radio from serious damage, while in a sideways blow the separate nose-pod is free to move or knock off. Location is normally taken care of by the friction of the Dunlopillo and rubber-band tension, but if desired, two laterial slots can be cut in the latex to fit over ¼ in. sq. runners glued to front of fuselage. Temporary packing can also easily be inserted to adjust the thrust-line when making initial trimming flights—when correct thrust-line has been determined, this should, of course, be permanently built in.

Yours faithfully,
HARRY STILLINGS.

Exeter,
Devon.

The case for 2.5 c.c.

DEAR SIR,—With reference to Noel Falconer's letter in your November issue, I would like to add a few comments.

Firstly he states that all places in stunt events are taken by big "35" jobs. This is not entirely true, for example, my own Oliver powered *Kentish Wind* has only been entered in two contests but was placed seventh and third respectively, while I noted several models under "35" size flying in the same events.

I cannot agree that all major stunters look alike any more than I could agree that all the World War II fighters did.

Given a performance requirement, it is inevitable that designers will arrive at a similar layout. Unfortunately, in this country far too many people are content just to copy American practice and build "35" models. Granted that these have several years development behind them, but we must not overlook two very important factors. The lack of a suitable stunt motor below the "35" size in the earlier years of development and the natural American tendency to do everything in a big way.

A 2.5 diesel is quite capable of the full schedule in the right airframe, why, even Noel Falconer flew diesel until he took the "35" bait!

I think that one of the real reasons for the failure of most 2.5 designs is that they merely copy "35" practice on a smaller scale—you just cannot do that.

For instance flaps cause very high drag in the squares, just when drag is least wanted, a "35" motor has the surplus power to overcome this, but a 2.5 has not. Providing the wing loading does not exceed 12 oz./sq. ft., flaps should not be necessary. It is very debatable if they have much effect on the lift of a small wing anyway. Another point is that a 2.5 diesel will give a much more consistent performance if the motor is mounted sidewinder.

These are just a couple of points—the actual design of a 2.5 stunter is far too lengthy and involved to go into in this letter.

However, at this point you may rightly query on what authority I base these statements.

Well, all these remarks are based on 10 years of stunt flying and model development. My latest model is the *Kentish Wind*, and into this I have built all my theories that have been proved in practice. This model has no vices and no flaps, but it is fully capable of the full schedule.

I would endorse Noel's remarks about having two stunt classes, as many budding stunt flyers turn to combat after watching the experts in action. There is no short cut to success in stunt so I think a simpler schedule would be just the job, with an extremely difficult one for the experts, and why not call the two classes Junior and Senior?

I do not, however, agree with the suggestion of a fly-off when places are within 10 points of one another. After all, we have got to draw a line somewhere. Stunt is the most gentlemanly of all aeromodelling contests, so let's not argue over a couple of points. I doubt if any self-respecting stunt flyer really worries about his final position in a contest, we fly for fun, or at least I do!

Yours faithfully,
STAN ROBINSON.

Hextable, Kent.

Twisted gadget!

DEAR SIR,—I feel that I cannot allow the "one man winder" idea of W. A. Morrison (MODEL AIRCRAFT, November, 1960) to pass without comment. Consideration of this device gives me grave doubts as to whether your contributor has tried it in practice, or that the "Gadget Selector" on your staff really thought about it.

Two lengths of wire are fine for carrying the tension imposed by stretch winding—but are hopeless for resisting the torque that also occurs. After all, the whole idea of winding is to twist the rubber motor and this tends to turn the motor peg, one end "up" and the other "down." To try and react this by two lengths of steel wire is somewhat hopeful.

Just to check the set-up, a test rig was made and eight strands of $\frac{1}{4} \times \frac{1}{24}$ in. Pirelli, with about 13 turns per in., were sufficient to revolve the motor peg through 45 deg.! In the case of an actual model, this would have adverse effects on the tailplane—if nothing worse.

Yours faithfully,
JOHN O'DONNELL.

Pendleton,
Salford.

We omitted to point out when this idea was published that it is intended to be used only with small sport models—sorry, Ed.

Whipping again

DEAR SIR,—Contrary to the majority of modellers in this country, I am in favour of whipping. The object in team racing and speed is to make the model go as fast as possible, and provided you don't wrap the lines three times round your body, whipping does increase the true speed of the model. By "elbowing," the effective radius is shortened, and false speeds are recorded of course.

If whipping is allowed, it does not mean that one is forced to whip, therefore those who like whipping would be free to do so, and those who don't, need not. Thus everybody should be happy.

However, the non-whippers would immediately sense that they may be at a disadvantage, and start moaning along the lines of unfair advantage, danger to other models, etc. The answer to this is that it is up to individuals to extract the maximum performance they can within the rules (that is the object of the specification). Therefore, if some like to risk whipping and the resultant instability sometimes induced, they are entitled to reap the benefits of a little extra speed.

As for the sheep who bleat about the "other model" danger, it is every pilot's job to keep out of the other fellow's way. Refer to the Highway Code here, "Always assume the other person is going to do the wrong thing." Team racing itself is dangerous, but you get used to it. Prangs and line tangles are far less common than when T/R was first introduced. The same would apply to whipping in a few years time.

Yours faithfully,
IAN RUSSELL.

Ealing, W.13.

The Editor welcomes letters for publication on any subject, but preferably of "newsy," topical interest or controversial nature. Address is "Model Aircraft," 19/20, Noel Street, London, W.1.

RADIO TOPICS

Continued from page 9

We quote a question from reader J. M. Brook, as it is significant. He speaks of instability on a receiver he has built to published plans . . ." using a red spot transistor . . ." Symptoms are ". . . with the meter in circuit the current is 0.2 milliamps and then slowly rises to 3 milliamps when no signal has been given . . .I have reduced the aerial coil by one turn, with no effect . . ." and more on the same lines.

We cannot attempt to diagnose the fault except to state quite bluntly that *using a surplus transistor on any model R/C circuit is a foolish economy* Performance limitations are quite unknown and quite probably in this particular case the transistor is suffering from thermal runaway. We would suggest substituting a Mullard OC 71 transistor in the circuit and see if this effects a cure.

* * *

The name moron is not only applicable to dull, unimaginative people. Sometimes a model, or a piece of equipment, can be just as "dim witted" and sluggish when there is apparently nothing wrong. Possibly this is caused by an aggregate of tolerances all falling the wrong way, when you end up with what the engineering trade often calls a "clunker." Whatever you do to it, it clings to those moronic characteristics. But don't accept this too readily as an excuse for blaming the model or the equipment. There could be a definite cause.

Balancing a model with the c.g. too far forward, for example, tends to make it "safe," but sluggish. It always retains that nose-up tendency coming out of turns, or whenever it picks up speed; or else it "kites" under power, however much down thrust you add. We always remember diagnosing some trimming trouble for one radio modeller with the recommendation to add some downthrust. He ended up with over 20 deg. downthrust and still the model climbed like a lift (upwards with little or no forward speed). But that downthrust was certainly effective as soon as he put rudder on! Second thoughts were much more productive. His *next* model, rigged with the c.g. farther aft, was much better!

* * *

Strictly for the radio fans, Henry's Radio Ltd., put out a 3s. 6d. book on Practical Transistor Circuits. This even includes a fully transistorised three-channel (reed) R/C receiver—but that one would be better ignored for model aircraft purposes. If the idea of playing with transistor circuits appeals, just for the fun of it, then this is an interesting book to have. And Henry's can supply kits of parts for any of the circuits, whether it be for an electronic organ or a car warning light flasher.

THE KEILKRAFT COBRA

·8 c.c. GLOWPLUG MOTOR

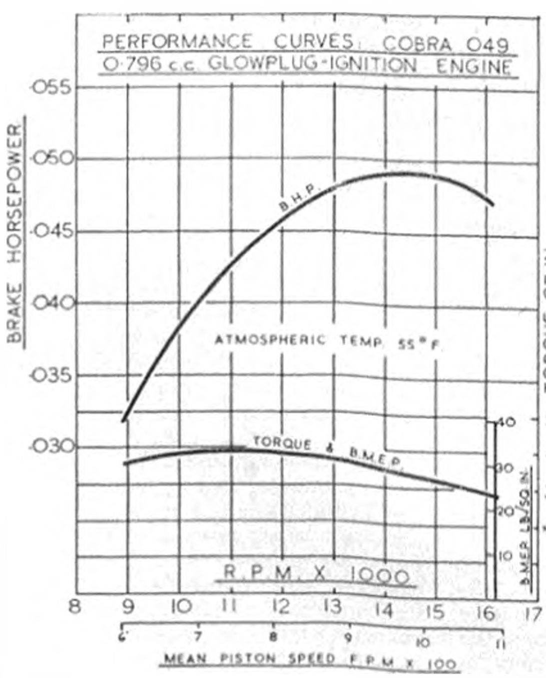
AS is generally known, the .049 cu. in. (.8 c.c.) class glowplug motor is of American origin and conforms to the American Academy of Aeronautics "Half-A" contest class. Over the past 12 months, four British-made .049's have appeared on the market and the Cobra is the latest of these.

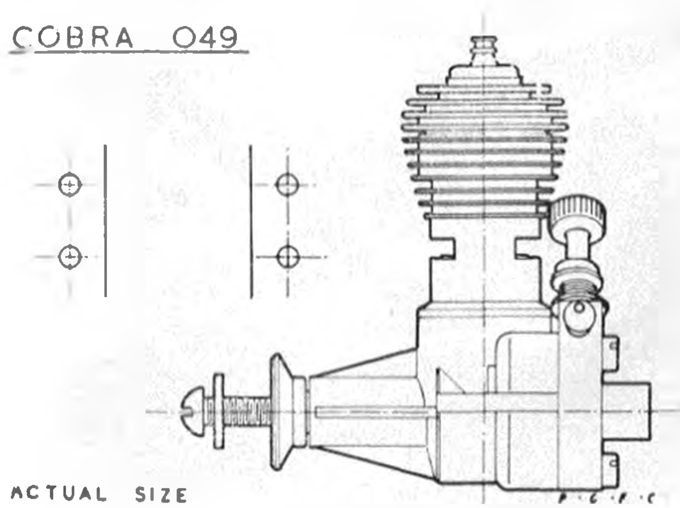
To be perfectly truthful, it must be admitted that the engines offered, so far, have, to some extent, fallen short of the standards set by the better American Half-A's. Since British manufacturers have clearly demonstrated that, in most other classes, they can compete with the best that the rest of the world has to offer, one cannot help but speculate as to the reasons why British glow 049's are not as good as they could be.

Firstly, it must be appreciated that these engines have, primarily, been designed for the low-priced beginner engine market, there being no official contest class for such engines in the U.K. at present and, therefore, no incentive for manufacturers to go all out to produce a high-performance motor. Secondly, it is probably true to say that our manufacturers embarked on the production of glow Half-A's with no great confidence in the glow 049's ability to wrest the lead from the well-established small diesels as the favoured type of power-plant for beginners' and small non-contest type models and, in consequence, one suspects there was a reluctance to invest too much time and money in their development and tooling. This attitude is understandable and appears to be confirmed by the fact that two manufacturers actually used parts of their existing diesel designs as a basis for their 049 glowpluggers. Finally, the fact should not be overlooked that our manufacturers are, as yet, comparatively inexperienced in the production of this type of engine, whereas the Americans have 10 years of steady development behind their present designs. The present U.S. .049 is a far cry, particularly as regards starting qualities and performance, from the Half-A's of 1950.

Having, we hope, put the matter into its right perspective and made the point that none of its three rivals is at present beyond criticism, we will start right in and comment that on the basis of our test findings the Cobra, too, is not yet, in our opinion, quite on the beam. Two engines were received for test and, although general opinion is that Cobras are fairly easy starters, the first of these proved slightly less than ideal in this respect. Main bearing clearance on the Cobra is large and while fairly large clearances are also evident in some U.S. engines, our first Cobra appeared to have an unusually generous clearance which complicated starting. A fairly heavy port prime is desirable with the Cobra, but with our first motor, we also found it necessary to introduce sufficient fuel into the crankcase to seal the crankshaft bearing—otherwise there was very little fuel draw at the carburettor and, seemingly insufficient crankcase compression to ensure a good transfer of mixture from crankcase to combustion chamber. The second engine was, however, free from this fault and we only mention our experience with the first model to illustrate the possible consequences of using just a trifle too much clearance on the main bearing.

The general design of the Cobra is clearly inspired by the highly successful American Cox engines. Cylinder design is typically Cox with one-piece machined cylinder, opposed exhaust ports and a screw-in alloy head with integral glow filament—this being the first British-made glow engine not to use a separate glowplug. The piston and ball-jointed conrod assembly is also similar to the Cox except that the rod





is of aluminium alloy instead of hardened steel and is retained in its socket by a circlip. Other Cox-type features include a two-journal, counterbalanced crankshaft and reed-valve rear induction.

Specification

Type: Single-cylinder, air-cooled, two-stroke cycle, glowplug ignition. Reed-valve induction.

Bore: 0.406 in. Stroke: 0.375 in.

Swept Volume: .04855 cu. in. = 0.7956 c.c.

Stroke/Bore Ratio: 0.924: 1.

Weight: 1.4 oz.

General Structural Data

Pressure diecast aluminium alloy crankcase and main bearing. Hardened steel crankshaft relieved at centre to provide two 7/32 in. dia. journals, with crescent counterbalance, 7/64 in. dia. crankpin and splined front section for prop driver. One-piece screw-in steel cylinder with two exhaust ports and single transfer channel. Screw-in alloy glow head seating on soft copper gasket. Hardened steel flat crown piston. Alloy connecting-rod with ball-joint small end. Pressure diecast aluminium alloy backplate and carburettor unit with integral needle valve and housing .001 in. valve reed retained by circlip. Steel needle with coil spring friction device and operating in brass thread insert. Backplate unit may be rotated through 90, 180 or 270 deg. to suit installation. Beam mounting lugs.

The Cobra engine broken down into its component parts. Note the cylinder head with its integral glow filament.

Test Engine Data

Running time prior to test: 45 min.

Fuel used: KK Record Nitrex 15.

Performance

The manufacturers state that no lengthy running-in period is required with the Cobra and this was borne out by our experience of the two engines tested. Both engines were, however, given the courtesy of 15 min. rich mixture running, followed by a further 30 min., in a series of short runs at between 12,000 and 15,000 r.p.m. Both readily accepted medium and high nitro content fuels with no tendency to overheat or lose power. Our second motor was the one chosen for our final tests.

Remarks on handling have already been made and it only remains to repeat that the Cobra liked to be fairly wet for initial starting. When warmed up, the second Cobra started promptly with intake choking only. Incidentally, no tendency to "bite" on props right down to 5 × 3 was detected, although reverse starts were rather frequent.

Increasing sensitivity to needle-valve adjustment was detected under light loads and, at 15,000 r.p.m. and above, the margin between the "four-stroke" and "lean" settings was a matter of less than a quarter turn. The conveniently and safely located needle control at the back of the engine, however, compensated, in some measure for this.

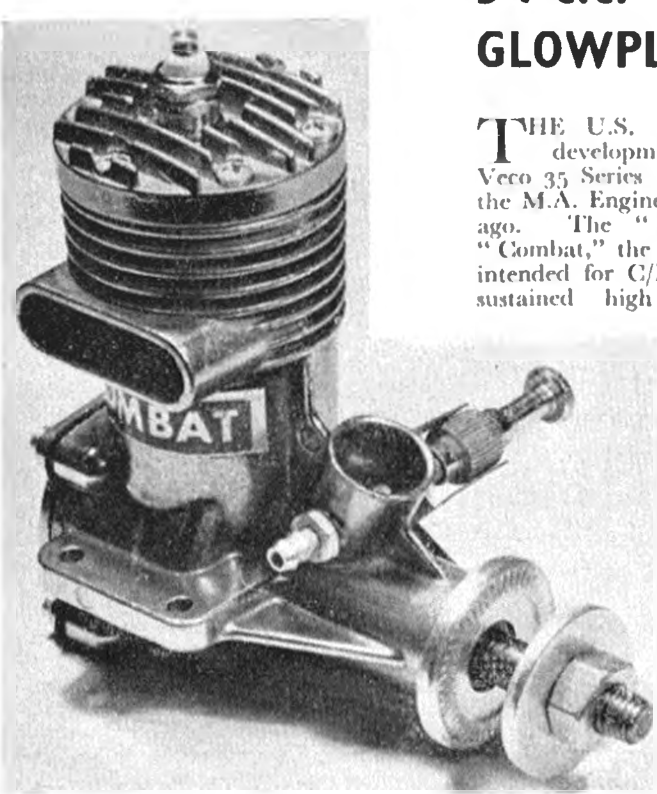
Running was at all times free from excessive vibration and the engine seemed particularly happy in the 12,500-15,000 r.p.m. bracket. Maximum power was determined at approximately 14,600 r.p.m., where a figure of .049 b.h.p. was recorded on 15 per cent. nitromethane fuel. This, incidentally, gives the Cobra the best power/weight ratio of any of the four British 049's tested to date.

Power/Weight Ratio (as tested): 0.56 b.h.p./lb.

Specific Output (as tested): 62 b.h.p./litre.

THE VECO 35C

5·7 c.c. GLOWPLUG MOTOR



THE U.S. built Veco 35C is a development of the standard Veco 35 Series 100 engines featured in the M.A. Engine Test series three years ago. The "C" suffix stands for "Combat," the engine being originally intended for C/L combat flying where sustained high speed, high power performance, rather than maximum stunt flexibility, is desirable. Accordingly, the 11/32 in. bore carburettor is not equipped with a venturi insert and is intended for use with a pressurised fuel system. A crankcase pressure take-off- is provided. This latter is in the form of a nipple which screws in place of the upper left-hand backplate screw and where the modeller prefers to use the system is thus of the low-pressure type. For stunt and other installations where the modeller prefers to use standard suction feed, however, a 17/64 in. i.d. venturi insert and a spare backplate screw are supplied.

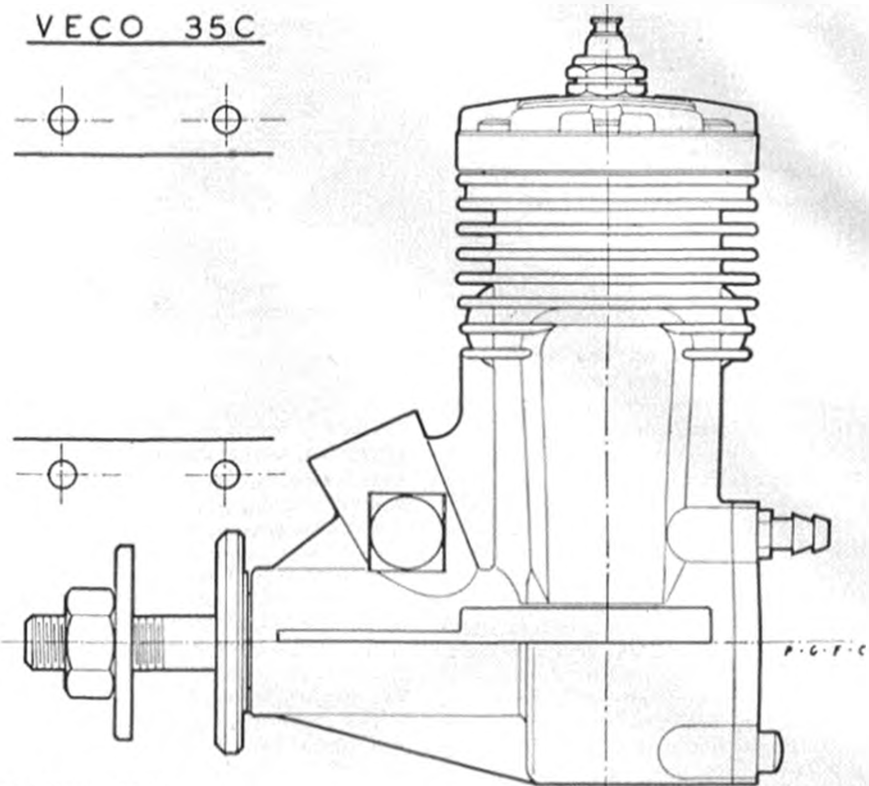
Several other features distinguish the 35C from the standard 35 introduced in 1957. The most interesting of these is an entirely new crankshaft which is hardened and follows the modern trend towards larger journal diameter, increased counterbalancing and more generous porting. Journal diameter is increased from 0.440 to 0.475 in. and the gas passage through the shaft is opened up to ⅜ in. dia.—an increase in cross-sectional area of some 44 per cent. The valve port is made slightly wider in order to maintain approximately the same induction period and timing as on the earlier engine—35 deg. ABDC to 50 deg. ATDC. Extra counterbalancing has been effected by a deeper counterweight and by cutting away the web flanks either side of the crankpin.

To accommodate the new shaft, the bronze bushed main bearing has merely been bored out, using the existing casting which embraces crankcase, main bearing housing and cylinder block. A new cylinder liner, of improved material and with larger ports is used, however. Ports are deeper (bottom edge only), to give approximately 45 deg. of supplementary air induction below the piston skirt on the exhaust side and a less abrupt entry on the transfer side.

An aluminium "blow-out-proof" gasket is now used under the cylinder head.

In all other respects, the 35C is of typical current Veco design. The connecting-rod is provided with a floating bearing at the big end, the purpose of this being to allow the bush to be extracted separately when dismantling the motor and so permit sufficient angular movement of the rod (after withdrawal of the cylinder liner) to enable the complete piston and rod assembly to be removed. This is necessary because the one-piece main casting renders it otherwise impossible to remove the piston and rod assembly or to extract the gudgeon-pin for removal of the piston and rod separately.

When using the pressure fuel system it is necessary to have a sealed fuel tank, preferably with three outlets in addition to the normal delivery pipe. One of these is coupled to the crankcase nipple and the other two are used as filler and vent pipes and are securely plugged. Alternatively but less convenient, a single filler can be used and the delivery line detached from the engine and employed as a vent during refuelling. The Veco Products Corporation make a range of suitable tanks and one of these was used for tests on our engine.



ACTUAL SIZE

Specification

Type: Single-cylinder, air-cooled, loop-scavenged two-stroke cycle, glow-plug ignition. Shaft type rotary valve induction with sub-piston supplementary air induction. Baffle piston with ignition plug offset to exhaust side.

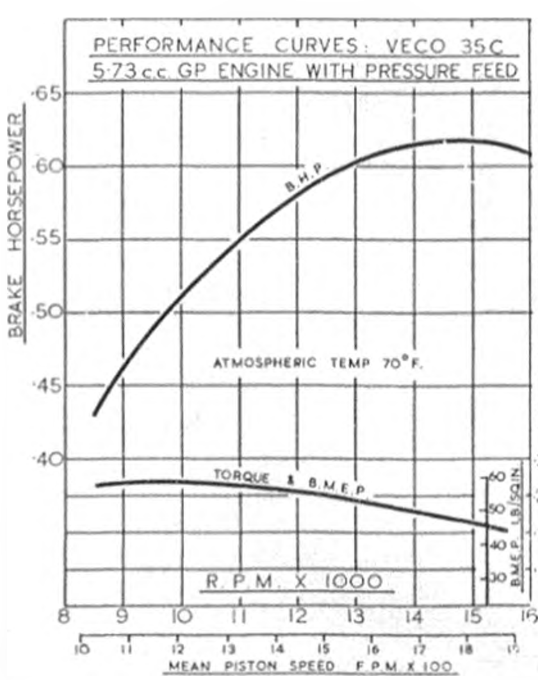
Swept Volume: 0.350 cu. in. (5.73 c.c.).

Bore: 0.784. Stroke: 0.725 in.

Stroke/Bore Ratio: 0.923 : 1.

Compression Ratio: 8 : 1.

Weight: 7.2 oz.



General Structural Data

Pressure diecast high tensile aluminium alloy one-piece crankcase/cylinder/main-bearing unit with phosphor-bronze main bearing bush. Heat-treated alloy steel counter-balanced crankshaft with taper-drive steel driving disc. Drop-in cylinder liner flanged at top and secured by die-cast alloy cylinder head retained with six Phillips screws. Mechanite piston, relieved 0.0015 in. for lower 9/32 in. of skirt and with 5/32 in. dia. fully floating gudgeon-pin. Machined aluminium alloy connecting rod with fully floating phosphor-bronze big end bush. Reversible spray-bar type needle-valve. Beam mounting lugs.

Test Engine Data

Running time prior to test: 8 hours.

Fuel used: Running in: 70 per cent. Methanol, 30 per cent. Shell Castor G. Dynamometer test: Record Nitrex 15 (15 per cent. nitromethane).

Ignition plug used: Veco "Hotshot" long reach, cold rating.

Fuel system: Veco T-31C tank pressurised from crankcase.

Performance

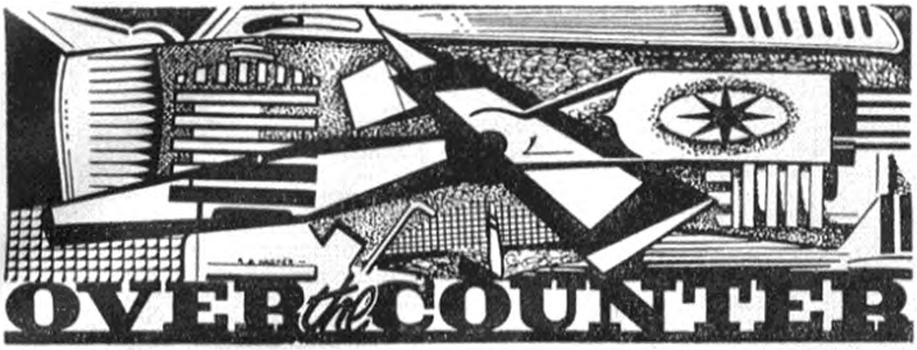
General handling characteristics of the Veco were good. Despite a higher all-round performance, our 35C was, in fact, a much better behaved motor than the standard 35 tested earlier, which was not all that we would have liked.

The pressurised fuel system presents no starting difficulties provided one remembers a few simple rules. Firstly, due to the forced fuel delivery, the needle-valve should be opened only about 1½ turns. The engine is then primed through the exhaust in the usual way. When restarting after a run, it is also necessary to port prime, since choking the intake is not effective. If a fuel cut-off valve is inserted in the fuel line, however, it is possible to stop the motor then restart instantly without further priming on re-opening the cut-off. The fact must not be overlooked that the tank also acts as a pressure reservoir and when the engine is stopped at any time with the tank partially full, the needle-valve must be closed or tank pressure released to avoid flooding, if the engine is not to be restarted immediately.

Running qualities of the Veco, following adequate running-in, were good, with smooth, even operation over the most commonly used r.p.m. range. Torque was up on that of the earlier 35 test, over the entire tested speed range from 8,000 to 16,000 r.p.m. reaching a maximum of 0.27 lb. ft. at approximately 9,500 r.p.m. and giving rise to a maximum b.h.p. at just under 0.62 at between 14,500 and 15,000 r.p.m.

Power/Weight Ratio (as tested): 1.37 b.h.p./lb.

Specific Output (as tested): 108 b.h.p./litre.



In recent months the customary deluge of new kits from most "plastics" manufacturers seems to have dried up. However, **Airfix** continue to expand their already vast range, and this month we received no fewer than three new models.

The largest of these is the Douglas D.C.3 *Dakota*—a fine kit in the standard 1/72nd scale, it will appeal to a very wide variety of modellers—from those who remember the nostalgic pre-war days when the D.C.3 was the very last word in air transport luxury, to the present generation of enthusiasts who may have flown in one of the grandly named B.E.A. *Pionairs,* the last flight of which made the headlines during October, 1960.

Airfix supply two sets of transfers for their model, one for Silver City, and the other for the colourful wartime C-47 variant, complete with correct red outlined U.S. national insignia.

There is a bewildering choice of colour schemes from which the *Dakota* builder can choose, for virtually every airline and airforce in the world has at some time or other flown this machine.

There were 10,926 *Daks* built and we are certain that it will not be long before this number is surpassed by accurate Airfix replicas, particularly as the kit costs only 6s. od.

The second Airfix kit is of that extremely interesting prototype—the Boulton Paul *Defiant.* This is an enterprising venture, and the first plastic model of this machine to be produced. It is a nice kit, moulded in black plastic and featuring a well thought out method of wing construction which ensures accurate assembly. The *Defiant* costs 2s. od.

Airfix, of course, do not only concentrate on elderly aircraft and for their third new model they have chosen the Hawker *Hunter.* The somehow elusive "lines" of the *Hunter* have not until now, been entirely successfully captured by the kit makers, but, here for 3s. od. is a model that really does look like its very shapely prototype.

Unique features of this model are the operating retractable gun pack and air brake, which, like the undercarriage, can be locked in the up or down position. There is also a full complement of rockets and overload tanks for use with the operational version. Two sets of markings are provided, one for the Swiss Air Force *Hunter* and a special white-outlined British set should you wish to complete the model as one of 111 Sqdn's *Black Arrows.*

For those who shy away from using the paint brush, the Airfix *Hunter* is moulded in black plastic—correct colour of course for this famous aerobatic team.

* * *

H. Marcel Guest have long been known as manufacturers of **Puk-ka** cement and dopes. Their range of products is, however, much wider, and includes clear laquer, wood stopper, contact adhesives, plastic cement, and their new fuel proof clear dope, which now requires no additives and comes ready for use.

Jasco, whose range of kits we detailed in our October issue, are the agents for Pukka products, which we have used and found to be of excellent quality.

* * *

In a Here and There paragraph last month we praised the catalogue of an overseas manufacturer, inferring that nothing comparable was issued by British firms. However, hardly was the ink of this issue dry when we were forced to eat our words by the appearance of the 1961 **Keilkraft** Handbook.

Although long established, this annual publication has now received a complete face lift, the most obvious change being in the format, which is now the same as MODEL AIRCRAFT. In addition to listing, with illustrations, the complete Keilkraft range of kits and accessories, there are useful articles of especial use to beginners, by expert modellers and a full-size plan for an 18 in. span C/L model. The Handbook costs 2s. od.

* * *

Although **Revell** have not produced any new kits this month, we have just had the opportunity of examining one of their latest batch of B.24 *Liberator* models. This detailed kit now comes complete with correct wartime R.A.F. transfers, and includes a neat camouflage chart. Although Revell do not, unfortunately, stick to a common scale for their kits, and thereby lose a tremendous number of potential customers, it is interesting to note that the *Liberator* is to 1/94 scale. It would, therefore, not be at all out of place alongside the Frog *Lancaster* or V Bomber series which, like many of their civil airliner kits are all to 1/96 scale.

The other Revell kit that caught our eye was the B.25 *Mitchell* in R.A.F. colours. This interesting aircraft makes a very nice model, and once again, although not to an accepted scale, is only slightly larger than the standard 1/72 scale in which there is such a wide selection of W.W.II prototypes. There are no other *Mitchell* models available and the kit provides the more creative modeller with tremendous scope for modifications, since the *Mitchell* has appeared in a bewildering variety of roles and colour schemes.

The *Liberator* costs 8s. 6d. and the *Mitchell* 8s. 6d.

* * *

Jetex have recently reduced the prices of their Atom 35 series of miniature flying scale models. These prefabricated kits which were reviewed in our October issue, are reduced from 7s. 6d. to 5s. 11d. and we are certain that this price adjustment will considerably increase their appeal.

* * *

In their advertisement last month the address of **Radio & Electronic Products** was given as 8, Station Parade, Sheen Lane. This was, of course, their old address—they moved recently to 44, Sheen Lane, Mortlake, S.W.14, but the phone number stays the same—Prospect 9375.

Over the Counter reviews

The Veron *Phoenix* and Performance Kits *Pinnacle*

Performance Kits *PINNACLE*

- **First .35 stunt model to be kitted in G.B.**
- **Price 76s. 7d.**
- **Built and flown by R. Gould**

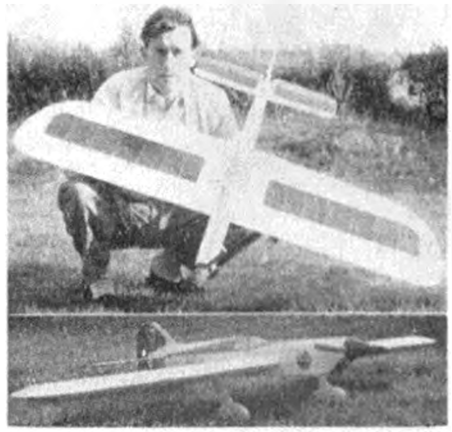
THE *Pinnacle* is a large area stunt model for .35 glo-motors, and it is the first model of this size to be kitted in this country.

Its designer claims this model to be

the last of a series of 52 models built and developed over a period of 12 years. It is, however, a very standard layout, and it does not boast any of the refinements normally found in the more successful contest models, i.e. tapered wings, asymmetric wing area or differential flaps. The appearance of the *Pinnacle* is, nevertheless, a little out of the rut, with its long sleek fuselage, inverted engine and spatted undercarriage.

No ply bulkheads are incorporated in the fuselage construction but this is partially made up for by using 1/16 in. sheet fuselage sides and a multiplicity of 3/16 in. bulkheads. The wing is slotted through the fuselage in the conventional way, but this point of the construction deserves some criticism. The fuselage is so slim that the thick wing section leaves very little "meat" top and bottom of it, and is a definite weak spot. On the test model, after the engine cut in an awkward position, the inside wing dropped while trying to land into wind, resulting in a cartwheel which snapped the nose clean off about 2 in. back from the leading edge of the wing. I would strongly recommend that 1/16 in. ply doublers are incorporated—I had to make a slap-dash fibreglass repair which is rather unsightly, but the model is now very strong at this point! The engine and tank installation are quite straightforward, and 1-1½ deg. right offset is recommended.

Wing construction is simple and the resulting structure is very rigid, utilising four 3/8 × 1/4 in. mainspars, 3/8 in. sq. L.E. built up sheet T.E. and the whole sheeted back to the front spar: controls are built into the wing and connected to flaps and elevators when the wing has been attached to the fuselage.



R. Gould with his 'test' model of the *Pinnacle*. The attractive lines that spats give to the design are clearly shown in the lower photo.

The tailplane and elevator are made of 3/32 in. sheet which may raise a few eyebrows as a sheet tail of this size is very prone to bending and flutter unless a very stiff piece of wood is selected, but tissue covering of this component will strengthen it. This assembly should not be firmly attached to the fuselage until all adjustments to the pushrods are satisfactory, as the slits in the bulkheads for the elevator push rod are very small to prevent flexing, and make for some profanity and time wasting if it is not rigged correctly first time. Plywood strips are used to join the flap and elevator halves which, although leaving rather unsightly triangular holes in the fuselage sides, do the job satisfactorily. Pre-formed aluminium control horns are provided and are glued and bolted to the plywood joiners.

The quality of the wood contained in the kit was good, the wing spars being of particular note while the die cutting of the wing ribs was very accurate. The plan is very good and comes in two sheets which are joined to give a complete wing plan.

The kit is not extensively prefabricated, this being confined to the wing ribs, T.E. strips, planking strips, and control horns. Bulkheads and other oddments are printed and blank sheets of balsa provided for the fuselage sides, tailplane and flaps. Two sheets of heavy Modelspan are supplied and are not quite large enough to cover the wings (at least they wouldn't make two top and bottom sheets for my wings). No cement, wheels, tank or spinner are provided.

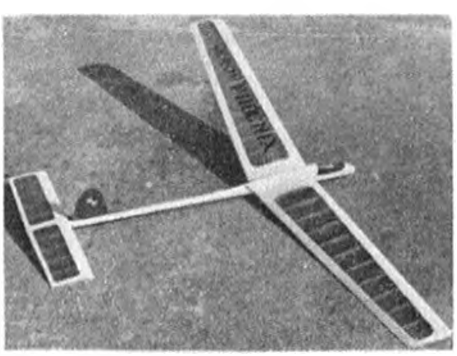
Flying

The test model, which weighed in at 41 oz. with a Max .35 installed, is rather touchy on the controls with a slight, tendency to 'tuck in' while manoeuvring when balanced on the pivot point as recommended in the instructions. With the c.g. moved slightly forward, the model was such steadier, making smooth flat take-offs and landings and taking all the round manoeuvres in its stride, but it was not particularly good in squares or triangles. It needs a lot of elevator to get round the corners and, consequently slows up rapidly and loses line tension quickly. Undoubtedly the recommended c.g. position would improve performance in this respect and the designer does emphasise the importance of this point.

The *Pinnacle* will obviously fly the complete stunt schedule and the prototype has been demonstrated by the designer at numerous stunt contests during 1960.

VERON'S *PHOENIX*

- **60 in. wingspan semi-scale glider.**
- **Extensively prefabricated.**
- **Price 36s.**
- **Built and flown by Sqn.-Ldr. Drinkell.**



THE stout box in which the *Phoenix* is packed is attractively labelled, although my youngest did remark that he didn't want the model to fly over the water! I hope it doesn't deter maiden aunts in the heart of the country from buying it for their nephews because of the sea association!

The contents of the kit are first class. The wood is beautifully cut, clean and of good quality. The shaped components are so well finished that it would be possible to build the model and not bother to use sandpaper at all. The only criticisms I could make are trivial—the short length of piano wire provided is barely sufficient, (*we pointed this out to Veron's and all kits now contain ample wire.—Ed.*) and the instructions recommend yellow tissue while that in the kit is white!

The construction is simple, due largely to the extensive prefabrication and I liked the precise slotting, at the correct angle, of the wing leading and trailing edges. P.V.A. (white glue) would simplify the leading edge sheeting operation and overcome the too-quick drying of balsa cement. In fact many modellers would prefer to use P.V.A. for most of the construction since there are several very large cemented areas which lend themselves to the use of this adhesive.

Covering and finishing are quite straightforward. It's a "pretty" model when finished and the artists among us will enjoy decorating it.

I found I needed all the compartment space for ballast to get the c.g. to the correct position. Small lead shot is the ballast to use here, and a slightly larger ballast space would be advantageous (this is easily arranged during assembly).

The *Phoenix* towed up very well, straight and smoothly and the only trimming needed was a little packing under the trailing edge of the tailplane.

Summing up, the *Phoenix* is as good looking as any model on the world market and far more attractive than the vast majority. It fully lives up to the manufacturer's claim of high quality prefabrication, and it is simple to build, yet there is plenty to build, if you follow me! I certainly wouldn't mind seeing it presented to my boys—or to myself for that matter—on Christmas morning.

CLUB NEWS

ST. ALBANS M.A.C.

1960 has seen the club achieve one of its greatest ambitions, namely, the winning of the Plugge Cup. For years now we have been striving to win this, and at long last perseverance and some luck have paid off.

We offer our heartiest congratulations to the Northern Heights club on narrowly beating us in the L.D.I.C.C.C. final.

Carl Simeons is at present building the biggest *Dixielander* yet, power being provided by an Anderson Spitfire converted to glowplug !

New members are always welcome, come along on Thursday evenings at 7.30. The clubroom is at 96a, Victoria Street, St. Albans, Herts.

ABINGDON & D.M.F.C.

In the C.M.A. Comp., A. Crisp reached the fly-off with his *Ikarus* 4, Hungarian A/2.

We recently held an A.G.M. and the secretary, treasurer and comp. secs. were re-elected. A new chairman, J. Baker, was elected, and the club's winter activities were discussed.

One of our keen Open Power members, "Jonah" (B. C. Jones) has left us for a season while he studies at the London Polytechnic. He should produce some cool "Beatnik" models when he returns to us.

MACCLESFIELD M.A.S.

At a club meeting when the shattered remains of the Rat-Race were still fresh in peoples' minds, someone suggested that we should have an Open Combat instead—"It's not so dangerous." So plans of huge glow powered juggernauts were hatched, but unfortunately only one came to the comp. ! It was a Johnson 35-powered model, which, we were assured, we would not see for dust—if it was going properly. All the other models were ordinary 2.5 c.c. combat jobs, and it was one of these that won, for the 35 was definitely not going—properly or otherwise.

Things were pretty hectic, but not nearly so hectic as they had been in the ½A combat. Unlike the earlier ½A combat, several models were destroyed and it was then that Gig Eifflaender's well-known 1½ c.c. stunt model met its end, and very spectacularly too, in a head-on prang which destroyed both models.

The Stunt competition, judged by Barry Corden, reflected the increased interest in this event. The emphasis was on diesel models and only one glow was entered. As usual Gig won with an almost perfect performance.

The most recent competition was the scramble, at which the whole club went quite mad for a few hours. Models of every type, from rubber models to *Heatwaves*, were tearing about in all directions, pursued by perspiring owners and accompanied by the frantic clicking of stop-watches. Inevitably there were collisions and o.o.s. flights, and the net result was a large pile of broken models.

With reference to the Editor's comment in the August issue. Admittedly Barry Corden did fly a "glow" model in the Eliminators. In the first round Barry flew his 2.5 c.c. diesel stunter, on the second day in the second round he flew his Fox 35 "glow" model and went up two places in the final placing, even though his flying was not as good as it had been the previous day. (*By whose reckoning ?—Ed.*)

PETERBOROUGH M.F.C.

Mick Harmer recently flew a P.A.W. 149-powered *Dixielander* in the Frog Senior, scoring 8.35, and Jim Wright flew in the C.M.A. Cup, which he won in 1959, but the best he could do this time was 7.30.

The club Glider contest for a new cup presented by the 1960 committee, drew a good entry and the outcome was a win for Jim Wright, with Phil Francis second and B. Riley third.

Our Combat cup was awarded to the person with the most points in two comps. (4 points for first, 3 for second place, etc.). This year it went to Michael (Pen) Fountain, with maximum points, second and third respectively, were Ted Fairchild and Ian Duffy.

SHARSTON D.M.S.

News has gone round of renewed interest developing in the club and the result has been most gratifying—several old, and some new, members finding their way back to our weekly meetings. Several attempts at R.T.P. have met with some success, and interest is increasing in this field.

E. Helliwell and P. Massey went to the last Stretton meeting, where P. Massey achieved a 30 min. flight with a Frog *Tutor*.

HAYES & D.M.A.C.

At the Blackheath Gala we found ideal flying conditions. Jim Baguley finished up with second place in the Open Glider event using his 8 ft. and 12 ft. span designs which have finished in one of the top two places, at most rallies in the south this season.

A small group on the same day went to Ivinghoe Beacon for the Cambridge M.A.C. slope soaring meeting. Bob Playle came fourth in the F/F while Allan Robinson took the opportunity to watch his tailless A/2 disappear straight from the top, neither turning nor losing height !

We are very pleased that Mike Smith has managed to win the S.M.A.E. area centralised team race which we flew at Kenley, in conjunction with the London Area Championships. His Rivers Silver Streak Mk. II got him through the distance in 4:47, with Graham Rivers mighty close on his heels with 4:47.3.

Our speed specialists had a rare day out at the Kenley meeting, which was organised by R. L. Taylor, on behalf of the S.M.A.E., (many thanks). They took along several different entries but only J. Taylor/R. McGladdery got in a score, and thus second place in the F.A.I. Class.

Winter indoor meetings are held on alternate Wednesdays, 7-9.30 p.m., at Townfield Senior School, Hayes, Middx.; if you want to, drop in for a natter.

BRIGHTON & D.M.A.C.

In conjunction with the Frog Senior Trophy we recently held an Open Power contest for the Charles Cup, and this was won by John West with 11:57, while Peter Brown was second with 6:48. In the C.M.A. Cup on the same day, John West came first with 6:51, followed by Fred Boxall with 6:14.

At the Croydon Power Gala John West won the fly-off of the Open Power, while Fred Boxall placed third at Blackheath with 5:5 in the fly-off for the Bill White Cup.

In our Open Duration contest for the Arthur Mullett Rose Bowl, Fred Boxall and John West tied with three maximums, and the fly-off was postponed to a later date due to the visibility reducing fly-off times to under 2 min.

WESTON CONTROLINERS

Interest in Stunt and Team racing is rapidly spreading, with a resulting loss of practice in Combat. This is probably one of the reasons that, except in Stunt, no notable successes have been scored at several large rallies entered recently. We did, however, retain the Bath Abbey Shield for Team combat at Blake Hill Farm.

Our members have been very critical about the Southern Area Rally at Tangmere which was cancelled in 1959 at the last minute, at some expense to the club, and in 1960 it was found that there was to be no Stunt or ½A Team race due to "lack of support" for these classes—which we find hard to believe.

R.A.F. Locking is proving to be a very ideal flying ground—we have tarmac (although a bit bumpy) and a hangar to fly in when it is windy or wet, for which many thanks.

WHARFEDALE M.A.C.

An excellent display for the young patients of the Wharfedale Children's Hospital was recently put on. The day was over-cast but not too cold and our younger members did a wonderful job in entertaining the crowd with round after round of hot combat, followed by aerobatics from J. Horton and R. Place.

As promised, we staged the first 1,000 lap race for S.M.A.E. Class "B" models in Great Britain. Although the number of entries was rather low, this did not prevent an extremely interesting final with four competitors thundering round for over one hour's continual racing. The eventual winners were the Horton/Howarth team in a time of 1 hr. 7 min. 46.6 sec., using the Frog 500 powered *Dalesman*.

Placed third were the Long/Davy team who limped up to 879 laps after burning out eight new glow plugs in an attempt to close the distance between them and the winning model.

The detailed results of this marathon were:

1. Horton/Howarth	Wharfedale	Frog 500	1 hr. 7 min. 46.6 sec.
2. Dugsmore/Bell	Novocastria	ETA 29	1 hr. 17 min. 32.6 sec.
3. Long/Davy 879 laps	Wharfedale	ETA 29	1 hr. 8 min. 0 sec.
4. D. Nixson 239 laps	Hinckley	Frog 500	

We would like to thank all those who helped either by entering as competitors or giving their services freely in organisation, for without them this very interesting race would never have been possible.

The club was strongly represented at the S.M.A.E. dinner in London, and we were surprised to see so few Northern clubs in attendance.

It is interesting to note from the 1960 result sheets that Wharfedale teamsters achieved nine first places, seven seconds, nine thirds and three fourths. In order to achieve this almost satisfying score club members have travelled over 4,000 miles by various means to attend rallies and functions spaced as far apart as Glasgow and London, not to mention the 3,000 mile Ilkley/Budapest run in September.

ANGLIA M.F.C.

The area inter-club contest was timed to coincide with the Frog Senior and C.M.A. cups. The weather was remarkably good, and in the Frog Senior, D. Roche scored three max's, only to over-run in the fly-off.

A number of the lads made the trip to Chobham for the Blackheath Gala where up-and-coming junior R. Humphries won the glider event. D. Roche being one of the many in power to score three maxs., but was only able to return 3:38 for the fly-off.

Castell of Letchworth was third in the Croydon Power Gala with this orange and black E.T.A. 15 model. Photo M. Dilly.

SOUTHAMPTON M.A.C.

Several of our F/F members went to Beaulieu for the Frog Senior and C.M.A. events and Norman Worley's 7.45 in the C.M.A. Cup was the best performance of the day.

The following Sunday was the date fixed for our A and ½A Combat event. The number of entries surprised even the most optimistic, but unfortunately the pessimists were right about the standard of flying which, with one or two exceptions, was very poor. The winners, Chris Mannell (A) and Bill Bessent (½A) were the only younger members showing signs of practice.

LIVERPOOL & D.M.A.S.

Recent competition successes include Alan Carter's 7:45 fly off time in the Frog Senior Cup to place second in the area, while Savini was third with 3:56 fly off.

The Rootes Trophy, the North West Area team award, saw five members flying. Barnes and Duce totalled 24 min. in rubber, but our terrible power twins dropped 37 sec. between them, and the less said about the glider the better.

We meet every other Friday at the Common Hall, Hackins Hey, Liverpool, while flying goes on at Burscough aerodrome on Sundays. Any new faces are welcome.

KIDDERMINSTER & D.M.F.C.

B. Fellows, a name that frequently comes up in our club news, is once again in. His recent visit to Cambridge club's R/C Comp. at Ivinghoe Beacon gained him a third place, where, incidentally, his brother gained second place.

We welcome any new members who come along to our field, which is situated on the main Kidderminster-Stourport Road. This is quite clearly marked by a notice outside the field with the lettering K.D.M.F.C.

Any young persons under 16 years of age who are interested in our modelling classes can obtain further information from: P. Tanser, The Model Mart, 2, Comberton Road, Kidderminster, Worcestershire.

SIDCUP A.S.

Another eventful year has passed since our last A.G.M., and early on, the team race boys, under the guiding hand of M. Bassett, started re-introducing the name of Sidcup in the team race circles. Later in the year they combined with J. Templeman of Surbiton and D. Dew of Godalming to form the Ecurie Endeavour team, and continued to get good contest experience.

At the Nationals we were one of the few clubs to volunteer to run one of the contests. We ran the Class "B" team race, not to everybody's liking we will admit! However, it is a well-known fact that there are always plenty of people to moan at how a job is done, but not so many willing to take the responsibility. Let's hope those who shouted the loudest will be willing to take the job on at the next Nationals.

We also held our first independent C/L gala at R.A.F. Kenley, which proved to be a great success. With a strong enforcement of the rules there was little to find fault with and the day ended with many competitors requesting us to hold the event annually!

CROYDON & D.M.A.C.

Chobham Common was waterlogged for the Croydon power gala and entries were rather low in numbers. Those who did turn up had a lot of mud to contend with, but flying conditions were not at all bad—some lift, very low drift and visibility around a mile plus.

Maximums were set at 3:20, and by 4 p.m., four people had a full house of three each—Messrs. Fuller, Young and West, all flying *Dixielanders*, and Castell with a highly visible black and orange, elliptical surfaced, Eta 15 model. They tee'd off into the late afternoon gloom and reshuffled themselves as shown.

Tony Young won ½A with three maximums, flying a Thermal Hopper powered PAA-loader minus cargo and crew; in second place was Don Butler with another Thermal Hopper original with an underfin and a 250 sq. in. wing.

RESULTS

Open

1. J. West	..	Brighton ..	10:00 + 3:35
2. G. Fuller	..	St. Albans	10:00 + 3:04
3. Castell	..	Letchworth	10:00 + 2:06

½A

1. A. Young	..	St. Albans	10:00
2. D. Butler	..	Surbiton ..	9:15

ESHER & D.M.F.C.

We are endeavouring to start scale Team Racing and suggest the following rules should apply.

Aircraft must be true scale, the only deviation allowed being an increase of 5 per cent. to the tail area if desired. The engine must be fully cowled except for needle valve, compression screw or glowplug. A cooling slot and exhaust outlet are allowed.

Engine size of up to 5 c.c. so that there will be 2.5 and 5 c.c. fighting it out together in the same circle.

Tank size for 2.5 c.c.—15 c.c.

Tank size for 5 c.c.—30 c.c.

If spats are fitted they may be shortened to the centre line of the wheel. Wheels must be nearest-to-scale commercial size.

The rake of the undercarriage may be changed but not the position. Wing rib depth may be decreased by 20 per cent. Pilot must be of scale size and period. Line length as in Class "B" Team Racing.

We will be holding a contest for scale Team Racing to these rules on April 9th, 1961, at Esher D.M.F.C.'s flying ground, West End, Esher, Surrey. Pre-entry is a must.

If any further details are required, please get in touch with: I. W. Creighton, 27, Harveys Road, Walton-on-Thames, Surrey.

CAMBRIDGE M.A.C.

The weather at Ivinghoe Beacon was ideal for our slope soaring meeting, apart from some fog which persisted until about mid-day. This cut down the flying time, and only one flight per competitor was possible.

RESULTS

Multi-channel R/C (5 min. nomination flight).

1. F. Knowles	..	Reigate ..	2½ sec. error
2. R. Copland	..	Nthrn. Hts.	11 sec. error
3. D. Bailey		Burton-on-Trent	25 sec. error

Single-channel R/C (5 min. nomination).

1. D. J. Wilsden..		C.M. ..	0 sec. error
2. J. Fellows	..	Kidderminster	1½ sec. error
3. M. B. Fellows		,,	12 sec. error

F/F (Best of three flights).

1. D. Edwards	..	St. Albans	..	6:30
2. S. Allsopp	..	Cambridge	..	6:14
3. B. Cox	..	St. Albans	..	4:50

CARDIFF M.A.C.

We recently held a scramble at Tre Lai Park. Conditions were ideal, no lift, hardly any drift, and cool enough to make dashing about pleasant. Each entrant was allowed 15 min., no single flight time of over 2 min. to count. First three were R. Flaherty, 6:47; L. Harvey, 5:56; S. G. Morgan, 5:53, while Frank Bessant made a creditable 4:56 flying rubber, which is doing it the hard way.

Roger Flaherty continued his winning sequence (he has won the last three F/F events) when beating his opponents o.o.s. in chuck-glider. Best four of six chucks gave him an aggregate of 141 sec. to the next best of 81 sec.

COSMO M.A.C.

Our fourth combat competition this season was won by S. Nutchey with D. Sizmur second and R. James third. This was a very hard fought contest with Stan, who was using a .19 glow engine, well deserving his win.

POULTON & D.M.A.C.

We now meet in our new clubroom every alternate Friday at 8 p.m., and have a new flying field, where flying meetings are held every Sunday, weather permitting. Prospective new members will find our secretary's address in the Changes of Secretary column.

CHICHESTER & D.M.A.C.

We recently held a barbecue which was attended by about 50 members and friends from the Horsham, East Grinstead, Horley, Crawley, Worthing, Lancing and Chichester clubs. Despite the poor weather, an enjoyable time was had by all.

Even more enjoyable was the flying on the following day, some members of the visiting clubs camping out overnight in order to get an early start. The weather for this event was good—the Chichester club faring very well, winning the Team Power and Glider events, while the R/C spot landing was won by R. Biggs, also of Chichester.

CONTEST CALENDAR

Jan. 15th East Lancs Winter Rally, Walton Spire Nelson. R/G/P/, Combat (S.M.E.E. class), Chuck Glider. (Full details in Club News.)

Jan. 22nd †Northern Area Winter Rally, Rufforth R/G/P, ½A/S.A.I./B, T/R, R/C Single, Chuck Glider, ½ hr. scramble. Pre-entry, 1s. 6d. per event to P. Hollis, 15 Sitwell Grove, Cranbrook Avenue, York.

CHANGES OF SECRETARY

POULTON & D.M.A.C. L. Wilson, 9, Main Drive, Poulton-le-Fylde, Lancs.

SIDCUP AERONAUTICAL SOCIETY. P. H. T. Noble, 32, Mottingham Road, Mottingham, S.E.9.

KIDDERMINSTER & D.M.F.C. M. H. Richards, 29, Park Street, Kidderminster, Worcs.

NORTH LINCOLNSHIRE M.A.S. E. Sales, 6, Granville Street, Grimsby, Lincs.

HESWALL M.A.C. F. P. Bodey, 26, Hesketh Drive, Heswall, Wirral, Cheshire.

OUTLAWS (CANNOCK) M.A.C. L. R. Lockley, "Meliden," Littlewood Lane, Cheslyn Hay, Near Walsall.

SEVENOAKS & D.M.A.C. D. Edwards-Winser, Oastbrook, Telston Lane, Otford, Kent.

NEW CLUB

NORTHWOOD R/C CLUB. J. Webb, 84, Tolcarne Drive, Pinner, Middx.

LATEST ENGINE NEWS

Continued from page 6

wonderfully smooth running (as one would expect of a flat twin), flexible, a delight to the eye and yet not too heavy and quite good as regards power output. A delightful motor to have for a nice scale R/C job.

Two typical American 29's passed through the mill in the shape of the low-priced McCoy Stunt (15) and medium-priced Veco 29R (20). Both handled well and gave good accounts of themselves as regards performance, with the edge in favour of the Veco, as befits an engine which is intended for team-racing, proto-racing, etc.

The two 35's featured in M.A. Tests were also the two best: The Merco (22) and the O.S. Max-III (23). The Merco, originally planned when trade restrictions excluded U.S. and Japanese 35's from the U.K. market, has since had to struggle against a flood of imports, but has proved itself with a string of wins in British stunt contests during 1960.

The O.S., No. 1 engine in Australia and a slight thorn in the side of U.S. manufacturers, has emerged as one of the pacemakers of 35 engine development. Both motors are superbly made and easy to handle, the O.S. having more power but calling for lengthier running-in, the Merco having the edge, perhaps, in flexibility.

Finally, we come to the two largest engines in this selection, both 7.4 c.c. R/C engines: the K & B Torpedo 45RC (18) and the Kyowa 45RC (25). As regards sheer power, neither has much of an edge—if any—on a good .35, but they score in their ability to swing 12 and 13 in. dia. props. The World R/C Championship winning K & B is a development of the Torpedo 35, is very light for its size and has a separate counterweight flywheel to provide increased counterbalancing for the heavier .45 piston. The Kyowa is a somewhat heavier and more robust engine and is expected to be available in the U.K. for 1961 through the regular trade channels.

So we look forward to 1961's promised offerings. The Wisniewski 15 to be built commercially by K & B, the new Cox and O.S. glow 15's, Merco and O.S. .49's, a new racing 29 from K & B, the new 1.5 b.b. Frog diesel and its p.b. glow counterpart, the Mk. III P.A.W. 2.49 and more to come.

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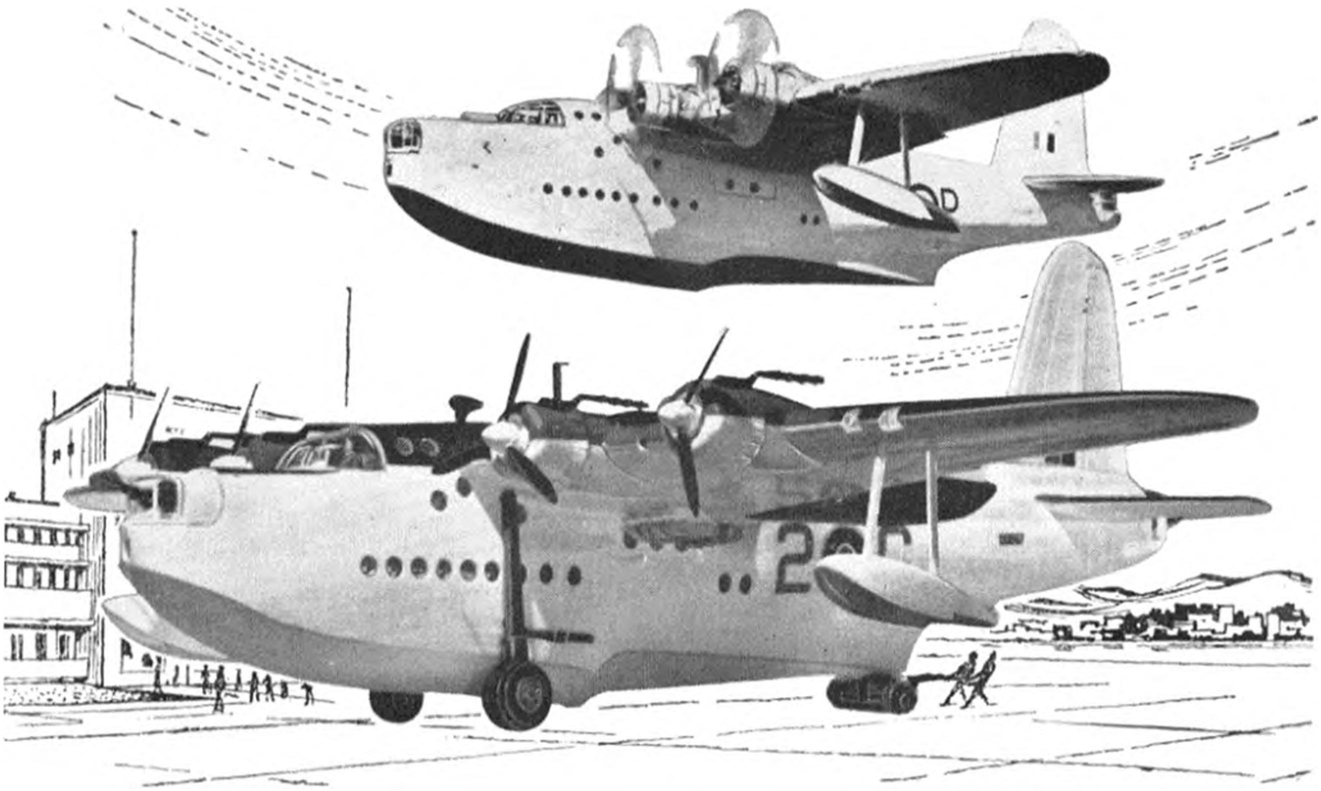

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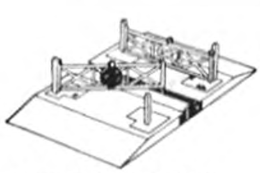

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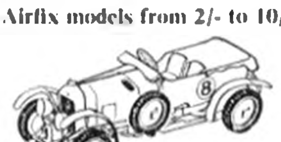

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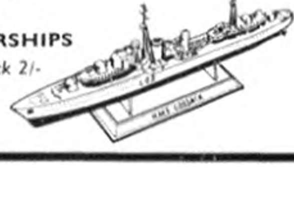

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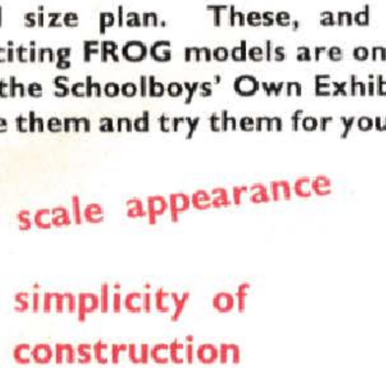

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