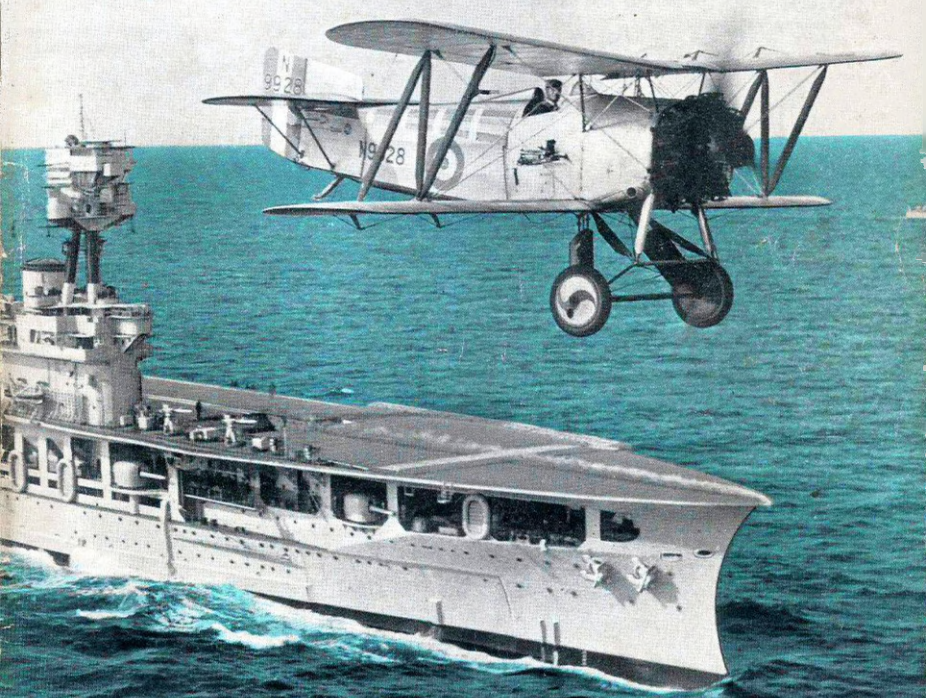
AERO MODELLER

MAY 1955



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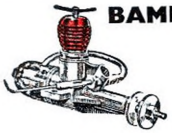
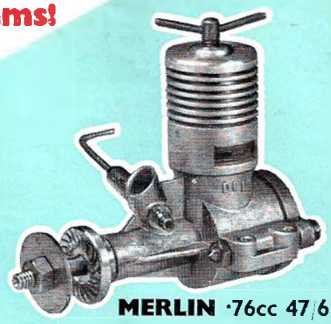
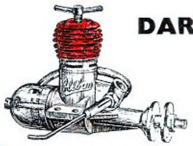


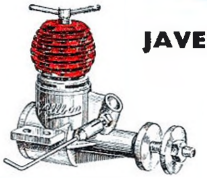
BAMBI ·15cc 10/11



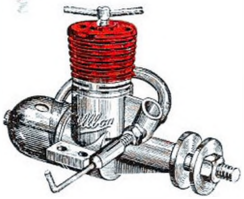
MERLIN ·76cc 47/6



DART ·5cc 64/2



JAVELIN 1.49cc 65/4



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Allen-Mercury 25 ...	57/–+ 9/6
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E.D. Hunter 3.46 c.c.	72/6+ 6/–
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Amco 3.5 P.B. ...	60/–+11/3
D.C. 350	66/–+12/6
D.C. 350 G.P. ...	66/–+12/5
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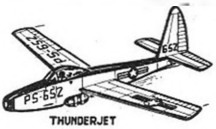

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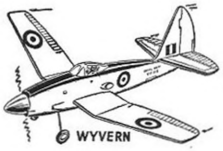

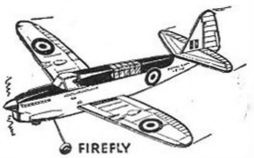

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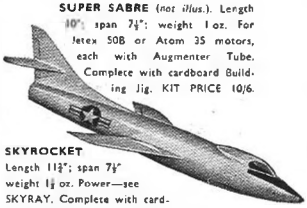

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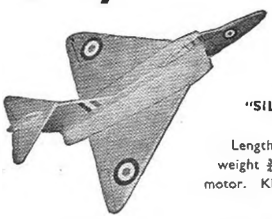

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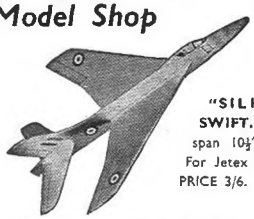

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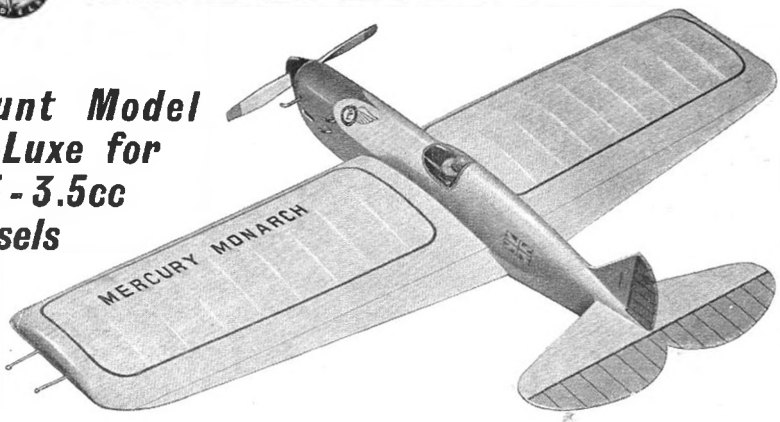

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AERO MODELLER

"Covers the world of Aeromodelling"

VOLUME XX
NUMBER 232
MAY, 1955

Managing Editor - - C. S. RUSHBROOKE
Editor - - - - H. G. HUNDLEBY
Assistant Editor - - - R. G. MOULTON

★

In this issue

Special features

★

Regular features

★

AEROMODELLER Incorporates the MODEL AEROPLANE CONSTRUCTOR and is published monthly on the 15th of the previous month by the Proprietors:

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Editorial and Advertisement Offices:
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FLYING AND THE NAVY

OUR SPECIAL Naval cover this month reminds us of the excellent work carried out by Naval helicopters during the past hard winter, especially in the hard hit areas of Scotland. The tasks surmounted by this highly specialised branch of the Services amply demonstrated the indisputable advantages of this type of aircraft, for too long a Cinderella of the aviation world.

We number an increasing following of the aeromodelling art amongst our Naval readership, which is hardly surprising, for those who follow the sea for a living are inveterate model-makers, and Jack has long been renowned for his "ship-in-a-bottle" activities which while away the hours between watches. The advent of the aircraft carrier introduced an aeromodelling touch into seamen's interests, and we know of a number of cases where the flight deck has witnessed some hectic model aviation!

We are left wondering why it is that no official recognition is given to this branch of hobby activities, for we have yet to learn of any clubs at Naval stations. Perhaps their Lordships of the Admiralty may soon be persuaded that aeromodelling is the modern equivalent of more ancient crafts, and of particular interest at shore establishments and Naval airfields. The success of the R.A.F. Models Association should be a sure guidance to those above, and we look forward to the days when a true inter-Services Contest can be arranged on the aeromodelling field.

The U.S. Navy has long been aware of the vast source of air-minded personnel to be reached through aeromodelling, and has on many occasions sponsored and played host at major meetings in the States, besides organising specialised deck landing contests for scale control line models. Can we hope that the Royal Navy will soon make itself known in similar activities?

On the Cover

One of H.M.S. Eagle's Fairey Flycatchers is caught by Charles E. Brown's versatile camera when flying at Gibraltar during 1930. Point of interest in this most interesting photograph is that the camera was approximately at the same altitude as the upper platform on the Eagle's tower—long way down is it not?

New style in Hangars is the tepee-shaped "clam - shell" with triple decked working platforms for the Convair XFY-1 "Pogo." Hangar rolls on wheels so that it can be taken to the aeroplane if needed

Heard at the HANGAR DOORS

How Simple is Radio control ?

Modellers who have shunned or hesitated at entering the somewhat technical field of Radio Control, frightened by such terms as "standing current", "quench coils", "crystal oscillator", etc., can take heart now that our Editor's long-awaited book "Simple Radio Control" is available.

It has been written especially for the average aeromodeller who, with no knowledge of radio, wishes to experience the thrills of radio controlled flying for the first time. In consequence the book deals only with simple single channel equipment described in clear non-technical terms.

An explanatory chapter gives the basic principles of operation, and individual items of equipment, such as the Transmitter, Receiver, Relay, Actuator, etc., are all dealt with in detail. The novice is helped in his choice of equipment, be it commercial or home-made, and in the latter event there are chapters giving stage-by-stage construction details for the "AEROMODELLER" Transmitter, Receiver, and also the Pike XFG1 Receiver.

Further chapters explain the installation of radio gear in the model, tuning and operation, the various systems of control linkage, and construction of an All-Purpose Meter.

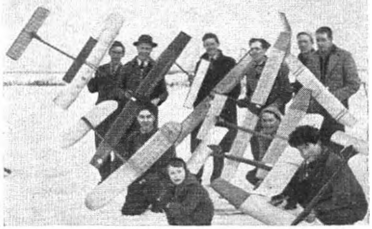
The Radio Model itself is given comprehensive coverage, and here as an aeromodeller, our worthy Ed. has the advantage over the somewhat technical titles already on the market. Choice of model and structural considerations particular to radio control operation, are amongst the many facets discussed, not forgetting important items such as the right type of landing gear and methods of trimming.

Test flying and radio pilotage, fault finding and correct soldering are also covered, and there are useful indices giving details of commercial equipment and batteries. Art plates and sketches portray, not only the author's ideas, but a multitude of other brainwaves from well-known radio experts, and we can safely say that this little book is as good a "five bobs' worth" as one is likely to find.

Merited Recognition

We learn that the F.A.I. has awarded a Paul Tissandier Diploma to hard working S.M.A.E. Secretary, Doug. Gordon, who has filled this post for a number of years. These diplomas are a form of recognition of activities devoted to the aviation movement, usually in fields that are not capable of acknowledgment by the award of trophies, etc., and it says much for Great Britain that this is the second award to be made to Britishers, the first going to S.M.A.E. Chairman and President of the International Models Commission, A. F. Houlberg.

Over eight inches of snow, Czechs Harapat, Brauner, Pech and Cizek in upper photo look as happy as the Wallasey boys (below) during their recent postal contest organised through AEROMODELLER World News columns.



World Speed Champs.

We learn on best authority that both date and venue are changed for the 1955 World Control-line Championships. Stated in the F.A.I. Calendar to be at Paris over Whitsun, they are now to be held at l'Aerodrome de Poitiers over July 1, 2 and 3. The city of Poitiers is just over midway between Paris and Bordeaux, and from the nature of these alterations we interpret that the meeting will be held with another major French meeting. Date for their Nationals has yet to be announced.

Fixed your Holiday?

The thrill of full-size gliding—a hobby close akin to aeromodelling—can be enjoyed in good company at the Gliding Clubs to be seen advertising at the back of this issue. First class accommodation, the chance of a whole unfettered week of flying and solo flying after dual control training can be yours for less than the cost of the average seaside laze. Why not try it this year and join the increasing band of A and B gliding badge holders?

Windsor Highlights

February 26th was the occasion of the annual Northern Heights M.F.C. Dinner, held as usual at the "Windsor Castle" near Victoria, and as usual the fun was fast and (at times) furious. Sir Pugh Lloyd received the "Malta Cup" on behalf of the R.A.F. Models Association from Lady Boyle who presented the prizes, and founder-member "Rip" was the proud recipient of an album of photographs. All in all, a very pleasant function, maintaining its standard as an "aeromodellers must".

East meets West

Through our World News columns we have been successful in matching by postal contest leading clubs in Britain and Czechoslovakia. The event took place on cold, snowbound February 27, with two teams nominated each by Wallasey M.A.C. and Kladno (Czech), plus another team from Wavertree M.F.C. to make it a triangular event, whilst Whitefield, due to strong wind in their district, postponed their part in the contest until better weather arrives. With similar conditions in each country, except for occasional turbulence at Kladno, we are able to draw direct comparison between East and West. Close results, both individual and for the Wallasey and Kladno "A" teams make the coming A/2 Championships even more interesting, should the Czechs be able to send a National team.

WALLASEY *versus* KLADNO
(Total in secs for 5 flights)

J. Hannay	813	J. Harapat	811
G. Hutton	782	E. Brauner	758
S. Hinds	775	Z. Pech	707
R. Sutton	421	R. Cizek	508
TOTAL ...	2791	TOTAL ...	2784

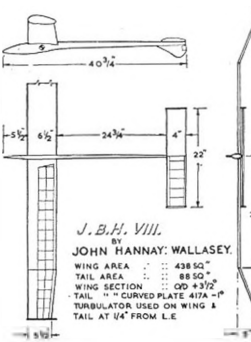
"B" Teams

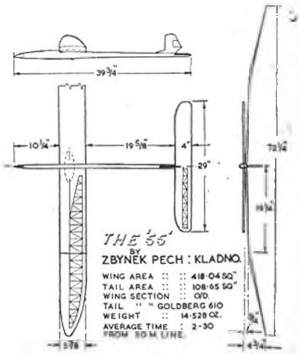
Wallasey ...	962	Kladno	1545

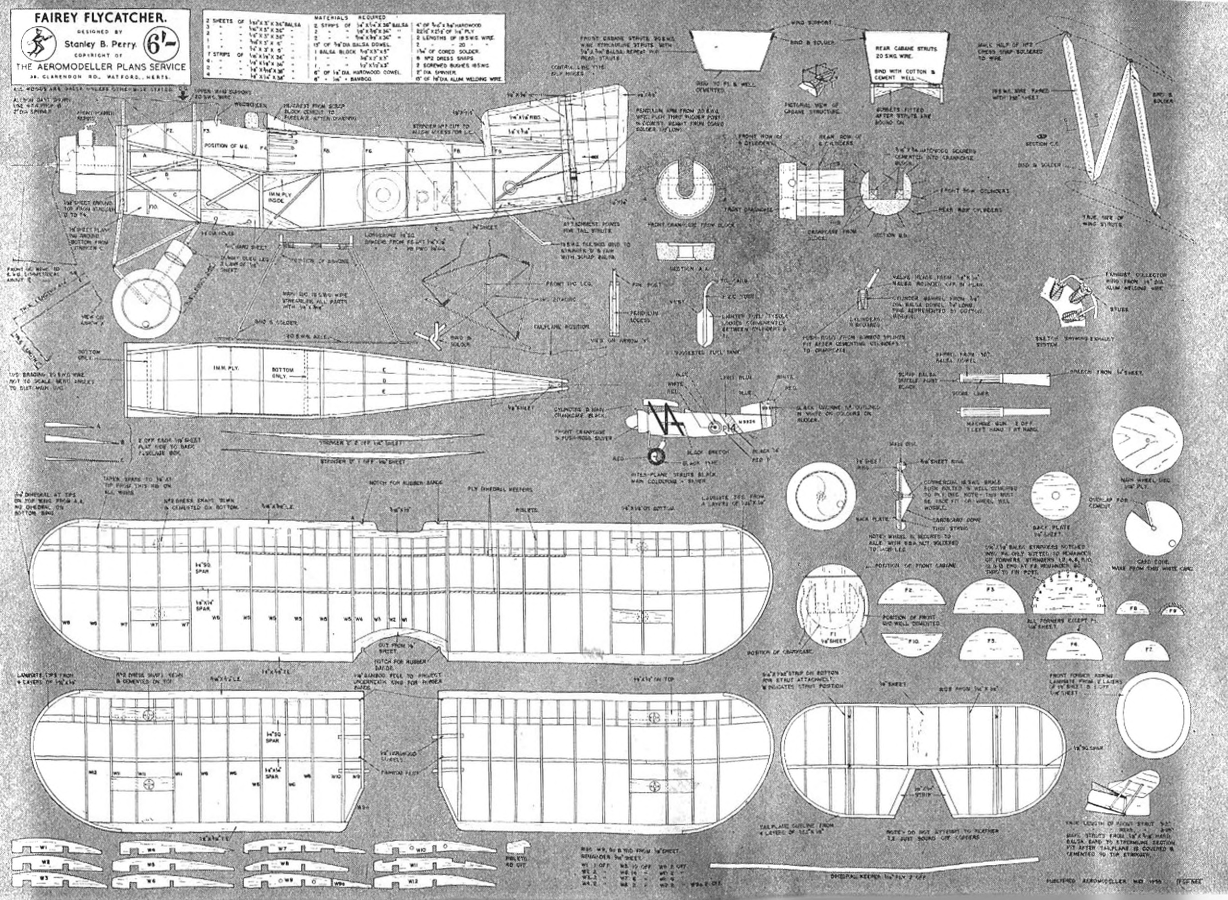
Wavertree Results

C. Chestnutt	744	D. Douglas	560
J. Dutton..	595	A. McLellan	510
TOTAL	...	2409	

Drawings of outstanding models are at right.







FAIREY FLYCATCHER.
DESIGNED BY
Stanley B. Perry.
6/-
COPYRIGHT OF
THE AEROMODELLER PLANS SERVICE
38, CLARENDON RD., WATFORD., HERTS.
MATERIALS REQUIRED
POSITION OF M.G.
IMM. PLY
BOTTOM ONLY
SECTION A.A.
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
W11
W12

Aircraft on the cover

The FAIREY FLYCATCHER

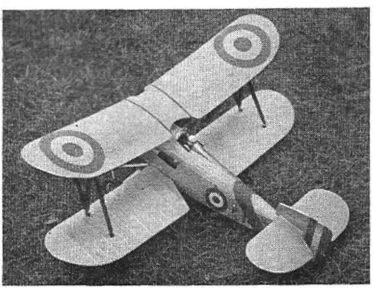
by **Stanley B. Perry**

THE FLYCATCHER was one of the early post 1914-18 war generation of fighters and was considered a very good aircraft. Its outstanding qualities were extreme noisiness and (for its day) an excellent speed range. It was the first fighter specially designed for deck flying duties to go into production and was available in both land and seaplane versions. Beginning service in 1925, it was issued to Nos. 401-8 (Fleet Fighter) Flights of the R.A.F. On the plan are *Courageous* aircraft colour details and with the relatively simple construction of Mr. Perry's Flycatcher in miniature, enable one to produce a realistic model with sports type flying performance.

Fuselage. Build the basic box structure, as in heavier outline, noting that spacers from F.6 aft are $\frac{1}{8}$ of $\frac{1}{8}$ in.× $\frac{1}{16}$ in. strip. See that the double stern post allows good access for the rudder pendulum. Cement the front former securely to the structure and attach the front and rear cabane struts. Now add the remaining formers and the side, bottom, and aft top decking stringers. The undercarriage may now be bent, soldered and bound to the fuselage.

$\frac{1}{16}$ in. sheet top and side decking can now be added up to the cockpit and the upper mainplane supports bound and soldered to the cabane struts. Add $\frac{1}{8}$ in. nose planking and front former fairing. The complete tailplane outline (with the exception of the edges of the elevator cut-outs) is made by laminating $\frac{1}{8}$in.× $\frac{1}{16}$ in. strips around a cardboard former. Round off the corners so that the tailplane is a simple flat plate, and mount on to top stringers. The fin can now be cemented on to the fuselage after which the rudder can be built complete with pendulum arm and attached with silk-strip hinges.

Wings. Take care to construct the upper wing strongly as it takes up all the lift loads of both wings. The long dihedral braces are important and should be well cemented to the spars. Note that the centre section of the upper wing is flat with the dihedral starting at the double ribs. The lower wing has no dihedral. Press studs are sewn to the wings with cotton and cement. The wings are covered with Modelspan. Before any water-spraying or doping is commenced, the tailplane struts should be fitted. This will help to prevent tailplane warps. The original model was water-sprayed and given two coats of clear dope and two coats of silver primer. The headrest should be cemented in place after clear doping and before silver is applied. Whilst this is drying the wheels can be made. The only difficulty with these is getting the brass bush square and true with the ply disc. The original wheels were made up complete except for the cones and then the bush was bolted into place. If the wheel is then placed on the axle and spun, any wobble will show up; by straining the wheel in the right direction, the wobble can be removed. Then lock the bush in position with cement, fit the card cone and string rim, and retain on the axle with an 8BA Hex nut.

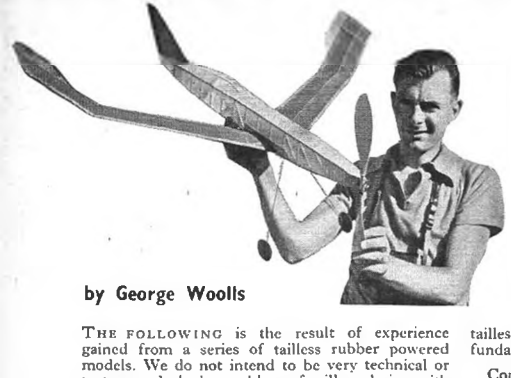


Dummy engine and engine mounting is made as a complete unit, complete with bearers as on the drawing. It is cemented firmly to the front former. It is not a detailed scale engine, but has a realistic appearance.

Flying Notes. Approx. 1 oz. of ballast was necessary in the nose of the original and the C.G. on the drawing is checked from the model in flying trim. The upper wing is strapped fore and aft with rubber bands to the cabane structure. The lower wing is plugged into the fuselage and the struts clipped on. Then the lower wings are strapped together with rubber bands underneath the fuselage. The original has a left-hand climb with a fairly straight glide. On no account alter the wing and tailplane incidences. Any fore and aft instability should be cured by ballast or by variation of thrust line.

A 12 ft. take-off run and then ground-wash effect keeps the model low until the speed builds up for the climb. Do not try short power-runs as the model does not climb very rapidly and when the engine cuts, the nose drops sharply before picking up the glide. The Flycatcher has proved to be a consistent flier and on one occasion, 10 consecutive flights were made with motor runs of up to 45 secs. There are many sports models that cannot claim a performance of that order!

Only 29 inch span, yet fully stable with a point-five diesel, the Flycatcher in miniature is a "must" for all biplane fans. Full-size copies of the 1/5th scale plan opposite are obtainable, price 5/- post free from AEROMODELLER Plans Service



TALE OF A TAILLESS

introducing **"ARROWHEAD"**

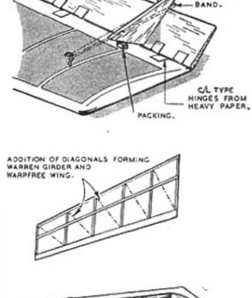
by George Woolls

THE FOLLOWING is the result of experience gained from a series of tailless rubber powered models. We do not intend to be very technical or to try to cloak the problem of tailless design with a mantle of mystery which may easily frighten off any average modeller who may like to have a go himself.

The possibilities inherent in the tailless layout had long intrigued us, as an interesting sports model if nothing else, although the fact that it was likely to be a very stable acroplane as well, seemed to make experiments likely to be worth the effort involved.

In case there are a number of raised eyebrows at your mention of the possibility of a tailless being very stable, may we state that the Dunne Tailless Biplane made a name for itself on account of its stability when it made many flights, circa 1913! !

Whilst searching for data upon which to base a preliminary design, we were somewhat bewildered by the variety of information that was unearthed. Some writers swore by reflex wing sections, others said that high lift sections were very satisfactory; wing tip fins attracted some people, but were frowned on by others. Degrees of sweepback or sweep forward varied, but most power tailless designers seemed to favour about 30°. We discovered little or nothing specifically referring to rubber tailless, but refreshed our memory regarding the fundamentals of stabilising an acroplane in flight.



Heading shows the "swept" appearance of Arrowhead in the hands of the author. Feathering prop is laminated

Conventional aeroplanes have a tailplane mounted behind the mainplane which damps out the inherent instability of a normal wing. Actually, wings can be built using a reflex section which have sufficient inherent stability to fly by themselves without a tailplane. However, normally a stabiliser of considerable proportions, from 30% to 50% of the mainplane area, placed at a lesser angle to the mainplane is mounted two or three wing chords behind the mainplane. Generally speaking, the nearer the tailplane is to the wing the greater is its size and the larger is its negative angle.

On a tailless, the usual plan is to sweep the wing back and rig the tips at a negative angle and *behind the centre section* so that they serve as stabilisers. Movable tabs are mounted at the tips to enable adjustments to the trim to be made. These are called "elevons"—combination of the elevators found on tailplanes and ailerons which are carried at the wing tips of full-size aeroplanes. As will be seen later, elevons serve as both elevators and ailerons. As too much sweep reduces the effective span and adds other complications, we are rather in the positon of having a large tailplane close to the wing. This, we reckoned, would normally mean a large area and/or a large negative angle in the case of a normal plane. We intended to use a twist throughout the wing to produce the negative tip, so did not know how big the effective stabilising area would be.

We were influenced by a certain amount of agreement amongst writers that 30° of sweep back worked well. Such a wing is also easy to draw with a 30° set square and so we started off with that amount of sweep on the Leading Edge. With regard to washout, well 10° seemed a nice round figure and we had to start somewhere. We had a wing rib template of 6 in. chord which was undercambered and another of a 4 in. chord Clark "Y" type, and 34 in. span looked about right. Dihedral was influenced by normal duration design and was on the generous side at 3 in. under each tip.

A fin that had a shape in keeping with the wing was drawn and a very simple flat-topped fuselage that enabled the wing to be moved over a large distance (we had no idea of where the final position

of the centre section would be) was made. An old standby prop was added and the contraption loaded with rubber.

We soon found that the plane would handle considerable power and climb very steeply without a stall, and that the tricky part was to trim the glide. It was noticed that if too much negative elevon was used as power fell off and the model went from level power flight into glide, the nose rose and the plane would sink as if dethermalised. The power climb however, was very fast and safe at something approaching 60° with no sign of a stall! !

An interesting theory is suggested that could account for this; from *Fig.* 1, it will be seen that a considerable portion of the wing lies behind the C.G. and it must be remembered that the angle of incidence progressively decreases towards the tip.

With 10° of washout the wing at the centre rib may be at about 5° angle of attack in level flight, in which the tips are 5° negative, probably below angle of zero lift, and so not lifting at all.

Now as an aeroplane climbs, the propeller pulling upwards, starts to carry some of the weight, thus the wings have less work to do. However, unless some measure is taken to reduce the wings' lift they will keep on doing their full work and develop too much lift. Thus loops and other similar and generally unwanted manoeuvres are brought about.

Now we suspect that our tailless being pretty highly powered, starts off lifting strongly and increasing its angle of attack until a point is reached where the centre section is stalled. The tips being at less angle of incidence and still lifting behind the C.G., overall lift is reduced and a nose down load is being applied. A very satisfactory state of affairs.

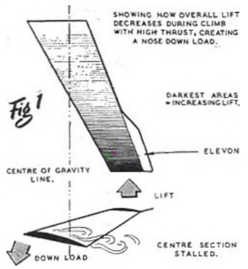
On the glide we have no thrust and of course, the forward speed is lower, so our guess is that the tip portions of the wing are giving an up-load on the nose tending to stall the aeroplane. This tendency has to be overcome by having a forward C.G. position.

The original tailless is still an excellent sport model, after nearly two years of flying, and created a British Record of just over two minutes.

We decided that we could have too much of a good thing in the way of washout, so the next design had only 7° and to play safe, we used a flat bottomed section throughout.

This time we tried a low wing and thought a cabin would look nice, so the result was *Arrowhead*. Stability was in no way impaired and flights were very consistent indeed. The glide was better than the earliest design but being faster, due to the lower lift wing, the overall duration was about the same. They result in an attractive though unorthodox sport flier plans of which are reproduced overleaf and are available through Aeromodeller Plans Service.

At this stage we did a bit of thinking. Both models weighed 5oz. and carried 1¾ oz. of rubber. Wings were about 170 sq. in. and they had no tails. Much of the wing was acting as a stabiliser and a short coupled stabiliser at that. Stabilisers that are short coupled, or close to the wing, are normally large in area, about 40% or more of the wing area, and this meant that our wing was probably no more than 60% efficient. Now 60% of 170 is only 103 sq. in. and a loading of 5 oz./100 sq. in. is quite high for a small model.

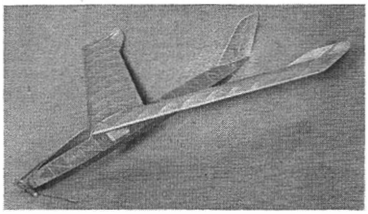


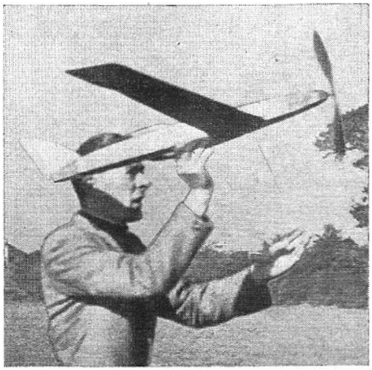
Feeling reasonably confident we now drafted a tailless to the following specifications—260 sq. in. area, 6 oz. total weight, with 3 oz. rubber. A large dia. single blade folding prop was planned. Sweepback was increased slightly by using 30° on the Trailing edge instead of 30° on the Leading edge as on the earlier designs. In an attempt to get as much of the wing lifting at normal angles of attack, and yet retain sufficient stabilizing action, only 5° washout was used with an undercambered "Davis" type section at centre, and a thin flat bottomed one at the tips. Using light wood, the weight came out as estimated.

Effective wing area was now in the region of 60% of 260 sq. in. or 156 sq. in. giving a loading of about 4 oz./100 sq. in., approximately Wakefield Loading.

We had no further opportunity to fly the machine before the Lady Shelley Cup Contest, but we were sufficiently confident with the type to enter this event, despite rather windy conditions. Our first two comp. flights were only just 90 secs. due to carelessly inserting the wrong motor. This was corrected for the third flight which clocked just

Barbastelle is British Record Holder, the model described above





George Woolls demonstrates that launching arrowhead is not difficult—in fact there's no tail to knock off!

over 3 minutes. This good time was largely due to the high degree of stability displayed when it bounced about in tight circles in a very turbulent area over the flying ground.

One of the first things that is likely to bother the designer is where to place the wing. On normal types this is not too hard to estimate in advance as most models are quite happy if they balance at about 50% back from the leading edge of the mainplane, and in any case there are plenty of published designs and much information available which can aid the decision.

The key to stability of any aeroplane lies in the position of the centre of gravity in relation to a point on the wing called the Neutral Point. The nearer these two points are together, the more stable the aeroplane and the less corrective work is required from the stabiliser.

This means that, in the case of the tailless, the nearer the Neutral Point and the C.G. are together, the less amount of washout is required.

Fig. 2 shows how the Neutral Point may be found. It is 25% of the Mean Aerodynamic Chord back from the Leading Edge measured on the Mean Aerodynamic Chord Line.

In practice, using approximately the same sweep as shown on the diagrams if the wing is mounted so that it balances approximately on the Leading edge at the Aerodynamic Mean Chord, and provision is made for about ¾ in. fore and aft movement, the final wing position will be easy to ascertain by test flying.

If different sweep back is used for the C.G. to come in the region of ·2 in. of the Mean Aerodynamic Chord in front of the Neutral Point and allow for a bit of fore and aft adjustment.

With regard to construction of the swept-back wing, we find that it is not too easy to build to the same total area as a normal wing and stabilizer for the same total weight. This is due to the sweep-back needing more material, so we would advise light wood.

Washout should be built in, for any variation in washout from one panel to the other is equivalent to a warp on a normal wing. As orthodox wings are built flat to prevent warps it is logical that a washed-out wing should be built washed-out for the same reason. The method we use is to pack up the trailing edge at an angle, by means of a wedge of balsa, running from Root to Tip, keeping the leading edge flat. As warps on a washed-out wing are not easy to detect by eye, some sort of warp resistant structure would seem desirable if it doesn't put up the weight too much. The obvious thing to do is to use either diagonal ribs thereby forming a Warren Girder rib layout, or geodetic construction. Arrange for about ·1 of the span under each tip for dihedral.

Our elevons have been around 8% of the wing in area and mounted in such a way that their settings are positive and yet shock proof. The method shown on p. 238 has proved satisfactory.

Are tailless types as efficient as normal aeroplanes? Well, given a fraction of the development lavishe upon their tailed brethren, we don't see why the shouldn't hold their own in open contests.

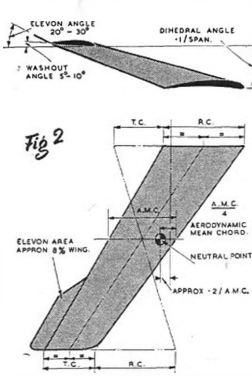
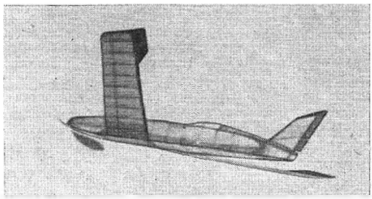
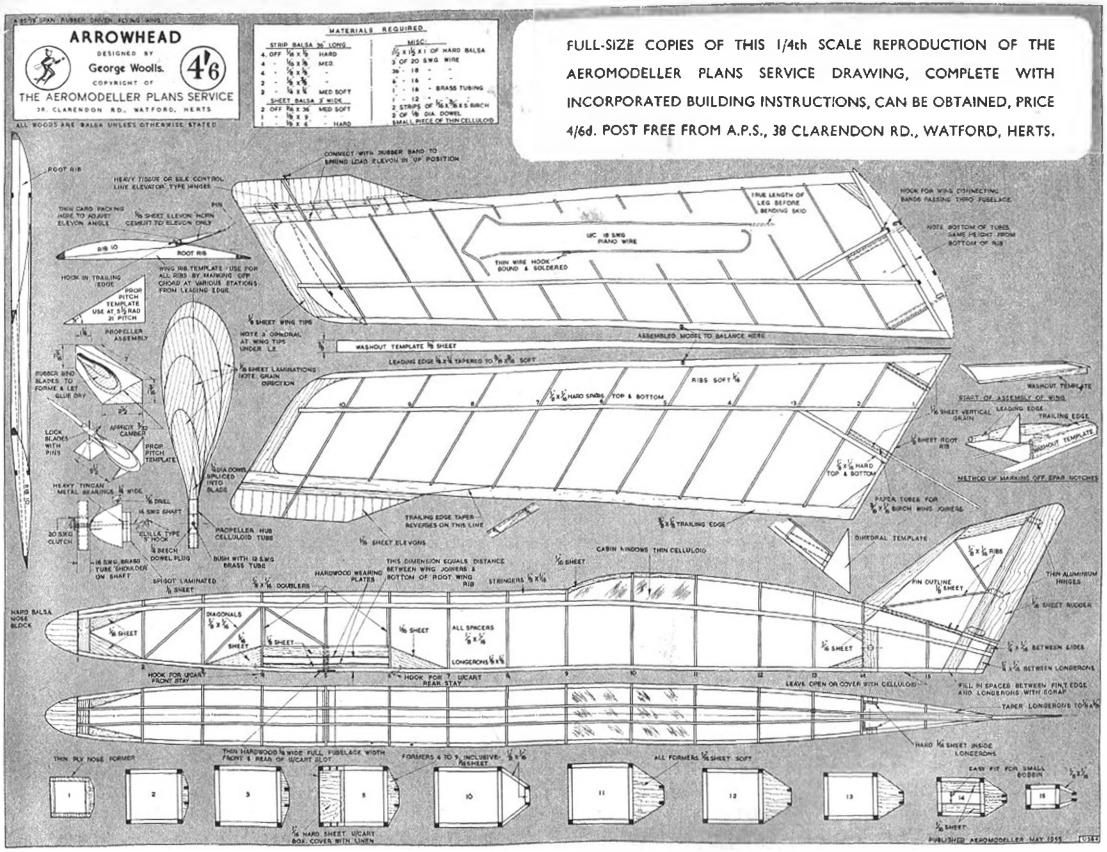


Fig 2

Skid type undercarriage is not distinguishable in this action shot. Note curve in the rubber motor which has just been released —on low turns




A 60"W SPAN RUBBER DRIVEN FLYING WING
ARROWHEAD
DESIGNED BY
George Woolls.
4/6
COPYRIGHT OF
THE AEROMODELLER PLANS SERVICE
39, CLARENDON RD., WATFORD, HERTS
ALL WOODS ARE BALSA UNLESS OTHERWISE STATED
MATERIALS REQUIRED.
STRIP BALSA 36" LONG
4 OFF 1/16 x 1/8 HARD
4 - 1/16 x 1/8 MED
4 - 1/16 x 1/8 -
2 - 1/16 x 1/8 -
2 - 1/16 x 1/8 MED SOFT
SHEET BALSA 3" WIDE
2 OFF 1/16 x 1.36 MED SOFT
1 - 1/16 x 3 -
1 - 1/16 x 6 - HARD
MISC.
1/2 x 1/2 x 1 OF HARD BALSA
3 OF 20 S.W.G. WIRE
36" - 18" -
6" - 16" -
6" - 16" - BRASS TUBING
1" - 12" -
2 STRIPS OF 1/16 x 3/8 x 5 BIRCH
2 OF 1/8 DIA. DOWEL
SMALL PIECE OF THIN CELLULOID
FULL-SIZE COPIES OF THIS 1/4th SCALE REPRODUCTION OF THE AEROMODELLER PLANS SERVICE DRAWING, COMPLETE WITH INCORPORATED BUILDING INSTRUCTIONS, CAN BE OBTAINED, PRICE 4/6d. POST FREE FROM A.P.S., 39 CLARENDON RD., WATFORD, HERTS.
CONNECT WITH RUBBER BAND TO BRING LEAD ELEVON IN 'UP' POSITION
ROOT RIB
HEAVY TISSUE OR SILK CONTROL LINE ELEVON TYPE HINGES
PIN
THIN CARD PACING HERE TO ADJUST ELEVON ANGLE
1/16 SHEET ELEVON HORN CEMENT TO ELEVON ONLY
RIB 10
ROOT RIB
HOOK IN TRAILING EDGE
WING RIB TEMPLATE - USE FOR ALL RIBS BY MARKING OFF CHORD AT VARIOUS STATIONS FROM LEADING EDGE
PROP PITCH TEMPLATE USE AT 3/4 RAD 21" PITCH
PROPELLER ASSEMBLY
1/16 SHEET WING TIPS
NOTE 3 DIHEDRAL AT WING TIPS UNDER L.E.
WASHOUT TEMPLATE 1/16 SHEET
LEADING EDGE 1/4 x 1/4 TAPERED TO 1/8 x 1/16 SOFT
1/16 SHEET LAMINATIONS NOTE GRAIN DIRECTION
RUBBER BAND BLADES TO FORM A LEI GLUE DRY
APPROX 1/32" CAMBER
LOCK BLADES WITH PINS
PROP PITCH TEMPLATE
3/16 DOWEL SPLICED INTO BLADE
HEAVY TINCAN METAL BEARINGS 1/4" WIDE
1/16 SHEET
16 S.W.G. SHAFT
20 S.W.G. CLUTCH
CLIJLE TYPE HOOK
BEECH DOWEL PLUG
PROPELLER HUB CELLULOID TUBE
BUSH WITH 12 S.W.G. BRASS TUBE
16 S.W.G. BRASS TUBE SHOULDER ON SHAFT
SPIGOT LAMINATED 1/16 SHEET
1/16 x 1/16 DOUBLERS
HARD BALSA NOSE BLOCK
1/16 SHEET
DIAGONALS 1/16 x 1/16
1/16 SHEET
1/16 SHEET
ALL SPACERS 1/16 x 1/16
LONGERONS 1/16 x 1/16
HOOK FOR U/CART FRONT STAY
HOOK FOR 7 U/CART REAR STAY
THIN PLY NOSE FORMER
THIN HARDWOOD 1/16 WIDE FULL FUSELAGE WIDTH FRONT & REAR OF U/CART SLOT
1/16 HARD SHEET U/CART BOX COVER WITH LINEN
FORMERS 4 TO 9 INCLUSIVE - 1/16 SHEET
ALL FORMERS 1/16 SHEET SOFT
HARD 1/16 SHEET INSIDE LONGERONS
EASY FIT FOR SMALL BOBBIN
1/16 SHEET
TRUE LENGTH OF LEG BEFORE BENDING SKID
U/C 18 S.W.G. PIANO WIRE
THIN WIRE HOOK SOUND & SOLDERED
HOOK FOR WIRE CONNECTING BANDS PASSING THRO' FUSELAGE
NOTE BOTTOM OF TUBES SAME HEIGHT FROM BOTTOM OF RIB
ASSEMBLED MODEL TO BALANCE HERE
RIBS SOFT 1/16
1/16 HARD SPARS TOP & BOTTOM
1/16 x 1/16 HARD TOP & BOTTOM
PAPER TUBES FOR 1/16 x 1/16 BIRCH WING JOINERS
1/16 TRAILING EDGE
TRAILING EDGE TAPER - BEVERGES ON THIS LINE
1/16 SHEET ELEVONS
THIS DIMENSION EQUALS DISTANCE BETWEEN WING JOINERS & BOTTOM OF ROOT WING RIB
HARDWOOD WEARING PLATES
STRINGERS 1/16 x 1/16
1/16 SHEET
CABIN WINDOWS THIN CELLULOID
DIHEDRAL TEMPLATE
1/16 x 1/16 RIB
FIN OUTLINE 1/16 SHEET
THIN ALUMINUM HINGES
1/16 SHEET RUDDER
1/16 x 1/16 BETWEEN SIDES
1/16 x 1/16 BETWEEN LONGERONS
LEAVE OPEN OR COVER WITH CELLULOID
FILL IN SPACES BETWEEN FINT EDGE AND LONGERONS WITH SOFAP
TAPER LONGERONS TO 1/16 x 1/16
WASHOUT TEMPLATE
START OF ASSEMBLY OF WING
1/16 SHEET VERTICAL GRAIN
LEADING EDGE
TRAILING EDGE
WASHOUT TEMPLATE
1/16 SHEET ROOT RIB
METHOD OF MARKING OFF SPAR NOTCHES
PUBLISHED AEROMODELLER MAY 1955

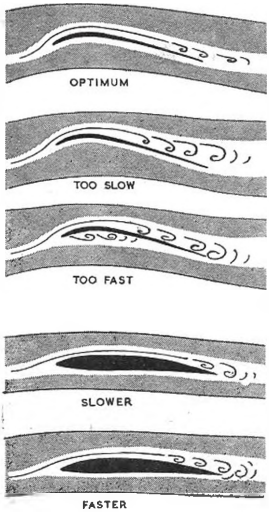
PRACTICAL AIRFOILS

Thoughts on selection of airfoils by New Zealand's

Frank Bethwaite

THE QUESTION of exactly how efficient one wing is, as compared with another, interests me. For some years I have been making glide tests on a wide variety of aerofoils. The method is to launch a test glider from a height of about twenty-five feet, and time and measure its glide path and distance traversed as it glides to the level surface below.

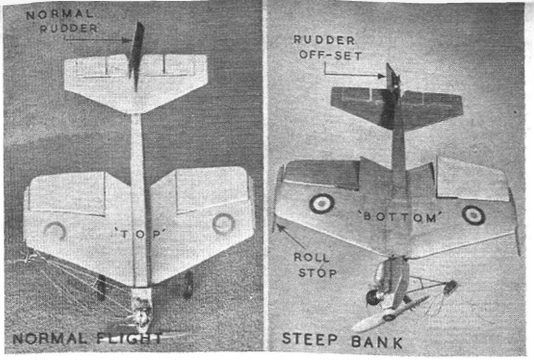
Very early it was apparent that different types of section varied enormously in their tolerance to change of speed. A thin, highly arched wing may be very efficient at one particular speed, but very poor at any other. A less arched, more evenly curved aerofoil may not be quite so good at any one speed, but will be far more tolerant to change of speed. I now think of the one wing trimming to a "point", and the other trimming to a "range". The sketches try to explain why this should be so. The thin, arched section accepts smooth flow at only one angle of attack. Greater (slower), separation spreads up the aft upper surface, the wake thickens, and drag increases rapidly. Less, (faster), separation occurs in the deep undercamber below, causing turbulence and again rapidly increasing drag. The smoother aerofoil manages to ease the air smoothly around itself over a much larger range of angle of attack, or speed, and hence it matters very little what speed the model flies at, provided only it is somewhere within the efficient range.



If our models were to fly only in a flat calm, the problem would be reasonably simple; build that wing with the proven minimum sink in calm air. But more often than not the wind blows, and wind means turbulence. An anemometer graph of say, a ten m.p.h. breeze will invariably show gusts to fourteen or fifteen m.p.h. and lulls of about five or six m.p.h. In other words there is a gust factor about the average speed of the wind itself. Nor is the turbulence confined to the layer just near the ground, although it may be more marked there than higher up. A ten m.p.h. wind would be expected to stir up the air to about fifteen hundred feet, or higher in thermal conditions. Thus a model will inevitably be riding turbulence in any sort of breeze at all.

A Wakefield, or an A/2, will normally fly at about 18 feet per sec. We have just explained that it will be riding constant gusts of say 6 or 7 ft. per sec., striking it from ahead, astern, or sideways, at any time that it is flown in a breeze. The model with the super-super thin highly arched wing, which is trimmed to fly at the stall plus a bee's whisker will probably plunge around the sky, either stalled by a tail gust, or rearing up with high drag in a gust from ahead, sinking rapidly, while its knowing owner mutters away about downdraughts. The model with the tolerant wing, which has deliberately been trimmed to fly in the middle of its speed range, and *not* just above the stall, may well be soaring easily. It will not stall in tail gusts, but will lift bodily and turn slightly into gusts from ahead or one side, and quite definitely reducing its sinking speed by this selective use of the air's energy.

Clearly the greater a range that an aerofoil will accept with efficiency, the better will it be able to soar in turbulence. Aerofoils which show a large range, both on test and in practice, are characterised by sharp entries, the high point of their upper surfaces well back, and little undercamber. The popular wings of today do not suit at all. My pick at the moment is an NACA 4409/34, with about 1 per cent. of undercamber swept in. This sinks at little if any greater speed than the best Isacson or Benedek, but it sinks faster near the stall than at a noticeably higher speed; in other words, it exhibits the "range" which I seek so earnestly. Another fairly good one is an NACA 4612, with the entry sharpened up and thinned to about 10 or 11% thick. (The former is the higher one in the heading, the latter is the lower one.)



May, 1955

Remarkable new variation on control-line opens a new field in aerobatics

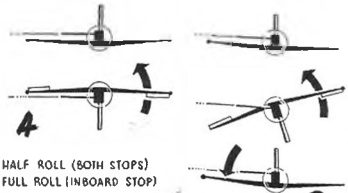
AILERON CONTROL

as developed by

H. M. JAMES

EARLY IN 1949 an aeromodeller flew his control-liner into some high tension cables and was killed. A press description of the ill-fated model said, "It could fly upside down, loop, and ROLL". Although presumably an error, it did raise the question—Why not? In December, 1949, a model with aileron control was tested. It never rolled, but it did prove the idea possible.

This was the start of a series of models of which the present model is the eighth. Two pairs of 30 ft. lines come away through an outrigger running parallel with the swept back leading edge to allow the guide plate to come in-line with the C.G.



'A'-HALF ROLL (BOTH STOPS)
'B'-FULL ROLL (INBOARD STOP)

Use of Stops

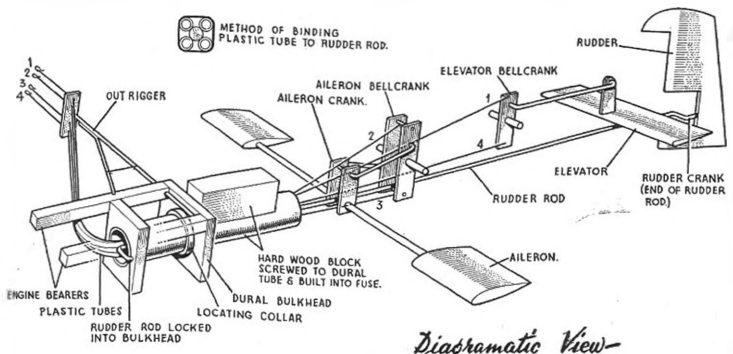
Rudder offset is adjusted automatically to give "out" rudder in both normal and inverted horizontal positions, and "up" in a vertical bank.

The out-rigger, nose assembly, and engine *do not roll* with the rest of the model. This avoids trouble with torque and fuel feed. Aileron control is by a second handle, arranged so that "UP" gives *Bank in*, and "DOWN" gives *Bank out*.

Slight "out" aileron is advisable on bank in—counteracting the natural tendency to bank in. The model will stabilise itself on an even keel, though more "out" aileron may be needed on the windward side of the circuit. To bank in, gently ease back the aileron handle. The model will maintain height in banks up to 45°, but will lose height if held at a steeper angle.

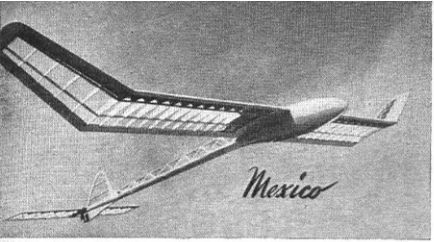
When rolling, the elevator must first be neutralized and full aileron applied. The rate of roll is such that it is difficult to judge when to neutralize the ailerons. Detachable "stops" can be fitted to the wing tips, checking them as they come level with the outrigger, and preventing over-rolling.

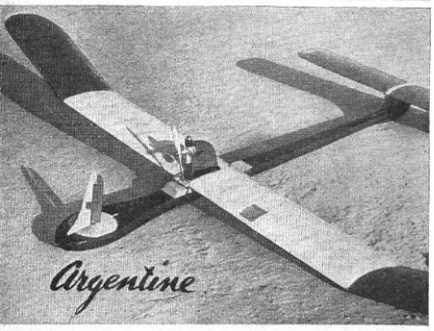
There is scope for further experiment with "Rollers", for example developing a larger version, and combining it with normal stunt characteristics, making possible a vast new range of aerobatics.



Diagramatic View

World News





MOST RE-PRINTED article ever published in the model world was undoubtedly our "scoop" on the Soviet Championships (MMS) at Moscow, reported in December '54 issue. To date we have had the pleasure of reading it in Spanish, French, Italian almost verbatim, complete with sketches, and snippets have appeared (one with A/2 and power times reversed) in other English speaking mags. This clearly indicates the enormous interest in Soviet modelling and means that participation of at least one Iron Curtain country in the World Championships will be eagerly followed by all readers. To date, we have news of intensive *monthly* eliminators for a **Czech** A/2 team calling for around 25 contest flights per entrant to find the better four—after flying through that lot the leaders deserve to make the team!

Kind words for British Mail Order houses in the model business come from S/Sgt. Tinkler serving in **Nigeria.** S/Sgt. Tinkler decided to try his hand at aeromodelling after arriving out in the "blue" and selected a kit (Mercury Monocoupe) and engine (Allbon Dart) from Advts. in the A/M. Both were received via airmail only 6 days after despatching the order and a subsequent query regarding fuel was replied with a formula per return. In three weeks the Monocoupe was completed and became the first model ever to fly at Kaduna airport. In fairness to the Mail Order houses, we refrain from quoting the name as we know such service is typical of all of them.

Highlight of the All-**India** Aeromodellers' Association annual rally held at Calcutta on January 16th must have been a 17¼ minute flyaway by Gopal Chandra Roy's Frog 250 powered A.P.S. Swiss Miss. Impressive Association handbook with a dozen or more beautiful trophies illustrated shows intense activity in this part of the world where A.P.S. plans are extremely popular.

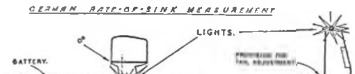
***MEXICO:** Britain's A/2 pioneer Phil Guilmant, now in San Angel, has a '55 A/2 with Benedek 8306b wing, Clark Y tail and 4 chord tail moment. **ARGENTINE:** German resident Ulrich Stampa uses a K & B Infant for Vane steering auxiliary power, model was seen last month as a glider in Herr Grenmer's thought provoking article. **CZECHOSLOVAKIA:** 4 ft. span Grumman Panther weighs almost 7 lb., flies at 62 m.p.h. on home-built jet. Gee Bee racer is only 30 in. for its racing Busek 10 c.c. engine. **SINGAPORE:** Young Miss Wee holds brother Robin's Bird Dog—a great flier until sabotaged by a rival we are told, and **MALAYA** Ho Loon Shu's daughter with poppa's stunt model. They train 'em young out there! In **GERMANY** Wolfgang Zwilling's Flying Frog follows his flying ring (Dec. '53 issue).*

In **Israel** first eliminators for an A/2 team to go to the World Championships took place over December 24-26th, together with an open rubber event and a power elim. 16-year-old Reuben Brand of Holon topped the A/2 results with a "Last Straw" doing 10 : 29, and notable point was the predominance of own designs—a very healthy sign. Naftali Kadmon suffered the embarassment of watching his Naftinofet entry ditch into the sea a half mile off-shore, then his reserve model showed obvious signs of being afraid of sharing its brother's fate. A second elim was due to take place in January.

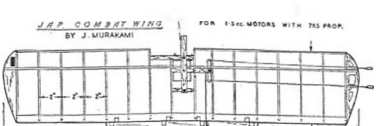
Tip fins have jumped the Adriatic from Jugoslavia and have taken on well in **Italy.** Several published designs have the new feature most of them having, perfectly flat wing panels and very large fins. We recently had the opportunity of seeing a range of Italain model plans marketed by "Aviomodelli" under the guidance of Adriano Castellani, one of the regular Eaton Bray visitors, and the standard of draughtsmanship and design detail is very high. Among the range of plans are Roberto Bacchi's F.A.I. "Tucano" power model, Amato Prati's "Speed King" 2.5 c.c. record holder and a host of topline controliners. Address is Via Grandi 6, Cremona.

Flypaper (1031 Pond St., Bristol, Penn) the alert newsheet style model paper from the **U.S.A.** carries an advt. for a 3½ oz. co-axial conversion unit to fit all engines from .19 to .35. Looks alright, but which prop do you flick, front or back? Magazine also states that a full team will represent the U.S.A. in A/2 this year for the first time. From the *West Coast Model News* we gather that the San Francisco Vultures have an annual 1,000 lap team race—and their lines are 60 ft. long. All c/l models are eligible, and this year there were six models in the circuit, ranging from the winning Fox 35 Flying Plank to an Anderson Spitfire powered Bomber. At one stage, all models tangled, and during the 1 hour 35 minutes taken to cover the fabulous mileage by the winner, tank and engine trouble took its toll, reducing finishers to three. Sacramento Aero Aces held an r/c round-the-pylons race with pylons 100 yards apart. Speeds were not high: but at least it's a start towards Jim Walker's suggestion of four years ago. Same club has a band of jet r/c-ers but cannot get their Japanese jets to stay in one piece, apparently they split at the seams. Maybe they should try Dynajets.

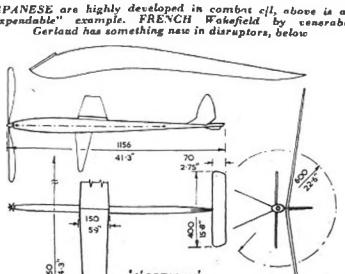
Last month we were able to give the **New Zealand** Wakefield team, and now we have the names for A/2 and F.A.I. Power. The glider boys are Laurie Ackroyd, B. McElwain (both also in Wakefield team) and C. Le Breton, Pete Carter. Top time was 12 : 19 for five flights. In power, there's H. J. Henderson, G. Gilliver and G. W. Gibbs; top time being only 8 : 36 and no name given for the fourth place. Proxy flown, the models are to be despatched in May from New Zealand.



Above: GERMAN method of measuring glide angle and rate of sink is indicated by sketch from Thermik. Presumably photographed by time exposure at night, light traces from fuselage and fin would give line of flight across a photo print. Right: Biggest control-liner in the World? CZECH scale Zlin trainer is 1/4th scale, 9 ft. 9 in. span, weighs 25 lb. alt in hardwood. Flies at 25 m.p.h. with 45 c.c. engine, made with the model by G. Busek. We are informed "it makes a monumental impression"—wonder what he uses or cable?



JAPANESE are highly developed in combat c/l, above is an "expendable" example. FRENCH Wakefield by venerable Gerlaud has something new in disruptors, below



for sport flying with ·75 to 1cc try . . .

SNOW WHITE

40 inch free flight design with new 'easy-to-build' sheet fuselage construction featuring tongued formers and slotted sides

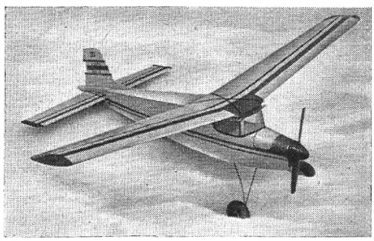
by **MARTIN BRIDGE**

SNOW WHITE WAS designed primarily as a good looking sports Model. Construction is strong and simple and can be tackled with confidence by anyone with even the most limited experience. An E.D. Bee powered the original, but the Mills ·75, Allbon Merlin or Spitfire can be substituted. The designer has had hours of trouble-free flying with the all white prototype and trimming is simplicity itself.

Construction

Start on the **Fuselage** by cutting out all the formers and the $\frac{1}{16}$ in. sheet sides. Check the former tongues in the notches in the sides. Bend the undercarriage from 14 s.w.g. piano wire and bind to the ply formers with thread. Join the sides with the formers, cementing carefully, especially around the ply joints and cement in the hardwood bearers. When dry drill the engine mount holes and fix the 6 B A bolts. Add the $\frac{1}{16}$ in. top and bottom fuselage sheeting, celluloid windscreen, dowelling and ply tailskid. Bind and solder the undercarriage legs together and construct the cowling as detailed.

The **Wings** are quite straightforward. For ease of construction, the wing thickness does not taper. Thus the ribs only require tapering rear of the main span. The wing section is thin to give a fast scale flying speed. Start construction by notching the T.E. and pinning it down on the plan, followed by the rear spar, wing ribs, $\frac{1}{4}$ in. × $\frac{1}{4}$ in. L.E., and the main spar. Use hard stock for the spars. Cement the $\frac{1}{16}$ in. L.E. sheeting carefully to the L.E., ribs and the main spar. Build the centre-section incorporating the ply dihedral brace and cement the wing panels in place, leaving them to dry at the correct dihedral angle.



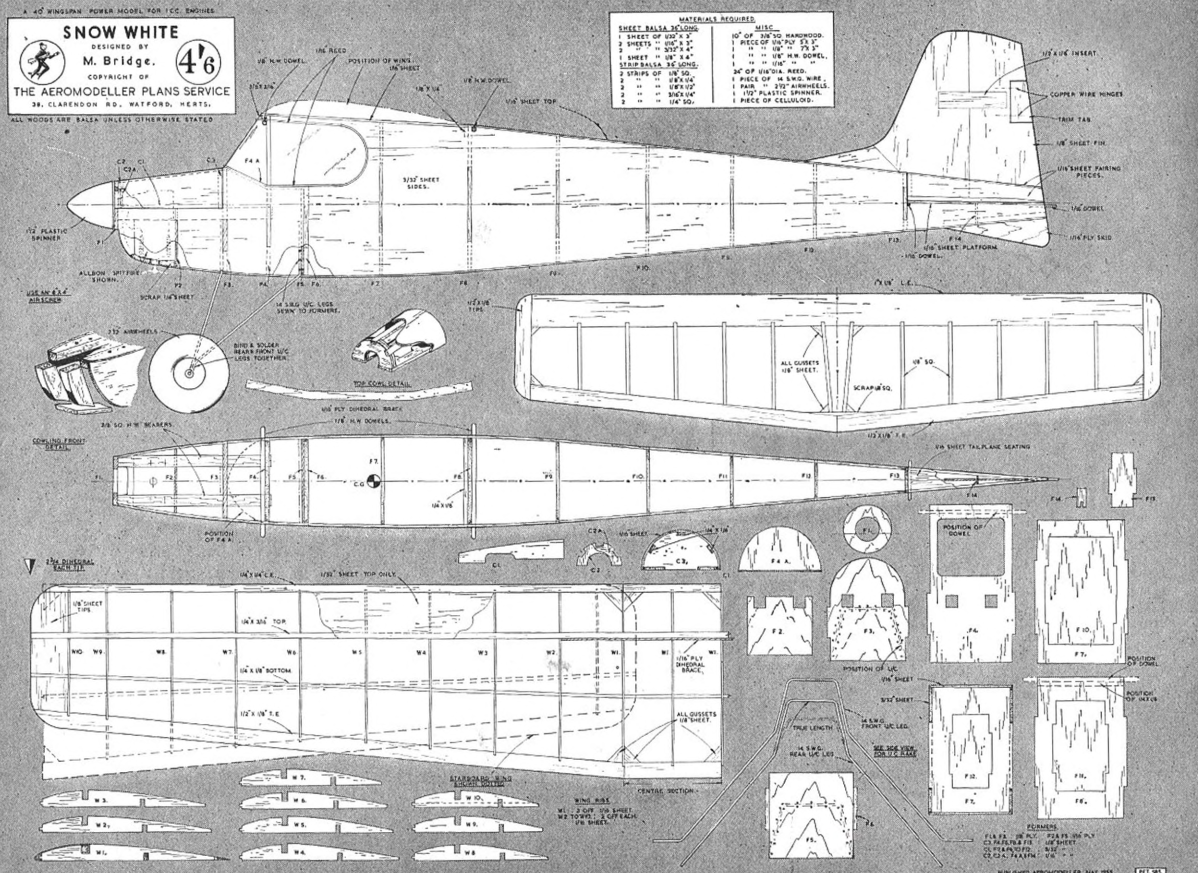
Tailplane and **Fin** need little explanation. Use medium-light stock for the fin, making the key from hard balsa. Cement the fin to the tailplane and fair it in with the fuselage using scrap sheet.

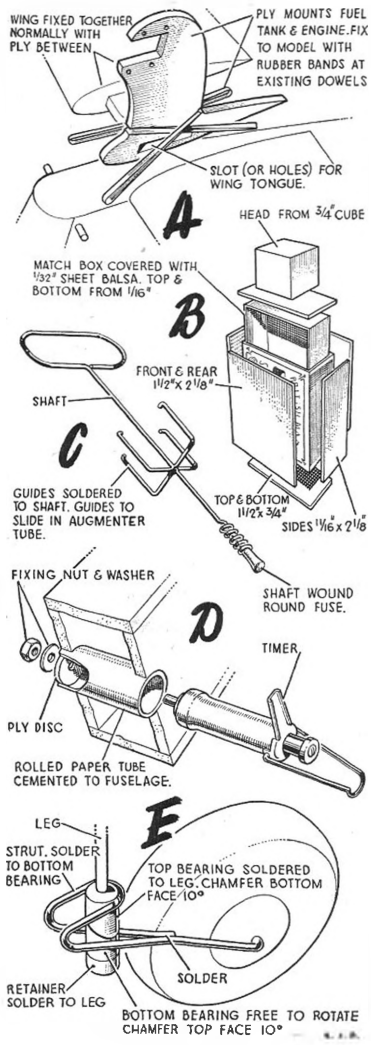
As Snow White is no contest model, it is worth the few extra ounces involved to obtain a neat finish. The original was doped white all over with red and black trim. Before covering give the entire model two coats of sanding sealer, rubbing down with the finest sand-paper when dry. Cover all surfaces with light weight Modelspan doped on. Give two further coats of sanding sealer to the sheet fuselage, sand lightly and give several coats of thinned colour dope. Water shrink the wings and tail and apply two coats of 50% thinned clear dope followed by colour dope if desired. Use Sellotape for masking the trim lines and give the completed model a coat of fuel-proofer all over.

Flying. Check the C.G. position and add any necessary nose or tail weight. Test glide over long grass. The glide will be fairly fast but flat. No more than $\frac{1}{16}$ in. packing under the tail T.E. should be necessary and a little left rudder should take care of the glide.

Right thrust and downthrust will give a wide climbing left-hand turn under power assuming that there are no serious warps on any surfaces. Use an 8 × 5 nylon prop for testing, and a wooden 8 × 4 for best results.

Nestling in its natural element, photo at left was taken during recent winter months. Full-size copies of the 1/4th scale plan opposite can be obtained price 4/6 post free from the AEROMODELLER Plans Service


A 40" WINGSPAN POWER MODEL FOR 1 C.C. ENGINES
SNOW WHITE
DESIGNED BY
M. Bridge.
COPYRIGHT OF
THE AEROMODELLER PLANS SERVICE
38, CLARENDON RD., WATFORD, HERTS.
4/6
ALL WOODS ARE BALSA UNLESS OTHERWISE STATED
MATERIALS REQUIRED.
SHEET BALSA 36" LONG.
1 SHEET OF 1/32" X 3"
2 SHEETS " 1/16" X 3"
2 " " 3/32" X 4"
1 SHEET " 1/8" X 4"
STRIP BALSA 36" LONG.
2 STRIPS OF 1/8" SQ.
2 " " 1/8"X1/4"
2 " " 1/8"X1/2"
2 " " 3/16"X1/4"
2 " " 1/4" SQ.
MISC
10" OF 3/8" SQ HARDWOOD.
1 PIECE OF 1/16" PLY 5"X 3"
1 " " 1/8" " 7"X 3"
1 " " 1/8" H.W. DOWEL.
1 " " 1/16" " "
24" OF 1/16" DIA. REED.
1 PIECE OF 14 S.W.G. WIRE.
1 PAIR " 2 1/2" AIRWHEELS.
1 1 1/2" PLASTIC SPINNER.
1 PIECE OF CELLULOID.
1/16" REED
1/8" H.W. DOWEL.
POSITION OF WING.
1/16" SHEET
1/8" H.W. DOWEL
1/16" SHEET TOP
3/32" SHEET SIDES.
1/2" X 1/16" INSERT.
COPPER WIRE HINGES
TRIM TAB
1/8" SHEET FIN
1/16" SHEET FAIRING PIECES.
1/16" DOWEL
1/16" PLY SKID
1/16" SHEET PLATFORM
1 1/2" PLASTIC SPINNER
ALLBON SPITFIRE SHOWN.
USE AN 8"X4" AIRSCREW
SCRAP 1/4" SHEET
14 S.W.G. U/C LEGS SEWN TO FORMERS.
2 1/2" AIRWHEELS
BIND & SOLDER REAR & FRONT U/C LEGS TOGETHER.
TOP COWL DETAIL.
1/4"X1/8" L.E.
1/2"X1/8" TIPS
ALL GUSSETS 1/8" SHEET.
1/8" SQ.
SCRAP 1/8" SQ.
1/2"X1/8" T.E.
1/16 PLY DIHEDRAL BRACE
1/8" H.W. DOWELS.
3/8 SQ. H.W. BEARERS
COWLING FRONT DETAIL.
C.G.
1/4"X1/8"
POSITION OF F4 A.
1/16 SHEET TAILPLANE SEATING
POSITION OF DOWEL
2 3/4 DIHEDRAL EACH TIP
1/4"X1/4" L.E.
1/32" SHEET TOP ONLY.
1/8" SHEET TIPS
1/4"X3/16" TOP.
1/4"X1/8" BOTTOM.
1/2"X1/8" T.E.
1/16" PLY DIHEDRAL BRACE.
ALL GUSSETS 1/8" SHEET.
STARBOARD WING SHOWN DOTTED
CENTRE SECTION
WING RIBS
W1 : 2 OFF 1/16 SHEET.
W2 TO W13 : 2 OFF EACH. 1/16 SHEET.
POSITION OF U/C
1/16" SHEET
3/32" SHEET
14 S.W.G. FRONT U/C LEG.
TRUE LENGTH
14 S.W.G. REAR U/C LEG.
SEE SIDE VIEW FOR U/C RAKE
POSITION OF DOWEL
POSITION OF 1/4X1/8
FORMERS
PUBLISHED AEROMODELLER MAY 1955



Gadget Review

LET'S DIP DOWN in the gadgetry files and see what readers have to suggest for improvements in our modelling. There is always something new to be learned from a visit to another modeller's workshop, so why not give a thought to these ideas, all of which are tried and tested. Don't forget, if you have a bright idea and think it would be of service to others, send it in to Gadget Review, c/o AEROMODELLER. We will soon tell you if we have seen it before!

Starting the ball rolling this month, George Gray, who spends his time at the Fire Station in London's Edgware Road, gives us **A**, an adaptor for converting glider into power. Following the success of the New Zealand R6-B radio-controlled design with high mounted engine, this conversion should be a popular one. Simply cut a ply former to the shape as indicated, cut a slot or drill holes to take the wing tongue, and slip between the wing halves. Used on a converted APS Hoverking, this mount has carried an E.D. Bee and required about 5 degrees downthrust to prevent looping.

PAA loaders will like the idea **B**, sent in by A. J. Longstaffe, well known to Belfairs and Hatfield clubsters. The small PAA man is, by sheer chance, just the same size as a standard British matchbox. Just cement a head and top to the inner drawer of the box, cover the outside of the outer with 1/32nd, add loose ballast up to the required 4 ounces (or is it to be 5 ounces? ? ?) and cement the top down firmly. Pilot can also be used without internal ballast for sport work. Also from the same chappie, gimmick **C** is especially for the Jetex boys, who are having trouble getting the fireworks into action up the spout of an augmenter tube. Piano wire frame in 20 guage serves as a locator and to hold a piece of igniting d/t fuse. Can also be arranged in pairs for a twin Jetex mounting in a scale D.H.110 or for the ambitious, in fours for a Comet installation.

Keeping the sludge from exhaust and other messy generations of a diesel, out of an airdraulic timer is no easy task. Reader John Hartley of Wednesfield in Staffs, cases his Elmic **D** in a rolled paper tube with a ply disc end mounted across the fuselage. Not only can the timer be removed for cleaning without leaving a gaping hole in the fuselage, but it is also protected both structurally and for cleanliness. With similar arrangement in all your models, the timer can be switched from one airframe to another on the field.

Anyone ever thought of using a castoring undercarriage wheel? D. Williams of Kenton has, and for a tricycle, the idea has much to commend it.

E shows the detail, as employed for a two-inch airwheel, with an angled bearing to prevent the wheels from swivelling about in flight. Cross wind landings are no longer a model hazard!

J. Green of Birkenhead is one of many who have suffered in recent months with a cold engine. When worn in the bore, a diesel can be pernickety in cold weather (with acknowledgements to more reputable makes) and a wrapping of silver paper from cigarette box or chocolate bar around the fins, liberally heated with a match, cig. lighter or taper, soon gets the engine into summer temperatures. The effect is quite surprising and usually results in a first flick start. See **F**.

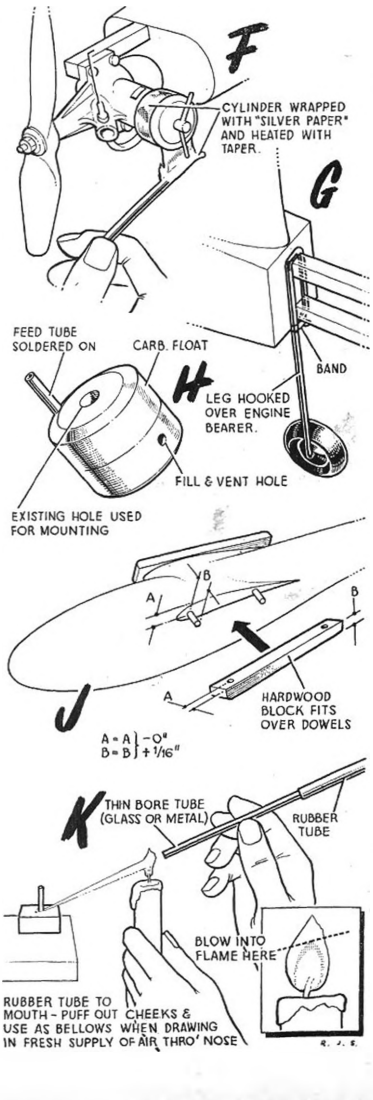
Simplicity pays off in any model, and with power contests mixed between hand-launch or rise-off-ground in the coming season, the idea of a quickly detachable unit from Sgt. Carfrae of R.A.F., Bawdsey, Suffolk, is worthy of study. Shown in **G** the "Clip-on" is hooked over sidewinder bearers and held in place with rubber band binding across the lower bearer. This band takes the shock in a heavy landing.

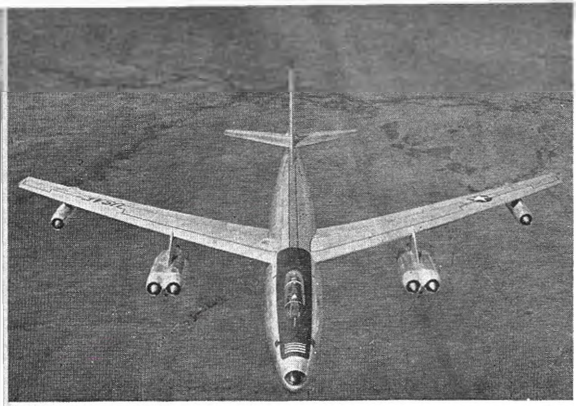
Could there be anything left as original in tank ideas? One *might* have thought that previous Gadget Reviews had exhausted the supply, but young 14-year-old J. Ridley of Newcastle-on-Tyne has found yet another. This time its an old motor cycle carb: float chamber **H** and it becomes an excellent tank for c/l or Helicopter with only minor modification. Larger floats can be cut down to any desired capacity and the only point to watch is that the filler hole is blanked off for flight, leaving only a small air vent.

Ever arrived on the field to start unpacking and have to get the cement tube into action straightaway? We do quite often, and the usual cause, apart from careless packing, is that projecting wing dowels, etc., have a nasty habit of poking into carefully covered wings. R. Bishop of Romford, offers a simple solution in **J** where a strip of hardwood (could be hard balsa scrap) is cut and drilled to slip over the offending parts. Easy isn't it?

And did you know that an ordinary candle can be made into a blowlamp? See **K** for the method, you'll be amazed how quickly a soldering temperature is obtained—only snag being that you need more than one pair of hands! J. Banks from all the way over in Jamaica found this one out for us.

Lastly, one which might cause you to break out in fits of spontaneous laughter—or might strike you as being a sensible thought. It seems that one,—McTavish of Scottish address, was out flying his KK Soarer Minor one fine day (when?) and after the first launch he lost the towing ring off the line. Doubtless heeding the expenditure of the day on bus fare to the field with only one flight achieved, our McTavish sought consolation and was rewarded with one of those sweets that arrive with a hole in the centre. Yes—you guessed it—they make fine towing rings, though the wet grass is a bit hard on their durability and they are likely to dissolve at any moment. So if you are due to go out for a day of towline flying, take along a packet of Polo's!





May, 1954

AEROPLANES IN OUTLINE

Number 23

by J. R. ENOCH

The Boeing B47 Stratojet

DURING 1945, several American aircraft manufacturers were engaged on design studies for multi-jet bomber aircraft to replace the existing piston engined types which were very quickly becoming obsolescent. Of these companies, Boeing Ltd., commenced work in July 1945 on the development of an aircraft based primarily on the tried and proven B.29 design.

Transition from piston to jet power presented numerous problems, and in order to obtain the maximum advantages of the new power medium, a considerable amount of research was undertaken, including continued investigation of Junkers research with swept-wings. To determine the layout of the basic design many 1/80 scale models were built and wind tunnel tested. Typical of the configurations first conceived was the Boeing Model 424, a conventional B.29 airframe having the piston engines replaced by four jet engines, mounted in Twin "paired" nacelles, similar to those of the B.45 Tornado. A later model, No. 448, had a "fish-mouth" intake in the fuselage nose with the efflux from the four jet engines passing over the centre-section of the high, swept wing. From this was developed a model which had shoulder intakes abreast the cockpit, the same engine installation as the Model 448, and similarly a B.29 fin with swept tail-plane. The forward fuselage was of "double-bubble" section with a large flat sided ventral radome. By November 1945, a model more closely resembling the B.47 shape had been tested, with two "paired"—pod mounted nacelles, each having a single air intake, mounted at 1/3 span, and a single jet mounted on each wing tip.

Basic design work on the Boeing Model 450 was completed in June, 1946, and in September, 1947, the first of the two prototype XB.47's was completed, the aircraft flying for the first time on December 17th with Robert Robins and Scott Osler (co-pilot) at the controls. The second prototype was flown on 21st July, 1948, and like the first was powered by six Allison J.35A turbojets of 24,000 lb. and capable of 500 m.p.h. In 1949, the XB-47's were re-engined, the J.35's being replaced by 5,000 lb. thrust G.E. J.47-3 turbojets.

A pre-production batch of B.47A Stratojets was ordered in November 1948, initially 75 were to be built but only ten were completed, the first on 1st March, 1950. Powered by J.47 GE.11 Turbojets, each of 5,270 lb. thrust, and with the all-up weight increased to 185,000 lb., the B.47A's were extensively used for development flying and crew training.

First of the Stratojets to enter service with the U.S.A.F. Strategic Air Command was the B.47B which embodied many refinements and structural modifications, principal of which was the strengthened wing. The first B.47B was flown on 26th April, 1951, and early production aircraft were similarly powered to the B.47A, later B series aircraft were fitted with GE.J.47.A23 engines with a thrust of 5,800 lb. each. A load of 20 × 1,000 lb. bombs could be carried over a range of more than 3,000 miles. The only defensive armament comprised a tail turret with twin 12·7 mm. cannon, remotely sighted and operated by the co-pilot from his swivel seat position in the cockpit.

B.47B's were being produced from three major assembly lines, by Boeing at Wichita, Douglas at Tulsa, and Lockheed at the government owned Marrieta plant. By December, 1952, over 300 had been built with a production rate of one aircraft per day.

On 7th April, 1953, the first two of a Wing of 45 B.47B aircraft touched down at Fairford, Gloucestershire, to begin a three month training tour in the U.K., having flown 3,120 miles from their U.S. base at an average speed of 555 m.p.h.

From the B.47B was developed the KB.47B flight refuelling tanker, the existence of which was made known on September 2nd, 1953, two years after tests had begun. The aircraft, normally a B.47B, is supplied with a conversion kit, enabling it to be modified for "Flying Boom" or "Probe and Drogue" flight refuelling. The RB.47B is a photo-reconnaissance version, adapted for this duty by the removal of bomb doors and the fitting of a self contained pack of 8 cameras. Several test-bed variants exist amongst which are two standard B.47B's which had the outboard motors replaced with PW.J.57 turbojets, for accelerated tests in connection with the XB.52 research

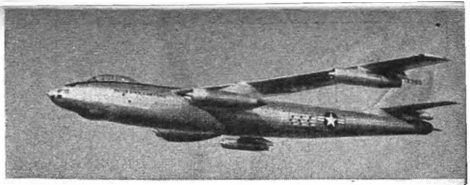
programme. XB.47C was the designation of a projected version, intended for production but later cancelled, powered by four Allison J.71.A5 9,400 lb. jets. Latest test-bed is the XB.47D two of which are used for high altitude research with turbo prop engines, and supersonic airscrews. The inboard engines are replaced with single, 9,500 shp Wright T.49.W1 turbo props.

The current production Stratojet, the B.47E, first of which was flown on 30th January, 1953, has been ordered in large quantities for the U.S.A.F., the 1,000th Stratojet to be constructed, a B.47E, emerged from the Wichita plant on 14th October, 1954, and was delivered to the Air Force on December 17th, seven years to the day after the prototype's maiden flight.

Classed as a medium bomber, the B.47E is manned by a crew of three, pilot, co-pilot, and bombardier-navigator, who together act as a very highly skilled and efficient operating team, capable of performing each others duties. Fully pressurised and air conditioned the crew's compartment has ejector seats in tandem for the two pilots, alongside which is a gangway, leading to the nose and entrance hatch. This is situated on the port side aft of the radar fairing, hinges at its forward edge, and has a built in telescopic ladder. An inner sliding door provides the pressure seal. The single piece backward sliding canopy is hydraulically operated. Within the nose, the Nav/Bombardier is provided with a downward ejecting seat, the escape hatch being forward of the "radome". The latter hinges downward from its forward edge providing unrestricted access to the blind bombing radar and mass of electronic equipment contained therein. An optical bomb-sight periscope projects slightly at the nose, above which, on the Starboard side, is the retractable fairing for the flight re-fuelling intake. Except when the large 1780 U.S. gallons fuel tanks are carried under the wing, all fuel is contained within the fuselage. Tanks are located forward of and behind the bomb bay which has capacity for a maximum load of 20,000 lb. Fore and aft of the bomb bay are the twin wheel units of the tandem undercarriage, retracting forward into the fuselage. Out-rigger single wheel units which retract forward in the inboard engine nacelle provide lateral stability on the ground. A twin 20 mm. cannon barbette is the only defensive armament of the B.47E. Located in the tail and fitted as a detachable unit, the turret is fully automatic in operation. The controlling Radar mechanism housed in the fairing at the base of the fin provides warning on the approach of aircraft, tracks, directs and fires the guns when within range. Access to the gun magazines is provided via a large door under the rear fuselage. Between this hatch and the turret is stowed the tail braking parachute.

Heading opposite shows an RB.47E flying high over Kansas. This photo-recce version is designed for both high and low reconnaissance. Above: A B.47E showing Assisted Take-Off rocket fittings. This is the type responsible for many of the high altitude contrails to be seen in British skies. Right: The XB.47 shows minor differences though most modification has been internal and with engines. Latest B.47E's have undersides painted with reflective white finish to protect crew and airframe from effects of nuclear weapons

The co-operation of the Boeing Airplane Co., is gratefully appreciated.

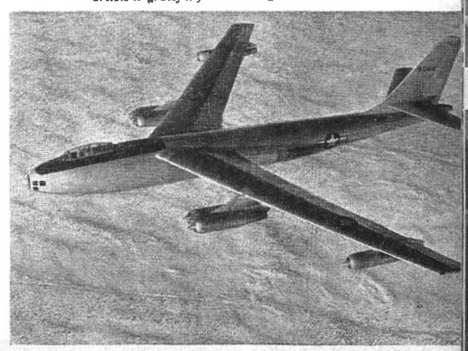


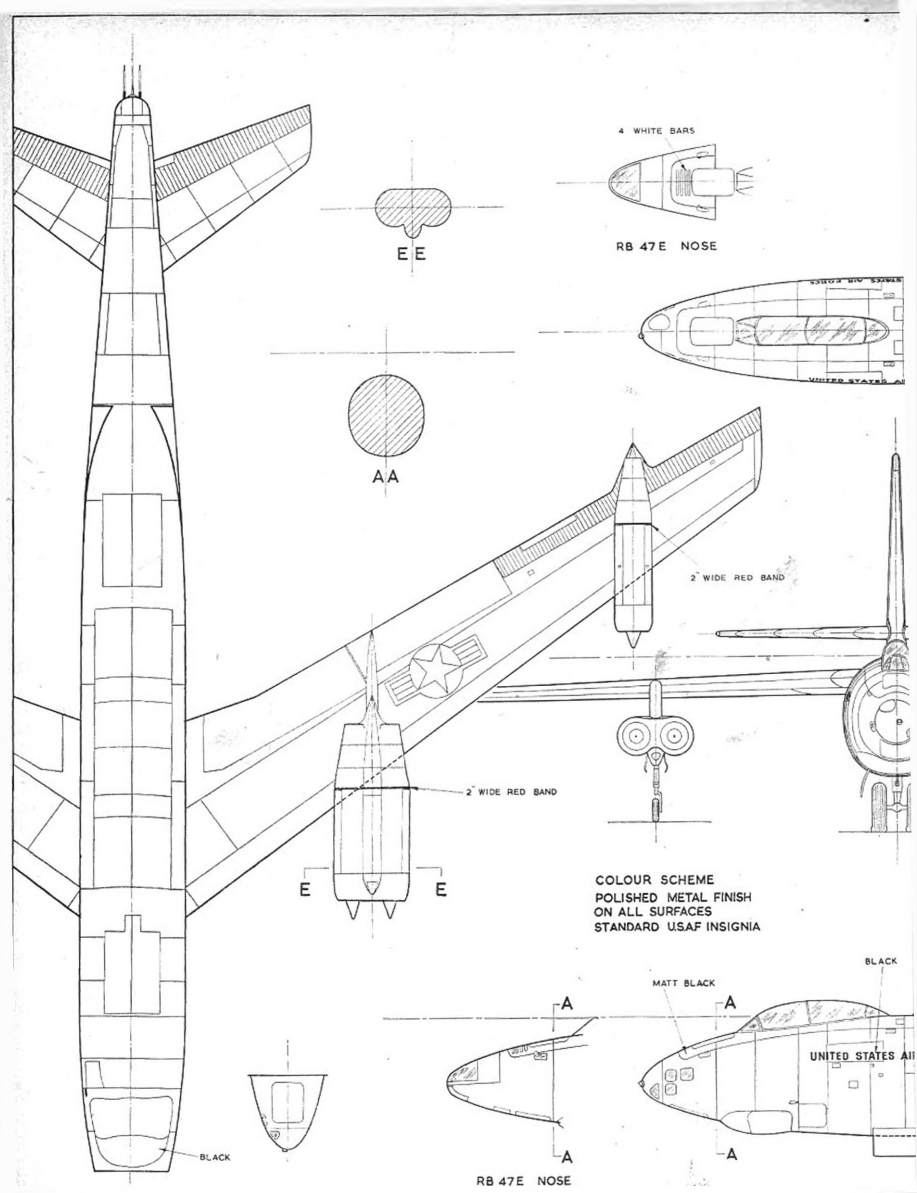
The thin flexible high aspect ratio wing of laminar flow section, swept at 35°, is in one piece, bolted to the fuselage at four main points, the Alluminium alloy skin being milled from sheet to a thickness of $\frac{1}{2}$ in. at the root and $\frac{1}{4}$ in. at the tip. Two piece hydraulically actuated ailerons and Fowler type extension flaps occupy the whole trailing edge. On the upper wing surface at approximately 1/3rd chord are two parallel rows of vortex generators which improve airflow characteristics over the ailerons to increase lateral control and stability at high speeds. Pod-mounted, to reduce airflow interference between nacelles and wing the power units are GE.J47.25 Turbojets of 5,850 lb. thrust. With water/methanol injection, thrust is increased to 7,200 lb. to supplement take-off power, additionally, a "collar" of 33 1,000 lb. Assisted Take-Off rockets can be fitted to the fuselage aft of the rear wheels. When power is expended, the unit is jettisoned instead of becoming deadweight as was the case with internal arrangement of earlier machines, later production B.47E's are not fitted with the internal rockets.

Generally similar to the B.47E a developed Photo reconnaissance variant, the RB.47E has a nose lengthened by nearly 3 ft. to accommodate photographic equipment in addition to that contained in the bomb bay. Designed for long range day or night operation, the first RB.47E flew on the 3rd July, 1953. The QB.47E a radio-controlled drone version was projected but after several successful flights the idea was dropped. A crew trainer variant is designated ETB.47.

Despite the critical landing and take-off technique, inherent with the tandem undercarriage arrangement, which requires landing speed calculated on weight at the time, to be within limits of 2 m.p.h., the performance of the Stratojet is remarkable. Normal maximum speed is approximately 635 m.p.h., but recently, whilst on test, a B.47E averaged 794 m.p.h. for 30 minutes, aided by a tail "jet stream".

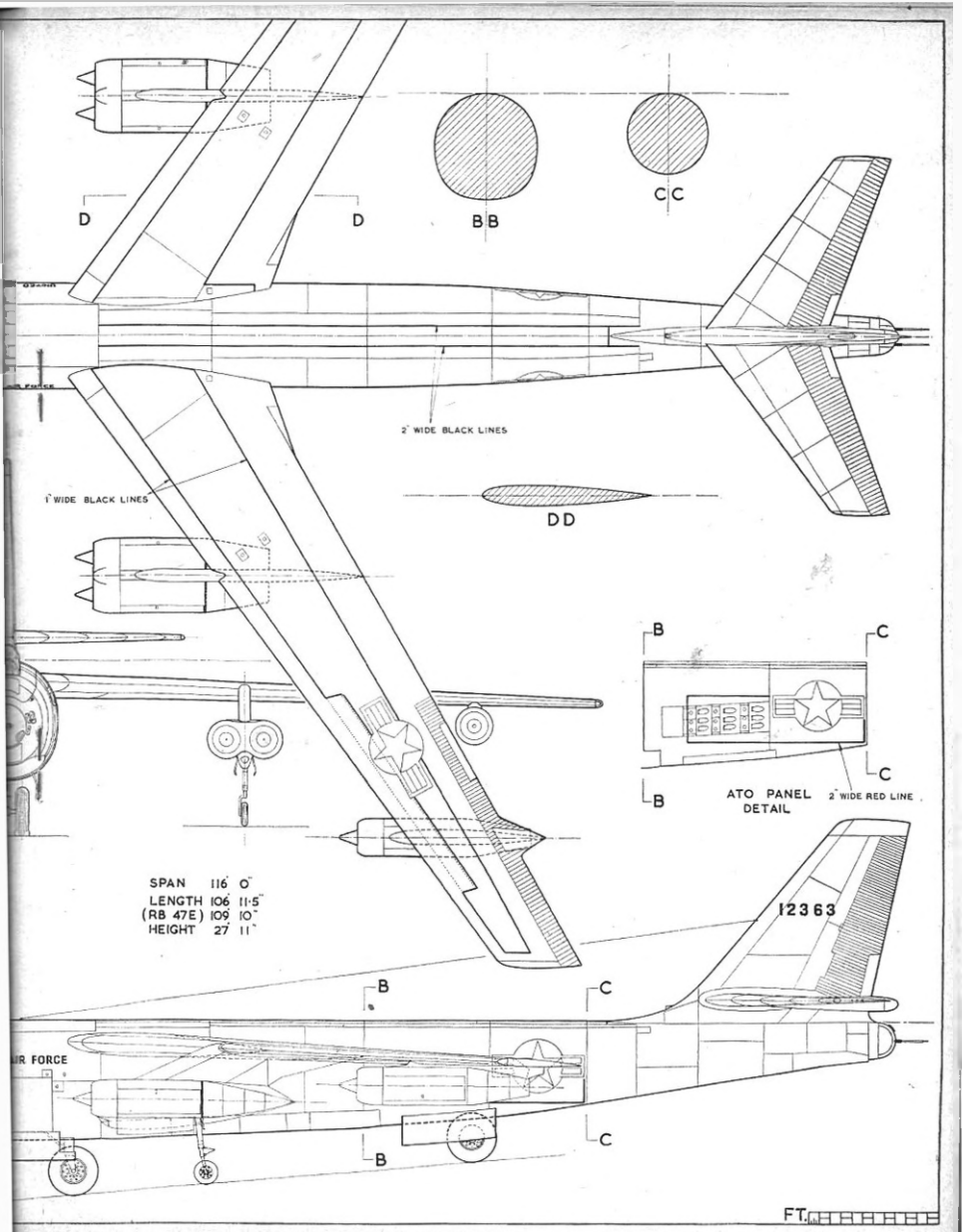
Co-operation of Boeing Aircraft Co. in the preparation of this article is gratefully acknowledged

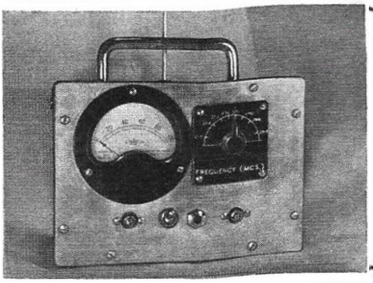




BOEING B 47E 'STRATOJET'

1/144th SCALE "N" TYPE REPRINTS AND 1/72nd SCALE "M" TYPE DIE-LINE PRINTS OF THIS DRAWIN





RADIO CONTROL NOTES

Howard Boys reviews a useful meter designed by H.R. Clayton that is both Absorption Wavemeter and Crystal Oscillator combined

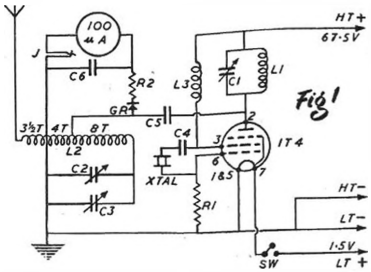


Fig 1

C1. 25 pf. Air Spaced Variable.
C2. 25 pf. Air Spaced Variable.
C3. 1 pf. Air Spaced Variable.
C4. .001 mfd. 350 v. mica.
C5. 5 pf. Ceramic.
C6. 50 pf. Ceramic.
R1. 47 K ohm.
R2. 47 K ohm.
GR. Germanium Rectifier, Westinghouse WG7H.
SW. On/Off Switch.
L1. 10 turns, 22 s.w.g. on ½ in. dia. former, 1¼ in. long, grooved 16 turns per inch.
L2. 15¼ turns, tapped at 8 and 12 turns. 20 s.w.g. on 7 in. dia. former 2 in. long. Grooved 16 turns per inch.
L3. Radio frequency Choke.
J. Phone Jack.
XTAL. 6780, 9040, or 13560 Kc/s.

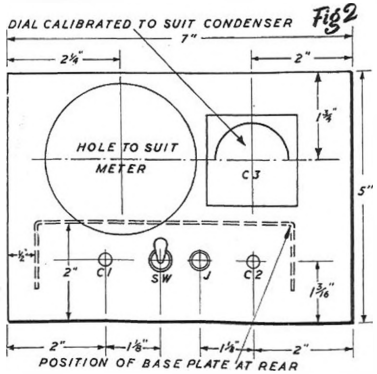
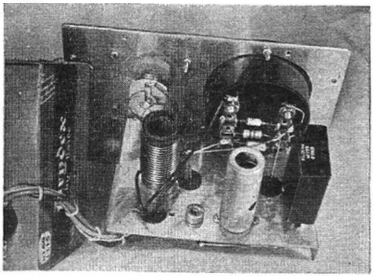


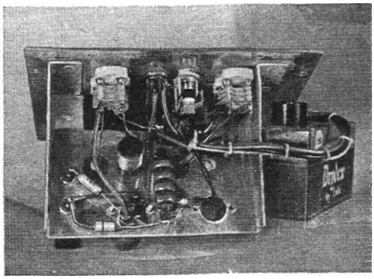
Fig 2

FOLLOWING THE writer's remarks in the February issue regarding receiver tuning, the following letter was received from Mr. H. R. Clayton of "Geebaa" boat fame:—

"I was interested to read in your article that you advocated the use of a low power transmitter for receiver alignment, the transmitter frequency being controlled by the same crystal as is used in the main transmitter. It may be of interest to your readers to know that a somewhat similar system has been used with my "Geebaa" series of boats, which have been demonstrated in public several times in the last few years. The transmitter is not crystal controlled, but adjustment of transmitter and receiver is carried out with the aid of a third unit, which is an absorption wavemeter and low power crystal oscillator built into one unit. The wavemeter can be calibrated at any time by reference to the crystal oscillator and can then be used to check or adjust the transmitter frequency, whilst the receiver can be adjusted on the signal from the crystal oscillator, which has a range of only one or two yards. In practice this system has proved most reliable and I have used it continuously since 1952. Its main value, of course, lies in the fact that it enables one accurately to check several transmitters whilst using only one crystal."

The reliability of this system can be fully endorsed by the writer, since he has used it (except that the wavemeter and crystal oscillator were two seperate units), on many occasions. The writer believes that if this system was generally adopted by radio control modellers, it would please the P.M.G. and all in authority who have the radio control movement at heart. It is a very attractive idea to have the crystal oscillator and wavemeter in one unit, so Mr. Clayton was contacted, and very kindly loaned his instrument for description. It is shown in the photographs, and the circuit diagram is given in *Fig.* 1. *Figs.* 2, 3 and 4, show respectively the front panel, top view of the baseboard behind the panel, and bottom view of this base. Both parts are made from aluminium about 16 s.w.g. and are rivetted together, flush on the front. This part fits into an aluminium box 4 in. deep inside, which has





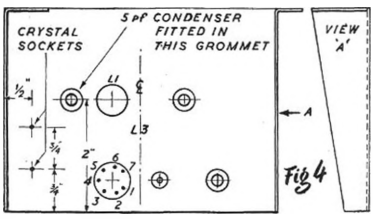
a handle on the top and an insulated hole for the aerial, to line up with the aerial socket in the base. There is room in the case for the combined L.T., H.T. battery which is a Drydex, Drymax 514.

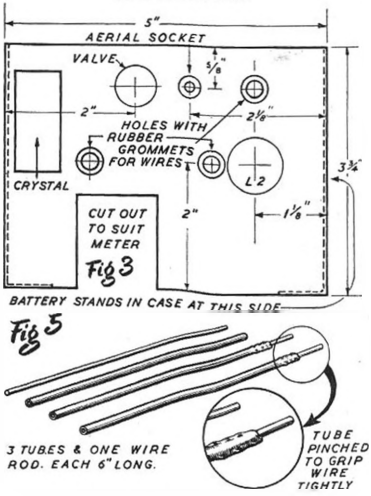
Note that the holes in the front panel must clear the spindles of the condensers C1, C2 and C3.

At the back near the top, a piece of aluminium tube is fixed horizontally inside, with one end open to the outside, which is covered by a swing plate. This tube holds the aerial for storage and transport. The aerial consists of three pieces of ¼ inch aluminium tube with a length of wire each 6 in. long, making a total of two feet. Two of the tubes have pieces of wire fixed in, and protuding half an inch, so that the aerial can be fitted together fishing rod fashion, see *Fig.* 5. Now for some notes on other components.

The valve is a IT4 and is readily obtainable at 5/- to 7/7 "surplus". The valve-holder can be amphenol, paxolix or ceramic. The types of resistors, condensors, and R.F.C. can be seen from the photos, and are readily obtainable at quite low prices. Although Mr. Clayton used a Westinghouse meter rectifier for GR, the writer has used a cheap germanium diode for the same purpose. The phone jack is not necessary ,but is sometimes useful with an audio modulated transmitter. The coil formers should be available from reputable radio component dealers. The wire is best wound on a slightly smaller former, and then eased onto the proper former, so it sinks firmly into the groove. It should be varnished with a proper coil varnish. Crystals of suitable frequency are not available cheaply these days but it is sometimes possible to obtain fairly cheap ones and get them ground to suit. Actually any crystal that will give frequency between 26·96 and 26·28 on its second, third, or fourth harmonic would be satisfactory. (For the tyro, this means that if the crystal frequency is multiplied by 2, 3 or 4, and the answer is between 26·96 and 27·28 then it will be suitable). Calibration of the dial is not very easy, but would not be essential if a crystal of the frequency stated under *Fig.* 1 was used. With C3 and 1 pf as stated, the

(*Continued overleaf*)





See how they launch!

Bob Linn, our Californian correspondent, sent this collection of photographs which show an amazing diversity of model launching technique.

Photos above, left to right:— Linn Junior with Torp. 19 powered design using anhedralled tailplane and high mounted motor. This unorthodox Flying Kidney being launched at the gallop, is radio controlled. Unfortunately, no details are available. John Banang Jnr. demonstrates the thrills of water-plane flying as his Class B model moves off in a cloud of spray and the owner gets his feet well and truly wet! Note the extra push down on the fin to get bouyancy to help the take off

Action! is the operative word as this Torp. 19 powered model takes the air. Sal Taibi, famous American designer, shows how to launch without wetting your feet. He was on this occasion attempting a new U.S. waterplane record—hence the long dist Ills design trend featured on the famous "Spacer" appears to have a following in the States, namely, the underslung fin as portrayed in the next picture. It shows Carl Lindley with an Elfin 1.8 diesel in the act of vertical 3-point take-off.

RADIO CONTROL NOTES CONTINUED FROM PAGE 255

dial covers 26·8 to 27·5 mc/s, which is just what we want. To help readers who build one of these instruments, and get it working satisfactorily, the writer will put two more spots on the dial for the cost of return postage. It will however be essential to write first, and not just send the meter along. The 100 microamp meter used by Mr. Clayton is not now available ex-government, the cost new being around three pounds. However, there is another type that can be used satisfactorily. This one as purchased has two needles that cross in the middle, and has L, and R, on the dial. In some of these meters the two needle movements have a common permanent magnet, but in others the two movements are quite separate, one of which can be removed if desired. This can then be put into another case and used for another frequency meter, or with a selenium cell to make a photographic photo-electric exposure meter. Great care is needed in removing these movements to avoid bending the needles. There are coils or something in the case which should be disconnected. Two little wire spirals will be found coming from the ends of the moving parts, and wires should be taken from the ends of these to two terminal screws going through the back of the case. A small tagboard can be fixed to these terminal screws to hold the associated rectifier, resistor, and condenser. A small tagboard is also fixed to the baseboard to hold the battery wires. All wiring should be as short, rigid, and well spaced as possible, but flexible wire is of course used to connect from the tagboard to the battery. Some wires are shown going through a large hole near the back of the baseboard. This hole was obviously made for some other purpose, so in making a new instrument it would be better to use a smaller hole and rubber grommet.

To set up this instrument, it is first switched on and a pointer on the knob of C3 set to the position on the dial corresponding to the frequency of the crystal harmonic. Adjust the two trimmers C1 and C2 to give maximum deflection of the meter needle. To tune a transmitter the instrument is set up and then switched off. The transmitter is then tuned to give maximum meter needle deflection, with the transmitter as far away as possible, still giving a readable movement of the needle. To tune a receiver, the instrument is switched on and the receiver tuned in the ordinary way, but will need to be only a yard or two away from the instrument.

CHUCKAWAY

BY JOHN SHEPPARD

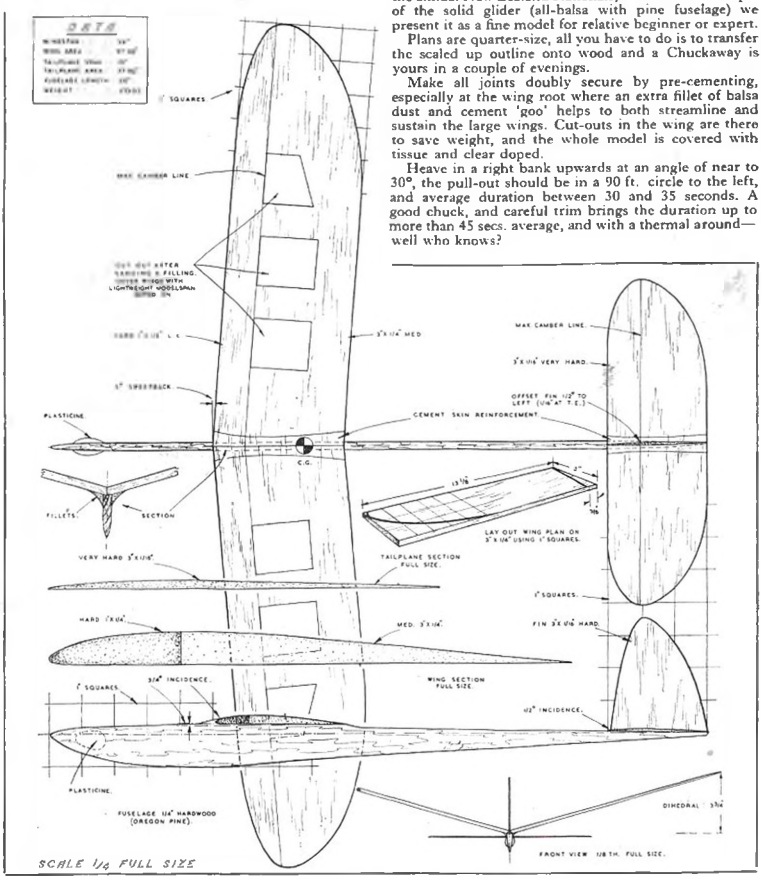
Try this large chuck glider for fun or contest flying

NINE MINUTES 38 SECS.—twelve minutes—fifteen minutes 40 secs.—those are times recorded for single flights with this remarkable BIG chuck glider from New Zealand. Its long list of contest achievements "down-under" make it one of the really outstanding features of the annual New Zealand Nationals, and as a fine example of the solid glider (all-balsa with pine fuselage) we present it as a fine model for relative beginner or expert.

Plans are quarter-size, all you have to do is to transfer the scaled up outline onto wood and a Chuckaway is yours in a couple of evenings.

Make all joints doubly secure by pre-cementing, especially at the wing root where an extra fillet of balsa dust and cement 'goo' helps to both streamline and sustain the large wings. Cut-outs in the wing are there to save weight, and the whole model is covered with tissue and clear doped.

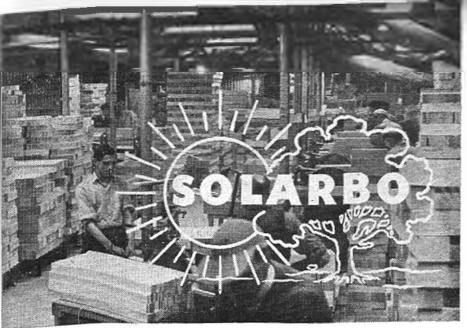
Heave in a right bank upwards at an angle of near to 30°, the pull-out should be in a 90 ft. circle to the left, and average duration between 30 and 35 seconds. A good chuck, and careful trim brings the duration up to more than 45 secs. average, and with a thermal around—well who knows?

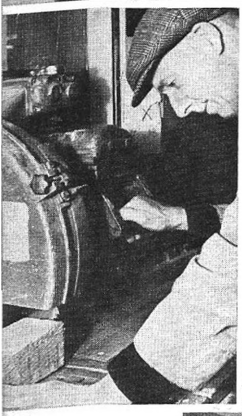


WE VISIT THE MODEL INDUSTRY

STORY

. . or how you get your Balsa





Close concentration of machinery with minimum movement of wood is evident in this view of the mill. All wood is transported on fork lift trucks, trays on which are made from balsa to help save weight for delivery girls who move trucks from various departments. Vertical pipes are dust extractors and bright illumination provides very clean working conditions

At left, Jack Kent cross cuts bulk timber to length with a special saw. Teeth are so arranged that a velvet surface results across the end of the block. This operator handles every piece of Solarbo, checking for "shakes" or rot, grading the wood according to weight, and removing useless timber

Right: The Overhand planer flattens and squares up bulk timber after it comes from the cross-cut. Operator Peter Priest is cleaning up 3 x 3 block

Left: At the dimension bench, block is cut to set length by Barry Bird with a high speed circular saw. Offcuts—if any—are grabbed by assistant and collected in sack at foreground

IN THE MIDDLE of the fifteenth century the Inca Emperor Tupac-Yupanqui was busily engaged in exploring and conquering the neighbouring territories of his empire. When content with overland operations, he set sail into the vast unknown Pacific Ocean with an armada of giant balsa rafts and no less than 20,000 followers. In a year he scoured the coastline and sailed 500 miles west to the Galapagos Isles before returning to claim that he had found the four corners of the earth.

Deep in the jungle of that same empire, now divided by new frontiers, one of which is that of Ecuador—the "Equator" land—a Colorado Indian with red painted body, black spotted face and mud caked crown, machetes his last "hand" of bananas for the day (A.D. 1955—five centuries after the Inca Emperor) and looks for the nearest group of balsa trees. He wants to make a raft, for balsa in the Spanish language means "raft" or "float" and our Colorado native knows that a few trees will lash together and float him downstream to Esmeraldas or Guayaquil with a profitable banana crop.

Now these two stories may, you think, have little to do with that sheet of smooth quarter grained 1/16 in. x 3 in. x 36 in. balsa you have on the workbench waiting to be cut into formers and ribs. How wrong you are—for if that Indian hadn't found the need to float his produce down to the port, or if the Incas hadn't explored the use of balsa—you might well be faced with other timber for your model making. For in Ecuador there is no such thing as a balsa plantation—and a good proportion of the supply of logs arrives because there exists a steady demand for bananas, pineapples and other tropical fruits—and the only means of transport in most cases from hinterland to coast is overwater on the rivers.

Balsa grows wild—and as the lightest timber known, with weight per cubic foot down to as little as 4 lb., it seems strange that it should share the jungle with the heaviest timber, lignum vitae, with an average weight of 96 lb. per cube!

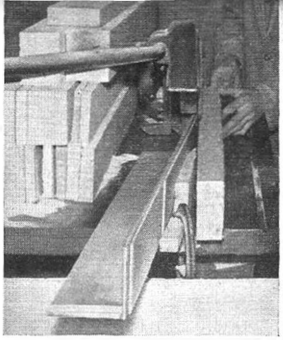
Our balsa grows fast in the torrid heat and heavy rainfall of Ecuador, reaching maturity in five or six years and adding four inches to its diameter each year. It is usually cut close to the ground when about 20 in. diameter and height reaches from 50 to 60 ft. If allowed to go higher it might become top heavy and damage itself in high wind, and, of course, in the restriction of natural growth a big tree becomes difficult for the cutter to handle.

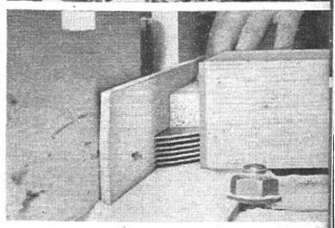
During the flotation down to the coast the balsa absorbs water and attendant pollution to add colour to the endgrain. Mineral colouring drawn into the trunk during growth is often seen as pinkish or streaky marking on cut sheet balsa and does not represent weakness or give any reason for not using it, though the idea is to provide the modeller with good clean wood, free from "blemish"—Solarbo, in fact.

This, then, was the background to our recent visit to Solarbo Ltd., on the south coast at Lancing in Sussex. In a day we were to learn more about balsa than one could expect to pick up in a lifetime of sparetime modelling—and far more than we could possibly hope to

convey in words at this stage to you the reader. The difficulties, involved procedures, and skill required to mill and market balsa on the scale of operations seen at Solarbo are sufficient to inspire the utmost admiration for the dominant personality of John Paterson and his extremely efficient organisation.

Balsa arrives at Lancing in huge planks. The current stock is of mammoth proportions and provides an awe inspiring sight for any ardent aeromodeller. It is scientifically stacked, kiln dried and graded according to weight and texture and it passes eventually through the hands of skilled craftsmen. At a glance they can identify the grading of the balsa and even tell the shipper responsible for sending the timber over. They weigh the wood in their hands and pass it to a saw that cross-cuts the endgrain to eliminate "shakes" or cracks in the wood and an off-cut is thrown away. When the sawyer has finished the balsa surviving this scathing examination passes on to the planer, and into the mill.





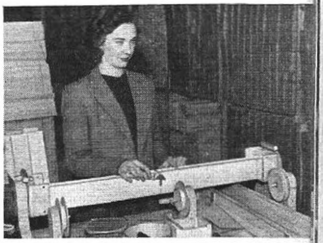
Close up detail: Above, cutting 3/32nd sheet from block, the cut sheet is parted off by a wedge after leaving the saw, then falls flat. Right: Spindle at work shaping sections. Leading edges, etc., are formed on this machine. Close-up below shows multi-blades on spindle about to gang saw block into six planks

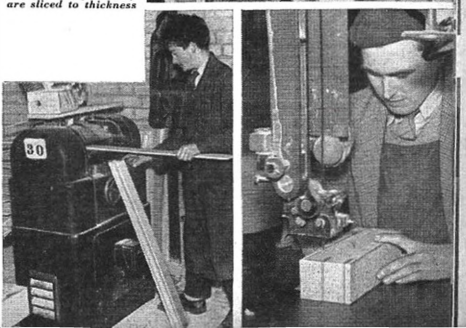
Now that offcut we mentioned may be a piece 6 or 10 inches long or just a skim off the end of the plank; but anyway it's the beginning of the waste figure looming over the horizon—a figure which magnifies up to almost 50% of the original stock by the time the circular saws, thicknessers and spindles have churned their way and turned balsa into dust. And that is only part of the story, for balsa's big enemies, mineral stain, fungus and worm can lie hidden in the largest of planks until the planer cleans the surface square. To help reduce the waste percentage, selection at the source of supply over in Ecuador is made by the Solarbo agent, a man retained at high salary to see that only the best comes our way. Thus we see that there's more to balsa than one might imagine—yet there's more to come. Analysis of the timber gives the amazing figure of only 10% wood content—the remainder is air! That is, of course, why balsa is so light and buoyant—and why it is a difficult timber to machine. Special saws, new techniques are needed for efficient sawmills like that at Solarbo, and there's no doubt about it, the endless cacophony of high pitched song from the battery of machines is a true indication that the factory is working at full speed ahead all day and every day.

Passing between the machines we see the way thin sheet is cut from block, only seven or so 1/16th sheets for each inch of block (that waste figure again). How the bandsaw cuts the outline of a block of wings, and the gang saw or multi-bladed spindle saw splits the block down to wing thickness. Most fascinating of all, the clever use of spindle action in making those near finished Mercury kit fuselages. The "Mac" was in full scale production during our visit, and the sight of that upper fuselage block being formed in scant seconds from a square block was revealing indeed.

Kit parts for many of our prominent manufacturers, some colour printed in Solarbo's own print room where small chuck gliders get their decoration by the ten-thousand—and strip, sheet or block bearing the familiar Sun and Tree stamp in red, pass through rigid inspection before despatch. Batched and graded, the balsa as we know it in the shop is a very different item to the baulk that entered the kiln.

Applications for balsa in industry, for packing, refrigeration, etc., are known to most of us; but how many are aware of the Solarbo surf board or the balsa/aluminium packing case with terrific strength/weight ratio, these are only two of many other items from the Lancing factory. Experience in lines like these lead to further developments in the model field, "Li-Ply" being one, resin bonded balsa modelling boards another—in fact so many applications that we left the Solarbo plant firmly impressed with a picture of a rosy future for all connected with so talented an organisation.

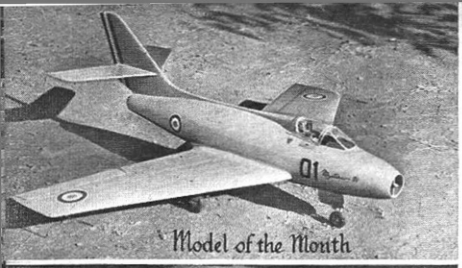


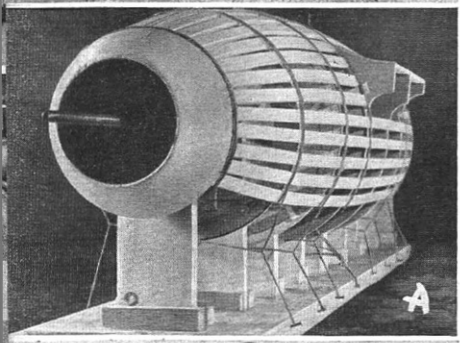


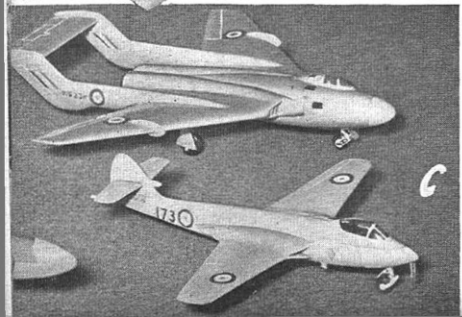
Right: Eileen Hemsworth making up packs of Solarbo sheet for despatch in the ingenious quick action banding jig which wraps sheet so neatly. Note bulk store in background. Below: A Black Prince planer with Eddie Darnham planing down off-cuts to a standard thickness. Bottom right: Band saw cuts a block of Mercury Mac wings to outline before they are sliced to thickness

May, 1955

MODEL NEWS







ONE MIGHT almost call this feature "Jet news" this month, there has been such a spate of torch-types recently that we have been able to gather this collection of variations from super-solid to ducted fan and pulse jet. Just to add a spot of convention we also have a Tiger Moth and RTP Team Racer to remind us that the airscrew is not yet dead!

Ambitious home-built pulse jet with microscopic bore (above) is by J. Shipley of Belfairs. Said to be a x1x1x1 to start, it uses flutter valves made from razor blades and has a glowplug for initial starting. Span is 17 in., performance unknown.

The admirable French magazine "Aviation" loaned us the photo of our Model of the Month. They featured this remarkably detailed "solid" of the Marcel Dassault Mystere IV by M. Roger Bessiere in a recent issue and it seemed to us that it is the involved model of its type yet described in print. Built to 1/10th scale, on the fig as seen in photo **A**, the Mystere has working everything, including an ejector seat and undercarriage. Inside the fuselage is a "magnetophone" to reproduce the whine of an Avon jet, plus a turbine to deliver realistic efflux of air at the tail end. We are not surprised that M. Bessiere spent some 2,700 hours in perfecting this 44 in. model.

One would not normally associate the Canberra (**B**) with gliding, and a flame-out in the real thing would certainly not inspire a desire to remain seated. P. J. Lambert of Kentish Town was prompted by the A.P.S. Fighter Glider design to think of making a model of the English Electric aircraft on the same lines—so the 42 in. all-sheeted tow-line version in this picture became reality and as visitors to Epsom Downs know, it glides fast and well. Mr. Lambert is currently building a 5 ft. Hawker Hunter.

1/72nd scale solid Kits are enjoying a minor boom in the trade, but Eric Vine of Bexley Heath builds from plans as he prefers to use the better woods such as American Whitewood. He also puts in long hours to get a perfect finish and the D.H.110 and Sea Hawk in **C** represent some 160 hours of effort. A stickler for accuracy, Mr. Vine makes his own transfers too!

Now for a ducted fan, only this time it's a centrifugal fan by John Coatsworth **D** with a Merlin '76 generating about 3½ oz. static thrust. Only 19¼ in. span and weighing 9¼ oz., this Boulton Paul III is the first centrifugal job to use a nose intake. Compliments are due to John Coatsworth for his pioneering of the "fan-on-its-side" layout.

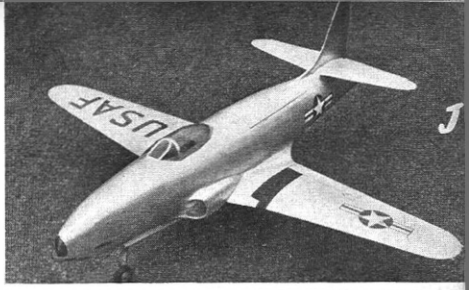
A nice breath of the conventional is brought along by Frank Buckland's control-line Tiger Moth in **E**. To 1/8th scale and using a Frog 500, the Tiggy *was* a regular sport flier until one fine day it was hooked onto a pair of borrowed lines—need we say more? Of course—they broke. Same engine is used in the ducted fan semi-Supermarine model in **F**, built by J. R. Campbell of Wokingham.

With multi-blade fan of the Newbold style and short intake duct this is a control-line model weighing some 30 ounces for its 32 inches span. Latest addition is a ring around the fan edge which improves thrust, but flight tests have yet to take place and we venture to suggest that Mr. Campbell is going to have to find a lot more revs before he gets that wing loading airborne.

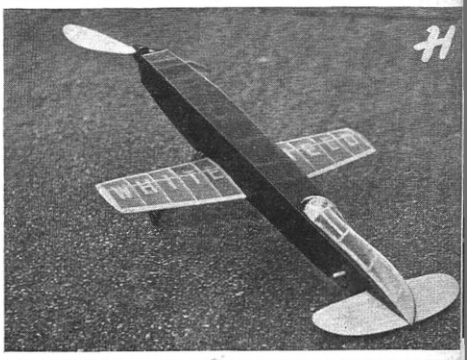
We've already mentioned Canberra's and the English Electric Co., and in **G** we have a picture taken at the home of the famous bomber, where the EEMAC held a static exhibition. Henry Pyptiuk produced his amazing jet for all to see, and we hope that he will be able to demonstrate same to the general public at the Nationals. Briefly, an Amco BB, 3·5 drives a two stage axial fan, with two stator rows, one of which forms the engine bearer and main structural unit. This blower is followed by a re-heat system with the ignition working on an entirely new principle. All of which is most inspiring and we hope that Henry, a member of the E.E. Aircraft design staff, will give us a thrill at Waterbeach.

That last model should be quite speedy, and the one in **H** is also in the fast class. This is an O'Donnell approach to the indoor team racer we gather is becoming a popular pastime in the North. With tiny wings and rear cockpit, it bears remote resemblance to the famous pre-war French Caudron Racer.

To finish on a jet, photo **J** is a scale Lockheed Shooting Star that has been on John Claydon's building board for the last three years and has at last received its final top dressing of silver wallpaper (what a blessing Pete Hickie discovered this medium and gave us the info. to mention it in Model News some time back—countless models have since been realistically covered since then). To return to the Shooting Star, Span is 50 in., and area 550 sq. in., with weight at 6 lb. A Dynajet enclosed in the fuselage should give it 75 m.p.h.



J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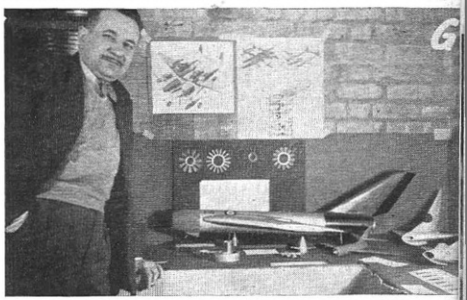
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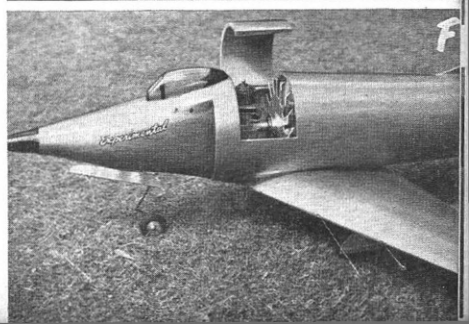
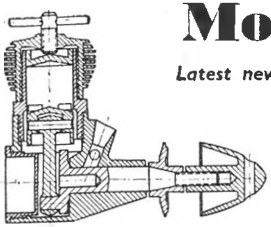
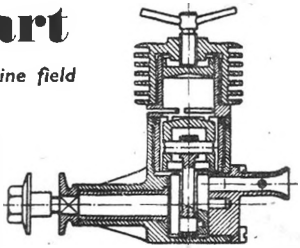
E


F

Motor Mart

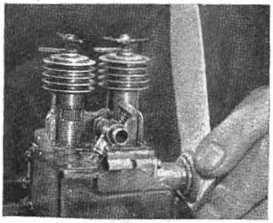
Latest news in the model engine field





East European 2.5's (left), the Yugoslav Aero-250-MK with front rotary crankshaft valve and plain bearings. (Right), the Hungarian SM-03 Proton, with extremely short stroke of 12.4 mm. and large 16 mm. bore. Rear disc valve and bushed crankshaft in this racer, said to produce .22 b.h.p.

TWINS ARE IN THE NEWS. Several twin cylinder diesels, the French Delmo and British Taplin special, and American petrol/ignition Elf, O.K. and Pal engines have been going for some time, the latter being convertible to glowplug if desired. What is really news is that a range of three air and marine glowplug vertical in-line twins are marketed in the U.S.A. by the newly merged **K & B-Allyn** Company and these are expressly designed for glowplug operation. With the K & B



Taplin Twin with single carb makes a terrific noise with one firing per stroke. Is started on "one" from cold

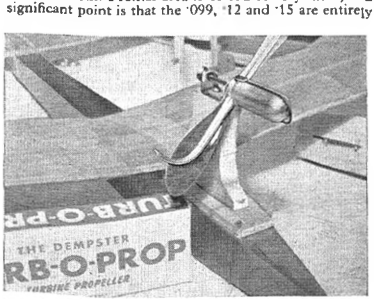
reputation for supreme performance in the contest field and Allyn's attractive employment of beautiful die casting particularly in marine outboard units, the new series should be worth having. Reports tell us that the 2·5 Sky Fury twin can be held in the hand at full revs, it's so smooth. Frontal area is of course very small, and significant point is that the ·099, ·12 and ·15 are entirely new displacements with new castings and not modified combinations of "singles".

Ohlsson and Rice, a name associated with model engines for many years, enters the ¼A sphere with an ·049 reed valve engine that comes with radial tank mount or can be beam mounted. Vertical rear downdraught carburettor and large exhaust ports, go with long crankshaft to give it a "new look" among small engines. At other end of the scale, **Forster** Brothers have re-introduced their petrol/ignition "99" 16·4 c.c. two speed engine for r/c.

Webra's for '55 are boxed in plastic with a transparent lid. Big price cuts are made through the range, and the two-needle 2·5 c.c. plain bearing Winner is now radial or beam for r/c. Increased performance in this engine is in part due to purchase of modern Steinhauser auto lathes which have raised the standard of internal finish even higher—as well as raising production rate and thus bringing the prices down.

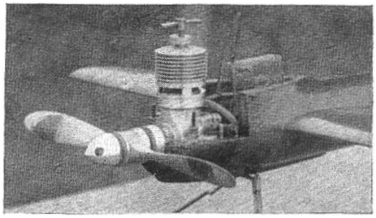
Oliver's have moved. Switching from Nottingham to "Four Acres", Ringwood Road, Ferndown, Dorset, the quality engine makers were hard at their machines within hours of getting the furniture off the van and Ferndown first heard the cry of new-born "Tigers" within 5 days of the move. Backlog of orders for these engines is big, our delivery date for a Tiger is scheduled for November; but we can wait—it's worth it.

Clang! About half the print of April issue had run through the machines when we discovered two figures had transposed themselves in the prop-rpm table for the 1 c.c. **Taifun Hobby.** These should read correctly as the 7 x 4 (Trucut) giving 10,700 and the 6 x 6 (Stant) giving 12,600 rpm.

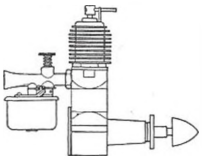


Left, the Turb-O-Prop utilises Jetex principles to drive an air-screw via twin jets—is very efficient, even when free-wheeling.

Below, Russian K-18, 2.5 diesel, bears resemblance to ED Racer, was used by Kucerov to place 3rd in Moscow contest. This one is in Bulgarian speedster

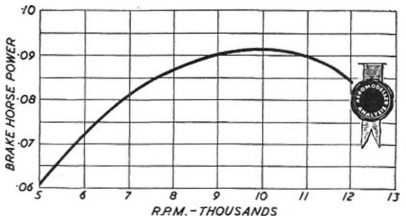


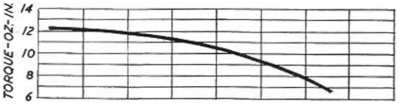
ENGINE ANALYSIS (Revised)



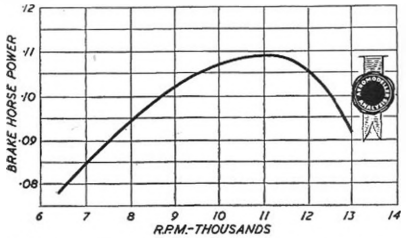
Mills 1.3 cc

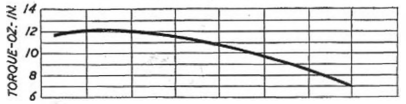
SPECIFICATION
Displacement: 1.33 c.c. (.081 cu. in.)
Bore: .406 in.
Stroke: .625 in.
Weight: 3¼ ounces.
Max B.H.P.: .093 at 10,000 r.p.m.
Max torque: 12.4 oz-in. at 5,000—6,000 r.p.m.
Power rating: .07 B.H.P. per c.c.





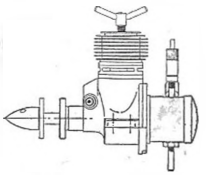
Two "used" models were the subject of this test, the better of the two performances being taken. Despite being a side-port engine the Mills is an extremely powerful unit and remarkably easy to handle. Design has remained largely unchanged since the Mills first appeared. The original Mark II was modified in 1950 to incorporate revised porting. An ideal engine for medium speed operation.





Le Simoun HR 15

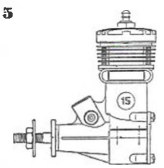
SPECIFICATION
Displacement: 1.5 c.c. (.09 cu. in.)
Bore: 13 mm. (.512 in.)
Stroke: 12mm. (.472in.)
Weight: 2.625 ounces.
Max B.H.P.: .109 at 11,200.
Max torque: 12.0 at 7,500 r.p.m.
Power rating: .0725 B.H.P. per c.c.
Previous report (no performance figures) May, 1954.



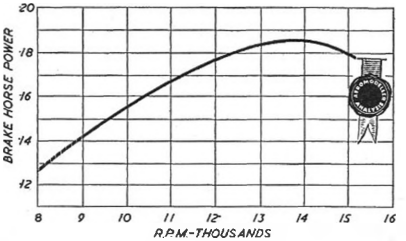
Previously tested for propeller/r.p.m. performance only, torque figures have recently been derived from the dynamometer unit to complete the "AEROMODELLER" data on this very popular French engine. Performance appears up to normal 1·5 c.c. standards, without being outstanding. Allbon diesel fuel used for the re-run.

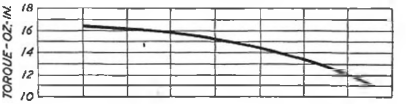
K & B Torpedo 15

SPECIFICATION
Displacement: 2.43 c.c. (.15 cu. in.)
Bore: 0.595 in.
Stroke: 0.535 in.
Weight: 3½ oz.
Max B.H.P.: .186 at 13,750 r.p.m.
Max torque: 16 oz. in. at 9,000 r.p.m.
Power rating: .076 B.H.P. per c.c.



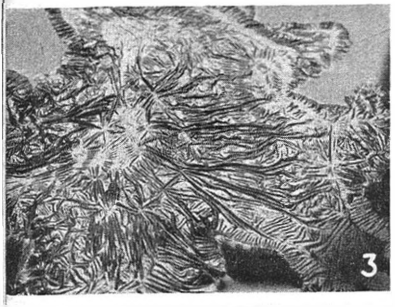
A complete re-test has been run, on a production engine, using a fuel more suited to the design, together with adequate cooling and the elimination of excessive vibration between engine and dynamometer. Mercury No. 7 fuel was used with the addition of a further 12·5 per cent. nitro-methane. Maximum torque achieved on test was slightly over 16 ounce-inches (although the engine was not tested below 9,000 r.p.m.) and maximum B.H.P. ·186 at 13,750 r.p.m.

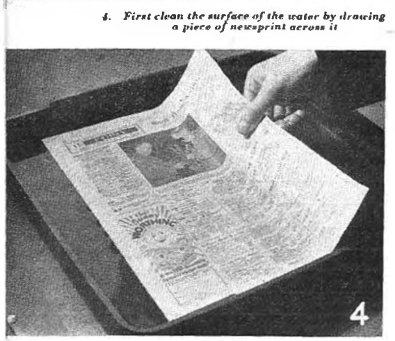




2. Curdled effect of acetone collodion poured on to water

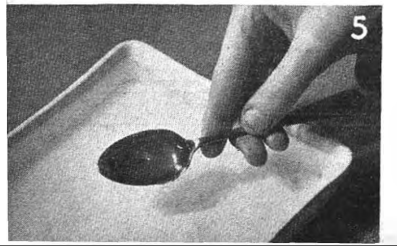
3. What happens when dope alone is poured on to water and allowed to set





4. First clean the surface of the water by drawing a piece of newsprint across it

5. Pour the mixture on to the water with the spoon just above the surface



IT IS NOW universally agreed that for really successful flights with indoor models, whether RTP or free-flight, Microfilm covering is a "must". When properly made, microfilm should look like cellophane but should differ slightly from it in consistency. Cellophane is quite "dead", having no elasticity, whereas microfilm should have a slight amount of "give" or resilience; not too much, however, or the covering will balloon out of shape when the model is in flight. Cellophane has a perfectly dry and almost brittle feel about it, but microfilm should be *very* slightly tacky—just enough to cling momentarily if the finger tip is pressed against it. Too much of this quality and the film becomes positively sticky; while if it is too dry it will not be possible to attach it to the framework of the model by the simple method of licking the balsa wood and pressing it against the film.

Materials Needed

1. A couple of fluid ounces either of clear dope or flexible collodion. The latter costs about 8d. per ounce from any chemist.
2. A few ounces of amyl acetate. (With dope, ordinary thinners would do.)
3. One or two ounces of castor oil.
4. A few feet of soft wire, about 18 s.w.g.
5. One or more flat dishes, at least two inches deep, free of soap or detergents which would affect the surface tension of the water they are to hold, and three inches larger all the way round than the particular unit of the model for which the microfilm is needed.

General Method

Fill the dish with lukewarm water and clear all foreign matter from the surface by drawing across it a piece of newsprint. A teaspoonful of the microfilm mixture is then poured onto the water from as near the surface as possible. If the dish is long and narrow, the spoon can be drawn down the centre as the liquid is poured smoothly out. The solution spreads rapidly over the surface, crinkles a little round the edges, and sets in anything from one to ten minutes according to the mixture. Collodion is usually quicker than dope.

To remove the film from the water, bend a length of soft wire into a loop or rectangle, an inch or so smaller than the area of the film all the way round, and with the ends of the wire bent into a strong handle at one end. Lower the frame gently onto the surface of the film, and with a moistened finger-tip, roll the edge of the film up and over the wire all the way round. Slide the frame and film sideways from the water, and hang up to dry.

The Mixture For Microfilm

Dope or collodion alone would not spread properly over the water surface. They would go milky in colour, and dry out wrinkled and hard. Amyl acetate is added to prevent this "blushing" effect and to thin the solutions, making it easier for them to spread, while a few drops of castor oil smooths out the spreading motion and imparts a certain elasticity to the resulting film.

• how to make it *by Rev. F. Callon*

Collodion

First of all a word of warning. There are two sorts of collodion available: Collodion BPC, containing acetone, benzine and amyl acetate (it is sometimes called simply "acetone collodion"), and flexible collodion, or collodion BP which contains ether and castor oil. *Fig.* 2 shows you what happens when acetone collodion is poured onto water; it breaks up into a sloppy, curdled mess, and does not improve much with the addition of castor oil and amyl acetate. So make sure that the collodion you buy is flexible collodion, with BP on the bottle.

For experimental purposes, a full teaspoon contains about one quarter of a fluid ounce. An old one-ounce dope jar, well cleaned out with thinners, will do for mixing the ingredients, and since we do not want to waste materials it is best to take one teaspoonful where the formula stipulates an ounce, and divide the number of drops specified by four.

A good film, though rather on the flimsy side, was obtained from one of the formulae given in the May, 1951 AEROMODELLER, but using more amyl acetate:

Flexible collodion	...	1 ounce
Castor oil	...	10 drops
Amyl acetate	...	30 drops

This at any rate will serve for a basis for experiments.

Dope Microfilm

The consistency of the dope used for microfilm should be watery rather than treacly. With the Britfix dope used in the present experiments it was found necessary to add an equal quantity of amyl acetate before the mixture became really workable. A much greater percentage of castor oil is needed with dope than with collodion. The amount recommended in the 1951 article was one teaspoonful to two ounces of dope or banana oil, but quite a good film was obtained by using much more than this, namely:

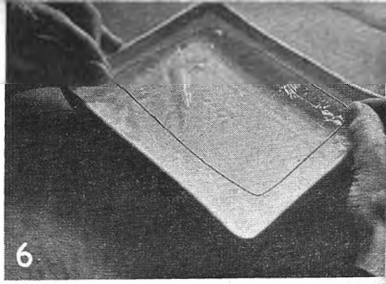
Dope	...	1 ounce
Amyl acetate	...	1 ounce
Castor oil	...	½ ounce

In teaspoons that would reduce to one spoonful each of the first two and half a teaspoonful of castor oil. Rather a flabby film resulted when equal quantities of all three were tried, but not too sticky for all that.

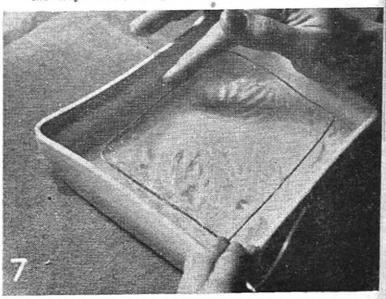
Final Observations

A teaspoonful of the correct mixture should spread evenly over an area of at least 15 inches by twelve inches. If a thicker film is required, do not alter the mixture, but pour on more for a given area, *i.e.*, use a bigger spoon or a smaller dish. If the film sticks to the sides of the dish trim it carefully away with a razor-blade dipped in water before attempting to curl the film on to the wire frame.

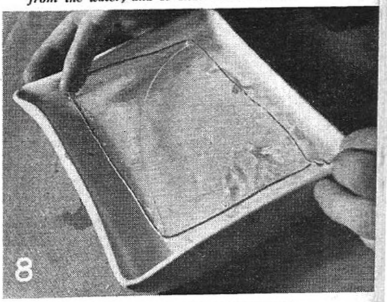
It sometimes happens that the film is prevented from spreading properly by an irregular crinkly edge which forms almost at once after the mixture is poured out, and which encircles a liquid pool of the solution. If this happens, the crinkly edge should be quickly picked up out of the water on a piece of stick, when the rest of the solution will at once spread out to the edges of the dish leaving a smooth, unbroken surface.



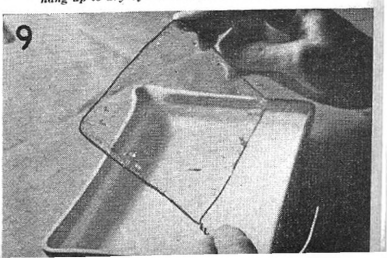
6. As soon as the film has set, carefully lower the wire frame until it is just touching it. 7. Curl the edge of the film round over the wire all the way round, using a moistened finger

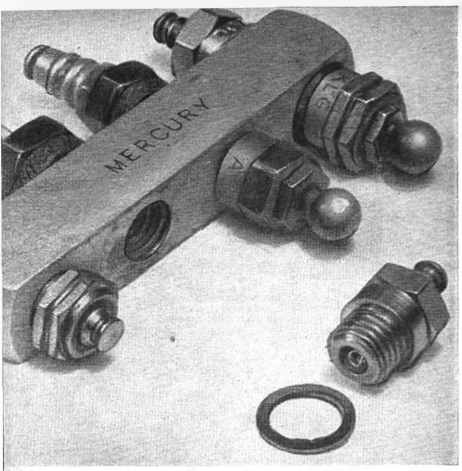


8. Holding one corner of the frame steady by the handle, gently lift the opposite corner from the water, and so slide out the whole



9. Carefully shake off the surplus moisture and hang up to dry by the hook on the handle





Save that GLOWPLUG

Words of warning for users of 1·5v plugs——from R. H. WARRING

TO USE an American type glow plug (designed to operate off a battery voltage of 1·5 volts maximum) on a 2-volt lead-acid accumulator without overheating the element, and thus shortening its life, it is necessary to drop about 0·5 volts between the accumulator and the plug. The advantage of using a lead-acid accumulator (nominal 2 volts) as compared with a standard dry cell (nominal voltage 1·5) is the longer life and ability of the former to give a high and constant current of the order required for easy starting.

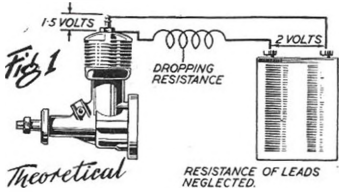


Fig. 1 *Theoretical*

Now the value of the dropping resistance required will depend on the current drawn by the glow plug. An average figure of 3 amps may be taken as typical (and again a point against the use of dry battery "boosters," since these polarise rapidly with such a high current demand and are readily discharged). The theoretical solution is then a dropping resistance of 1/6th (·166) ohms inserted in one of the battery leads, assuming that these leads have negligible resistance. Typical lengths of solid copper wire, or copper-nickel resistance wire which could be used for the "dropping" resistance are given in Tables I and II. The actual value of the dropping resistance will not remain constant, but will change as the resistance heats up (although with resistance wire this change is small enough to be negligible). In any case, heating effects are minimised by using larger wire sizes, in preference to very thin resistance wires.

However, an equally suitable, and far more practical solution is to use the resistance of the leads themselves as a suitable dropping resistance, by making them of length equivalent total resistance of about ·166 ohms. Again data can be derived from tables of the electrical resistance of high conductivity copper wire (as used in normal "flex"), but in view of the divergence between some data of this nature and practical tests on a number of samples of flex, it was decided to measure the actual voltage dropped by typical lengths of readily available flex which could be nominated as a "standard."

Practical test results

The practical specimens selected were sample lengths of flex purchased from Woolworths, of the 2d. per yard, fourpenny, fivepenny and sixpenny quality. All of these flexes, incidentally, are stranded from ·0076 in. (36 s.w.g.) diameter wire, the price difference being largely accounted for by the number of individual strands employed in each lead and the type of insulation. Typical test results are summarised in Table III.

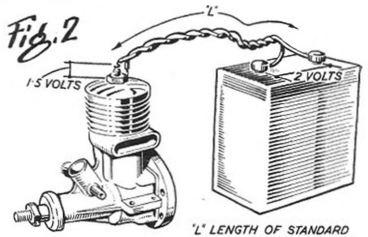


Fig. 2 *Practical*

'L' LENGTH OF STANDARD FLEX REQUIRED SELECTED FROM TABLE III
NOTE: FOR RESISTANCE PURPOSES ACTUAL LENGTH OF WIRE EMPLOYED IS 2 X 'L'

TABLE I. LENGTH OF SOFT COPPER WIRE (SOLID) FOR .166 OHMS RESISTANCE

Size (s.w.g.)	14	16	18	20	22	24	26	28	30	32
Length (ins.)	1,250	800	450	250	150	95	63	42.5	30	23

TABLE II. LENGTH OF COPPER-NICKEL RESISTANCE WIRE FOR .166 OHMS RESISTANCE

Size (swg.)	20	21	22	23	24	25	26	27	28	30
Length (ins.)	8.75	7.0	5.3	3.9	3.3	2.7	2.2	1.85	1.5	1.05

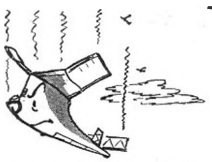
TABLE III. TYPICAL PERFORMANCE DATA "STANDARD" (WOOLWORTH) FLEX LEADS

Price	Wire Size	Insulation	Voltage at Plug* 4 Yards Flex	Nominal Length for 1.5 Volts at Plug	Recommended Lead Length (yards)
2d.	7 Strands .0076	Plastic	0.5	1 yard	1¼
4d.	14 Strands .0076	Rubber and Plastic	0.95	2 yards	2-2¼
5d.	14 Strands .0076	Rubber and Braid	0.95	2 yards	2-2¼
6d.	23 Strands .0076	Rubber and Braid	1.2	2¼ yards	2¼-3

* 1.95 Volts at Battery on Load

It will be seen that about two yards of the 4d. or 5d. flex (identical except for the type of insulation) should provide a lead length capable of "dropping" the necessary half a volt between accumulator and glow plug—*Fig.* 2. With the more expensive flex, 2¼ yards would be a safer figure. In the case of the plastic-covered seven-strand flex, just over one yard of lead would be sufficient.

An apparent anomaly is that the more expensive the flex the more you require of it! But this quite is logical when you consider that the better the flex, the lower its resistance or the better its conductivity for normal purposes. A general recommendation would be two yards (or perhaps two and a half yards, to be on the safe side) of the 14/·0076 flex, when the mortality rate of 1.5 volt glow plugs used with accumulator "boosters" should be considerably reduced. Once accumulator voltage drops to about 2·0 volts off load, however, it may be necessary to shorten the lead length (*i.e.*, reduce the "dropping" resistance) to maintain a satisfactory "hot" glow plug element.



I've got that sinking feeling

What's the answer?

"Some thermal ! My model went upwards just as fast when the D/T operated." An all too common remark, which generally means another lost model.

It happened at our local club contest towards the end of last season, although this time two models were involved. Both had tip-tail dethermalisers, and both models were similar in design, size and weight. And both had got in the same area of lift. But when the D/Ts cut in, one continued to go up out-of-sight, whilst the other one came down.

What would YOU do in a case like this ? Think a moment, then twist the page for one solution to the problem which is printed below:

Left: **Effective, but drastic!**

THE ANSWER . . . Luck does play a part in such situations since two models flying quite close together can be affected in different ways by air currents.

Tripping the tail to a large negative incidence produces a "dethermalised" descent. However, if the angle of tip does not exceed about 30 degrees, *the actual rate of descent* can be fairly low. It is usually reckoned that a minimum angle of tip of 35 degrees is necessary for *effective* dethermalising. If your model flies like this, then you may well lose it in even a moderate thermal. No dethermaliser will bring a model down through a really *strong* thermal, but if it is efficient it will bring it *out* of the thermal quicker and down much faster after—so keep chasing, even if the model is still going up! Both models in the sample quoted had *working* dethermalisers, but only one had enough tailplane "tip".

Are you SURE it was alright?

Making your own ENGINE

Part Six

Assembly and test

by DAVE SUGDEN

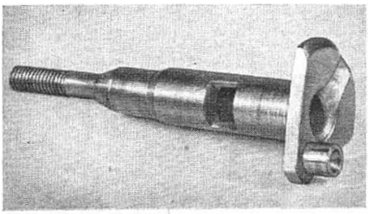
HAVING at last reached the stage where all constructional obstacles have been overcome, the assembly and test of a new engine must not be rushed, but be carried out with as much care as was put into the construction. Cleanliness is of supreme importance in ensuring that the motor shall have a long working life.

Cleaning.—Wash the parts thoroughly in petrol, paying special attention to bearings. Assemble all the parts and check that everything fits together properly. Usually something does not. The con-rod may foul the sides of the crankcase and the piston may touch the top of the back cover. Whatever the trouble, attend to it now. This does, of course, assume that you have designed an engine which *can* be assembled ! !

Dismantle and select all the ferrous parts (shaft, piston, cylinder, etc.) excepting ball races, which should still be perfectly clean; put them into a tin containing washing soda, and if this is not available, soap powder and water, and boil for several minutes to remove ingrained grit. The parts are super-clean after boiling and if not oiled will rust rapidly. Lay them out on clean paper and handle as little as possible.

If a ball race has become dirty, it can be cleaned out by carefully spinning it over in a bath of clean petrol. Aluminium parts are cleaned with petrol and a smooth cloth, bearing surfaces being rubbed as vigorously as possible to remove grit. Give them a final dip in petrol to remove fluff.

Crankshaft Assembly.—Assembling an engine having a plain bearing crankshaft is not difficult.



Inserting a plain journal bearing is effected by warming the crankcase and pressing home the bush in a vice, using suitable blocks of wood, being careful to avoid any transverse loading which might distort the bearing.

Fitting a ball bearing crankshaft can be decidedly tricky. Using a piece of tube to bear upon the inner race, press the rear ball race on to the crankshaft, using a vice. Warm the front bearing housing over a clean gas flame and insert the race. Tight force with a vice might be needed. There should be a face against which the outer race may seat squarely. It is easy to distort the outer face and excessive force must not be used. If the bearing will not enter or has distorted out of round or does not run freely, it must be removed and the offending part of the housing, usually detected by the score marks, scraped down. A balsa knife makes a good tool for this job. Be careful to remove metal evenly all the way round if the bearing is too tight. To remove the bearing, re-warm and tap out with a drift or with a piece of ground silver steel made to a very tight fit in the inner race.

Having fitted the front bearing into the crankcase part of the engine and with the rear ball race on the crankshaft the next step is to mate the two assemblies. Warm the rear housing, or the crankcase, and with the front bearing supported on both its outer and inner races press the crank shaft into position with the vice. If it will not fit or is stiff, remove and attend to the trouble. When fitted, a slight tap in the reverse direction relieves stresses set up between the bearings, and the shaft should then spin freely. Slight "lumpiness" may be tolerated on an ordinary engine and it may be found to disappear when the engine warms up.

General Assembly.—The remainder of the assembly is not difficult. As parts are put together they should be marked so that on re-assembly they can be fitted in the same position. *E.g.*, mark the front of the con-rod and insert the gudgeon pin from the front of the piston. Mark the cylinder. Always tighten opposite screws progressively to ensure that the part—a cylinder head or back cover—is evenly seated.

Gaskets should be used on all joints for the purpose of making absolutely certain that there are no leaks. Many a good engine fails to perform properly due to a leak. A leaky crankcase can make starting tricky, which on a new engine can be quite difficult enough with unknown settings. Tough paper is ideal for gaskets.

With everything assembled the engine should turn over rather stiffly. It is a good thing, having mounted the piston and cylinder, to turn over the motor whilst it is immersed in petrol to flush any remaining dirt from the bore. If on tightening up, the piston has become stiff in the bore, either the cylinder is out of line or the con-rod holes are not true. Try the effect of turning the

Heading: 11,006 r.p.m. on an 8 x 6, is the reading indicated by a spring steel rev-reader of repute, and by comparison, this is equal to the best of the ball-race engines. Figure is now higher from Dave's latest. Left: Shaft from heading engine has mods to the crankweb; much credit is due to Oliver for detail in this particular engine

con-rod back to front. If the cylinder is giving the trouble, turn the motor over several times, remove the cylinder and look for rubbing marks which will indicate which way it is out of line, and where the seating should be adjusted. Tightness due to malalignment will loosen up with running as the con-rod bearings wear, but if it is the cylinder that is out of line the motor will never deliver peak power and the con-rod will rapidly wear and may even bend or break. Every effort should be made to assemble the motor free from binding of any sort, as this is the best means of ensuring a long life and high power output. If any parts have to be worked upon they should be re-cleaned in the manner prior to the commencement of assembly. Lubricate with castor oil.

Testing and Running.—The motor is at last ready to be run. Bolt it to a suitable mounting and arrange the fuel level low enough to prevent the motor from flooding, but high enough to keep the fuel at the jet. The weight of a plastic prop eases starting and one should be selected which will not allow the r.p.m. to exceed 8,000 on a plain bearing engine or 11,000 on one fitted with ball races.

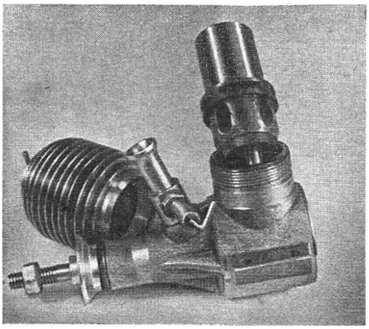
A suitable fuel is equal parts of castor oil, Derv or paraffin, with either a 2% addition of amyl nitrite or nitrate. As the motor becomes more free this may be modified to a final mixture as follows: 15% castor oil, 55% Derv, 27% ether and 3% amyl nitrite.

Open the needle so that when choked the fuel is drawn through the tubing at a normal rate for the size of engine. Choke a couple of times and screw down the compression until it feels reasonable. Flick several times and if without success try and prime through the ports. Whilst flicking, turn down the compression until the engine "pops". Further priming should result in a burst and if the engine fails to roar into life, open up the fuel setting. If the motor still does not start and shows no signs of excess fuel, drill out the jet to a slightly larger size. A reasonable design, made with moderate skill, must run, and perseverance will end in success. My first motor took 1½ hours to start; the latest one went on the third flick.

Glowplugs present no appreciable starting difficulties. Equip with a long reach or warm plug, wind the needle well open, prime through the exhaust port with fuel, say Mercury 5, and with a good glow the motor will run. A reduction of fuel brings it to the best running setting. It is as easy as that! The compression ratio is difficult to assess on glow motors because of their deflector head pistons and shaped cylinder heads, but it is easily judged by performance on various fuels and plugs. If on changing to a short reach plug the engine runs as though it is starved of fuel when the correct running setting is approached, compression ratio is too low. On the other hand, if it runs well on all plugs but sounds rough on certain fuels the compression ratio is too high especially for the fuel involved. The best ratio is determined only by checking performances carefully, on the best fuel with the best plug.

When the motor has lost all stiffness in the piston bearing it is virtually run in and small props can be used. If after a run the piston feels on the stiff side or looks dry the oil content of the fuel should be raised or a thicker oil used. To prime a new engine with oil before a run is a good thing, making for a long life.

The state of the oil thrown out of the exhaust ports gives a good indication of the conditions within the engine. More nitrite is needed if it contains carbon. If after two or three runs however it has a "poly-chromatic" look, rapid wear on some part is indicated and the motor should be stripped, examined, and the trouble rectified, before the part—usually the con-rod—is too badly worn. Engines fitted with ringed aluminium pistons are more prone to produce this phenomenon, but it should not be allowed to persist.



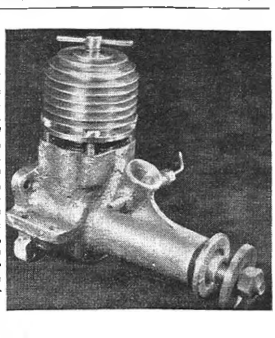
Dismantled view reveals transfer ports and construction

A spot of jeweller's rouge or Brasso in the fuel assists a stiff engine to run in more rapidly, where without it the process might take many hours; but it is only recommended where peak power is wanted quickly. It can knock hours off the life of the engine.

The most important instrument for engine testing is a good tachometer. Wire reed indicators are not sufficiently sensitive or reliable. The most convenient method is to run the motor whilst someone compares its note on a piano. If the instrument is in tune you have a fairly accurate check on r.p.m., and anyway it provides a sensitive means of checking small variations in r.p.m. The table gives the r.p.m. indicated by the various notes. R.p.m. are halved if the note is an octave lower and doubled if it is an octave higher ! !

Notes of Engine R.P.M.

NOTE	c	d	e	g	a	b	Middle c
R.P.M.	7,680	8,640	9,600	10,200	11,500	12,800	14,400	15,350

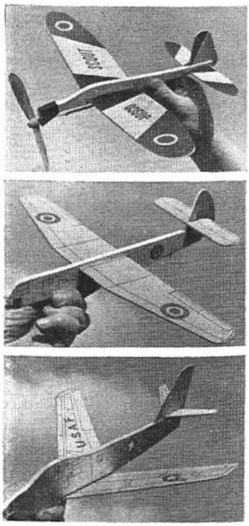


NEXT MONTH
Full details of Dave Sugden's specially commissioned 2.5 c.c. contest diesel with combination radial or beam mounting, simple cylinder fitting, and terrific performance. Gives 13,500 on a trimmed 8 x 5, or 10,300 on a 9 x 6. Crankcase castings will be available for home-builders

TRADE NOTES

WE WANTED some really good control-line wire for a 2½ lb. full stunt model and wrote to **Russell Models,** 6 Ryton Street, Worksop. Pete Russell came back with full details of his range, plus copies of the useful hints and tips sheet he sends with every order. Single strand galvanised in 8, 10 or 15 thou, is 1s. 6d., whilst multi-ply stainless stranded wire ranges from 6s. to 8s. according to thickness from 8 to 16 thou. Latter is supplied on a returnable reel, and any length can be supplied to order. Russell wires are used by most leading C/L fliers.

Jasco, of Southport, sent along their ready to assemble trio pictured below, and in an hour we had all three flight-tested. The Scout (4s. 6d.) has a smart plastic prop and nose assembly, flies well, and the Horsa (3s. 6d.) surprised us by being quite a performer in spite of having no dihedral. Most attractive is the silver-doped Sabre (3s. 6d.) which can take a Jetex unit or be flown as a realistic chuck glider. Handlaunch is not so easy due to wingsweep, so we advise catapult action for this one.



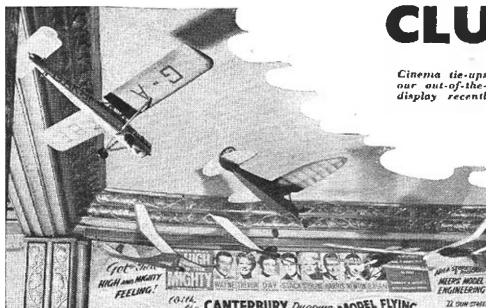
Jetex back-room boys with prototypes. Note Javelin in front and Starfire in background. Right: E. H. Balsa Stripper is accurate and easy to use

1 in.-1 ft. scale pilots in modern vogue, complete with U.S. style "brain-bucket", glare visor and oxygen mask are marketed by **Peter Smith,** of Croydon. Unpainted, they are 2s. 9d. and fully painted at 3s. 6d. inc. tax. For Team Racers (Class A) and the Jetex Swift or Hunter they are just the job. Smaller pilots are to follow, all in same plastic, and packed in Polythene bags. New Soldering Iron, below pilots, is the **Solo** tool, with pistol spot welding action. Can be used from mains or battery on the field and costs 85s. complete, or 37s. 6d. for tool alone. It works immediately after switching on.

Transfer Varnish by **Humber Oil,** sold with internal brush at 1s. 9d. (below) also comes in handy for that super high gloss finish you want—a tip worth remembering for that next Concours effort.

Below right: New wallpaper adhesive is also good for covering—makes 1¼ gallons per pack! 1,001 Knife at 1s. 6d. with two double-ended blades is to be recommended

CLUB NEWS



Cinema tie-ups are excellent and easy publicity stunts, and our out-of-the-ordinary heading picture shows an overhead display recently arranged by Canterbury Pilgrims M.F.C.

SOMETHING UNUSUAL in displays is being laid on on St. George's Day, April 23rd, by the Army at No. 1 Petroleum Reserve Depot, R.A.S.C., at West Moors, near Ringwood, Hants. (just behind Bournemouth). A complete range of demonstrations of all types of models is organised, starting at 2.15 with yachts and power boats, free and R/C, and working through all branches of aircraft and other models to a conclusion at 5.30. Demonstrators will include "works teams" from E.D., Veron, and Jetex, and refreshments will be available throughout the show, which is, needless to say, open to the public. Sounds like a very nice afternoon out.

Northern

The four Area S/C meetings for 1955 will again be held at Rufforth, and the committee have agreed not to take advantage of the variation in eliminator dates now permitted by the S.M.A.E.; the eliminators will definitely be held on the dates given in the S.M.A.E. programme.

The inter-club postal contest between New Zealand's Hastings M.A.C. and the **HUDDERSFIELD D.M.A.C.** was flown off on March 13th; in gusty winds and with snow and mud to contend with, the British club did very well to aggregate 31 : 01 with a four-man team. Unfortunately the N.Z. time was not yet in by press date. Huddersfield will be staging a rally on May 15th at David Brown's Airfield, with open rubber, glider, power, C/L stunt, and combat. Pre-entry 1/9 including programme (D. Armstrong, 64 Dryclough Road, Huddersfield) or 2/3 on the field. Good prizes in all events.

Reconstitution of the **ROTHERHAM D.M.F.C.** sees a new start made with 33 S.M.A.E. affiliated members, including a number of old stalwarts. All the old club's 10 trophies have been revived, and a club room and flying field laid on, so that any lone hands in the district have a chance to join a top-line group.

South Western

Now in the forces is S. Gibbons, who collected all the '54 **EXETER M.A.C.** Championships; at least he's in company, for a good many of this club's members are in the same spot. More members would be welcome. R/C and scale are two major interests recently, and, with the extensive building going on, an excellent season is anticipated.

East Midland

Winter has seen combat the main activity in **FORESTERS (Nottingham) M.F.C.**, with all sorts of vintage jobs being dragged out to replenish supplies. Building has concentrated on T.R., and the strength is at present about 25 class A and 12 class B. Plans are afoot for a grand open C/L rally, of which more anon.

London

Sunday, May 1st, sees the **CROYDON M.A.C.** Gala at Chobham Common, 10.30–6.30. Entry 1/6 sr. and 1/- jr. on the field only, any number of entries may be made. Events are open power, rubber, glider, slope soaring, and chuck glider, three cash prizes in each, and a championship trophy for highest aggregate in the three main events. S.M.A.E. rules apply. Train or Green Line or A30 road to Sunningdale. Further info. from R. Martin, 21 Caesar's Walk, Mitcham (mark envelope "Gala") or phone Derwent 6611, ext. 110 in office hours.

C/L is the principal activity in **MINCHENDEN M.A.C.**, chiefly T.R., but with improving weather more outdoor stuff is anticipated. More members are sought—write to B. Bagot, 12 Winchmore Hill Road, Southgate, N.14.

Anarchy (or something) is suspected in **HAYES M.A.C.**, where one member has made an R/C car and another a boat. However, the snow hasn't put the rest of the members off their stroke, and squads of comp. jobs are being readied. After last year's experiences, some mods. are being made to the club championship points system, and the number of contests counting for club trophies is being cut down.

Two interesting open events arranged by **NORTH KENT NOMADS M.C.** are the C. H. Roberts Cup, for rubber-driven flying boats, on Blackheath, Sept. 11th, and the All Kent Rally (open to all Kent modellers and those in S.E. London postal districts) on Dartford Heath, July 10th. Other events are not as yet dated. Further gen. can be had from A. R. Parker, 3 Eversley Avenue, Barnehurst, Bexleyheath, Kent.

Re-organized under a new name, Chelmsford M.A.C. now becomes the **ANGLIAN M.F.C.**, on the look-out for new members. A very full and interesting programme is laid on for the year, including four fete displays, an exhibition, and club and inter-club events, besides the S.M.A.E. schedule. All types of models are built, with contests for all. Flying takes place every Sunday on the Baddow Meads.

North Western

Activity is strong in **WIGAN M.A.C.**, who firmly intend to make this year even better than last. The winter programme finished with last year's prize-giving and a film show of club contests by D. Morgan. Power holds pride of place in the club, with rubber and glider close behind, but only one R/C enthusiast is reported so far.

Fourteen trophies were distributed among **CHESTER M.F.C.** members: G. R. Fittness (3), F. Dodd (2), H. F. Wilde (2), K. Modern, R. Nichols, D. Dodd, A. Lever, G. Jones, and Mesdames Modern and Fittness. The prizes were presented at the Annual Dinner, attended by some 60 people, including visitors from other clubs. The A.G.M., held a few days later, passed off smoothly and left the club all ready for the season.

The first 1955 event in **SHARSTON D.M.S.** was a 3-flight, 2 min. max., 100 ft. line event for gliders of a total area of 180–220 sq. in. Snow and wind intervened, but flying took place, winner being comp. sec. E. Helliwell. No times given.

Monthly club nights have been instituted by **WALLASEY M.A.C.** for a trial period. The club have decided to take in the Nationals and the Scottish meeting this year; other news of their activities is detailed elsewhere.

Up to 40 goes the membership of the relatively new **ST. HELENS (Y.M.C.A.) M.F.C.**, and this number includes six R/C fliers. First contest trip ever was scheduled for the Congleton rally on Easter Monday, but this will be by no means the last. April 16th sees a dance, etc., being run to raise funds.

Shattering performance by a 12 yr. old of **BLACKPOOL AND FYLDE M.A.S.** was the turning in of two half-turn test flights of over 2 : 30 straight off by P. Richardson, with a Thomas-designed 40 in. lightweight. Two other juniors, M. Roe and P. Moss, also have potent rubber jobs, and all the juniors are mad keen to get at contests. Should be some red faces up there this year!

Another club changing its name is Edgley Heath M.A.C., in future to be **STOCKPORT M.A.C.** Active in all directions, the latest scheme is a series of very simple lectures on various aspects, to foster junior interest. On away days a prize is awarded for the best club flight of the day, and at the Winter Rally this was won by S. Lenssen.

Southern

Permission to fly at R.N.A.S. Lee-on-Solent has brightened the future of **GOSPORT D.M.F.C.**, though the first comp. arranged there was snowed off after an hour. However, a second attempt a week later saw R. Harris win with his 2.46 powered *Senator* averaging 2 : 30 off 9. Combat also took place with the usual results.

Still spotting is **ASHMEAD S.M.S.**, whose 70 members will be visiting numerous aerodromes, etc., during the summer, as well as competing in identification with nearby schools and clubs.

Early efforts at combat by **READING D.M.A.C.** saw practising entrants eliminating themselves rapidly, till when the contest officially started only two remained! Indoors, Jetex speed was won by P. Farm-

S.M.A.E. CONTEST CALENDAR

Apr. 24th		
Weston Cup	2nd Wkfld. elim.	Area
Astral Trophy	2nd Power elim.	
May 8th		
Ripmax Trophy	R/C	Cent.
Aeromodeller R/C Trophy	R/C	
May 15th		
Hamley Trophy	Power	D.C
May 29th		
British Nationals		Cent.

brough with 41.1 m.p.h., the model, like several others, suffering from insufficient area and therefore flying at a tremendous angle of attack. D. Stenning won a design contest, with a 1½ c.c. F/F job, and B. Beale was well ahead in engine starting—14.9 secs. with a Mills .75.

A most enjoyable dinner, etc., in **BOURNEMOUTH M.A.S.** was attended by a company of 48, and a considerable amount of unsuspected talent was revealed in the cabaret and in forfeits which contributed to the evening's jollity.

First of the year's contests in **SWINDON M.A.C.** was a scramble event, which let the juniors in with a bang. First was Jr. Mortimer with a *Playboy*, second Jr. Howard with a flee-powered *Scorpion*, third K. Pavier with his new A2. Much building is going on, but an air of secrecy prevails, so anything might appear.

Loose-end modellers in the Southampton district should go along to Cemetery Lodge, The Common, any Friday between 8 and 10.15 p.m., where **SOUTHAMPTON M.A.C.** will welcome them. So far this year A. Sanger has won the chuck glider event and B. Hay, Jetex; spectacular demise was E. Jenkin's team racer, which left the lines at 80 and finished up in a tree. Better check connections next time, eh?

Photographed at last year's Northern Gala was this cheery group from Novocastria M.A.S.

East Anglian

Bullying by the comp. sec. has occasioned a spot of contest-mindedness in **NORWICH M.A.C.**, although a scheduled T.R. comp. had to be postponed due to snow covered runways. J. Rant won an "Appearance and Ingenuity" event with an o.d. rubber model which later, on test, ingeniously disappeared on its first flight—3½ mins. o.o.s. with the motor still going!

Midland

Practically all C/L is **HEANOR D.M.A.C.**, who assiduously practise each Sunday morning for forthcoming duels with Derby M.A.C. Lack of a club-room is badly felt, but members are keen and champing to have a go at a few T.R. events.

Around 100 people thoroughly enjoyed a **LEICESTER M.A.C.** film show, and a small profit was made. A recent Jetex speed event saw a new club record of 54.6 m.p.h. set up by G. Brewin, while R. Shepherd leads the dozen or so entries in the first leg of the winter building/flying competition.

A stand at a local exhibition (April 16th-23rd) is being filled by **RUGBY M.E.S.** (A.S.) and despite the near eliminators a good show of models is guaranteed. Highlight of the winter was an aeronautical film show which will now be made an annual event.

An exhibition and a comprehensive contest programme are in the offing for **WEST BROMWICH M.A.C.** The existing officers were returned at the A.G.M., but four members were added to the committee and two trustees were appointed. It was also decided to go into the question of new club transfers and headed paper.

North Eastern

Surprising the number of clubs reforming this month. Yet another is **WEST HARTLEPOOL D.M.A.C.**, with fifteen keen members, a choice of flying grounds, and a clubroom which they're hoping to exchange for a larger one. F/F power is favourite, but 12 entries have been registered in a building, covering, and flying comp. for 30 in. rubber models. Monthly meetings will change to weeklies when membership climbs; senior men would be especially welcome. S.M.A.E. affiliation is expected shortly.

Western

Not very competition-minded but nevertheless pretty active is **CHELTENHAM M.A.C.**, running to 25 members and with a choice of flying grounds, thanks to negotiation in the proper spirit. Novel touch is the holding of C/L and F/F meetings on alternate week-ends; another unusual idea is the production of a once-yearly magazine with designs, etc., included.

Provisional date for the West of England Championship is August 28th, says **BRISTOL AND WEST M.A.C.** Recently the club invited the public to a Brains Trust and, with the help of press publicity, attracted a good crowd to ask questions on the club and aeromodelling generally.

South Eastern

A C/L stunt comp. on May 1st kicks off the **HASTINGS AND BEXHILL A.** domestic programme. New members are invited to contact Jempson, 379 Bexhill Road, St. Leonards.

Scotland

As may be imagined, snow put a crimp in flying activities in the first couple of months or so of 1955, but **ARBROATH M.A.C.** members dug themselves a C/L circle to keep their hands in. Most of the club's current building is C/L, with the odd glider here and there.

MONTROSE M.A.C. had an enjoyable social evening at which all fair companions received a box of chocolates to munch while watching a film-strip review of '54 and a film-show. Outdoors, one of the most interesting models due for flight tests is K. B. Whyte's 80 in. (1⅓ in.–1 ft.) scale *Selbergh*. F/F fans have been ploughing through 9 ins. or so of snow, flying rubber kits and a *Bird Dog* from A.P.S.

An unusual event for Club News is a report from a Channel Island club. **GUERNSEY M.F.C.**, recently formed, numbers 20 and is increasing fast. Weekly indoor meetings are held, and the first flying meeting was quite a success.

Finally, a request for an American penpal, 14–15, with Jetex, sport power, and C/L interests, comes from I. F. Homewood, 87 Station Road, Hendon, London, N.W.4.

And that's all for another month,
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H. Shermer, 141 Woods Moor Lane, Stockport, Cheshire.
WEST HARTLEPOOL D.M.A.C.
D. Applegarth, 18 Grosvenor Street, West Hartlepool, Co. Durham.
KEIGHLEY M.A.C.
B. Miller, 37 Woolpack Street, Keighley, Yorks.
GUERNSEY M.F.C.
H. Winterflood, Tiverton, Gibauderie, Guernsey, C.I.

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ST. ALBANS M.A.C.
C. M. Christie, 96a Victoria Street, St. Albans, Herts.
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P. Sanderson, The Village, Moulton, Spalding, Lincs.
LEEDS M.F.C.
M. W. Barnet, 6 Manston Gardens, Cross Gates, Leeds.
SOUTHERN AREA
J. Webster, 4 Alma Square, Cross Street, Farnborough, Hants.
BLACKHEATH M.F.C.
P. Crossley, 11 Broadfield Road, Catford London, S.E.6.
EXETER M.A.C.
R. Densham, 25 Hamlin Gardens, Exeter, Devon.
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D. Morgan, 8 Lock Street, Orrell, nr. Wigan, Lancs.
SHARSTON D.M.S.
D. Cook, 63 Stancliffe Road, Sharston, Wythenshawe, Manchester.
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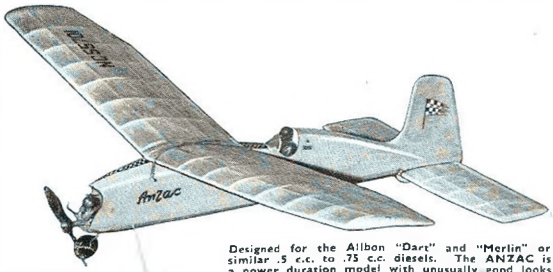

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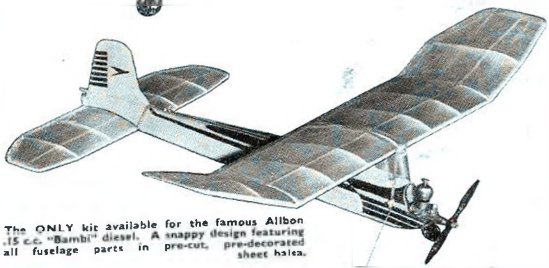

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