AUGUST 1959

AERO MODELLER

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1/6

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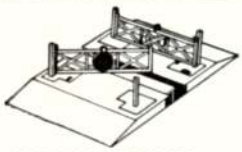

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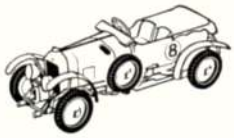

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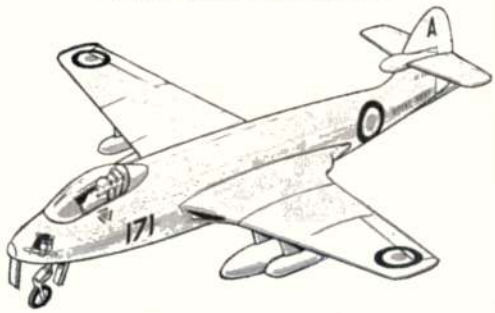

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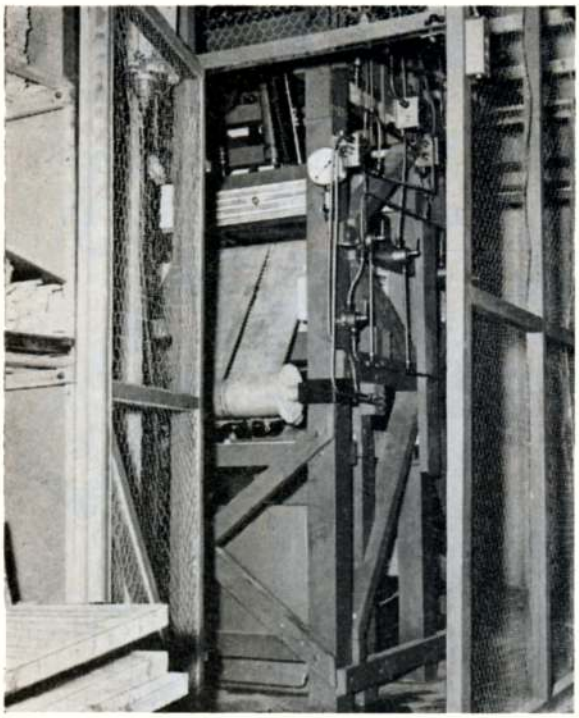
THE SOLARBO BALSA STORY

This is one of a series of articles written by John Paterson, Managing Director of Solarbo Ltd., all about Balsa Wood and its many applications in aeromodelling and other industries.

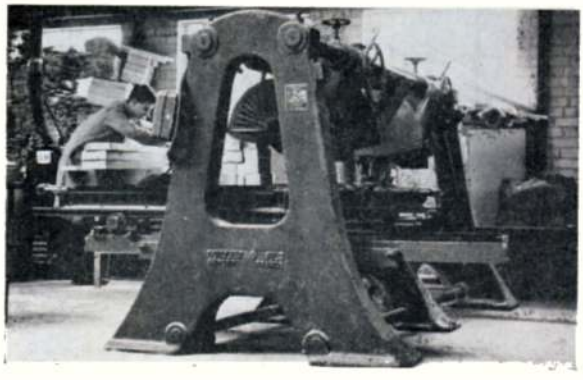


THE METHOD ADOPTED for making the curved segments is the subject of a patent held by the Shell Petroleum Company and in which I am named as the inventor. I cannot yet give you all the details of this patent, but I can show you a picture of the jig which I designed and developed and in which the segments were made (*top*). The most interesting feature of this jig was that the glue was cured by means of high frequency (radio frequency) waves. It would have been impossible to get heat through six inches of Balsa in any other way—which is pretty obvious when you remember that we were designing a lining specially to stop heat getting through.

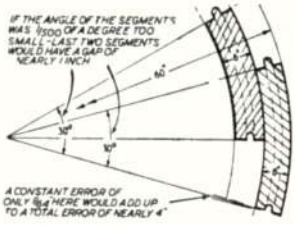
You will notice that the whole apparatus is enclosed in a wire cage, rather like a birdcage. The reason for this is that unless the apparatus is "screened", the high frequency waves can cause all sorts of fun and games with people's wireless and television. Indeed, when we were setting up the plant, and before it was effectively screened, it was at times making the electric lights in the ceiling glow, and producing sparks all over the place.

In production the equipment was so interlocked that power could not be turned on until the doors were shut. Nothing quite like it has been produced before. It was very complicated, but in the long run it worked as regularly as a clock and we made tank lining segments in it at the rate of one every 17 minutes.

The manufacture of these segments presented us with the biggest machining headache that we have ever had. In the bottom photograph you will see the huge double cross-cut saw which might be said to be the basic machine for doing the work. As I have said in my last article, absolute accuracy in the angles of the joints was essential. In the drawing I have tried to indicate just what error could arise from relatively small errors in this initial cut. Not only did the angle have to be right, but the length of the segments had to be absolutely true; added to this there was the other complication that for the outer row of segments it was the length of the inner face which had to be controlled, and for the inner segments it had to be the length of the outer face which had to be controlled to be exactly the same as the first I mentioned.



This diagram illustrates the exceptional degree of accuracy demanded in the machining of the segments. Tolerances far closer than normally called for on woodworking were demanded to ensure perfectly true rings and close fitting joints.



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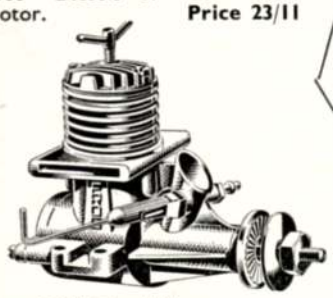

Frog "80" Diesel Motor.
.79 c.c. (*shown*). **Price 46/–**
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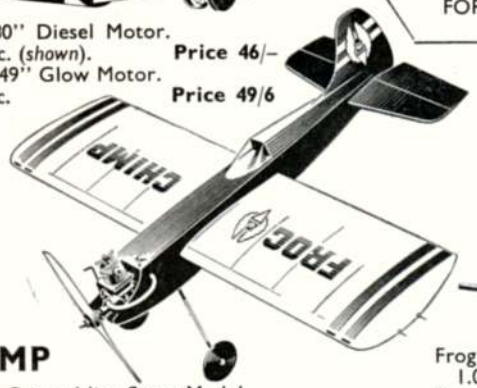
.79 c.c. **Price 49/6**



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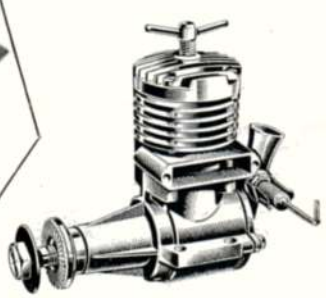

Frog "349" BB Diesel.
3.49 c.c. (*shown*). **Price 79/2**
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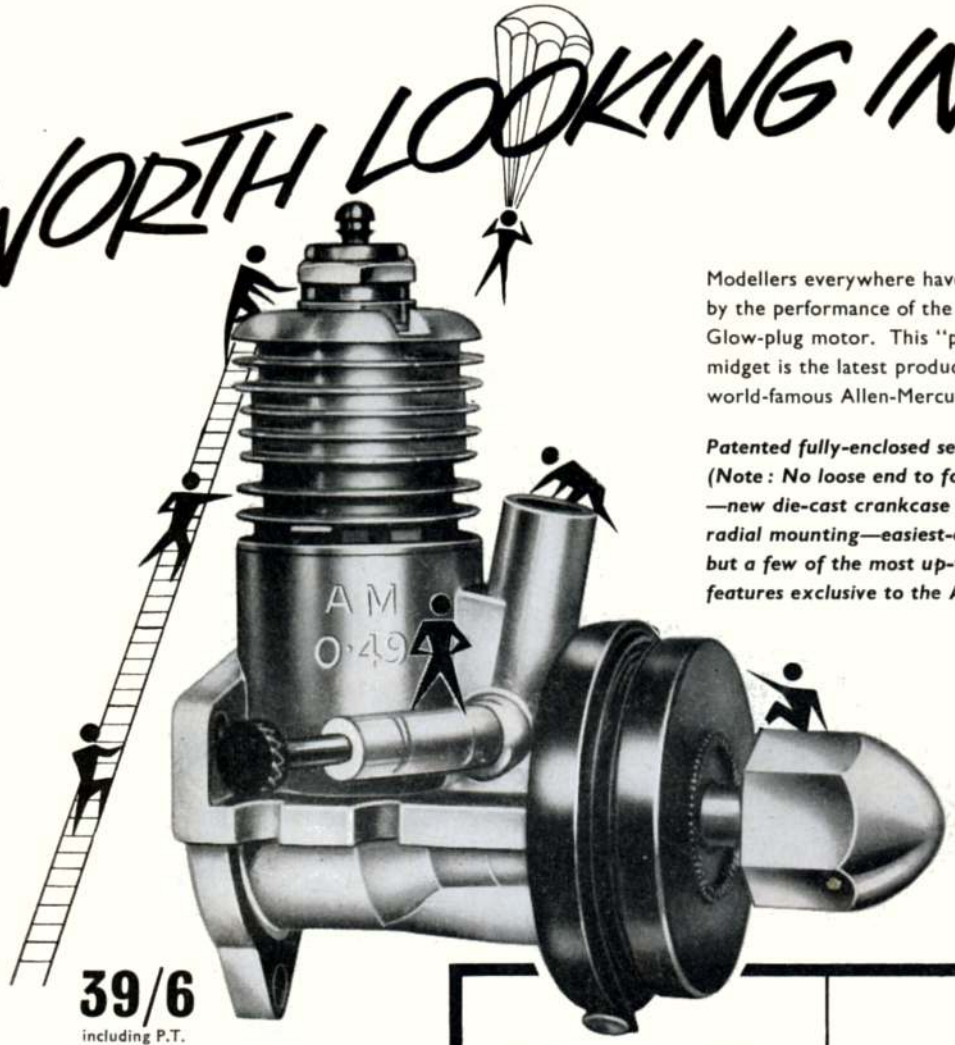

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66/5

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August, 1959

Heard at the HANGAR DOORS

AERO MODELLER
Uploaded to Hip Pocket Aeronautics

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VOLUME XXIV
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CONTENTS

On the Cover:
The Boeing P-26a in full colour over a New York skyline depicted by aero artist Laurie Bagley.

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

MODEL AERONAUTICAL PRESS LIMITED.
SUBSCRIPTION RATE: (Inland) 28/6, (Overseas) 27/6 per annum prepaid including the special Christmas Number.

Here we are again!

TRADE DISPUTES and printing industry stagnation notwithstanding we are *not* going to lose an issue of your favourite magazine. We owe apologies to all readers for the fact that this issue arrives one month late and can but suggest that you take consolation in the fact that the next few editions will appear more frequently, at approximately three-week intervals. There's far too much top-class material awaiting your enjoyment for us to lose a single issue, and as you can see in this edition, Club News and other regular features have been sacrificed to bring readers up to date with the many important events that have taken place in recent weeks.

Our constant encouragement in the bleak weeks of non-publication has been the spontaneous support of countless readers who have written, phoned or met us on the flying field with good wishes for "a speedy recovery and early return to work".

We know our policy of "better late than never" will be appreciated by all enthusiasts and will avoid disappointments for those ardent modellers who so frequently tell us that they simply cannot live without the dear old AEROMODELLER.

Value for Money

Your next copy of this magazine will cost you 2s. Since May, 1950, AEROMODELLER has been available at 1s. 6d. per copy. These nine years of price stability have not been achieved without considerable sacrifice—time after time we have absorbed rising costs of blocks, wages, printing, rent, by internal economies, careful elimination of waste, employment of newer production techniques, and reduction of our profit margin. Increased circulation and splendid trade support with advertisements has helped us to put off the day when a cover price increase must be made. This day, alas, has now come.

To compensate in some measure for this higher price, we shall be increasing the number of pages to a regular 60, including cover, a size which recently has only been possible on special occasions. We do sincerely hope that another long period of price stability can now be assured and that our 50,000 and more readers will all continue to give us their loyal support. The recent lull in our activities has given us time to consider a number of new features in the light of the Reader Survey conducted last year, so that an ever brighter and better magazine angled precisely to your wishes can be expected, as we press on with confidence.

R.A.F. Halton's latest acquisition for the training of Aircraft Apprentices is the de Havilland Comet, Avon-engined prototype. The jet transport was flown into the tiny grass field by Chief Test Pilot G/Capt. Cunningham taking the same landing run as normally allowed for the trusty Anson!

F.A.I. power trials

The on-off-on-off atmosphere of 1959 World Championships has hardly contributed to the already limited interest in this event. When it was discovered during the course of the International Tailless meeting, reported on pages 370/371 that the U.S.A. would sponsor a German organised meeting at a Saar airfield, hopes were raised and a trials weekend arranged at Wigsley for July 25th/26th.

F.A.I. decision to stand by its undertaking not to accept late offers for organisation of this year's meeting switched the lights from green to red once more. Nevertheless, British trials *were* run and a small entry of fifteen flew in perfect weather, Dave Posner leading at 29:58, with most of his max's made by a Cox Olympic powered model, said to continue accelerating right to cut-out stage. Vic Jays, his Surbiton clubmate, was 5 sec. behind, then Peter Manville to make up our "possible" team of experienced internationalists.

Rally vandals

Downwind motor pirates are in action again, this time at Halton. D. Hancock was enjoying a nice day out with his McCoy 049 glow powered *Ebenezer* and taking his time to collect the model after each flight, as he is disabled in the legs. Imagine his dismay at finding the model some 200 yards from landing spot with the engine missing. Such vandalism calls for vigilante action and we hope that responsible modellers will take appropriate action if they see any tinkering to arouse their suspicions.

Man of accomplishments

Our expert of the month, P. E. Norman, is too well known in modelling spheres to require special introduction, but few of us know of his many other talents.

A teacher of repute in sculpture, holder of over 250 certificates and cups for violin and viola recitals (he uses his own home-constructed viola and has made many violins), holder of the distinguished honour of having the best watercolour in last year's National Exhibition at Guildhall, he has three exhibits accepted in this season's Royal Academy, and his paintings also grace the walls of the Royal Aero Club library. Yes, "P.E." is quite a dynamo, and when one considers the equally meritorious accomplishments of his wife, and son Marcus, it's no small wonder how he maintains such a prolific output of scale and ducted fan models.

Philately Corner

From the Philippines, Alberto Sandoval has sent two very interesting stamps of 30c. and 50c. values which have a special connection with the Boeing P.26A described in this issue. We illustrate the 30c. version which shows the famous fighter in Philippine Air Corps markings and commemorates Lt. Cesar Fernando Basa, whose exploits were particularly moving in the time of the Japanese invasion. He intercepted and shot down a Jap fighter before his own P.26 was hit, and then while floating down in his parachute, another enemy aircraft machine-gunned him. Philippines' most modern Air Force base is now named after him. The 50c. stamp similarly commemorates Lt. Jose Gozar. On one occasion six P.26's challenged an attacking force of 75 Japanese Zeros and the Filipino fighters shot down several Zeros in that hopeless engagement with aircraft capable of twice the P.26 speeds. The National markings are blue, white, blue diamonds.

Wakefield Cup

In fantastic weather conditions, the 1959 Wakefield Cup Contest took place in France at Brienne le Chateau on the 19th July, when 22 countries participated in an almost exact replica of the 1955 event held in Germany. Much-fancied competitors failed to make the grade, whilst hitherto unknowns placed high in a contest where maximum flights and rubber troubles were the order of the day.

Seven men were required to make a sixth round 'fly-off' to decide the holder of the coveted Trophy, and again it was a replica of the Wiesbaden affair, where failing light for this vital flight played havoc, putting an over-great stress on the eyesight of the timekeepers. A full report of this exciting meeting will appear in our September issue, but to whet your appetites, we append the top results.

WAKEFIELD CUP (Individual)

1.	Dvorak, F.	Czechoslovakia	900	+285
2.	Hatschek, R.	U.S.A.	900	+256
3.	McGillivray, J.	Canada	900	+245
4.	Zurad, S.	Poland	900	+230
5.	Zapachny, V.	U.S.S.R.	900	+198
6.	Mackenzie, D.	Canada	900	+184
7.	Tysklind, L.	Sweden	900	+121
8.	Bilgri, J.	U.S.A.	883	
9.	Cardoro Sueno, A.	Portugal	875	
10.	Kothe, H.	U.S.A.	873	
11.	Petiot, J.	France	865	
12.	Hyvarinen, R.	Finland	847	

ALPHONSE PENAUD CUP (Team)

1.	U.S.A.	2,656
2.	Canada	2,571
3.	Great Britain	2,408
4.	Finland	2,406
5.	Italy	2,358
6.	Germany	2,357

Surprise packet

Nine-years-old Nigel Colin Alan Brown, a pupil of Wellingborough School, will fly in an aeroplane for the first time on September 15th—Battle of Britain Day. All because he bought an Airfix plastic construction kit for the Silver City Superfreighter—the type of plane that is used to ferry cars over the English Channel to France and Belgium.

When Nigel opened his kit he found inside it a Silver City voucher offering a free trip by Superfreighter from Ferryfield Airport, Kent, to Le Touquet and back. Lucky Nigel! Who sold the kit to him? None other than Ted Evans, of Wakefield fame, through his shop at Northampton.

"Cascamite" resin glues were used to withstand the fuel.

The design for the fuselage duct would have to be kept fairly gentle curves, and this, coupled with the previous need for down-thrust vanes, led to a fuselage shape which now had a straight underside and slightly curved topside. Again, with the previous models I had made, it was becoming quite clear that in order to get good thrust it was necessary to keep the intake and efflux area as near to the same total area of the fan blades as possible and to stop the air stream from rotating by means of flow-straightening vanes.

These considerations resulted in a rather ugly shape with a tubular fuselage, and in order to improve appearance, I used twin intakes and efflux with nose and tail dividing the duct with added realism, as can be seen in the photos of recent models. The weight factor was helped by using a short duct and when comparative areas of 1/32 plywood and materials used in previous models of construction were weighed, the results were very much in favour of ply. In order to try out the new construction, a scaled down version of the swept wing tailless *Rapier* design was built to 30 in. span with thinned Clark Y airfoil, 210 sq. in. wing area and total weight 22 ozs. This model (Frog 1.49) had a $3\frac{3}{4}$ in. fan employing eight blades made from sheet fibre, each set at 40 degrees and the engine was mounted on a ply plate with bicycle spoke stays and the plate extensions in turn became wing root fixings.

P. E. NORMAN contributes EXPERTS FORUM No. 8 on . . .

DUCTED FAN MODELS

FOLLOWING MY 2.5 c.c. ducted fan models, such as the *Mig* 15, *Boulton Paul*, *Cougar*, *Mystere* and *Rapier* range, I decided on a series of 1.5 c.c. powered models.

The Frog 1.49 Vibramatic diesel was very attractive when it entered the market, the upturned carburettor providing easy accessibility and the very means of induction, with the valve permanently closed when the engine was not turning over, overcame the usual problem of flooding from a gravity feed tank.

My intention in producing these ducted fan semi-scale models is to try to attain scale airspeed. Let us take as an example a *Javelin*, having a span of roughly 50 ft. and flying at 700 m.p.h. To give scale speed appearance a 5 ft. span model would have to fly at 70 m.p.h. and a 30 in. span at about 35 m.p.h. Although they flew well, I did not feel that my *Migs*, *Cougar*, etc., attained their true scale speed. Now, quite apart from scale speed, a small model will always give the *impression* of flying faster.

I had experimented with balsa construction with balsa and nylon, balsa and fibre glass, fibre glass alone and in each case oil and fuel seepage was ever present, and in the case of fibre glass, more weight and tendency to fracture without necessarily breaking, coupled with increased construction cost, led me to try something else. I decided to try resin bonded 1/32nd 3-ply.

It was logical that in order to get increased speed, the size of models had to be reduced, but this in turn called for greater strength and the requirement to maintain a reasonable wing loading. When 3-ply had been left in a mixture of fuel and oil for several days, it was removed, dried and the weight appeared to increase slightly, but there was no loss of strength and the only physical change was that the ply became more pliable. The next experiment was to soak the ply in dope and the result of this, was the decision to use this material which was now impervious to seepage, provided "Aerolite" and

Behind the engine I fitted a streamlined cone made of balsa and carrying four flow straightener vanes with their leading edges curved at 30 degrees to collect and straighten the air from the fan. No trim tabs were fitted, but the ailerons could be moved and rudder warped. The model proved to be extremely stable with very good climb and superb glide. Gliding trim was obtained by warping the rudder trailing edge above the efflux. With power on, the efflux vane proved powerful enough to overcome the rudder trim which took effect following the loss of airspeed during the glide.

Following upon this came a swept wing model, carrying a swept tail and fin on a fuselage extension beyond the effluxes, this extension being carved from two blocks of light balsa hollowed out, doped thoroughly and applied each side of a $\frac{1}{8}$ in. balsa keel. The span was reduced to 27 in. a similar Clark Y section employed, the wing trailing edge at the tips reflexed slightly (no dihedral angle), and the lifting section tail about half way up the fin. The same principles of fuselage design were used, but the streamlined cone behind the engines was made from stout drawing paper—soaked in dope. This model proved more difficult to trim, having a tendency to rocket skywards and eventually stall and dive steeply.

The centre of gravity was eventually moved forward $\frac{1}{8}$ in., down-thrust vanes built into the top of the effluxes and the reflex on the wing tips slightly reduced. With these various alterations made carefully one at a time and with many test flights between each alteration (which speaks pretty well for the construction as the model would often stick in the ground up to the cockpit, like an arrow), further satisfactory flight patterns were achieved, the model being capable of left *or* right turns. The wing area was 190 sq. in. the weight 22 ozs.

The next experiment was the most successful model of the series, plans for which follow this article. *Javahawk* used identical construction and design methods, but the

thickness chord ratio was reduced for even faster flying speed. The tail was made to have symmetrical section and set on top of the fin, thus providing an appearance which was a mixture of the Javelin and Skyhawk, hence the name. After only three glide tests the model was so satisfactory that it was sent off with half a full tank and climbed to a height estimated to be 400 ft. over Epsom Downs to be eventually recovered about half a mile away. Since that day, no alterations have been necessary to the model, either in construction or in trim for flight, and a point of interest, it climbed to such a height at the 1957 Northern Heights Gala, that it was timed on the glide for just over seven mins.! *Javahawk* gives one a great deal of pleasure to fly as it is so consistent, and has the characteristic nose down attitude in flight of a full size jet. It will take off unassisted from a dolly and with its relatively simple construction, employing an unmodified motor (*and taking the Veron type D Impeller*—ED.) it provides a tough, almost uncrashable ducted fan delta within the scope of the average modeller.

Hitherto this type of model has been considered very much to be a speciality for the more ingenious amongst us, but now the only hurdle one has to overcome, is to get used to employment of formed 1/32nd ply for the duct. Sketches on the drawing clarify the process and with little patience one can soon discover how simple it is to obtain such a strong structure. Since *Javahawk* was built, a small model with 23 in. span and similar high tail, was made to the very low weight of 17½ ozs. This is an extremely fast model having terrific climb and is capable of consecutive loops, in fact it does these specially for the cine camera!

After this came a .8 c.c. model which was not altogether in favour due to cord starting difficulties and was put to one side in favour of a semi-scale *Supermarine Scimitar*, again using a Frog 1.49, but with an oval section fuselage incorporating balsa venturi fillers to curve the internal flow from the widened intake to the fan area and then widening out again to the efflux. The thickness ratio of the wing was only 5 per cent., span 23 in., weight 22 ozs. Although trim is very sensitive, it is a most impressive model, but it proved that considerable height is necessary to recover flight attitude after a stall with models other than deltas. *(See heading)*

Design features for fans

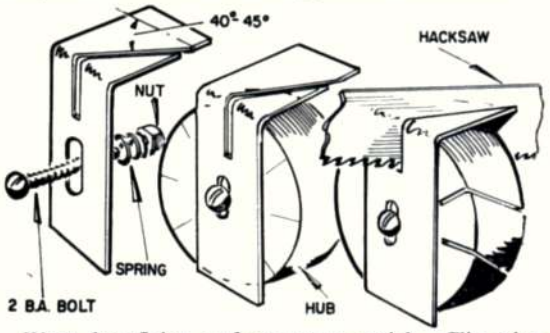
Necessary thrust is best obtained by a large volume of air moving at good speed, unrestricted as much as possible, rather than a large volume of air being drawn into the fan and then being compressed and passed through restructed efflux.

The intake and efflux should be similar in area, with the intake possibly slightly more, and this area should be governed by the area of the blades of the fan. The duct should not be long, this only adds unnecessary weight, and no advantage is gained in the airflow. A direct intake and efflux give a better thrust than indirect intake, *i.e.*, wing root intakes, etc. Flow straighteners add slightly to the thrust obtained, but should not be too large or at too great an angle to impede the air.

The engine unit should be streamlined by a cone aft. A spinner in front of the fan may help very slightly to smooth and direct the oncoming air to the blades. The fan clearance should be kept as small as is possible allowing for grit, etc., which is invariably collected inside the duct. The engine must be mounted as rigidly as possible, and the fan should be carefully balanced and tried in various positions until the smoothest running is obtained, when it should be suitably marked for correct replacement if removed. The complete interior of duct, mount, cone, vanes, etc., should be thoroughly doped and proofed against fuel and oil seepage. The hatch must be made to positively close. The engine and tank should

The Rapier for 2.5 c.c., which was scaled down for the first 1.49 model

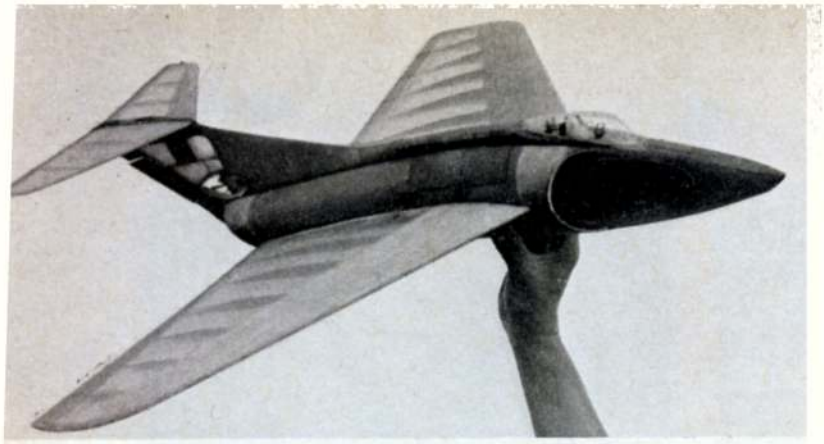
be easily accessible for field checks and overhauls. For maximum performance, the model should be kept as small as possible round the particular power unit intended. 1.5 c.c. from 23 in. to 30 in. span, wing loading from 14 ozs. to 18 ozs. per sq. ft. Thin wing sections with flat undersurfaces and incidences of from 1½ to 3 degrees to centre line. Fan slot jig should be as below.



Warp free flying surfaces are essential. Clip wing fittings are preferable to elastic bands, and wings and tail must be knockoffable. Maximum strength with light structure should be the keynote, the nose end in particular should be strengthened. Any trimming surfaces, if used should be fixed securely against vibration or crashes.

All engine mounting screws should be locked. All joints made in the 3-ply should be resin-bonded glues. by With swept and delta winged models dihedral angle is not necessary, provided the tail is placed high. Needless to say, maximum care should be taken when flying these fast models to prevent injury to spectators and model.

Javahawk* in U.S.A. markings. *See next pages for design details



August, 1959

This is "it" for ducted fan enthusiasts. New construction methods and terrific performance

JAVAHAWK .... by P. E. Norman

UNDOUBTEDLY THE FINEST example of ducted fan propulsion yet produced by its talented designer, *Javahawk* enjoys the admirable reputation and great distinction of being the first ducted fan model to take off unassisted from the ground (using a dolly undercarriage) and established a world "first" by successfully flying under radio control. Photo above shows the 28-oz. development which was demonstrated by P. E. Norman and his team of collaborators at Northern Heights Gala.

Ultra-lightweight 4.5 v. transistorised radio is carried in the nose, pen-cells occupy the fuselage spine and a Fred Rising actuator in the fin blister operates the rudder. Performance is outstanding. It will climb fast, spiral dive, recover immediately on correction and produced the finest spot landing of the day at Halton Meeting. All this with a standard Frog 150 diesel and fan as detailed on the drawing opposite, but with the airframe expertly modified to reduce weight and increase area.

The standard *Javahawk* is a diminutive 27½ in. span and weighs only 21-oz., yet as all who have seen it know, it is extraordinarily robust, and the life of P. E. Norman's prototypes will probably exceed several thousand flights apiece. The only difficulty likely to arise in construction concerns the method of making a "moulded" plywood fuselage, so this side of building is detailed as follows.

Cut a piece of aircraft grade resin bonded 1/32 in. 3-ply measuring 7 in. by 17 in. (this is oversize but allows for trimming at a later stage). Glue the belly strengthening piece A in place and mark a centre line accurately inside and outside. Measure the length of half the circumference of the already made fan ring carefully with a strip of paper, and mark half this length each side of the centre line on the inside of the 3-ply, in the position the fan will occupy. Measure the distance both to the rear of the engine mount, and mark two more points each side of the centre line, allowing for incidence.

Carefully cut ply away so that the mount fits correctly in position with the ring locating correctly, and then glue in place, with formers 1 and 3 pinned to shape the ply.

When the ring and mount are set, cut off surplus wood on each edge to allow an overlap on upper half and chamfer the edges. Straightening vanes will have to be trimmed to their correct length just prior to glueing the assembly.

Mould for upper half

It is practically impossible to bend thin plywood in a complex curve, *i.e.*, two directions at once, but a very good shape can be obtained fairly simply.

Cut a piece of 1/32 in. 3-ply for upper half of fuselage to 19 in. by 8 in. and mark centre line inside and out, and slit with a sharp knife from the front as far back as former 2 position. Soak ply thoroughly in hot water. Ensure that mould has grease-proof paper in position (*see* drawing).

Lay ply over the mould (made in either of two ways as sketched) and pin and bind rear portion in position ensuring that slit portion is central. Have a cloth handy to keep the ply damp with hot water. Carefully pin along one bottom edge and also pull down to fit to top curve of mould. Pin in position and lightly bind the front. Repeat performance with second half, removing pins to fasten down this half but pin through both pieces; gradually working towards front end. Do not worry about glueing the parts together yet, but only be concerned with getting the pieces into position, forming as true a surface as possible.

Have resin-glue ready, so that it may be applied immediately the pins and binding are removed. Then replace binding and pins to hold wood in position to the mould and set aside to dry thoroughly. File and sandpaper the overlap portion.

Mark the exact position of the hatch on the ply and prick each corner with a pin. When everything is set, remove ply from mould and fit and trim upper portion to lower assembly. Cut away ply at sides and in the region of mount to allow about ⅛ in. overlap between lower and upper half. When satisfactory, remove again and dope and fuel-proof the *inside* very thoroughly having first removed any surplus glue, etc.

Other points are detailed in the sketches on the plan which show the sequences of assembly.

Prepare two lengths of jig strip, square hardwood, two or three inches longer than fuselage. Cut these away at mount position, so that they lie snugly against lower fuselage shell sides. Their purpose is to serve as a board into which the assembling pins are driven and to prevent sides from becoming concave. Mark their position and proceed. When assembly is complete and dry, the sides may be cleaned up with file and sandpaper.

The nose portion must be securely dowelled [illegible]

cemented in place as it invariably makes first contact with *terra firma* and it is an advantage to protect the extreme nose with glass fibre, although hardwood has been satisfactory on prototypes.

Wings are, apart from the incorporated washout, perfectly standard construction, the only point needing comment is the use of spring clip fastenings to hold the wing in place on the tongues. These have been found superior to rubber band retainers and a sketch is provided on the drawing to show how the spring is fitted.

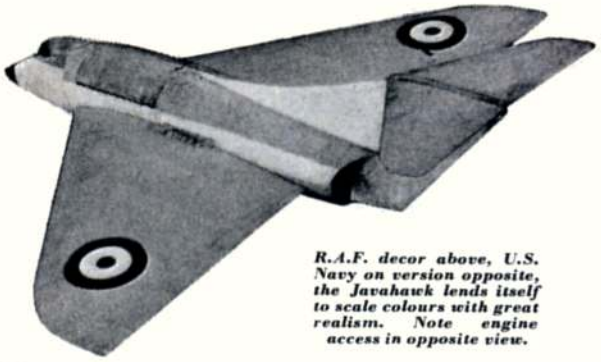
The fan

This type of fan, which is the result of several years experiment has proved extremely efficient, and is not too difficult to make, the 8-bladed type is simple and the rate of climb with *Javahawk* proves its superior efficiency.

The sketch in previous pages shows a simple sawing jig for the 9-ply ⅜ in. thick hub. The slots are cut at an angle of 40 degrees and the slot through which the spring-loaded screw (2 B.A.) passes, allows different diameter hubs to be cut.

Hub and jig are held in a light vice while being sawn with hacksaw blade, and released and moved round to next mark for cutting. Blades are cut overlength from 1/32 in. fibre or ply, then glued into the slots with a resin glue, and pinned through with a small shoe brad. Circular former 2 may then be held to front face of fan by the screw, the exact lengths marked and cut off to size.

The blades are then curved by finger coaxing, and when completed, thoroughly doped and fuel-proofed against fuel and oil soakage.



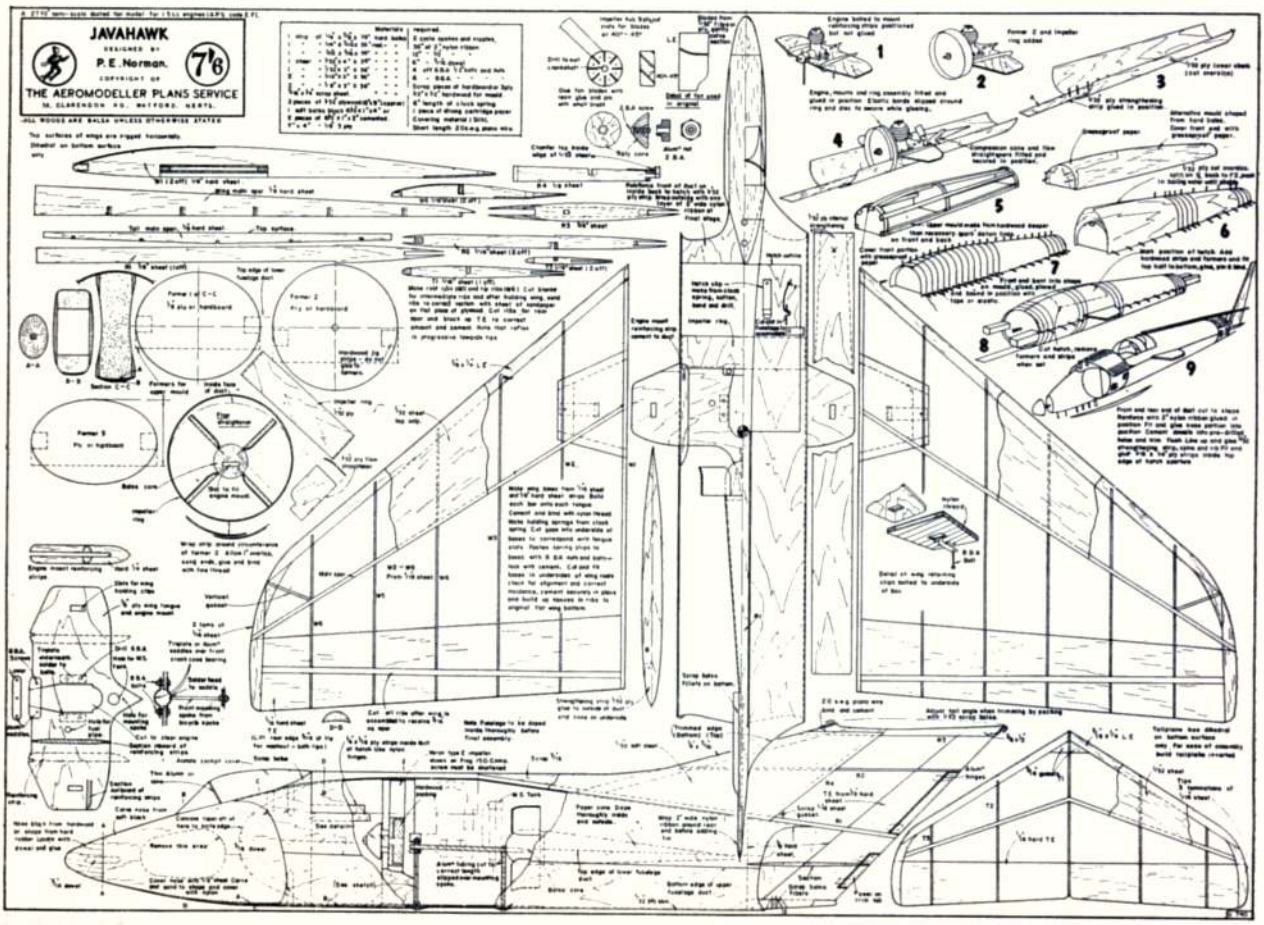
R.A.F. decor above, U.S. Navy on version opposite, the Javahawk lends itself to scale colours with great realism. Note engine access in opposite view.

Flying

Although balance is not critical on Deltas, it is advisable to make sure that the Centre of Gravity is in the advised position. The first hand glide should be fast and straight. Remember that the model is expected to fly at scale appearance speed, so it is no use trying to obtain results from a half-hearted launch. The same launching effort must also be given when power is applied and correction for directional trim can be made by adjusting the thrust trim tab, which will be found most effective. Stalls can be cured by adding weight to the nose, but it is advised that the tail incidence be left alone. A down-thrust vane is another means of providing power control and this can be made of 1/32nd ply and fitted into the top half of the efflux.

Once the model is correctly prepared, it is virtually set for life and the owner will be rewarded with literally hundreds of thrilling and very realistic flights from a robust design of unique construction and appearance.

FULL SIZE COPIES OF THIS 1/6th SCALE REPRODUCTION ARE AVAILABLE AS PLAN U740 FROM AEROMODELLER PLANS SERVICE PRICE 7s. 6d. PLUS 6d. POSTAGE



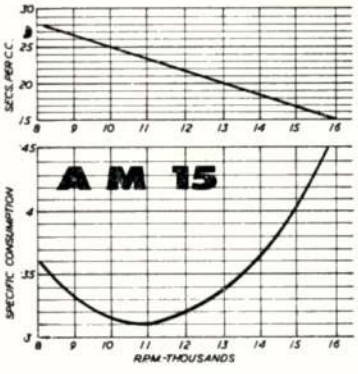
Fuel consumption tests

by R. H. Warring

CONTINUING our fuel consumption tests on popular engines for team racing, we deal this month with those included in the ½A classification, with a maximum capacity of 1·5 c.c. The emphasis is laid on the fact that the tests are the result of many readings to obtain optimum lean settings.

The Elfin 1·49 figures given on the graph for that engine are typical of the extremes which can be obtained. The upper curve represents minimum fuel consumption with "maximum lean" mixture and the lower curve the consumption *for the same r.p.m.* at "maximum rich" setting. Over a wide range of speeds the difference is of the order of 100 per cent.—*i.e.*, the fuel consumption figure can be *doubled* by adopting a richer needle setting for similar consistent running.

This immediately implies a limitation on the validity of static fuel consumption tests for application to "in flight" conditions. Whilst the same basic condition applies that the engine will run at the same speed over a range of needle settings, this range of "band width" will be reduced, principally because the mixture demand is affected by the speeding up of the engine as the load comes off the propeller in flight, just as with a change of load-speed on static test some readjustment of the needle valve is usually called for for optimum setting.

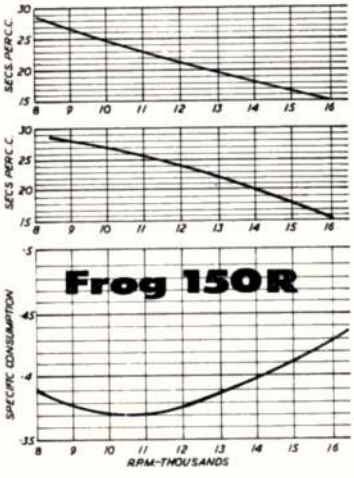


A.M. 15

A nice smooth running engine, very easy to adjust again but gets very hot under a prolonged run. Nitrobenzine additive might have a good effect on reducing fuel consumption which is already excellent. And, of course, although only a plain bearing engine, the Allen-Mercury is characterised by an outstanding power output. Typical propeller/r.p.m. figures:

7 x 6 (Trucut)	...	12,000 r.p.m.
6 x 6 (Trucut)	...	13,000 r.p.m.
8 x 4 (Stant)	...	11,400 r.p.m.
7 x 4 (Trucut)	...	12,400 r.p.m.

Peak r.p.m. 14,000 approx.



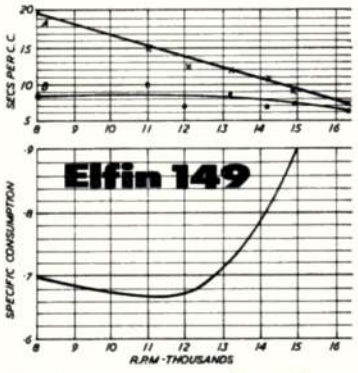
Frog 150 "R"

This is a "hotted up" version of the original "150" in which power output has been increased by a matter of 10 per cent. by modification of the porting. This engine, incidentally, lends itself to further modification by opening up the transfer passages and ports, readily possible with hand tools since the liner is not full hardened.

Top fuel consumption curve shows performance of standard fuel give (4 per cent. nitrate) and the lower curve consumption with 3 per cent. added nitrobenzine—a saving of the order of 10 per cent. at normal operating speeds. The specific consumption is also relatively low and the curve shallow. This curve is plotted for standard fuel.

Elfin 1·49

Although an old design and now out of production, this engine is still widely used and favoured for competition work, particularly free flight. There is no reason why it should not also have a useful performance in a team racer. Fuel consumption curve A is extracted as "maximum lean" needle valve settings from 8,000 r.p.m. (9 x 4 Trucut propeller) to 17,000 r.p.m. (Frog 6 x 4 nylon propeller). Fuel consumption curve B represents "maximum rich" setting



for the same r.p.m. with each propeller used—the difference in terms of needle valve opening being as much as 1½ turns in some cases. Specific fuel consumption is plotted on the "maximum lean" mixture data and shows a minimum value over the range 10,000-12,000 r.p.m.

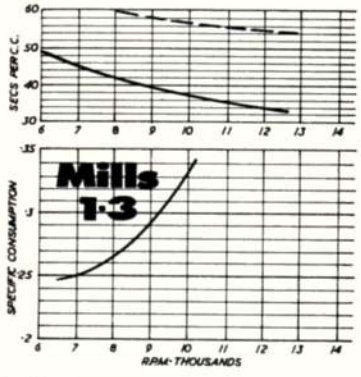
Taipan 1·5

This Australian engine is noteworthy for the fact that transfer ports are partially "throttled" which should logically have the effect of decreasing the specific consumption at lower speeds and *vice versa*. The specific consumption is, however, high in comparison with other engines of this size, reaching a minimum value at around 10,000 r.p.m.

Mills 1·3

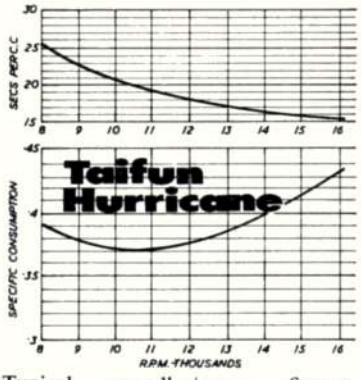
This engine is included mainly to show how economical is side-port induction, although, of course, this inherently limits the maximum speed and peak power output. Although the Mills peaks at a comparatively low r.p.m. and the peak B.H.P. figure is correspondingly reduced, it does develop high power over the

lower r.p.m. range. Its economical operation (as regards duration on a given amount of fuel) is unrivalled. Also its specific fuel consumption is low—the economy of sideport induction. The top curve shows further economy using nitrobenzine additive in the fuel.



Taifun Hurrikan

This is a 1·5 c.c. diesel with reed valve induction which can give a good account of itself in team racers. Inherently, reed valve induction tends to be economic but on the test engine needle settings tended to be inconsistent and possibly because of the construction of the reed the consumption figures realised are in no ways outstanding.

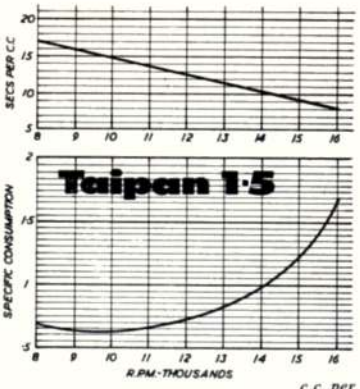


Typical propeller/r.p.m. figures realised on static test were:

6 x 9 Tiger	...	11,000 r.p.m.
6 x 8 (Trucut)	...	10,800 r.p.m.
7 x 9 (Trucut)	...	8,000 r.p.m.

A maximum speed of 15,000 r.p.m. was measured with a 7 x 3 Trucut.

TAIPAN 1.5 c.c. R.P.M.	B.H.P.	Seconds Duration on 1 c.c.	on 10 c.c.	c.c. per B.H.P. per second
8,000	.087	17.0	2.50	.68
9,000	.097	15.6	2.36	.66
10,000	.102	14.6	2.26	.62
11,020	.107	13.5	2.15	.69
12,000	.110	12.4	2.04	.74
13,000	.107	11.3	1.53	.83
14,000	.100	10.1	1.41	.99
15,000	.090	9.0	1.30	1.24
16,000	.072	8.0	1.20	1.74
A.M.15				
8,000	.100	28.3	4.43	.36
9,000	.113	26.8	4.28	.33
10,000	.125	25.2	4.12	.32
11,000	.135	23.7	3.57	.31
12,000	.143	22.0	3.40	.32
13,000	.149	20.0	3.20	.34
14,000	.152	18.3	3.03	.36
15,000	.148	16.8	2.48	.41
16,000	.100	19.2	2.32	.47
17,000	.137	—	—	—



FROG 15OR R.P.M.	B.H.P.	Seconds Duration on 1 c.c.	on 10 c.c.	c.c. per B.H.P. per second
8,000	.08	29.0	4.50	.43
9,000	.09	27.0	4.30	.41
10,000	.10	25.0	4.10	.40
11,000	.11	23.4	3.54	.39
12,000	.12	21.8	3.38	.38
13,000	.125	20.0	3.20	.40
14,000	.13	18.3	3.03	.42
15,000	.125	16.6	2.46	.48
16,000	.12	16.0	2.40	.52
TAIFUN HURRICANE				
8,000	.10	25.5	4.15	.39
9,000	.115	23.0	3.50	.38
10,000	.13	20.8	3.28	.37
11,000	.14	19.2	3.12	.37
12,000	.145	18.0	3.00	.38
13,000	.15	17.0	3.50	.39
14,000	.154	16.5	2.45	.40
15,000	.153	16.0	2.40	.41
16,000	.15	15.5	2.35	.43
ELFIN 149				
8,000	.072	20.0	3.20	.70
9,000	.081	18.0	3.00	.68
10,000	.09	16.5	2.45	.67
11,000	.10	15.0	2.30	.67
12,000	.11	13.5	2.15	.67
13,000	.115	12.0	2.00	.72
14,000	.12	10.5	1.45	.79
15,000	.115	9.0	1.30	.97
16,000	.11	7.5	1.15	1.20
MILLS 1.3				
5,000	.07	—	—	—
6,000	.08	50	6.20	.25
7,000	.09	44	7.20	.25
8,000	.088	42	7.00	.27
9,000	.084	40	6.40	.30
10,000	—	38	6.20	—

MAKING UP FUEL MIXTURE

by G. Oswell

AS THE TITLE implies, this article is intended for modellers who make their own fuel. A typical National Health bottle has thirty-one graduations. This does not appear at first to have any significance. However, if we make a simple equation thus:—

30 parts : 100 per cent.

we can see how the two figures are related.

i.e.,

3 parts : 10 per cent.
1½ parts : 5 per cent.
¾ parts : 2½ per cent.

E.G., to make Oliver formula simply mix:—

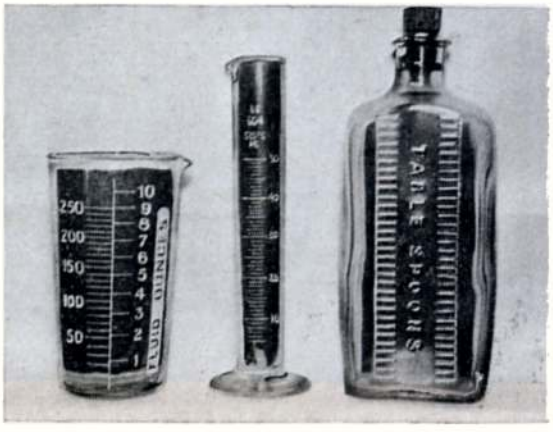
15 parts or 50 per cent. Paraffin
9 parts or 30 per cent. Ether
6 parts or 20 per cent. Castor Oil
Plus: ¾ parts or 2½ per cent. Amyl Nitrite

The last part which is left at the top of the bottle is now used for the additive.

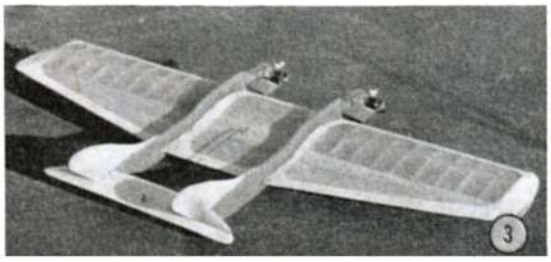
Using this system it is quite easy to mix complicated mixtures without any special equipment and can be certain that the proportions are correct.

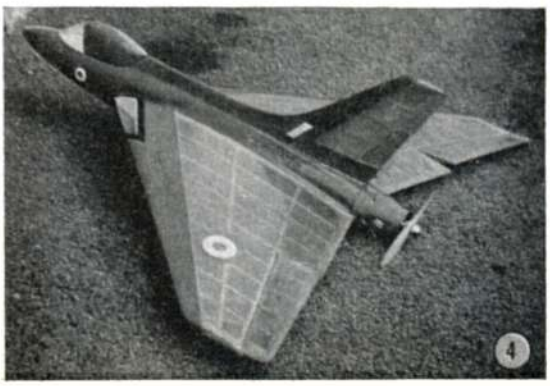
Any graduated vessel is suitable for mixing fuel if the proportions are worked out correctly.

On the left of the illustration is shown a photographic beaker, and centre is a graduated pipette. These two apparatus may also be used for mixing fuel, but the medicine bottle enables the mixture to be shaken up without having to pour into another container. Ether evaporates readily and therefore fuel should not be poured too often as a slight percentage of ether will disappear into the atmosphere, and don't forget to filter the fuel before pouring into the container.



MODEL NEWS



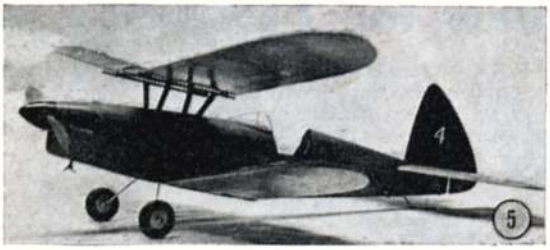


TAILLESS MODELS ARE in the news and lest it be thought after reading the report on the International Contest, that this type of model is not built in Britain, take a look at our heading picture **1** where D. S. George of Liskeard, Cornwall, is seen with his modified version of the A.P.S. design A.V. 10. Some of Mr. George's ideas are very good and include a moulded acetate bottom cover on the under fin which provides an effective wearing surface against landings over rough ground. Model has a thicker leading edge and 1/32nd sheet wing covering to improve the airfoil. Wing dowels are made of 12-gauge piano wire and the fins have a modified shape with press stud fittings to knock-off in heavy landings, as can be seen in the additional photograph. It is covered with Jap silk dyed yellow with Dylon home dye and the result is an almost unbreakable model to stand up to those Cornish winds.

What's happening in picture **2**? This is not a genuine crash, but a fake picture by Messrs. Addy and Whalby, also from the West Country at Barnstaple, North Devon. Model is 45-in. span with an E.D. 246 and Frog 149 in fibre-glass cowlings the mould for which happened to be a quart milk bottle. Colour is duck-egg green with red trimming and black spinners, and the smoke provided to simulate a forced landing has been created by Jetex.

Our combat weary eyes have seen many tunes played upon the *Peacemaker* theme, but none have been as original as the twin engined version **3** made by 14 and 15 year-old N.Y. Heywood and R. Cleminshaw of Cottingham, E. Yorks. The model spans 54 in., weighs 40-oz. and has the same proportions as *Peacemaker*, but uses increased trailing edge area and a pair of A.M. 25 diesels.

The Delta 707 is a very popular A.P.S. drawing



and in picture **4** we see W. Lister's version from Kendal, Westmorland. He finds the model a little fast for his liking, especially as it is his first venture into radio control and the flying field is surrounded by such hazards as trees and high tension cables. The aerial has been placed in the wing for the sake of appearance and the receiver is the E.D. Airtrol. All-up weight is 2 lbs., and power by a Frog 150.

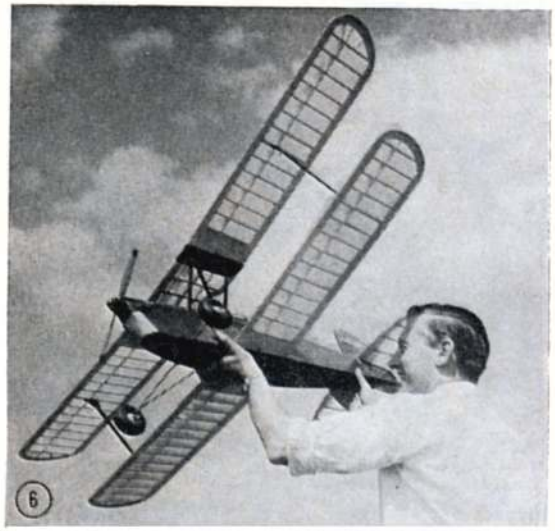
Picture **5** is a snappy model biplane made for the Davies Charlton Dart .5 diesel by B. Peckham of Bournemouth. Span is a mere 24 in., colour scheme orange fuselage with grey wings and as can be seen in the photograph, Mr. Peckham has combined attractive appearance with efficient practical features.

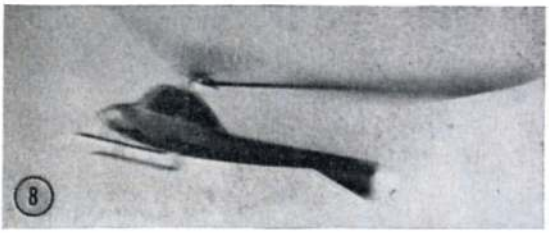
A much larger biplane is the established 66 in. span model from AEROMODELLER Plans Service, seen in picture **6**. This version of Brook's biplane was made by Bob Knight, secretary of the Model Aircraft Club of Vickers-Armstrong, Weybridge. The design is an ideal model for those who want a stable sport model to operate on single channel R/C.

In our last issue, our Trade Notes heading photograph showed a particularly well made Bristol freighter made from an Airfix plastic model kit and covered with metal foil. It was built by R. H. Williams of Letchworth, Herts, who also made the *Crusader* seen in picture **7**. Mr. Williams was disappointed by the reproduction of aluminium finishes when using aluminium paint and read in our plastics features that aluminium foil can be successfully applied to give a more realistic finish. He has now completed four models which are completely covered with "Polyfoil", and all of them are of an extraordinarily high standard.

Helicopter enthusiast, J. Norris of Denver, Colorado, over in the United States, sent us pictures 8 and 9 of his latest efforts and it would seem that as far as the "Whirly-Birds" are concerned, Mr. Norris is ahead of a good many experimenters.

Model seen in picture **8** has a fibre-glass fuselage which weighs 4 oz. and has a detachable 66 in. diameter rotor driven by cross-beam mounted engines. The rotor has overhead tilting hub and has often taken off many times in strong winds at altitudes over 5,000 feet. In picture **9**, Mr. Norris is seen just after releasing the same rotor unit on a balsa fuselage. Engines used are two Cox Pee-Wee's and construction of a similar model using two Cox Thermal hoppers is under way. Large helicopters of this type are comparative rarities in Europe and we wonder if these two photographs will inspire further thoughts on this fascinating subject. Come on the helicopters!





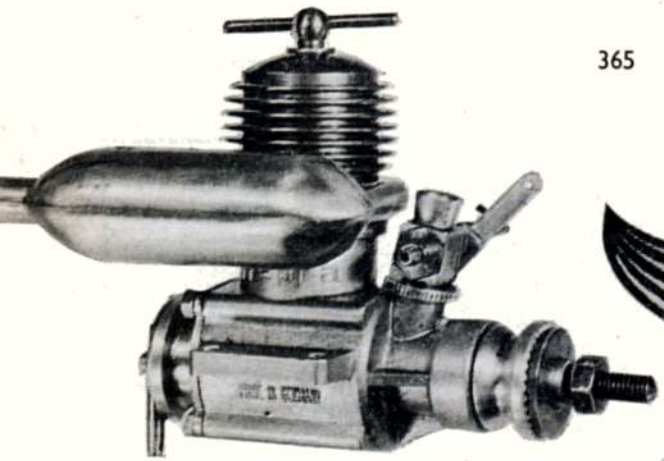
They flew for Gt. BRITAIN

R.A.F. WIGSLEV, near Lincoln, has been the scene for the 1959 Team Trials and provided glorious but thermal potent weather on each occasion.

In Wakefield the pattern for selection of top three fluctuated between North, Picken, Roberts, Monks, O'Donnell, Wiggins and Fuller, through the last few rounds. Brian Picken qualified at third place but had to withdraw from the team, so Ray Monks, who was already secure at second place in the A/2 team, pulled off a terrific "double". Both he and Jack North have the distinction of having represented the country in all three free-flight World Championship classes.

A/2 was well in Northern Heights' Ferrer's lap with a wonderful series of seven max's, only to have a whopper downdraught pull the glider down at 53 sec. on the 8th round. This cost him a team place, all honours going to 17-year-old Eddie Black, Glasgow, who hitch-hiked his way to the trials and came through to top place working single-handed. Our five reps. have done their duty well in France and Belgium, full reports on the final championships will appear in our September and October issues.

Above, all-rounder and double place man Ray Monks (Birmingham) with A/2 (totalled 27:18) and Wakefield (23:44). Note how all A/2 models have involved anti-warp wing structure. Below, clockwise, Ray Shirt of Sheffield (27:16 total) uses high aspect ratio surfaces, tows fast and launched into lift each time. George Roberts, having a successful season, was top in Wakefield times at 25:03 with hinged fuselage design using two-piece, wire-braced wings. Design is in its second year, has 20 x 25 in. propeller, 12 strands Pirelli rubber. Bottom left, Eddie Black, Glasgow schoolboy A/2 winner (27:28) prepares Tzigane, his own design and very neatly made. Veteran Jack North also completes his all-round capabilities with Wakefield team place (24:58 total) using model components dating back to 1950, and Dunlop power



ENGINE ANALYSIS No. 62

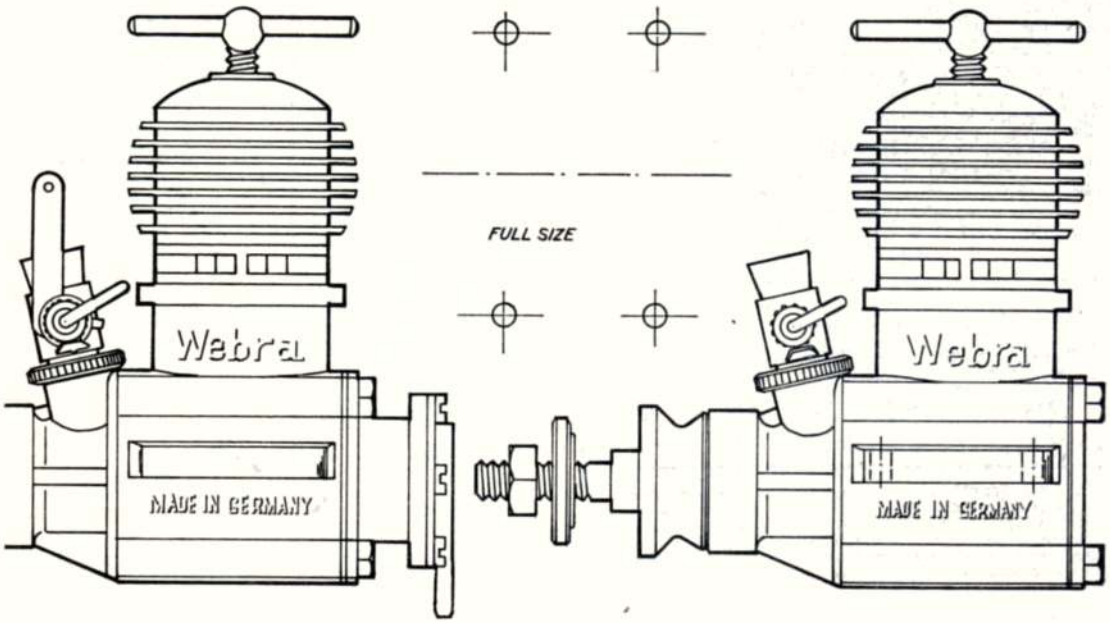
by R. H. Warring

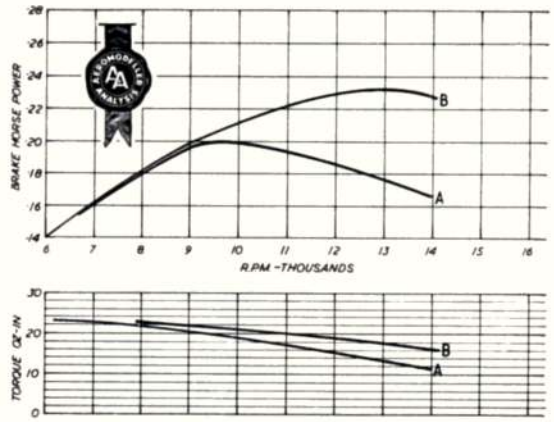
KOMET & BULLY

THE TWO BASIC versions of these engines are identical, except that the "Bully" utilises a bored-out cylinder to increase the swept volume by approximately 1 c.c. The 2·5 c.c. "Komet" (Red head) was submitted as a standard engine. The 3·5 c.c. "Bully" (Blue head) was fitted with a barrel-type carburettor, exhaust unit, and vane-type pump mounted on the rear crankcase for supplying vacuum pressure for radio control servo power. Apart from this, the same general descriptions apply to both engines.

The most surprising feature of the tests was that the "silenced" 3·5 c.c. version appeared to be very strongly affected by exhaust back pressure, realising only a similar power output to the 2·5 c.c. version up to 9,000 r.p.m. and then falling right off. The 2·5 c.c. "Komet" peaked at 13,000 r.p.m. and thus showed an appreciably greater power output than its larger counterpart with silencer unit.

The appearance of the crankcase is that of a ball-bearing engine, nevertheless the bearing is, in fact, plain and simply reamed to size in the crankcase casting. Dimensions are comparatively squat with a chunky, square-looking crankcase, the basic design being quite orthodox throughout with the exception of the propeller shaft. This is a separate length of ·193-in. diameter threaded steel (5 mm. DIN thread with a pitch of ·8 mm.) which screws into the crankcase proper. The end of this extension shaft is slotted to take a screwdriver for tightening up, or removing if broken. *continued overleaf*





The silencer unit as fitted to the "Bully" consists of two identical die-castings, rather like two halves of a toy pistol in shape, which bolt together with two screws. The assembled unit is locked in place by screwing down the cylinder liner when the collector ring effectively encircles the 360 degree exhaust porting on the cylinder. If the unit is mounted the wrong way up, *i.e.*, clamped under the cylinder flange, the port timing is altered. A baffle plate is cast in each half of the expansion area with only two small passage ways for the escape of exhaust gas. The silencing effect is very good indeed, but engine performance suffers appreciably.

The silencer appears to put an abrupt limit to maximum speed running, with the deterioration in performance above about 10,000 r.p.m. very marked indeed. Even with quite small propeller loads a further increase in speed was gained with some reluctance—an 8 x 3 propeller, for example, giving only 12,500 r.p.m. when one would expect a figure approaching 15,000 r.p.m. for an engine of this size. The power curve shows an abrupt peak at 9,500 r.p.m. with exhaust fitted.

There is undoubtedly considerable back pressure from the fitted exhaust, which also tends to make the engine run very hot even in an adequate slipstream. This, in turn, has the effect of producing a marked falling off in power after a matter of 20 seconds running or so.

Response to the barrel-type throttle was extremely good and positive. The engine could be throttled down to a safe minimum "idling" speed of 2,500-2,700 r.p.m. on almost any size of propeller, with immediate pick-up

WEBRA "KOMET" 2·5 c.c. FUEL CONSUMPTION

R.P.M.	B.H.P.	Duration on 1 c.c.	Duration on 10 c.c.	Duration on 15 c.c.	c.c./B.H.P./per Second
6,000	·14	26:4	4:24	6:36	·27
7,000	·16	24:8	4:08	6:12	·25
8,000	·18	23:4	3:54	5:51	·24
9,000	·20	21:8	3:35	4:49	·23
10,000	·21	20:2	3:22	4:41	·235
11,000	·22	18:7	3:07	4:33	·24
12,000	·23	17:3	2:53	4:20	·25
13,000	·235	15:7	2:37	3:55	·27
14,000	·225	14:3	2:23	3:35	·31

The "Komet" shows a relatively low fuel consumption with a minimum demand at 9,000-10,000 r.p.m. An interesting fact is that both the fuel consumption and power output figures are higher than those of the 3·5 c.c. "Bully" with exhaust manifold and silencer unit—the "Bully", in effect, using a bored-out 2·5 c.c. cylinder.

Propeller—r.p.m and Power curves

(A *represents* 3·5 *c.c. Bully with throttle, silencer and pump.* B *represents* 2·5 *c.c. Komet.*)

PROPELLER—R.P.M. FIGURES

Propeller	Bully with silencer & fuel pump *r.p.m.*	Komet *r.p.m.*
12 x 4 (Trucut)	6,500	
11 x 4 (Trucut)	7,700	
10 x 4 (Trucut)	8,700	8,800
9 x 6 (Trucut)	8,500	
9 x 5 (Trucut)	9,200	
9 x 4 (Trucut)	10,400	10,400
8 x 5 (Trucut)	10,500	
8 x 4 (Trucut)	12,000	13,300
8 x 3 (Trucut)	12,500	
10 x 6 (Frog nylon)	8,200	8,500
9 x 6 (Frog nylon)	9,600	10,000
8 x 8 (Frog nylon)	7,600	
8 x 5 (Frog nylon)	—	11,400

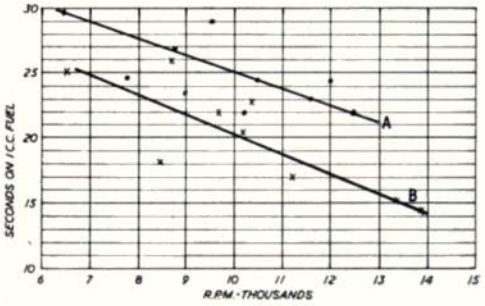
Fuel used: 2 per cent. nitrated, standard diesel mix. *Throttle control.* Fully effective in reducing speed to 2,500-2,700 r.p.m. on engine fitted with exhaust unit. Partially effective only on engine without exhaust unit, reducing idling r.p.m. to approx. 3,000 r.p.m. but fluctuating.

and fast response to throttle movement. The throttle is conventional in form, the brass barrel rotating over a spray bar. The carburettor body is a casting and includes an ingenious solution to provide locking for the hexagonal end of the spray bar so that this cannot rotate accidentally with the barrel if the spray bar is not assembled tight. The bottom of the carburettor body is threaded into the crankcase casting and can therefore be mounted on a standard engine as well. A large knurled ring nut enables the spray bar to be locked at any convenient angle. In the normal right-angled position the forward position of the throttle lever is very close to the propeller disc for manual operation.

The throttle is also effective on the "Komet" (without exhaust fitting) and can be used to produce an idling speed of the order of 3,000 r.p.m. However, at any throttled-down position running is rather erratic and the response to throttle movement a little indefinite. The most probable reason for the difference in response is that without the exhaust the cylinder has a small amount of sub-piston induction.

A feature of the throttled engine (*with exhaust*) is that it would not start with the throttle closed. In this position it blows fuel back down the line, however, with the throttle in the wide open position (and with the standard engine) starting characteristics were good and adjustments easy to establish for optimum settings. Without an exhaust, both engines run much cooler with consequently less power loss on warming up.

A particularly unattractive feature was the high vibration level experienced when running both engines at all load-speeds. This definitely appeared to be excessive and was rather worse with the 3·5 c.c. "Bully" than with the "Komet".



The vane-type pump employed on the "Bully" is of elementary design, consisting of a 12 mm. diameter rotor eccentrically mounted in a 14 mm. diameter housing formed as an extension on the standard backplate. The phosphor bronze vanes 10 x 4 mm. fit into slots in the rotor. The rotor shaft (cut integral with the rotor) extends through the backplate and is riveted to a disc which picks up the drive from a pin fitted into the hollow crankpin (thus enabling the same crankshaft to be used on the standard and "special" engine).

Performance of the pump was measured by a vacuum gauge and proved to be exactly linear with speed. Vacuum pressure generated is virtually nil below 5,000 r.p.m., but from then on increases progressively with speed up to a maximum measured of 2·75 p.s.i. suction at 13,000 r.p.m. Suction available from the pump at peak power (9,000 r.p.m.) is 1·5 lb. per sq. in.

Despite its diminutive size, therefore, the pump is a reasonably efficient working unit although somewhat restricted in performance by the limited operating speed of the engine. We feel that the diameter size of the pump could well have been increased with considerable advantage.

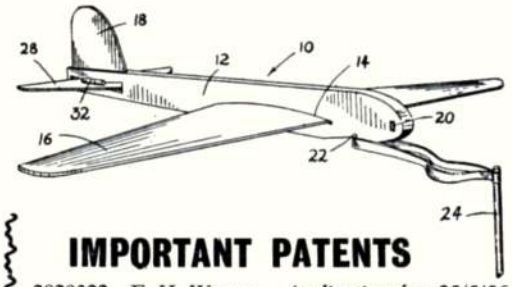
Fuel consumption measurements showed the Webra 3·5 to be extremely lenient on fuel, achieving quite remarkable duration figures for an engine of this swept volume on 1 c.c. of fuel. Minimum lean mixture setting was a little difficult to establish accurately with different propeller loads since the overheating tendency of the engine demanded a rather richer setting at some loads to maintain speed (presumably by promoting some further degree of cooling). This contributed to a degree of "scatter" on the plotted points.

Comparison tests with the 2·5 c.c. "Komet" showed fuel consumption to be up at every load-speed, nor was it possible even with the most careful settings to equal the figures obtained with the 3·5 c.c. "Bully". This can probably be put down to the fact that with sub-piston induction exposed by removal of the exhaust the mixture setting at the carburettor has to be somewhat richer to compensate for the extra air being inducted into the crankcase, and also the fact that the specific power output is higher with the smaller engine. Again, as with the other engine, running was not always consistent on minimum lean needle setting and a slightly richer setting was generally called for to complete a run at a constant speed.

SPECIFICATION

	Bully 3·5 c.c.	Komet 2·5 c.c.
Displacement:	3·416 c.c. (·208 cu. in.)	2·454 c.c. (·175 cu. in.)
Bore:	·6505 in.	·551 in.
Stroke:	·627 in.	·627 in.
Bore/Stroke ratio:	1·04	·88
Weight: Standard engine:	5¼ ounces	5⅛ ounces
with exhaust throttle and pump:	6¼ ounces	
Max. B.H.P.:	(2·5) ·235 BHP at 13,000 r.p.m. (3·5) ·20 BHP at 9,500 r.p.m.	
Max torque: (2·5) (3·5)	23 ounce-inches at 6,500 r.p.m.	
Power rating: (2·5)	·069 B.H.P. per c.c.	
(3·5)	·059 B.H.P. per c.c.	
Power/weight ratio: (2·5)	·043 B.H.P. per ounce	
(3·5)	·03 B.H.P. per ounce	

Material specification:
Crankcase: Pressure die-cast light alloy
Cylinder: Hardened steel
Cylinder jacket: Light alloy anodised, red "Komet" or blue "Bully"
Piston: Cast Perlite iron
Contra-piston: Hardened steel
Crankshaft: Hardened steel with extension screw
Connecting rod: Forged dural
Main bearing: Plain
Spraybar assembly (and barrel throttle): Brass
Exhaust unit: Pressure die-cast light alloy



IMPORTANT PATENTS

2820322 F. H. WHITE *Application date* 25/5/56

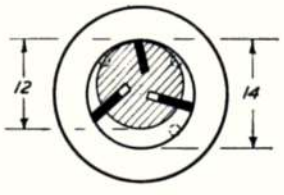
THIS INVENTION provides a catapult launched glider in which the well-known trimming difficulties which are associated with high speed launch are tackled in a novel manner. The entire tailplane is pivoted in an eccentric slot through which it passes and supports a small closed tube at its pivot point, containing a free ball weight. During launching and while in an "ascending" attitude, the tailplane assumes a normal attitude; when the nose drops the forward movement of the weight in the tube tilts the tailplane in its slot to raise its trailing edge into an elevating position.

Constructionally the Webras feature a robust crankcase die-cast in light alloy with screw-in cylinder. Exhaust ports are cut in the cylinder flange and four narrow transfer ports are milled on the inside of the cylinder, tapering at the top end and overlapping the exhaust almost completely. The piston is of cast iron with a relatively thick wall around and above the gudgeon pin. Piston top is conical.

The light alloy connecting rod appears to be a dural forging with a ·155-in. (4 mm.) little end and ·197-in. (5 mm.) big end bearings finished by reaming. The silver steel gudgeon pin is a tight fit in the piston.

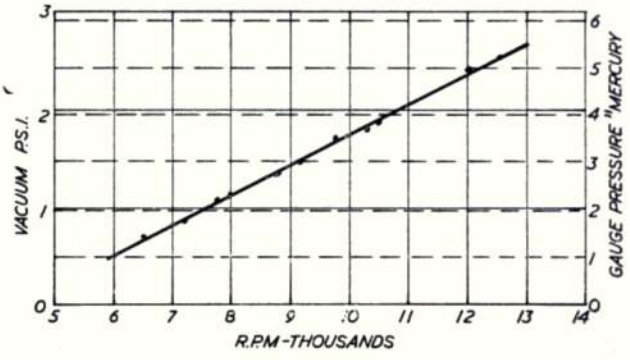
The hardened steel crankshaft is ·354-in. (9 mm.) diameter, ground to taper immediately in front of the bearing and finishing short in the light alloy propeller driver. It appears a little on the small side, rather emphasised by its stubby length. The crank web is rather crudely finished. The crank pin is hollow (·098-in. hole) and takes a stud to extend its length when fitted to the "special" to engage the rear disc driving the vacuum pump rotor.

The general standard of workmanship and finish is good and the running fits just about right. Although both engines showed signs of overheating whilst running, in both cases the main bearing ran cool.



DIMENSIONS IN MILLIMETRES

Webra 3·5 c.c. Bully Pump efficiency



Tailless International

Wolfgang Zwilling, 31-year-old chemistry student, again showed his superiority by placing top for the second year in succession

JUNE 13TH/14TH was the period set aside in the F.A.I. calendar for the 1959 International Contest for Flying Wing Model Aircraft, organised this year by the Flugtechnische Arbeits-gemeinschaft im Kreise Segeberg on behalf of the Deutscher Aero Club, on the flying field at Kaltenkirchen in Schleswig/Holstein.

This venue is right at the "top end" of Germany, and in consequence many would-be participants were deterred for economic and other reasons, the contest resulting in a two-country affair between Germany and Holland, ardent supporters of the pterodactyl class of model. Three classes of event were contested, gliders to A/2 specification, power, and rubber-driven sections, awards being made on an individual basis in all classes, but the main Team award being for gliders only.

Teams were welcomed in the picturesque town of Kaltenkirchen, home of Werner Thies, 1958 Manager of the victorious German team, and in charge of general organisation in co-operation with Herr Pempe of the Aero Club. Processing was skilfully conducted during the morning of the 13th, and a move made out to the airfield after lunch where three of the five rounds were due to be flown.

The field, a wartime fighter 'drome which had been destroyed, and now made over to gliding and the local model flyers, is a long stretch from east to west, with good open country particularly in the former direction, but rather narrow in the north/south direction with belts of trees on the boundaries, especially on the west and south-west. Unfortunately, though the weather was for the most part bright, the wind was almost due north and blustering from 10-20 m.p.h., with cloud cover of approximately 3/10ths.

As a result, the start of the contest was delayed until early evening, and only two rounds dealt with. Fiks of Holland (engaged on glider repair and maintenance at the site at Terlet) was the first to fly, but had difficulties on launching to give an 81-sec. flight. With few exceptions it seemed impossible to get full height on the line before the models veered off, and Zwilling (Germany) was the only one to get really well up and thus miss the turbulence which created so much trouble at the lower altitudes.

John Osborne had cruel luck, for, when attempting to bring his model down on the line following a poor start, the model flicked off at low altitude to hit one of the large pieces of concrete that littered one portion of the 'drome, seriously damaging the model. On setting up his reserve, almost identical luck robbed him of his second string, and this much-fancied Dutchman was out right at the start. With the same fate affecting Kiesel, first round scores were not impressive, with the exception of Zwilling.

Round 2 saw rapidly deteriorating conditions, as evidenced by Schwarze's best time of 53 secs., and a return was made to the town for refreshment and much-needed repairs.

The following morning was much more promising, and though cloud had increased, the wind was much kinder at 4-10 m.p.h., and flight times showed an all-round improvement. After a little *contretemps* when the local flyers were politely told that it "just was not done" to fly their A/2s, etc., in the middle of an International contest, flying proceeded with commendable smoothness, and Zwilling, following a clever "bring-down-on-the-line" launched at height for the first maximum of the contest.

Lust and Fiks were next best in Round 3, but were well behind the German who looked all set to repeat his 1958 win. This prediction was clinched with a further max in the next round, though the two Dutchmen were trying hard with no hope of catching the skilful Wolfgang.

Round 5 saw Fiks almost certain of second place, but he got his poorest duration of 51 seconds, and both Muller and Lust produced their best efforts to pass him, with the Dutchman (flying an Osborne designed model) scoring a near-max. Youngest member of the Dutch team, de Koning, had consistent trouble with a model that persisted in fluttering to an alarming degree, threatening to emulate other models that had broken up in mid-air. Van der Caay, Dutch T/M, thereupon light-heartedly "threatened" to show his members how to launch; put up models lent by Lust and de Koning; and promptly lost both of them in strong thermals!

Meanwhile, Klinger had been demonstrating his immense superiority with his beautifully-finished Activist powered model (with Zwilling, the same models that gained them victory in Holland in 1958), and wound up his five flights with an easy maximum. Schubert's rubber-powered model again demonstrated its fine qualities in the hands of proxy Laue, but again unfortunately without opposition.

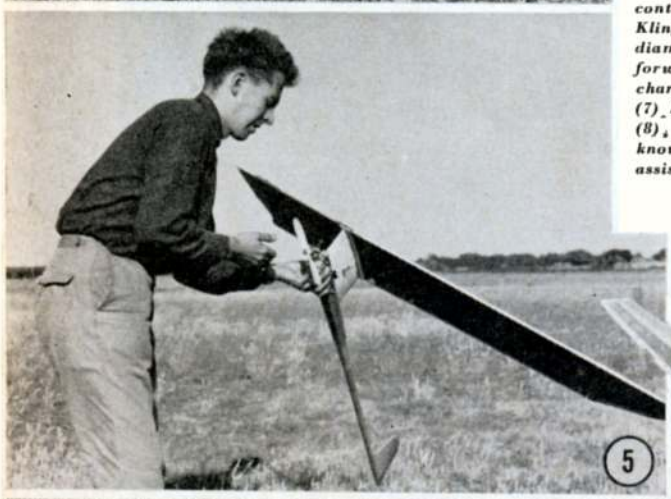
So ended a very fine and interesting contest, regrettably without the support this class of event deserves, and the news that by mutual agreement the 1960 event will take place at Terlet (Holland), when it is hoped that the more convenient venue will attract more, and particularly British entries.

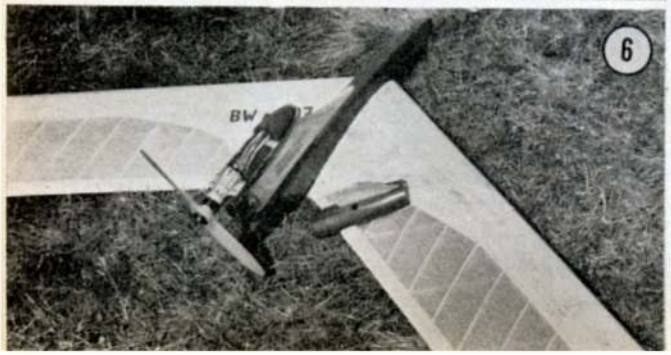
C. S. R.

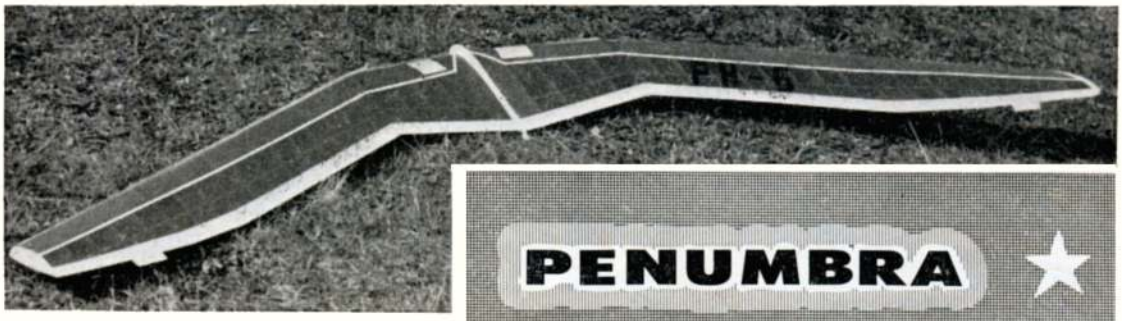
GLIDER								
1. Zwilling, W. ...	Germany ...	118	42	180	180	80	600
2. Lust, P. ...	Holland ...	43	50	80	68	176	417
3. Muller, J. ...	Germany ...	86	42	49	61	122	360
4. Fiks, G. ...	Holland ...	81	52	78	56	51	318
5. Schwarze, P. ...	Germany ...	81	53	34	64	84	316
6. de Koning, H.	Holland ...	64	30	36	29	24	183
7. Kiesel, A. ...	Germany ...	—	—	24	—	—	24
8. Osborne, J. ...	Holland ...	8	—	—	—	—	8
POWER								
Klinger, W. ...	Germany ...	67	40	128	123	180	538
RUBBER								
Schubert, W. ...	Germany ...	—	—	41	126	77	244

Techniques with Tailless models at Kaltenkirchen

(1) The Dutch team of de Koning, van der Caay, Lust, Osborne and Fiks, all showing Osborne-type models. (2) The German equippe of Muller, Kiesel, t/m Geiger, Zwilling, Schwarze and proxy Laue. (3) One way to steam out warps! Fiks used Volkswagen exhaust to good effect. (4) The simple yet efficient Schubert rubber - powered (Wakefield Specification) model with its handler, Laue. (5) Meuser of Hamburg had good flights on test, but broke the rather vulnerable stick fuselage before the contest started. (6) Power egg on Klinger's model featured a large diameter neoprene tube facing forward, providing a supercharging effect to good purpose. (7) Second placeman Piet Lust. (8) Dutch t/m showed expert knowledge of both launching and assisting. Note wash-out on this model of Osborne's







PENUMBRA ★

TOP TAILLESS DESIGN FROM HOLLAND MEETS F.A.I. SPECS.

by J. S. Osborne

FOR THOSE ABOUT to reach for their dictionaries, the name refers to the "partially shaded region of light around the total shadow of the moon or the earth in an eclipse", and such a "glowing" title is particularly apt for this very successful tailless design to international specifications. When the decision was taken to make the international tailless class meet the same regulations as for A/2 gliders, tailless enthusiasts were set a rather hard task of absorbing the higher wing loading in a smaller than usual size model.

The Dutch have always been keen protagonists for the tailless type and J. S. Osborne has in recent years influenced the Netherland's designs to an extent that the models flown by his country's team for this year's international were all based on his conception, typified by *Penumbra*.

He was Dutch champion for 1956/57/58. The winner at Terlet in 1957, third in 1958, second at the Saarbruken international in 1958 and *Penumbra's* still-air average time is no less than 2 : 20, proving its thoroughbred background.

Penumbra is the fifth in this series of designs and was first made in 1956. From the start, the main object was to produce a fairly simple model with washout incorporated in varying stages of wing taper. This "stepped" trailing edge method means that one can build in the

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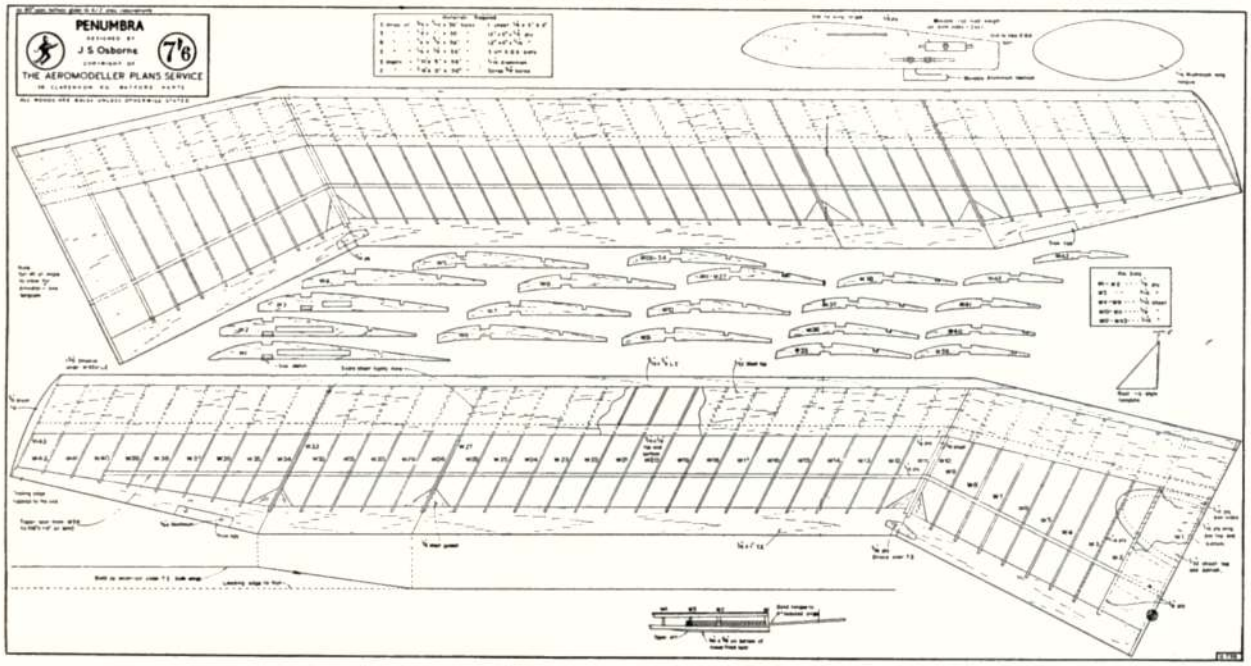


Elegant in its appearance yet simple in lines. Penumbra shows off its cranked trailing edge.

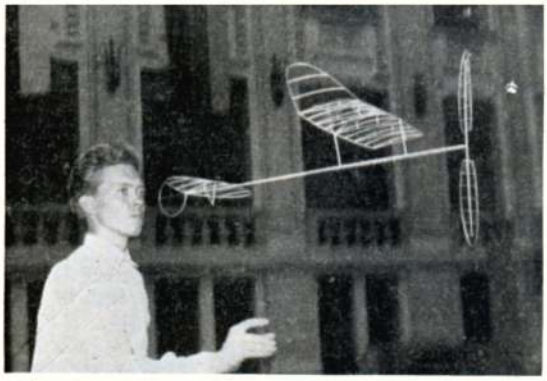
washout comparatively easily by packing up the construction over the building board and with a straight line leading edge and sheet covered forward section of the airfoil, the wing is immensely strong (as seen in Germany this year, it takes a concrete block to put the model out of action!)

Construction begins with pinning down the leading edge and the trailing edge to rib W 27 over on the board, with jig or packing blocks to support the trailing edge for the remaining outboard panels of the trailing edge. Assembly follows the normal sequence of fitting upper spars, bracing gussets, wing boxes, etc., and the wing is then lifted from the board for the lower spar to be fitted prior to adding leading edge sheeting when the trailing edge angles are well and truly set.

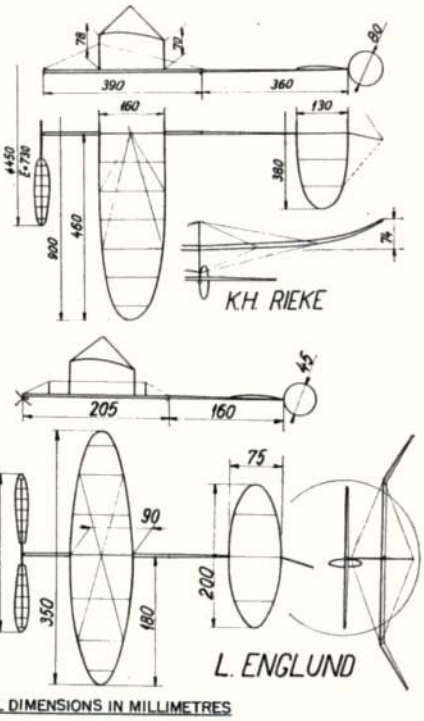
For experienced modellers, construction will be found very simple and the model is soon made. First flight tests should be made from hand launches with the trim tabs deflected to make *Penumbra* fly *straight*. It is then an omni-directional model, able to slip into lift on either side of the line of flight and this gives it considerable advantage in competitions. For final trim, a movable ballast weight is arranged in the "fuselage" and this can be used to compensate for varying wing strength.

With such a high performance tailless model available now for everyone to build, maybe we shall see larger entries for events during next season. Certainly the flying wing is a fascinating subject and who could ask for anything more simple than a couple of wing halves to carry to the flying field for a day's enjoyment?

Left: Rieke, Kujava and Englund were 1st, 2nd, 3rd in large size class, winning model at right drawn in simple detail.



Left: Lief Englund launches his larger model; he won the under 35 cm. class, model details are given at right.



ALL DIMENSIONS IN MILLIMETRES

International Indoor Contest

THE CENTRAL AERO CLUB of Hungary were hosts to representatives from Finland, Germany, Poland and Bulgaria at the Technical College hall in Debrecen on May 17th. There were two classes of competition, for models of over 35 cm. span (13¾ in.), and below that span. In the larger class the majority elected to go for models around 36 in. and in the eventual results it was rather surprising to find the hosts beaten on their own ground in such ideal conditions. The weather was dry and external sunshine developed some lift inside the hall. Lief Englund led constantly through all rounds in the smaller classes making his excellent 14 : 27 flight in the third round which concluded the contest at the luncheon break.

During the afternoon, the big stuff came out and very first flight was a 19 : 13 effort by Karl Heinz-Rieke to set the ball rolling at a very high standard. Unfortunately during this round the two Hungarian leading lights Varszegi and Egri had their models collide in the air with inevitable damage.

Poland's Kujava led the second round with 18 : 50 and then Rieke made his third flight of 22 : 05 to establish a new record for the hall and also a new duration record for Germany, as well as carrying off this section of the contest. All models used Pirelli rubber and construction followed the established Anglo-American practices with nichrome wire bracing, etc.

35 cm. Span

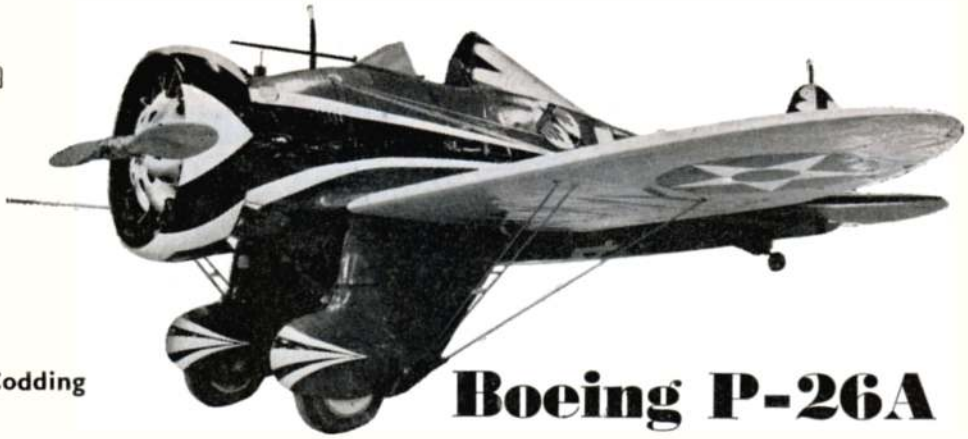
	min.	sec.
1. L. Englund (Finland)	14	27
2. G. Varszegi (Hungary)	12	36
3. O. Roser (Hungary)	11	52
4. S. Niemela (Finland)	11	49
5. S. Kujava (Poland)	10	58
6. L. Hamalainen (Finland)	10	57

Over 35 cm. Span

	min.	sec.
1. K.H.Rieke(Germany)	22	05
2. S. Kujava (Poland)	18	50
3. L. Englund (Finland)	17	26
4. L. Hamalainen (Finland)	16	49
5. Gy. Simon (Hungary)	16	40
6. I. Antal (Hungary)	15	04

AERO MODELLER

AIRCRAFT DESCRIBED No. 96



by G. E. Codding

Boeing P-26A

DESIGNED IN 1930 as the Boeing Model 248, otherwise known as the U.S. Army XP-936, and often considered as America's "First Modern Fighter", the P-26A was commonly referred to as the "*Peashooter*".

The series of P-26 low-wing fighters started active life with the Y-1 ordered by the U.S. Army in 1932, three of which were delivered in early 1933, Gross weight was 2,789 pounds, span 27 ft. 5 in., length 23 ft. 9 in. engine, Pratt and Whitney R-1340-21 of 550 h.p. offering a top speed of 227 m.p.h.

Following the Y-1 came the P-26A delivered in 1933. Weight had arisen to 3,012 pounds, span increased to 28 feet and one inch added to the length. The newer P and W R-1340-27 engine produced 600 h.p. and the top speed rose to 234 m.p.h. The other major change was the "new landing gear", perhaps due to the landing speed of 73 m.p.h. without flaps. Boeing, meanwhile, called the demonstrator the Model 281 Fighter-Bomber. It became a familiar sight at air shows and Army manoeuvres to see impeccable P-26 formation flying, and for years it was the symbol of America's fighter force.

Late in 1937 a number of planes were sent to the Philippines, where they remained until the Japanese invasion in 1941. However, most of the P-26's, as well as later models, were sent to Panama. Others actually saw combat service in China.

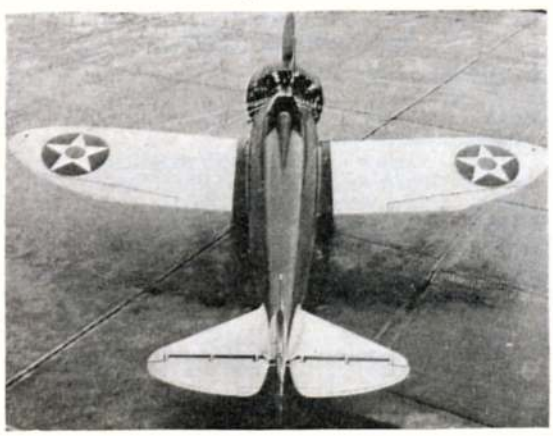
The arrival in 1957 of two P-26A's from the Guatemalan Air Force has re-awakened interest in the U.S.A. The first, serial No. 33-123, is now to be seen in Ed Maloney's Air Museum, Claremont, California. This aircraft had an interesting history in that it was first accepted on 16.6.34 and went to the 1st Pursuit Group, 27th Pursuit Squadron, Selfrige Field, Michigan. The number on the fin at the time was 23. In September, 1934, it was damaged in a nose-over due to brake failure on one wheel, was repaired and used in Panama up to the time of Pearl Harbour. Later it was one of two P-26A's sold to Panama and later still, passed to Guatemala.

Colour scheme as delivered to the Air Museum was silver fuselage, medium green wings, black fuselage No. 0672 in American style numeral about 18 in. deep, centrally painted aft of section "E" position on drg. opposite. Rudder had standard Guatemalan blue-white-blue stripes, but the insignia was the five-pointed American star on a blue circle. The Smithsonian Institute received the last Guatemalan P-26A, the subject of the photo above, where it is now on exhibition at the Air Force Museum and has been re-painted in the colours of the 34th Pursuit Squadron, according to recollections of Col. Wadman, who was pilot with that Squadron and is also a former director of the Museum.

This has brought about considerable controversy in that the P-26A has an Olive drab fuselage as depicted on our cover. Other historians maintain that the fuselage should be blue as noted on our drawing. The Olive drab enthusiasts appear to have more to substantiate their claims, but from the modeller's aspect, it would seem that either colour is acceptable, for whilst 1934 Technical Orders certainly specify that Olive drab should be used, the subsequent standard fuselage and landing gear colour was medium Blue. Another bone of contention concerns the arrangement of the Squadron Markings on the fuselage underside. Col. Wadman has the numbers laterally disposed on the Museum aircraft as seen above, and on our cover, but photo evidence points to a tandem numbering as shown on the drg. opposite.

Its armament was two .30 machine guns synchronised to fire through the airscrew from fuselage mountings and altogether 151 P-26's were made, including 111 of the P-26A, flapped version. The P-26B was the same airframe, with a fuel injection engine and the P-26C employed modified controls.

We are indebted to Edward Maloney, and Robert S. Houston of the American Aviation Historical Society for their enthusiastic assistance in providing us with information to prepare the drawing opposite.

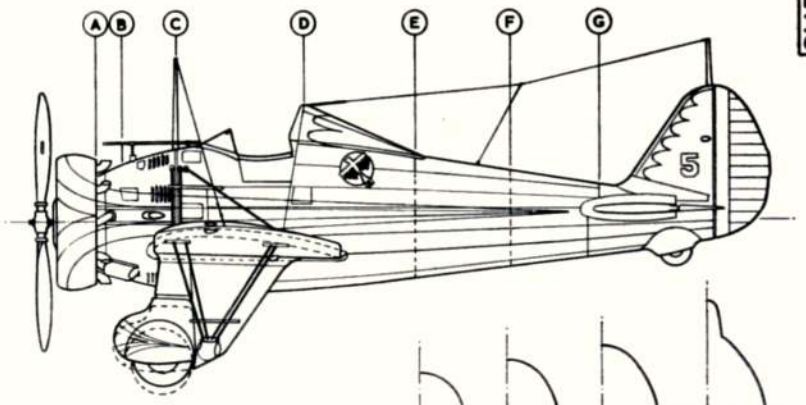


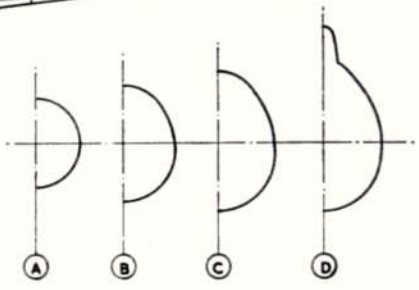
Two views of the P-26A as ready for delivery from the Seattle factory and without bright Squadron markings. Heading photo is of the repainted aircraft in the Museum.

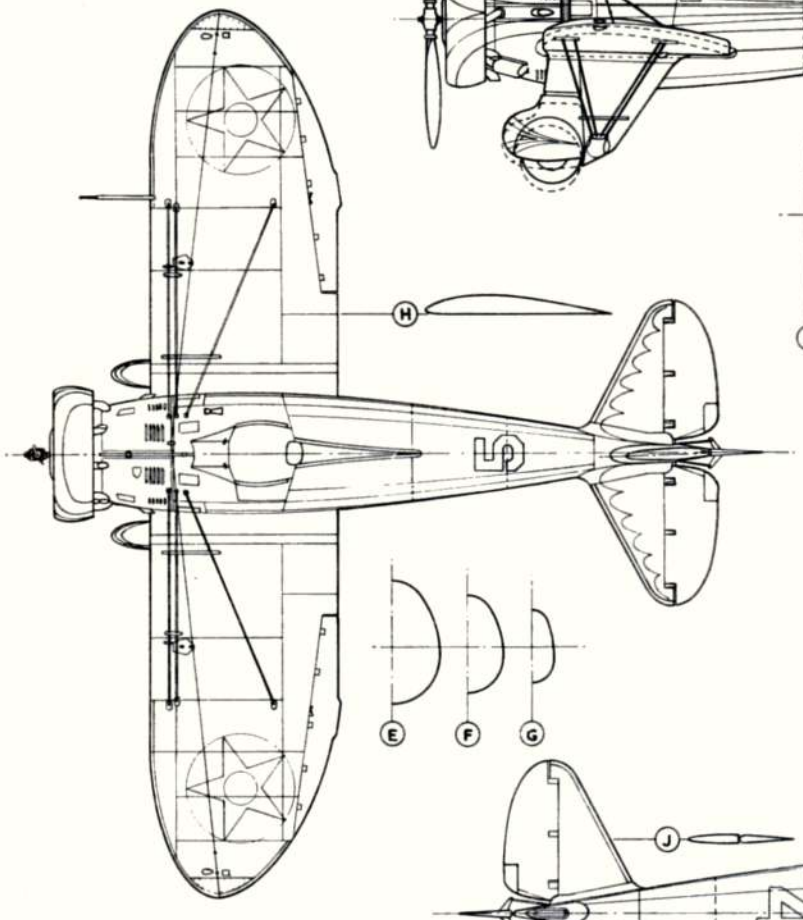
J 2710

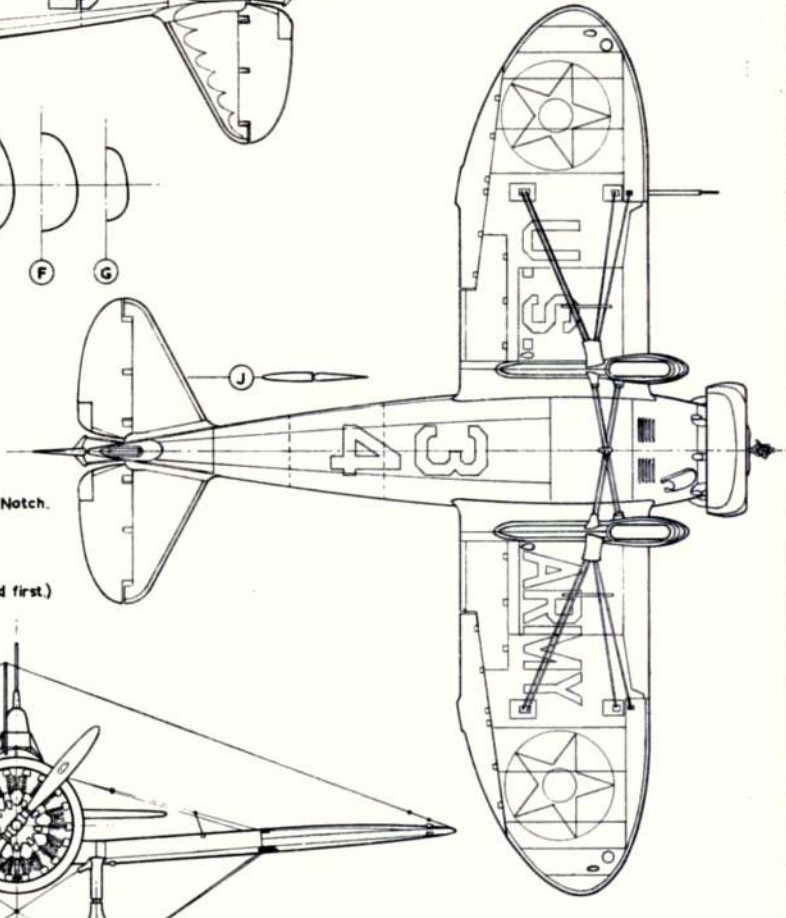
COLOUR SCHEME.

Fuselage:	Medium Blue.
Landing Gear:	Medium Blue.
Wings, Fin, Tailplane:	Yellow.
Wing Root to Dihedral Joint:	Black.
Wing Lettering:	Black.
Fuselage Numbers:	White.
Fin Numbers:	Black.
Fin & Tailplane Scallop:	Red.

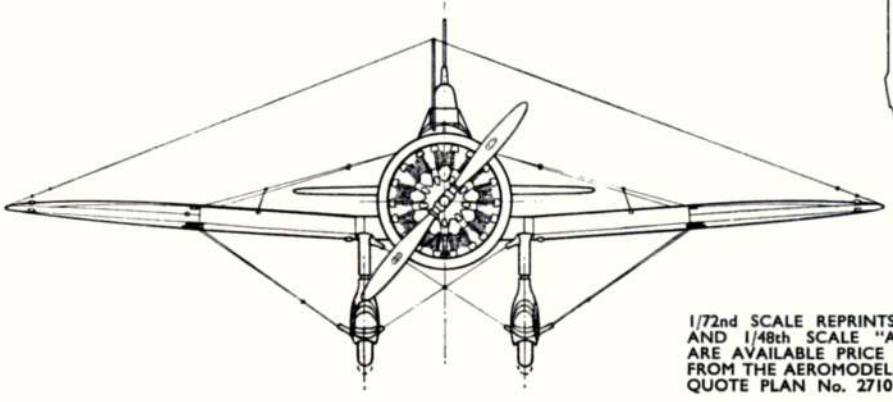








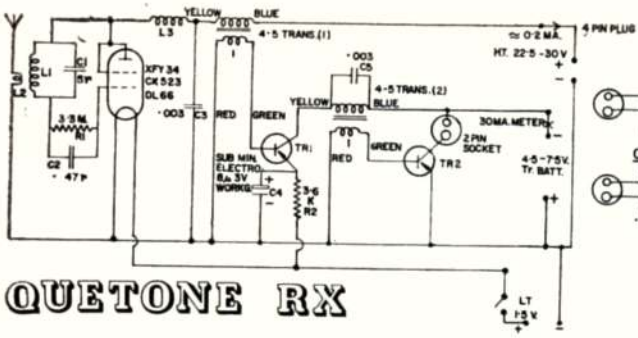
Fuselage Stripes:	White Outer: Red Inner: White 'V' Notch.
Thunderbird Insignia:	Black on White Circle.
Stars:	White on Blue Circle. Red Dot.
Rudder Hinge Stripe:	Blue.
Rudder:	Alternate Red & White Bars. (Red first.)



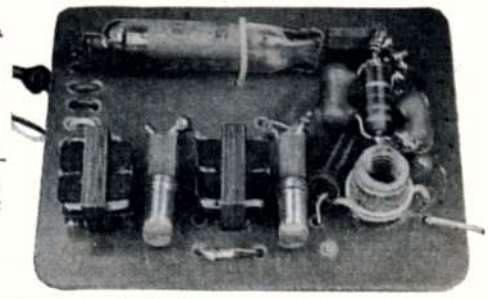
1/72nd SCALE REPRINTS OF THIS "J" TYPE PLAN AND 1/48th SCALE "A" TYPE DYE-LINE PRINTS ARE AVAILABLE PRICE 6d. AND 1s. RESPECTIVELY FROM THE AEROMODELLER PLANS SERVICE. PLEASE QUOTE PLAN No. 2710 WHEN ORDERING.

BOEING P-26A

FT



QUETONE RX



RADIO CONTROL

This month brings two gems for the home constructor

AT LAST WE ARE ABLE to reveal a tone circuit that has been in demand, and in Quetone we have the standard Bletchley Club circuit for single or multi operation.

David McQue also sends a relay-less version of Quetone which has been flown for the past season by John Soper. No originality is claimed and a valve is used as the Superregen detector as it still represents the most economic approach today.

Valve and transistors are fed from separate batteries. This reduces the drain on the valve H.T. battery (22·5 v.) to from 0·1 to 0·2 m/A at which current even the smallest batteries will last a season. The separate transistor supply is made up from a number of slim pen cells 4½ v. for relays of 300 ohm, and 7·5 v. for 1,000 ohm relays. When the tone is sent, TR2 acts as a virtual short circuit connecting the TR battery to the relay. Relay current is less than 0·1 m/A rising to 15 m/A with 300 ohm relay on 4·5 v. and 7½ m/A with 850 ohm relay on 7½ v. (capacitor across relay 5 mfd. for 1K, 25 mfd. for 300 ohm).

In the originals, the relay is mounted separately for flexibility as the Rx can also be used for driving a low resistance reed unit such as an E.D. rewound with 40 s.w.g. enamelled to give a D.C. resistance of 150 ohm and an impedance of 1 K/ohm when tuned with 0·5 mfd. Tuning of the Tx notes to the reed unit is best done with 3 v. supply and normal operation on 7·5 v. for most accurate tunings and reliability. Other reed units have been made using 100 ohm and 145 ohm bobbins off Siemens relays.

A modulated Tx is required and the carrier should be left on continuously, the relay being operated by any tone in the reed frequency range (300-600 c/s). With the Tx switched right off noise will produce a relay current of 1 or 2 m/A which disappears when the Tx is switched on and the Rx tuned in for *minimum* current without tone at progressively greater ranges. Phones can be plugged in place of the relay for this purpose of tuning for "quiet space".

Whilst any tone Tx will do, greater reliable range will be obtained with Xtal control, especially if a hand Tx is used.

The Rx can be made up on a paxolin panel and mounted in a balsa box. Layout is not critical except that leads to the valve and L1 should be short, L3 and L1 at right angles and neither too near the A.F. transformers.

TR1, TR2 can be any small audio transistors, for example, Newmarket V10/15A. If transistors with higher beta are used C3 and/or C5 may need increasing to ·005 to reduce standing current with Tx off.

COMPONENTS FOR QUETONE

L1.—19 turns 28 g. double silk-covered close-wound (reduce to 18 if core projects when on tune) on a ¼ in. Alladin dust cored former.
L2.—1 to 1½ turns of aerial flex over centre of L1.
L3.—2 amp neosid choke core close-wound full with 32 g. enamelled Transformer (1) and (2) Ardente T1079. Araldite leadout wires where they leave former to prevent accidental damage caused by leads twisting during wiring.
C1 and C2.—Miniature ceramics or silvered mica.
C3 and C5.—High K ceramics disc or tube.
C4.—8 or 10 mfd. 3 v. working subminiature electrolytic—watch polarity.

A kit of parts will be available from F. Rising including the base panel.

Since publication of tone circuits—in particular *Aerotone*—we have been requested to include a tone transmitter circuit and David McQue provides one of the simplest possible in the McQue Simpletone. It will fit in an Oxo tin and is therefore hand-held and mobile. and is Xtal controlled. This calls for further explanation and the following anticipates your queries.

Question.—Why use a Xtal controlled Tx?

Answer.—It is the *simplest* method of producing an accurately known stable radio frequency.

Reservation.—The Tx must, of course, be designed and constructed to obviate uncontrolled oscillation at other than the Xtal frequency and in cases where the output frequency desired is a multiple of the Xtal frequency the correct multiple or harmonic must be selected, *i.e.*, to produce an output frequency of 27 M/cs. a Xtal of this frequency or one of 13·5 M/cs. or 9 M/cs. may be used.

Question.—What are the advantages of a Tx with a stable output frequency?

Answer.—

(1) Whatever type of Rx is used it always responds best to the frequency to which it is tuned, *i.e.*, gives greatest range, and if Tx frequency drifts, range will be lost.

(2) There is a legal requirement to remain within a band of frequencies 26·96 M/cs. to 27·28 M/cs. which is 27·12 M/cs. ±0·6%.

NOTE.—Although (2) can be met by frequent checks with an accurate stable wavemeter such a device will cost more than a Xtal and then have to be calibrated against a more accurate source.

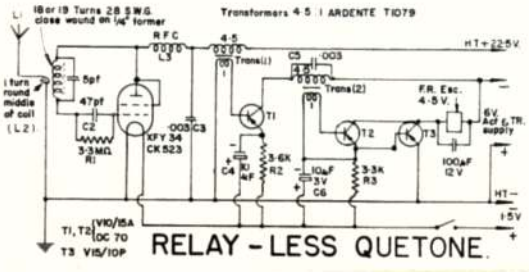
Simple absorption wavemeters, especially those using a lamp indicator, rarely have a long term accuracy better than 1%, if that. Their use is best restricted to monitoring and course frequency checking, *i.e.*, with a Tx using a 9 M/cs. Xtal, just to ensure that the output frequency is 27 M/cs., not 18 M/cs. or 36 M/cs.

Question.—What sort of Xtal do I want?

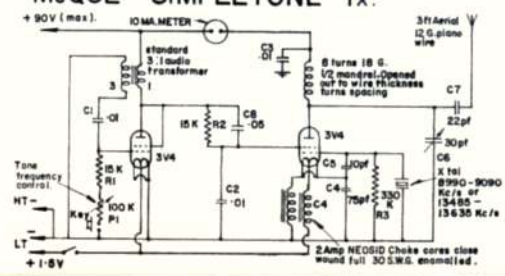
Answer.—The practical choice lies between the use of 9, 13·5, and 27 M/cs. Xtals. The latter are all overtone types, *i.e.*, have a natural frequency around 9 M/cs. and are operated on their first mechanical harmonic or overtone which is slightly less than 3x natural frequency. Circuits using these look very simple but can be tricky to set up and ensure that the oscillations are Xtal controlled. With the 9 or 13·5 M/cs. Xtals the Xtal oscillates on its fundamental and the third or second harmonic, electrically selected, is used. As with these the Xtal is isolated from the aerial circuit, they are easier to set up and 13·5 M/cs. is perhaps the best choice.

Question.—Has Xtal control any special tuning advantages?

Answer.—An advantage of the Xtal Tx is that Rx tuning can be carried out at short range by reducing Tx power output by one means or another—in the case of Simpletone Tx by removing the aerial. This can be done because unlike the ordinary Tx's, the output frequency is not affected by aerial loading. It saves the legwork and arm working process of distant field checking.

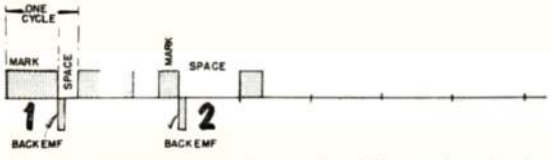


McQUE SIMPLETONE Tx.

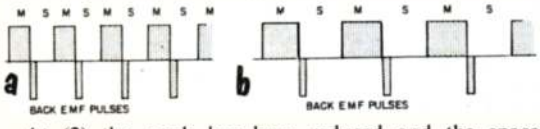


Sinclair dual proportional

THE MCENTEE SYSTEM operates by reason of the fact that a back voltage is set up whenever a circuit in which a voltage is applied to an inductance is broken. This system uses the back EMF of the 1st relay to charge a condenser via two diode rectifiers. This causes a build-up in the condenser and the transistor base circuit is controlled by the current flowing from the condenser. The amount of current flowing depends upon the frequency with which the pulses feed the condenser. As the current flowing in the collector circuit is controlled by that in the base circuit it follows that the current available to the second servo is dependent upon the frequency with which condenser in the base circuit is fed with pulses.



At (1) we have a complete cycle. The mark pulse is shown shaded and the space is blank. Underneath the line is the back EMF pulse which commences immediately the mark is stopped.

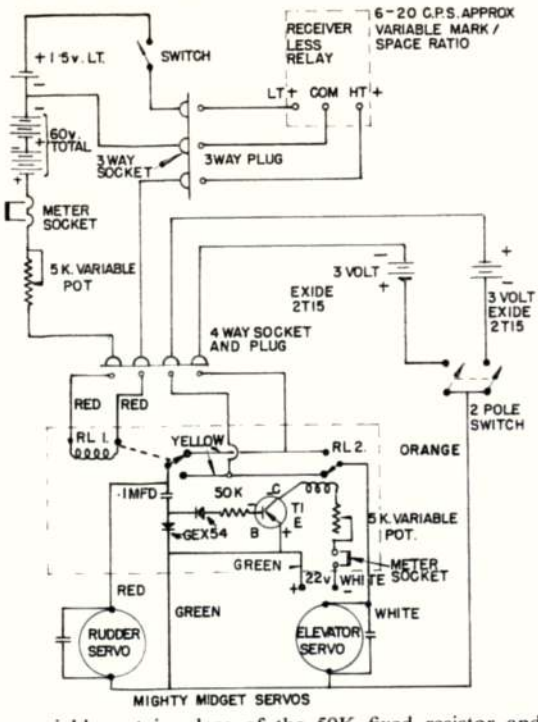


At (2) the mark has been reduced and the space increased. (*a*) and (*b*) show that the Back EMF remains the same width at all pulse rates but as they are closer together at high rates the relay is "on" for a greater proportion of the time, *e.g.*, pulse width 1/100 sec., at 6 pulses per sec. dwell time is 6/100 sec. or .06. At 50 cycles per sec. it is 50/100 or .5 sec. and so on.

The dual proportional unit was installed in a fast flying 60 in. span model; it has been found completely reliable and the degree of rudder and elevator control is quite remarkable, response being immediate in all flight attitudes. The receiver and relay unit has functioned so reliably that it has not been found necessary to fit any fail to safe units, though this could be achieved by fitting cut-outs in any of the extreme limit positions on the servos. A standard ECC951A receiver (which has been used in about 7 radio models over the past few years) was stripped of its relay. Two E.D. Polarised relays and the rest of the components shown within the lower dotted area are mounted on a small paxolin chassis 2½ x 2 in., layout of components not being critical. Operation is via transmitter pulse box, a Mighty Midget motor driving a set of contacts and made to give a variable Mark Space (Rudder Control) motor speed via a 20 Ohm resistor (elevator control).

As can be seen, the rudder servo responds to M/S ratio via relay 1, but when the contacts of relay 1 change over, the pulses are fed via the .1 mfd. condenser and 50K fixed resistor to form a time constant circuit. Thus each time the rudder relay changes over, a pulse of a definite time is fed into the coil of relay 2 (elevator relay) and thus another independent M/S ratio is formed. The diodes used to prevent the wrong polarity on the transistor are GEX 54, but any similar type would be suitable also the transistor used in an (OC 71) but any suitable type could be used. The best method of finding the correct time constant circuit is to substitute

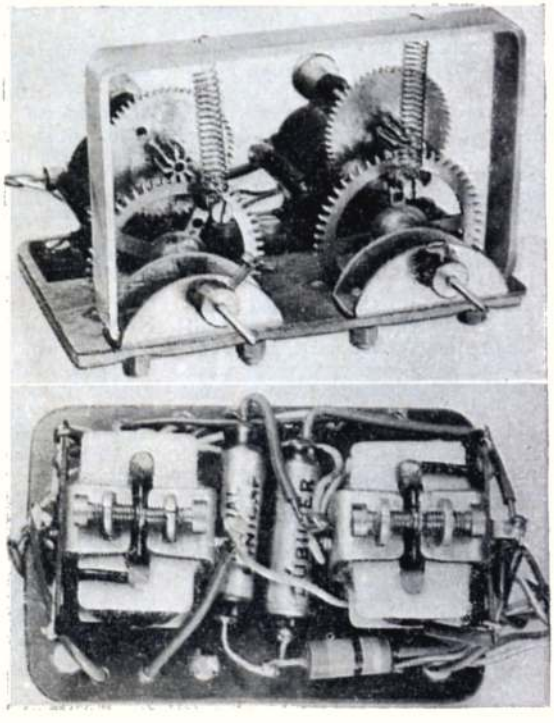
CIRCUIT: SINGLE CHANNEL DUAL PROPORTIONAL

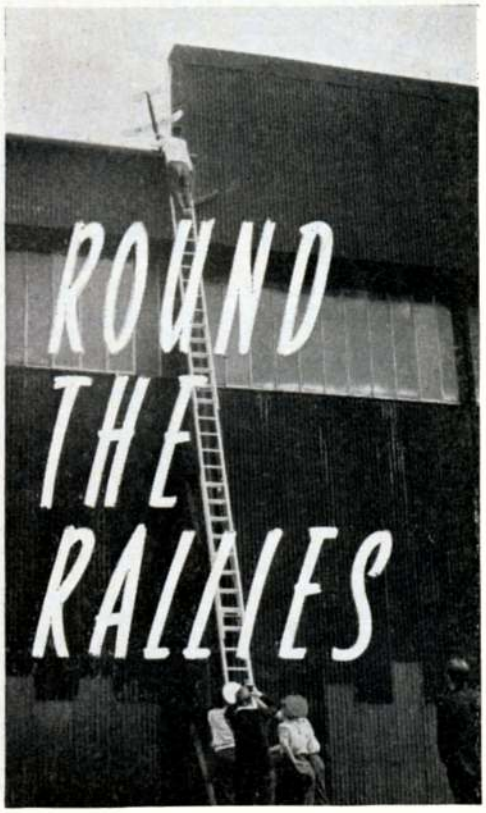


a variable pot in place of the 50K fixed resistor and adjusting until an acceptable value is obtained. This system has been developed by A. Sinclair of Renfrew and we believe it to be one of the most advanced of its type in the world.

NOTE.—Back EMF is the same width whatever the mark space proportion. Whatever the pulse rate the mark space is unaltered. With the higher rate the Back EMF pulses are closer together (*a*). The effect on the relay is to give a longer dwell time with higher pulse rate.

Photos show motor and relay units





NORTHERN HEIGHTS GALA RESULTS

Queen Elizabeth Cup (*Wakefield*)

1. G. J. Lefever ...	South Essex ...	501 points
2. G. Fuller	St. Albans ...	480 points
3. M. Dixon	Leamington ...	417 points

Flight Cup (*Open Rubber*)

1. D. Greaves ...	Leamington ...	360+395
2. N. P. Elliott ...	Men of Kent ...	360+363
3. E. Barnacle ...	Leamington ...	360+296

Fairey Cup (*Open Glider*)

1. J. H. Foxall ...	Northwick Park ...	360+145
2. J. Orde-Hume ...	Northampton ...	360+103
3. E. Wiggins ...	Leamington ...	360+ 99

Thurston Trophy (*Helicopter*)

1. E. J. Jukes	107 points
2. R. M. Dudley	82 points
3. F. G. Boreham	28 points

De Havilland Bowl (*Open Power*)

1. N. Lennox	Birmingham ...	360+189
2. M. Lovett	... ...	360+160
3. P. Dodd	Surbiton	360+124

R.A.F. Review Cup (*Radio Control, spot landing*)

1. P. E. Norman	19 ft.
2. D. Knights	48 ft.
3. J. Batchelor	55 ft.

Keil Cup (*Combat*)

1. K. Pratt	Northwood
2. M. Smith	High Wycombe

Concours D'Elegance

General Flying Models	—. Williamson ...	A/2 Glider
Power Models... ...	V. Spence ...	Westland Widgeon
Flying Scale	R. L. Aaron ...	Bleriot
Special Award ...	A. W. Evans ...	Sikorski 39B

AEROMODELLER Trophy *Gala Championship*

E. Barnacle ... Leamington ...

GODALMING C/L RALLY

Class "B" Team Race:

1. J. K. McNess ...	West Essex ...	7 : 46.5
2. Walker/Tuthill ...	Enfield	7 : 54.6
3. P. Drewell ...	LOMAC	11 : 5

F.A.I. Team Race:

1. Hartwell/Allen ...	Enfield	5 : 38.8
2. J. Williams ...	Ecurie Endevour ...	5 : 47.5
3. D. Tyler	Feltham Eagles ...	5 : 47.8

Combat:

1. J. Palmer	Wimbledon
2. D. Cherry	Wimbledon

Sunt:

1. Fisher	Coventry	448 points
2. R. Brown ...	Lee Bees	447 points
3. P. Thwaites ...	Lee Bees	405 points
4. J. Perry	Wimbledon ...	367 points

AT GODALMING on June 14th the local club entertained modellers from all part of the country including three team racers from Prestwick and a stunter from Cornwall. Very gratifying was the fact that there was a good entry in the stunt (13) which Mick Blundell dealt with most capably. Brown's *Coy Lady* receiving a narrow 1-point defeat as the result of not putting enough fuel in the tank!

Class B was very fast, both Pete Drewell and Walker-Tuthill doing the fastest heat times of 3 min. 29 sec.—an overall average of 86 m.p.h.! However the final was a bit slower and J. McNess pulled off first place, as is his habit this season. F.A.I. team racing was rather scruffy, as can be seen by picture 10, opposite. The character in front appears to be the only one not whipping—and tolerance of this bad habit (now unfortunately official) will lead to degeneration of the class. John Williams of Ecurie Endevour made the fastest heat time of 5 min. 6 sec. but again a slower final when the Enfield reliability won the day.

Combat entries had to be restricted to 48 and 3 in a circle in the first round due to the lack of staff and time. However, the clashes ran smoothly and were enjoyed by most, especially Wimbledon who had three models out of five entered in the semi-finals. Most impressive was perhaps the aggressive but calculated flying of the very young pilots of between 12 and 14.

This fine summer we are having in Britain guaranteed the continuation of NORTHERN HEIGHTS M.F.C.'s fabulous record for superb flying conditions at R.A.F. Halton on June 21st. "Winds light to variable" was the order of the day—much to the amusement of the public—and annoyance of competitors for the large black hangars seemed to trap occasional flocks of models whenever the wind direction shifted.

John O'Donnell proved an intrepid climber on the flexible alloy ladder used for recovery as can be seen in the photo above.

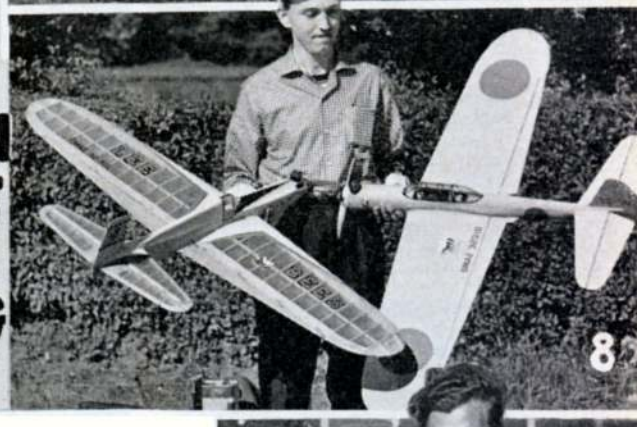
Any visitor to the Northern Heights Gala cannot fail to be impressed by the galaxy of models which fill the Buckinghamshire air. This time, rubber took precedence and with a handsome cash prize attached to victory in the Queen Elizabeth Cup, rivalry was keen though no fly-off was needed to decide Geoff Lefever's win—unlike the 'Open' events where the 6 o-clock rush to make a deciding flight, bore all the excitement of a race finish. Birmingham and Leamington fliers were well to the fore and Eric Barnacle's all-round efforts deservedly earned him the AEROMODELLER Trophy for Gala Championship.

But the greatest crowd draw of all the many sections in this annual Gala is undoubtedly Radio Control and this year what fine rewards the onlookers had when Percy Norman's R/C Delta took the air.

Besides this demonstration, 'P.E.' excelled himself by winning the spot landing event with 14-year-old *Ants Pants*, revived with a new wing and Frog 250 replacing the Ohlsson 23 which used to fly the 48 in. streamliner at Eaton Bray in 1946.

AT NORTHERN HEIGHTS & GODALMING

(1) Big heave at Northern Heights by Norman Elliott, 2nd in Open Rubber. (2) P. E. Norman and son with spot landing Ants Pants. (3) R. Lennox takes things easy with ice lolly after winning power. (4) Veron's Phil Smith with new kit design, the pusher Velox with tube fuselage boom. (5) Geoff Lefever looks pleased with the Queen Elizabeth Cup



(6) Novel tailless R/C by T. W. Waters of North Kent. (7) At Godalming, F.A.I. winners Allen and Hartwell with typical big canopy Enfield design. (8) R. Brown with Coy Lady and neat Jap dive bomber variation missed stunt win by 1 point to O. W. F. Fisher in 8, down from Coventry with a new Performance kit? (10) F.A.I. Race pilots demonstrate how whipping has marred the sport. Jostling and arm pulling do not contribute to good flying

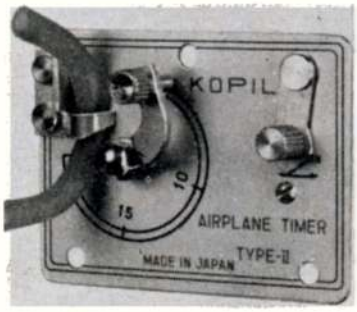
Mobile model shops have become an accepted side of trading in Germany. Our heading picture shows how they excel for slick efficiency and score with a wide range of goods on display for purchase by a ready-made market at any modelling rally. That little DKW van takes in the U-shaped collapsible trestle tables, covered display cases and as large a stock as can be found in many a permanent shop. In Britain this type of trading has a more limited market due to the widespread nature of our modelling organisation and the loss of hitherto popular centres of model flying; but there's still room for more than the few traders who support rallies. We are not suggesting that Gala days should become open markets, but the opportunity for casual visitors to clinch their awakened interest by taking home a kit is one which can only benefit the hobby in the long run.

News from the Plastics market. Surely the finest detailed and most cleverly designed plastic kits yet seen are the military series of missile launchers, tanks, atomic cannons, etc., etc., recently introduced by **Frog.** These are the first plastics we have yet seen that simply cannot be assembled in a few hours. Moreover, everything can be made to work and some wag in the U.S.A. has radio controlled a motorised tank made from the original U.S. moulds. Also outside the aero sphere, but still close to our interests, are the all-British Rosebud series of **Kitmaster** plastics. Latest is the Stirling 8 ft. single power wheel loco—a beautiful piece of moulding. **Airfix** have negotiated for sales in the U.S.A. via the General Hobbies Corporation and this will further enlarge their already vast market. The 4s. 6d. *Heron* kit in Jersey Airlines markings is another example of how this company beats down price while still including 'luxury' features, and the Heron boasts retracting undercarriage, moving controls, crew, passengers and flight steps. A smart display stand can also be bought for this one at the actual manufacturing price of 4s.; it can be ordered through your model shop if not in stock. Soon to come from Airfix is the *Fairey Rotodyne.*

New display packs in the adhesive lines are from Airfix and Britfix. At right is Japanese Kopil timer, has snap off action, is light, can be obtained in 20 and 30 secs. ranges.

From the **U.S.A.** the plastics trend is to more and more detail. **Revell's** *Sopwith Camel* to 1/36th, is a mate for the Fokker DR1 already on sale here, and incorporates the additional detail of longeron, bracing and control panel engravings on the *inside* of the fuselage. **Lindberg** have also started in the same internal detail for their *Hawker Hunter* and a new line just introduced by **Monogram** is the 1/12th scale Wright Cyclone 9 aero engine moulded in four colours so that painting is not necessary, every detail is faithfully represented and the size appears just right for many a scale model. We emphasize that these U.S.A. kits are not yet available in Britain.

In the adhesives line, **Airfix** have a bottled polystyrene cement that brushes smoothly, does not string and is a great aid to neatness. **Humber Oil Co.** introduce *Britfix 55 white*, a PVA glue in soft plastic squeeze bottle to retail at 1s. 9d. and the pack is neat enough to be taken for a ladies item for make-up, so don't leave a bottle on the dressing table in error! Incidentally, the Aeromodeller "test bench" has just completed its sixth model using PVA exclusively and we are quite enthused over it—but be warned, don't expect it to stand up to dampness.



The **Davies-Charlton** *Quickstart* springs have proved so popular that demand for the conversion kits to fit existing motors has exceeded all expectations. Three different types of Quickstart are available according to engine size and it is quite important to get the correct size for the best performance. Kits can be purchased through model shops but in cases of difficulty the factory at Hills Meadow, Douglas, Isle of Man, will help and offers a fitting service at 3s. 6d. which

includes post and packing, the charge for springs at shops being 2s. 6d. The new DC-049 glow motor now christened the *Bantam* is rapidly approaching the marketing stage and promises to be Britain's cheapest-ever engine. All we can say for the moment is that it will be based on the popular *Dart* crankcase, making it interchangeable and of small dimensions for its capacity.

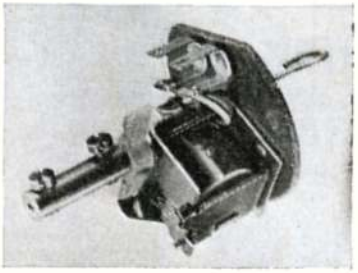
Stanley Tools, well known for their range of fine woodworking aids, have a little shaper in their catalogue that comes in very handy for roughing out blocks and thick sheet. Known as the

Stanley Jr. Shaper in action on a block of balsa. Is good for roughing out shapes, more useful on glass fibre and hardwood. Blades are replaceable, fit on red plastic handle.

Shaper Junior 492, selling at 7s. 6d., it has a red plastic handle and replaceable tempered steel blade (2s. 6d. each). Specially useful on glass fibre and home jobs, we found it helpful in shaping a large glider fuselage—see photo. This happens to be the **Graupner** *Trabant* R/C slope soaring or towline model, one of several kits made up from this German range in recent weeks and of which more anon. Lothar Piesk's famous *Atlas* F.A.I. power design for 1.5 cc. was another, and the *Dornier Do* 27 C/L scale model is in the course of testing. Vacuum formed plastics for cowls, etc., large transfers and excellent plans are really attractive features of Graupner kits, so popular on the Continent but unfortunately subjected to import restrictions as far as this country is concerned. This also applied to their latest *Mikrokombi* R/C receiver, a battery box, Rx and actuator all in one piece!

British kits on test have included the **Keilkraft** *Tiger Moth*

Apt choice of Boeing P-26 plastic kit to demonstrate how small TMY electric motors distributed by Ripmax can be used to drive the prop. Motors sell at 3/3. Below: the F. Rising lightweight escapement for rubber drive, with two pawls for self neutralising.

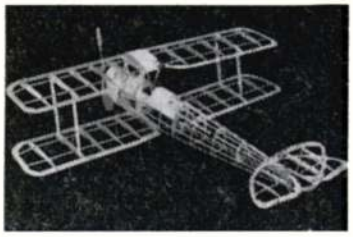


at 19s. 10d. and the 51 in. *Caprice* glider at 15s. 9d. We found a few points adrift on the Tiger and with characteristic K-K enthusiasm to get matters right, the offending short wire parts are being corrected. Small criticism this, for a good model, and high praise from us for a superb flier in the *Caprice*. Two minute flights have been regularly clocked these summer evenings off 164 ft. line, and in experienced hands the *Caprice* could be a contest threat. We recently judged a combat event and were agreeably surprised to see how quickly the K-K *Gazelle* had taken on. There's no need for us to emphasise the original derivation of this design as everyone will recognise the shape; but it certainly inherits the capabilities of its larger counterparts and with the kit including a made-up tank, it will be very popular at 19s. 10d. Tip for builders—cover with silk or double tissue and face the fuselage with 1/32 in. ply for a crash-proof model.

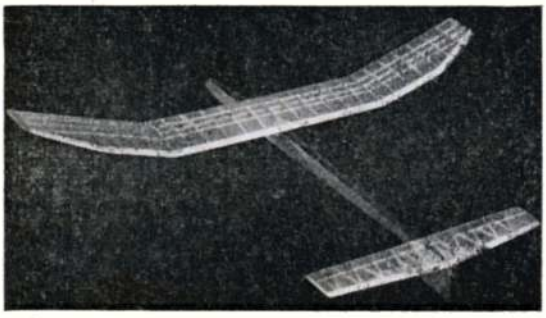
Elsewhere in this issue we have recorded the achievements of P. E. Norman's Ducted fan R/C model; but it should not be for-

gotten that, apart from the Frog 150 diesel, the only commercial accessory used was an **F. Rising** super lightweight escapement, as distributed by **Henry J. Nicholls Ltd.** This ¼-oz. weight-saver is small in stature, low on current drain, and played a great part in making this ducted delta a possibility. F. Rising escapements are well known for their very high standard of manufacture and the compact rubber-driven version forms an ideal replacement for rear fuselage mounted units on older models.

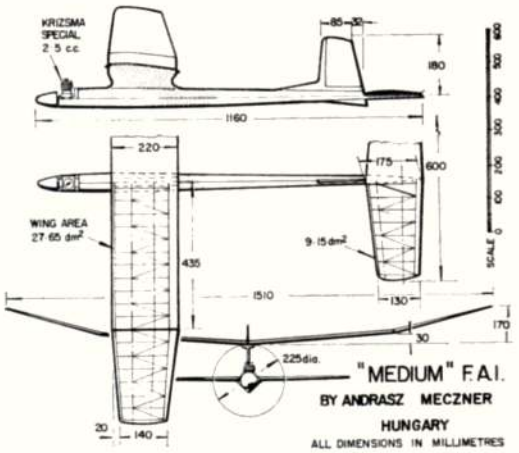
More gen. is now available on those new **Mercury** controline kits. The *Viper* is for 1—1.5 cc. and has been tested on a Fox 15 at remarkably high speed. The *Cobra* is for the 29 and 35 engines, and *Mamba* for the new range of .8 cc.'s. All are to the same pattern of profile fuselage constant thickness wing with tapered trailing edge, and are fully aerobatic. At the moment they are passing through the 'engineering' stage and long awaited kits for this type of controliner should be very popular.



Keilkraft kits, the Tiger Moth and Caprice glider. Functional lines of the latter make it easy to build — and performance is equal to many larger A/2 deisgns. Suitable for "Open" events, it is 51-in. span.

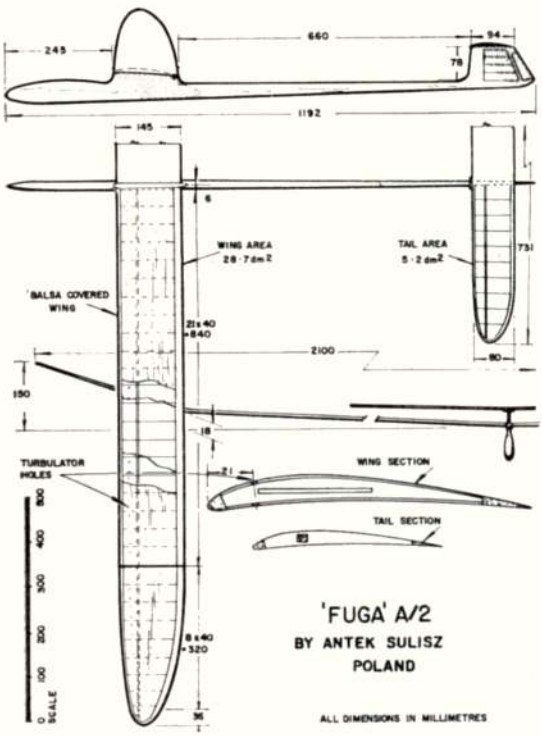


1959 M.M.S. SOVIET INTER-NATIONAL



Power model at top right, by Andrasz Meczner of Hungary, follows typical long nose moment lines of Budapest Institute designs, with diamond fuselage section, and a new type diesel which impressed for its power. Model scored 4 maximums in rough conditions.

As host country, Poland was responsible for attractive multi-colour poster in heading. Representing the country in A/2 glider was Antek Sulisz, details of his model are given below. Note the all-sheet covered wing surfaces and use of turbulator holes. Model placed third in the contest, also appears at left in photograph on opposite page. "Fuga" is typical of refined model glider design in Eastern States, with slender fuselage, high aspect ratio, and in this case, tail above the fin.



THE SEVENTH international free flight championships for "peoples' Democracies" in Eastern Countries was held on May 28th - June 6th at the Leszno gliding centre in Poland. Seven countries sent representatives and the most notable absentee was the U.S.S.R. itself, the stock excuse of "training for other events" being offered. As in previous meetings, only one representative flew in each class for each country, so the load of responsibility rests very heavily on the single individual.

Hungary was a natural favourite and in A/2 which opened the contest Roser secured the lead after the fourth round, with his lowest flight duration of 2 : 33. He was the most consistent of the entrants and as will be seen in the results tables, thermals and accompanying downdraughts seriously affected durations.

Wakefield produced a surprise victory for East Germany, the winner himself was said to be agreeably surprised, and this was due in the main to the light wind and turbulent atmospheric conditions. Cizek was obliged to fall back on a reserve model for his last flight and so lost what was expected to be a victory for Czechoslovakia.

That country came to the fore in F.A.I. power held in bad weather, strong winds, occasional rain and overcast. Hajek was the only one to make perfect score, flying the familiar "Rocket" design which we have seen at Cranfield, and which has gained him International fame Most interesting in this event was the performance of the new Hungarian Moki diesel which was said to be every bit as good as the Czechoslovakian Institute M.V.V.S. Ginalski from Poland had a Russian engine similar to the M.V.V.S. and was the only rival to the two leaders.

Whereas China was represented last year, the North Korean contingent was the only Asian country at this year's events and although not exactly highly placed, they impressed by their enthusiasm to learn and improve their flying standards.

A/2

N. Roser ...	Hungary ...	180	164	153	180	180	857
V. Horyna ...	Czechoslovakia ...	79	180	180	180	180	799
A. Sulisz ...	Poland	180	178	180	117	132	787
D. Ducklauss ...	East Germany ...	180	180	141	46	180	727
A. Vlaicev ...	Bulgaria	170	49	83	180	180	662
M. Vuletic ...	Yugoslavia ...	156	180	79	55	180	650
Pek-You-Tchun	Korea	180	180	100	88	55	603

Wakefield

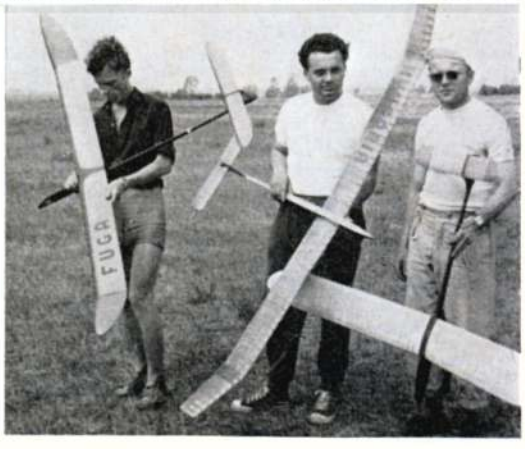
K. H. Fischer ...	East Germany ...	180	180	180	179	109	828
R. Cizek ...	Czechoslovakia ...	180	180	161	180	113	814
A. Kossowski ...	Poland	180	112	180	180	159	811
G. Kriszma ...	Hungary ...	180	140	155	111	180	766
K. Raskov ...	Bulgaria	75	111	180	119	180	665
An-San-Hek ...	Korea	138	62	150	140	110	600
M. Tomkovic ...	Yugoslavia ...	109	0	170	180	84	543

F.A.I. Power

V. Hajek ...	Czechoslovakia ...	180	180	180	180	180	900
A. Metzner ...	Hungary ...	180	180	105	180	180	825
K. Ginalsky ...	Poland	180	166	106	129	180	761
S. Tinev ...	Bulgaria	180	169	150	86	104	689
W. Korber ...	East Germany ...	74	86	101	97	180	538
A. Stepanovic	Yugoslavia ...	30	46	180	117	85	458
Pak-Col-Tiu ...	Korea	0	0	0	0	0	0

Team Placings	*A/2*	*Wake*	*Power*	*Total*
1. Czechoslovakia	799 ...	814 ...	900 ...	2513
2. Hungary	857 ...	766 ...	825 ...	2448
3. Poland	787 ...	811 ...	761 ...	2359
4. East Germany	727 ...	828 ...	538 ...	2093
5. Bulgaria	622 ...	665 ...	689 ...	2016
6. Yugoslavia	650 ...	543 ...	458 ...	1651
7. Korea	603 ...	600 ...	0 ...	1203

Above: Metzner shows off the new Hungarian diesel. Right: Burly K. Fischer of East Germany with winning Wakefield. Below: Pak-Col-Tiu from N. Korea, crashed in test flight. Below right: Sulisz, Roser (Winner) and Horyna with A/2's.



FOR YOUR DIARY

August 23rd
South Midland Gala, all classes at College of Aeronautics, Cranfield.

August 30th
I.R.C.M.S. R/C contests, single and multi classes, R.A.F. Wellesbourne, Mountford, pre-entry to 56 Lime Avenue, Leamington Spa.

September 13th
Croydon Gala, F/F Rubber, Glider, Power, Chuck and Slope Glider, Chobham Common.

September 13th
Leicester M.A.C. C/L Rally, Stunt and Combat only, Stapleford Park, Melton Mowbray, 10 a.m. start Combat, 12 noon start Stunt.

October 4th
South Coast Gala, R.A.F. Tangmere, Nr. Chichester. Full programme of free flight events being arranged. Enquiries should be sent to 28 Milton Road, Dunton Green, Sevenoaks, Kent (S.A.E. please).

S.M.A.E CONTESTS

August 23rd
Scottish Gala. R.N.A.S. Abbotsinch. United Kingdom Challenge Match. K.L.M. Trophy, C.M.A. Trophy, Glider, Taplin Trophy, Team Racing, U/R Power, U/R Rubber, U/R Glider, Radio Control, Classes "A" and "B".

September 6th
Northern Gala. Linton-on-Ouse or Rufforth. Hamley Trophy, Caton Trophy, Glider, AEROMODELLER Trophy, Pan American Trophy, Team Racing, U/R Power, U/R Rubber, U/R Glider, Radio Control, PAA-Load American Class, "1A", "A" and "B".

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Two modified E.D. 2·46s, Amco P.B. 3·5, uncovered KR56, A/2 sailplane, AEROMODELLERS December, 1957-June, 1959, *Model Aircraft* October, 1957-June, 1959, 1¼ pints full strength clear dope. Offers. 123 Bulverhythe Road, St. Leonards-on-Sea, Sussex.

E.D. Transistrol, £5. M. Parrott, 3 Wyness Avenue, Little Brickhill, Bletchley, Bucks.

Keil Kraft Junior 60 with 2½ wheels, £2 5s.; E.D. Baby ·46 c.c., 35s.; Frog Hornet control line kit, 15s.; Keil Kraft Pacer, 15s.; Allen Mercury 1·5 engine with prop, £2. S. Mulholland, 11 Woodstock Road, Greenock, Renfrewshire.

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More selling out. Two Oliver Tigers Mark II, one with full rework, £5 10s., one standard, £3 10s.; one Cox 2·5 Olympic (the latest), £8 10s. Hall, 133 Westward Road, Chingford, London, E.4.

Elfin 249PB, 42s. 6d.; Frog 180 minus needle valve, 27s. 6d.; Super Merlin minus tank, 37s. 6d.; books, plans, kits, etc., send for list, only S.A.E.s answered. B. Wallsworth, 83 Foxhill Road, Peel Green, Lancs.

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Selling out. ETA 29 Mk. IV, two Frog 500s, Veco 19, A.M.35, D.C.350, Amco 3·5 P.B., A.M.25 (glow), Elfin 1·8 BB, Frog 100, E.D. Bee. Offers. S.A.E. please. Fred Peet, 20 Granville Avenue, Maghull, Liverpool.

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(Continued on page 392

27 M/cs. Crystals, 4th Harmonic, brand new miniature 2-pin, 12s. 6d, Thorpe, 1 Beattie Park Central, Dunmurry, Belfast, N. Ireland.

Taifun Hurrikan, bench run only, 65s.; A.M.10 without cylinder liner and jet assembly, useful spare parts, 10s.; 38 *Model Aircraft*, February 1956-March 1959, 28s. S.A.E. only please. P. Ball, 13 Greywell Avenue, Aldermoor, Southampton.

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1/72nd scale W.W. I aircraft (detailed—no Airfix); 1:1200 scale Admiralty ship identification models; 1:1250 scale Viking (German) metal model merchant ships and warships; 1:1200 scale model liners by Bassett-Lowke; Admiralty ship identification manuals, any country or period; *Jane's* Naval War Game, complete *circa*. 1914; *Jane's* Fighting Ships, 1898 or 1920 only; *Janes* Aircraft 1910 or 1918 only; aircraft identification manuals, W.W. I only, any country. Good prices paid—write and describe. Don Schroth, 321 N. Monroe Street, Hinsdale, Illinois, U.S.A.

Single-channel radio control transmitter receiver escapement working order. R. Seymour, New Pond Cottage, Warren, Crowborough, Sussex.

Amco 3·5 BB crankcase or scrap motor with good crankcase. Percival, 56 Bellamy Drive, Stanmore, Middlesex.

Urgently wanted, Fenners-Pike Servo units. State price and condition. John Jeffrey, 79 Beaconsfield Place, Aberdeen.

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MODEL AVIA—the monthly magazine for model flying in Belgium. Send for free specimen copy and subscription details. Model Avia, 67 Avenue Victor Emmanuel III, Uccle, Belgium.

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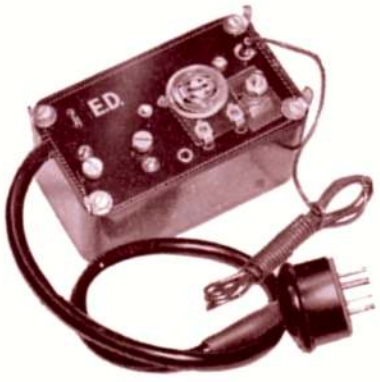

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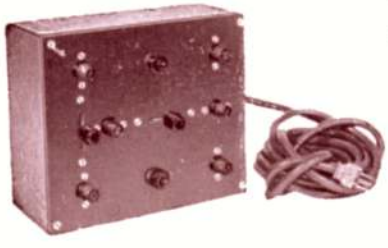

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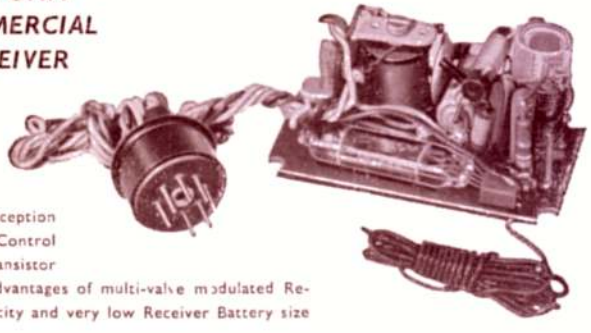

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