

# AERO Christmas 1959 MODELLER

64



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**FURY PLAN**

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# AERO MODELLER

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**A**EROMODELLER ANNUAL this year contains over 60 PLANS from all over the world, dimensioned or scaled so that they can be built from the book, or serve as wonderful inspiration for o/ds. Cover is by artist Laurie Bagley and depicts the Fairey Rotodyne (reproduced in colour within as frontispiece). Articles include Design Charts — 8 principal types analysed for you — Stress Problems in Models, Twin Cylinder Engines by Ron Moulton, Do-it-Yourself Printed Circuits for Radio Control, Know How on Engine Materials, Rigging Models for Flight, Indoor and Small Space Radio Control Flying by Ken Willard, Plotting Taper Wings, Streamlining, plus, of course, Engine Analysis digest, Contest Results, and a host of new surprises.

160 pages size 8½ x 5½ ins., bound in linson cloth with gold blocked spine, three colour dust jacket, with a wealth of drawings, diagrams, plans, pictures and articles all brand new to British readers. (Post free direct from the publishers, price 11/6.)

# ANNUAL 1959-60

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**10/6**



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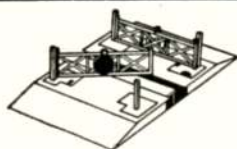


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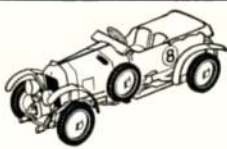
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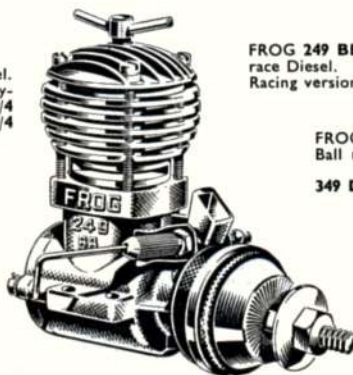
TRADE MARK

## DIESEL AND GLOW PLUG MOTORS

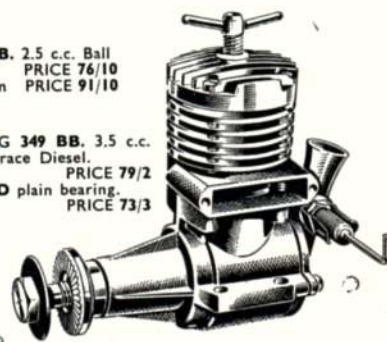
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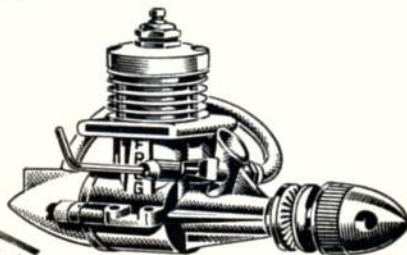


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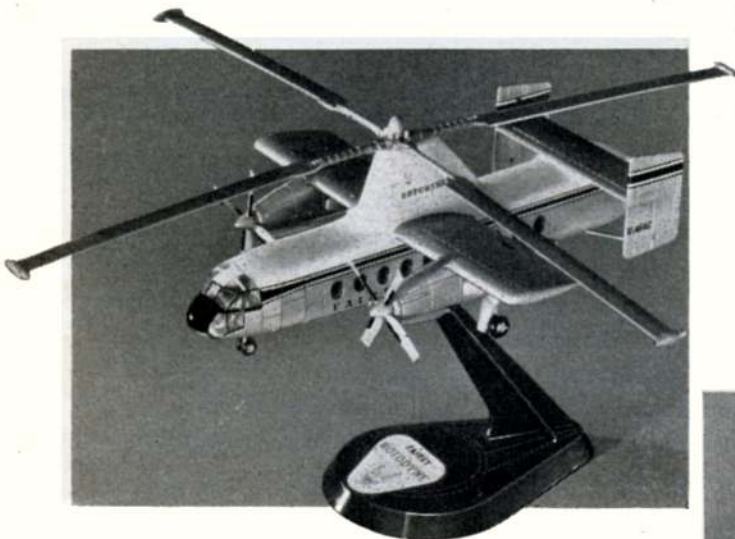
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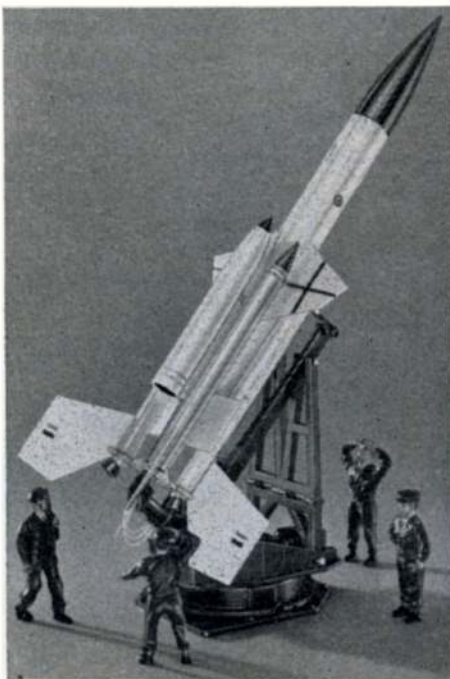
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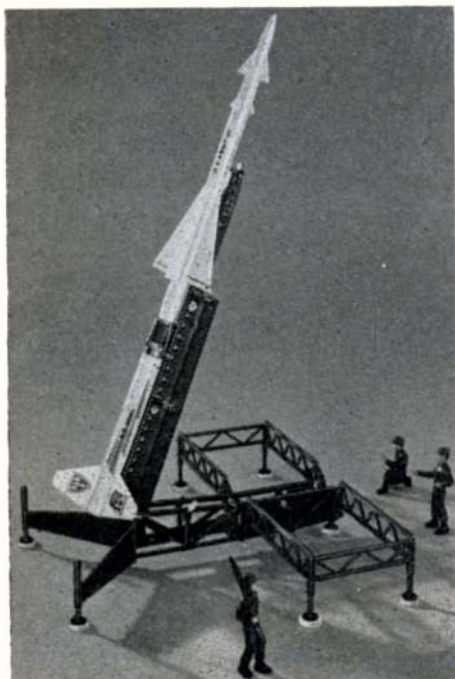


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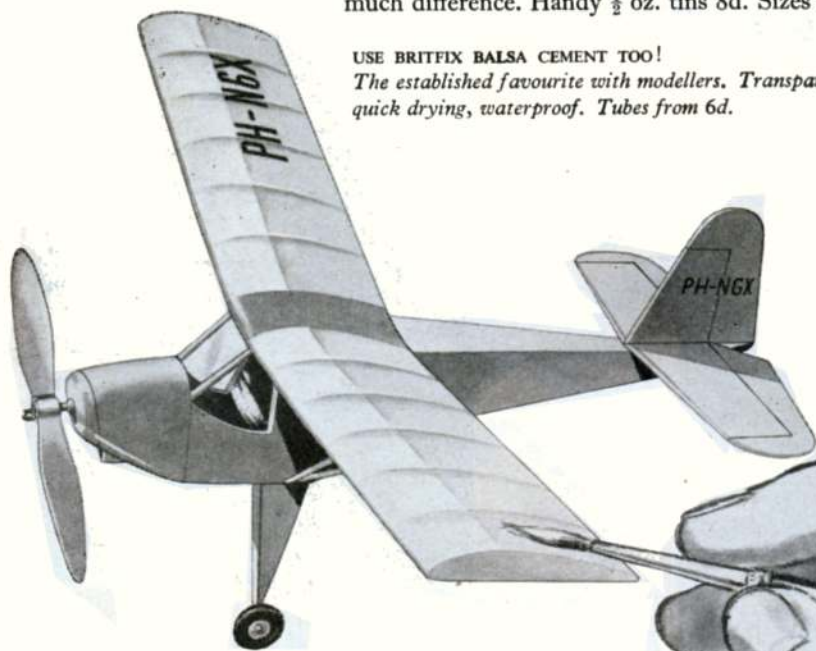
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"One other thing I must do in this letter is to wish all our aeromodelling friends a Happy Christmas and a Prosperous New Year, for Christmas it will be when this issue of the Journal is published."

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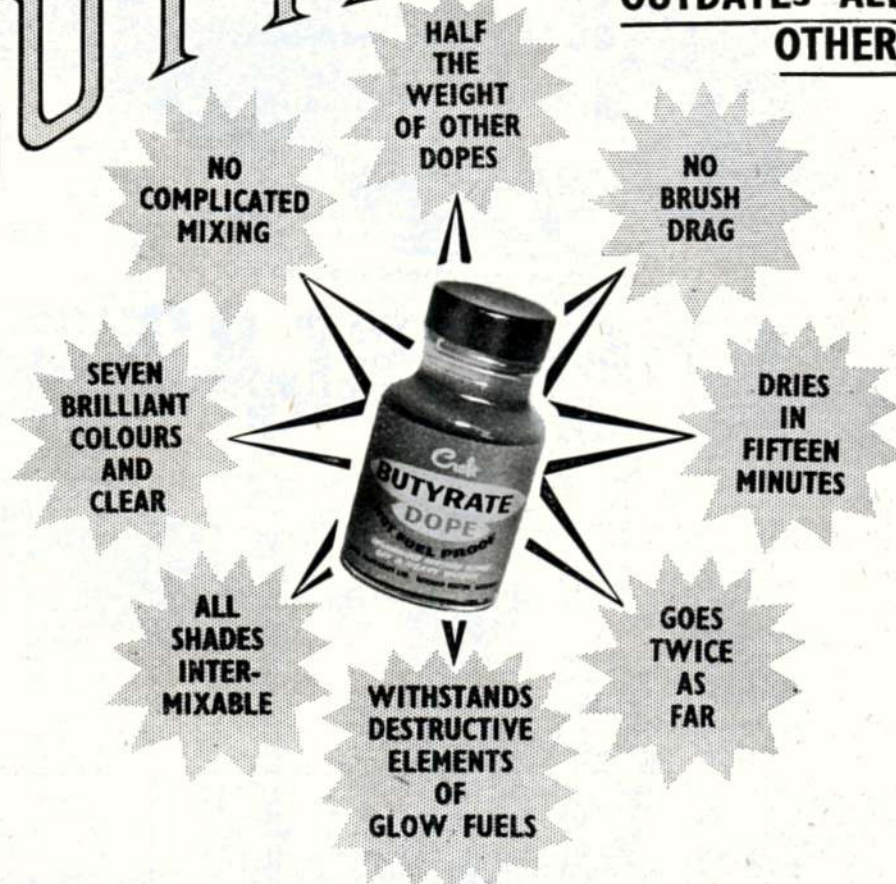


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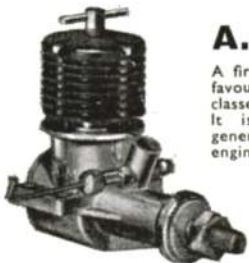



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 <p>19" SPAN  <b>AERONCA SEDAN</b>                  Beautifully coloured in maroon and American civil registration, this is a grand model for building — and flying, too. Could take a baby glo motor. <b>5/10</b></p>	 <p>15" SPAN  <b>GLOS. GLADIATOR</b>                  Exclusive pre-fab for easy assembly of rounded decking, cowling, etc. <b>6/9</b></p>	 <p>15" SPAN  <b>TIGER MOTH</b>                  World famous trainer, finished in yellow colour scheme with British civil registration. An authentic scale model. <b>6/9</b></p>	 <p>15" SPAN  <b>HAWKER FURY</b>                  Famous R.A.F. biplane in R.A.F. markings and squadron insignia. Detailed ribs, panel lines, etc., and easy assembly. <b>6/9</b></p>
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**QUICKBUILD KITS FEATURE**

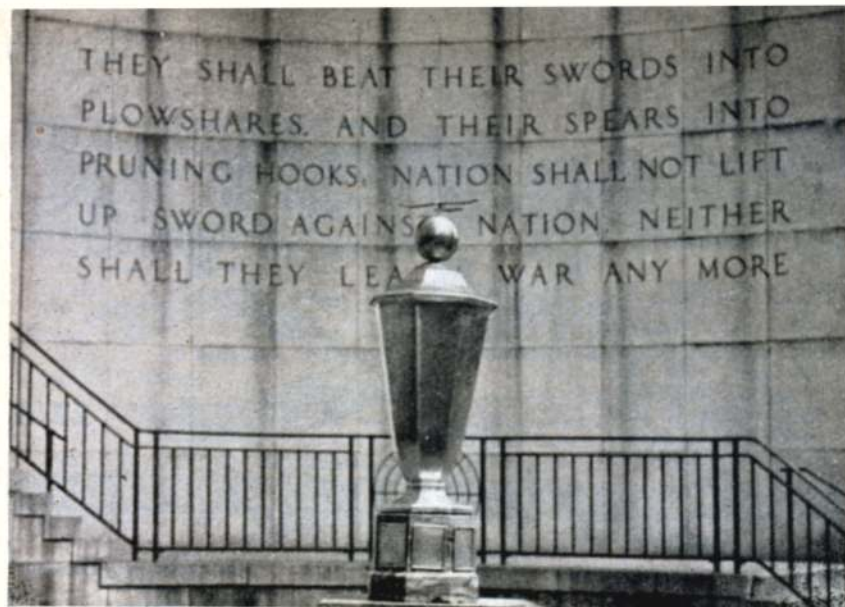
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## Aeromodelling fellowship

"PEACE ON EARTH and good will to all men" is the time-honoured and so well-worn expression we hear often as the year closes and we celebrate those memorable days of family reunion and festivity at Christmas.

In this year of 1959 we have, perhaps, moved nearer to making this phrase a reality for all time. Nations are coming closer together in their search for a solution to the strife and trouble that besets the political world.

Yet, for we aeromodellers, there never has been a division of feeling between nations, for such we are, so engrossed in our enthusiasm for the chosen hobby, that the only barrier in our international movement has been that of language. Even this is surmounted by many Slav and Latin modellers of our acquaintance who have taught themselves the English language, albeit limited to certain channels, by monthly scrutiny of this magazine. We are one happy family, and on the flying field our common interests have made a mockery of political antagonism.

In this past season, aeromodelling fellowship has been markedly evident at the World Championships and other international radio and control-line contests. Exchange of ideas has spread to interchange of Wakefield models betwixt leading United States and U.S.S.R. modellers, radio control circuits and servo designs have been openly discussed, airfoils and A/2 glider techniques freely made available to those who chose to enquire about supposed "secrets". When a British modeller found his C/L handle did not conform to latest F.A.I. regulations, a Belgian competitor made it his duty to locate a new handle, and borrowed one from a Spaniard. Such is this international camaraderie which makes our grand hobby all the more pleasant to enjoy.

Because we at AEROMODELLER believe that such interchange of ideas and designs from different countries is essential to our well-being, we are particularly pleased on this occasion to feature as our Christmas edition heading photograph, the subject of the Swedish Glider Cup, won this year by Gerry Ritz of the U.S.A., posed before the fitting inscription on the walls of United Nations building in New York. We are indebted to our friend Bill Winter, Editor of *Model Airplane News*, for this perfect example of international exchange (even Editors do it!) and trust that all will read into it a message for the coming year, to which we add MERRY CHRISTMAS and a prosperous thermalful season for all modellers, wherever you may be, from the Editor and Staff.

### Council v. Control-line (1)

The Cambridge County Council have agreed that their Commons Committee should have second thoughts before they ban members of the Cambridge Model Aircraft Club from flying powered models on local recreation grounds.

First news the club had about the proposed ban was a paragraph in the local paper the *Cambridge Daily News*, explaining that the Commons Committee were to instruct the Town Clerk to prepare a bye-law for authorisation by the Home Office prohibiting flying powered models.

Alderman Capt. A. C. Taylor, who is the club's President and the paper's Managing Director, as well as being one of the senior Aldermen of the Council, promised he would do all he could to persuade the Council to "think again" before taking the initial steps that would have resulted in the ban.

At the October meeting of the Cambridge City Council Alderman George Nobbs, the Chairman of the Commons Committee, commented: "We should like to take this suggestion back in order that we can have some more information from the Town Clerk."

After the meeting Alderman Nobbs said he was under the impression that control line models were not under proper control when they landed! No doubt after Alderman Taylor's efforts the club will get a chance to prove to the "City Fathers" that there is nothing "dangerous" in aeromodelling.

### Control-line v. Council (2)

Another Council which has instituted the bye-law restricting flying of models on commons and recreation grounds is that at Esher in Surrey. Under the terms of the bye-law the council is obliged to allocate an area for model flying, but apparently the particular site offered by the Esher Council is totally unsuitable. Although at the moment no club actually exists in Esher there are a large number of free-lance flyers in the district and it is on their behalf that Mr. E. G. Cotton has been conducting a most vigorous campaign to provide local modellers with proper track facilities. After several meetings with the council representatives and the surveyor, the investigation into the costs of a suitable track resulted in the figure of £360 being quoted to the Council. This was for a circle in concrete 4 inches thick!

Naturally, this quotation is being contested by Mr. Cotton, for quite obviously someone has misunderstood the requirements, since all that is really needed is a thin covering of asphalt over a smooth surface. The *Esher News* has published Mr. Cotton's views and we are sure that many of the Esher citizens will support him in his campaign. Should the Esher Council accept his proposal for a much less imposing track it would bring this community to the fore in Great Britain and would initiate a provision for youth which other districts should emulate. This country is far behind others in this respect. Reference to the photographs of the Etterbeek circles on page 606 will illustrate our point. Modellers in Brussels provided the labour; military and civic facilities were made available to provide the material. The result in Brussels is an ideal ground to which can be attributed Belgian ascendancy in controline competitions.

### Improper behaviour

How mean can one get? Lowest trick of many we have heard of in our long experience of contest reporting is that which happened on October 25th at Chobham on the occasion of the Blackheath Gala. John O'Donnell had made his usual long distance trip south from Manchester to compete in the Bill White Memorial Trophy and was doing quite well up to the stage when he discovered his model downwind after a long flight

minus the complete propeller assembly. It would have required an experienced aeromodeller to have removed the assembly without damaging the fuselage and there was no possibility of the unit falling off accidentally. The onus, therefore, will be laid upon one of his fellow competitors or friends (?) present at Chobham on that day. Should the offender's conscience smite him sufficiently for him to want to return the unit we will gladly act as a clearing house and see that John gets his propeller back. If, however, we hear nothing and can eventually confirm suspicions, the culprit can rest assured that he will receive maximum publicity and be given full penalty for such a despicable act.

Results of the Bill White were:

1. E. Barnacle	...	Leamington	...	9 : 00 + 4 : 15
2. A. Payne	...	Stevenage	...	9 : 00 + 2 : 43
3. E. Thorpe	...	Derby	...	9 : 00 + 2 : 15
<b>Power</b>				
1. L. Larimore	...	Portsmouth	...	9 : 00 + 4 : 00
<b>Glider</b>				
1. M. Desvaux	...	Croydon...		6 : + 58 secs.

### Cross Country flight

For several weeks Charles Dance and Wally Skeels have been working on their 6-ft. free-lance design powered by a McCoy 29 and fitted with a pressurised long-range tank. First successful cross-country mission was completed during the afternoon of October 20th when the model flew 10½ miles taking off from Dartford Heath at 3.35 p.m. and arriving twenty minutes later at 3.55 p.m. over Gravesend Airport. The model landed ten minutes later within 20 ft. of the Ford Consul chase car from which Wally had been keying single-channel signals to the compound escapement in the plane. The transmitter was lashed to the roof rack with a rubber cushion for insulation and in spite of having to wait for traffic lights and main road junctions, and cope with the traffic on the A 2 road, the model was kept in sight quite comfortably. Down elevator trim was not altogether successful and some ten spiral dives were made to kill the height which at times was at an estimated 1,400 ft.

These Kentish Nomads clubmates made their own equipment and have spent a lot of time developing the 16-oz. fuel tank which is pressurised from the engine crankcase. Their next aim is a flight from Dartford to Detling, which they hope will constitute a world record.



## Chris Olsen on Multi-Channel Radio Control



THIS ARTICLE WAS written specifically about multi-channel stunt aircraft with respect to contest flying, but many of the points will apply to radio flying in general. The subject of radio controlled model aircraft may be approached under three headings:

(1) The Radio; (2) The Airframe; (3) Flying the model.

### The Radio

Radio weight should be kept to a minimum but not at the expense of using small batteries, particularly for the actuators. Nickel cadmium cells are an essential if you are an active flier as they repay the initial outlay very quickly and provide a very flat discharge curve. This is particularly useful as it means that the control surfaces move at a constant speed and do not slow up as the batteries run down.

Most 8-channel radio equipment seems to weigh between 1½-2¼ lbs. and this seems a reasonable payload for a 5½-6½ lb. aircraft. Physical size is not very important as the aircraft can be designed or modified to accommodate.

Layout of the radio equipment in the aircraft should be as simple and neat as possible, all wires should be soldered wherever possible and as few plugs and sockets used as possible, as they can be a cause of intermittent operation. The receiver mounting is very important, particularly in view of the engine vibration, foam rubber not plastic should be used as a shock absorber. It is not necessary to wrap the whole receiver with rubber, just four ¾ in. cubes on the receiver base, a piece of rubber in front of the receiver and four pieces, two on each side, to support it in the aircraft.

Transmitters are a matter of personal choice, particularly regarding whether they are hand held or placed on the ground and what method they have to operate the controls. The preference is for a hand-held transmitter with four two-way switches, two on each side, rudder and aileron on the left side and engine and elevator on the right, these are operated by the respective thumbs and this is considered to be the most satisfactory method. The only other important points about the transmitter is that it must be quite stable, both in the R.F. stages and the tone circuits, in fact this stability is the most important consideration when choosing or designing a transmitter.

To delve into the radio side a little deeper, tuned reeds at the moment seem to be the most simple and reliable method of obtaining multi controls, as tuned filters and proportional systems are still in the development stage, and a few words about tuned reeds ought not go amiss. As far as the receiver goes, one valve and two or three transistors in a super-regenerative circuit seems to be in almost universal use, all transistor circuits except superhets, are not quite as reliable as all transistors tend to be temperature sensitive and R.F. transistors are particularly difficult to stabilise. Reed units are the most abused part of the set and once correctly adjusted should not need to be touched unless damaged in a crash. Relays are also very important and usually not enough

trouble is taken over their adjustment, they should be adjusted to pull in on about half the current that is normally used to operate them and the contacts should be regularly checked for pitting and dirt. The few ounces extra involved by using reliable relays is always worth while. Actuators for reed control should be capable of providing at least 2 lbs pull on the control surfaces and should be fast moving on rudder and ailerons and somewhat slower for elevator and engine, once again weight is less important than reliability. The motor brushes should be checked as often as possible for wear and if they are made of shim, also for fatigue.

### The Airframe

As in other aspects of aeromodelling there is a great deal of argument about the aerodynamics of stunt models, what most people do not realise however, is that many models can be made to perform the necessary manoeuvres by what are sometimes quite simple modifications, and the advantages of the various configurations, wing sections, moment arms, etc., only become really important when optimum performance is required. To the average modeller these advantages are not so noticeable as is at first thought, since flying ability can often overcome many disadvantages in a particular airframe.

The most suitable model for competition work is a compromise between a number of factors. It must be capable of doing all the necessary manoeuvres easily and smoothly and yet be stable enough that it is not too difficult to fly as even experts like to have some peace of mind when flying. The model must have a normal flying speed that is high enough to penetrate into the strong winds normally encountered in competitions in this country, yet it must not be so fast that the judges have difficulty in determining what it is doing. The size of the model should be such that it can carry all the necessary equipment and a bit to spare and yet is not too awkward to transport or too costly to build and repair. Large models also tend to break more easily, due to airframe inertia. A light wing loading is desirable so that manoeuvres are smooth and airframe stresses during manoeuvres are kept to a minimum. A model which is simple and cheap to build is an advantage as the airframe mortality is high in this type of model. The least important aspect of model design is whether it looks "nice", no points are awarded for this and anyway it is a matter of opinion. Functional models have a certain charm of their own.

From a structural point of view models should be as light as possible, consistent with enough strength to withstand minor prangs. It is impossible to make an airframe that will withstand a vertical dive under power which seems to be the other type of crash encountered. Working on the assumption that if the airframe gives first, the engine and radio suffer less and it is easier and cheaper to provide a new airframe.

The motor is an important part of the model, it should be capable of providing a high rate of climb, pull any



model through the most complicated manoeuvres without slowing or missing a beat and at the same time be capable of being throttled down to a consistent tickover. The most satisfactory power plant at present available is the glow motor. Large diesel motors are more difficult to adjust and do not speed up in the air to the extent as to glow motors, although the slow running characteristics are in many cases rather better than glow. This speed-up is characteristic, particularly useful in outside loops, as the model peaks up a lot of revs on the bottom of the manoeuvre which help haul it back over the top more smoothly; diesels tend to slow up in the latter part of this manoeuvre and the manoeuvre does not look so clean.

Finally, most radio modellers make their models from kits and published designs, the reason that many do not fly properly is because they are not made as per plan; if you make someone else's model, at least give him some credit for knowing more about his own model than you do and make it as per plan first. Particularly in respect to weight, power, rigging angles and C.G. position, before applying your own modifications.

### Flying

Now we come to what is probably the most important part and also the most difficult to write about as it is a case of quick reflexes and experience more than anything else which make a good pilot and these can only be acquired by doing a lot of flying.

Assuming that you have a model which you wish to fly in competitions and assuming the radio is reliable and you are capable of flying it, the first essential is to trim the model properly. This is a point which does not seem to be considered by many flyers, but if the model is properly trimmed it will do many manoeuvres almost by itself without constant correction.

If a model is trimmed properly it is capable of flying upright and inverted, straight and level hands off, and outside and inside loops are obtained by merely applying the appropriate control and holding until the manoeuvre is completed. This sort of trim is very difficult to achieve; in fact with some models it is never achieved and on most models it needs 20 or 30 flights to do so.

Here are step-by-step instructions on how to trim a model:

(1) Trim the model itself with rudder or aileron to fly straight on the glide and use side thrust to trim straight under power.

(2) Set the elevator at neutral so that the model glides properly and adjust downthrust to give a shallow climb on this elevator setting. When you have had some experience the elevator and downthrust should be adjusted to give straight and level flight under full power.

(3) Next, inverted flight should be attempted and straight inverted achieved by adjustment of rudder and ailerons, it will probably be necessary to adopt a compromise here in order to get one perfect and the other by

slight corrections of lateral control. *Uproar* is trimmed to fly inverted hands off by use of a floating neutral on the elevator so that up neutral gives straight and level (upright) and down neutral straight and level (inverted) this takes some experience to get the hang of it and, of course, if the radio fails the controls do not completely centralise, but it does make for smoother inverted flying than constant pulsing of down elevator to achieve the same result.

(4) The elevator limits should now be adjusted to give outside and inside loops of equal diameter, if these are not true to the vertical it may be necessary to make other lateral trim changes, either sidethrust, rudder or aileron, or perhaps a combination of all three. Remember all adjustments have effects on each other and rudder and sidethrust work in the opposite manner when inverted.

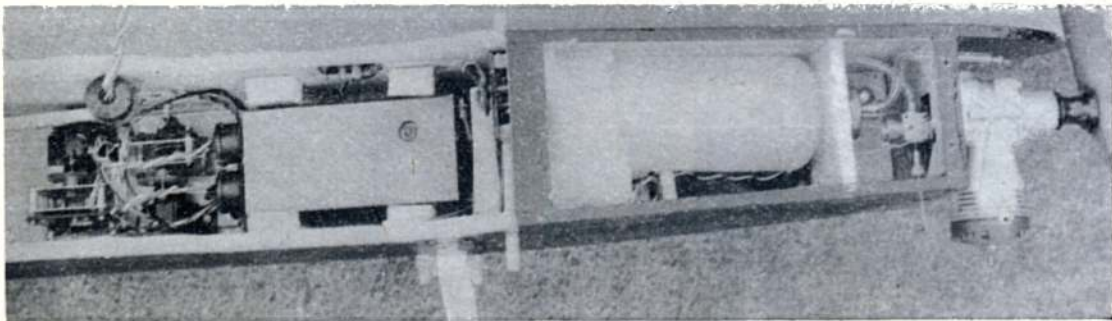
(5) Spins can be achieved in most models by applying up elevator and one or other of the rudders simultaneously. If the model does not spin then increase the up until it does, this will mean that to get smooth loops it will be necessary to pulse up elevator.

(6) Lastly, adjust the aileron limits to give equal rate of roll in each direction and the rudder limits to give a smooth turn and quick response on the glide.

When flying in competitions there are a number of things to watch which can be classed under "Gamesmanship". You must realise that the judges cannot mark what they cannot see, so tell the judges what you are going to do, then do it immediately where they can see it easily without having to strain their eyes, get a crick in the neck or be blinded by the sun. Make sure you know the schedule that is being used and have someone with you with a copy of it who can remind you if you go wrong, as this is not the judges job. Do the manoeuvres in the order on the score sheet if possible as it makes the judges job easier and the easier they find their job the more marks they are inclined to give. Do all the manoeuvres upwind and downwind and do not do manoeuvres in the vertical plane-end on, as they are very difficult to judge in this position. One further point, although the judgment is on the way each manoeuvre is executed, some judges are influenced by the smoothness of flying in between manoeuvres so make all turns and positioning manoeuvres as smooth as possible.

To end, consider this thought as one well-known American modeller once said "There is no substitute for altitude". So when over-confidence sets in and you start flying lower and lower remember this, as you can have no idea how much damage a bicycle frame will do to a model!

*Equipment layout on "Uproar". From left to right: elevator and rudder servos; plug for aileron servo; receiver; motor servo; polythene fuel bottle; fuel filter; throttle for ETA Mk. VI.*





## ROUND THE RALLIES



WITH AN ENTRY slightly below last year's R.A.F. U.K. Championships at Debdon on September 26th-27th provided two days of keen flying under mixed conditions — second day only being ideal flying weather. Quality was the usual high standard expected of these specialists — and some interesting scale prototypes, in particular, S.A.C. Brown's Hawker Hector were flown. Growing interest in R/C was noted and flying by Judge Rex Franklin after the event much appreciated. A hangar proved ideal venue for the team racing heats. Organisation and entertainment was first class as ever, and officials must be congratulated on a happy "all ranks" occasion.

Cambridge M.A.C. staged a successful Slope Soaring Rally at Ivinghoe Beacon on October 4th, George Upson (Northwick Park) winning the R/C event with two 10 min. maxs; followed by R. Godden (Cambridge M.A.C.) 1 max, and country member W. L. Manuel with 5 : 01. Star of show was undoubtedly his dog — a pooch apparently specially bred to be an aeromodeller's hound! Free flight event went to D. Edwards (St. Albans) 5 : 17; 2nd W. Cleghorn (St. Albans); and 3rd Burrows (St. Albans). Knowledge of the venue paid dividends to St. Albans boys, as results prove. Many entrants found wind too strong for them and refrained from entering, but, by and large, everyone had a grand time which is what rallies are for!



Left centre: S. A/JC Mackie with his Messerschmitt and Cpl. Godfrey with his Pembroke, entrants in R.A.F. C/L event. Bottom left: Clive King (Cambridge M.A.C.) with his old slope soarer, seen on right-hand page (upper centre) in flight. Bottom centre: Dick Godden with his 2nd place R/C slope soarer of 84-in. span, 9-in. chord and 5½-lb. weight. Bottom right: S A/JC Carter of R.A.F. Marham with Dixielander and scaled-down ditto for Jetex power



## RESULTS OF R.A.F. U.K. CHAMPIONSHIPS held at R.A.F. Debden, 26-27 September

### Concours D'Elegance

*Class A* (solid scale models)

1. J/T. Miller—Coastal.

*Class B* (flying models (F/F)).

1. Cpl. Johnson—Flying

Training.

*Class C* (C/L models).

1. S.A.C. Brown—Maintenance.

*Best Concours model—A/M*

*Trophy.*

S.A.C. Brown—Maintenance.

*Best Flying scale—R.A.F. ST.*

*ATHAN Trophy.*

Cpl Johnson—Flying Training.

### Free Flight

*Glider A 2.*

1. Sgt. Rees—Fighter.

*Open.*

1. Fg. Off. Gots—Fighter.

*Rubber (Open).*

1. C Tech. Rowe—Maintenance.

*R.A.F.M.A.A. Thurston Trophy*

(Wakefield).

1. D. Greaves—Leamington

*Open Power.*

1. F/Lt. Andrew—Flying

Training.

*F.A.I. Power.*

1. Sgt. Emery—Bomber.

*C/L Aerobatic.*

1. F/Lt. Hawkins—Fighter,

*C/L Speed (Class 1).*

1. S.A.C. Lambert—Fighter.

*Open JETEX—Wilmot Mansour*

*Trophy.*

1. Cpl. Johnston—Flying

Training.

1. *Team Racing (1/4).*

J/T Prosser—Bomber.

*Team Racing (A).*

J/T Bell—Bomber.

R/C "Malta Cup".

1. F/Lt. Andrew—Flying

Training.

*Combat.*

1. A/A Phinn—Tech. Training.

*Inter Command Challenge Shield*

—Fighter Command.

*Victor Ludorum—F/Lt. Andrew*

(Flying Training).

*Wooden Spoon—Signals*

Command.

*A/A and Boy entrants—*

A/A Phinn.



*Across the top: Manuel and his dog — let the dog speak: "Let's go flying!" "See! I can loop with no wings!" "And I can fly inverted!" "I'm not in this one — but down the slope recovering for master." Bottom left: S.A/C Brown's lovely Hawker Hector R.A.F. winner — test flying damage has been repaired. Bottom right: S.A/C Rosman (Bomber Command) gets the last few turns on his Wakefield. Lower centre: Derek Knight (St. Albans) with "Walter Lindrum Special" fast glider made from a billiard cue (fuselage) and decorated with the snooker "balls" on wing. Definitely a lethal weapon*





# United NAT'S

THREE NIGHTS, three long nights of measurement, calculation and evaluation were endured by the handful of expert judges from the Aviation Historical Society. So meticulous were they that scale points were subtracted on models that were finished more glossy than the original aircraft. One comment overheard was "It would take the whole U.S. Navy two years to get a polish like that."

No accurate three views meant no fidelity to scale points. When Garry Korpi heard this he went to North American Aviation Co. and spent six hours there while the engineers hunted down accurate prints of his F-86F Sabre jet.

Granger Williams was the first man to make an official attempt on free flight scale day. He had trouble with ground looping but finally got a perfect flight away and flew his eight-year-old D.H.4 to fourth place. One of the neatest free flight models was the Art Chester "Jeep" built by Dan Lutz, Hawthorne, California. The model flew fast and earned him a hand in realistic performance as well as second place in open scale. Locating cockpit interior information was Dan's roughest job. He finally contacted people who saw the real craft in 1936 and went according to their memories. (Pity our drawing of last month was not available to him!—Ed.)

High points in free flight fidelity to scale judging went to the Curtiss Robin built by Bill Kreck, Van Nuys, California. This fabulous model had a very ingenious two-speed engine control which works off a fuse timer. High speed for take-off then throttles back to flying r.p.m. The unit was custom built by Bob Holland, maker of those hot Hornet engines. Unfortunately, Bill did not get in his qualifying flight of 40 seconds.

Tying for second place in scale points (only one point below Kreck's Robin) were Bob Bolling, Lakewood, California, and your author. The detail in Bolling's D.H. Gipsy Moth was about the finest of any seen to date in a free flight model. The wings folded, controls worked from cockpit and the speed indicator on the wing strut actually functioned. Model had four Cox .049 cylinder heads for the dummy engine but was underpowered and crashed after a perfect take-off, and Bolling did not get his flying points.

The man of the day was Walter Mooney, San Diego, California, flying his Bleriot IV. He had a bit of trouble getting his plane off at first, but after truing up his rear wheel it got off very realistically. Walt said he used coffee as a stain on Woolworth scarves for covering to achieve the desired colour on his model. Also he had the misfortune to have a friendly dog step through the wing and stab at an earlier contest. Walt won first place in the open event by a narrow margin.

1. R/C Cosmic wind by Harold de Bolt, Fox 25, 4 1/2 lbs., Bramco 8-channel; 2. Nationals scale model director, Russ Barrera, holding Norman Deitchman's FJF SE-5a; 3. C/L Grumman Avenger by Bill Curry, span 40 in., area 260 sq. in., Torpedo 35, 2nd place in Senior; 4. C/L, North American T-28 by Jim Morgan, wing span 30 in., area 165 sq. in., Torpedo 29; 5. C/L Spad 13 by Rolf Norstog, 4th place in open Atwood .60 ign. Span 39 in., wing area 575 sq. in., fabulous details; 6. C/L Macchi Castoldi 72 by Les McBrayer, span 32 in., area 184 sq. in., Torpedo .15; 7. C/L Sopwith Baby by Anthony Palethorpe, Jr., Span 26 in., area 260 sq. in., Torpedo .09; 8. FJF Curtiss Robin by Bill Kreck, span 40 in., Holland Hornet .049, 2-Speed control worked off fuse.



# States

SCALE PORTRAITS  
by  
Norman Deitchman

Doug Mann, Tulsa, Oklahoma, age 10, won the junior-senior free flight event with his S.E.5. This talented youth put up more consistent flights during the day than a number of experts. The little model had a pendulum rudder.

In control line scale the modeller can safely branch out to multi engines and build up to heavy wing loadings. Their choice of models is unlimited and the entries showed it.

Rolf Norstog's Spad XIII had about everything the full size had including drab finish. It was powered by an Attwood Champion (ignition) and placed fourth in the open event.

Elbert Rutan, Dinuba, California, had a bit of a tussle trying to get his 476 sq. in. Fairchild F-27 into the air. On his first attempt the model did about 12 laps on the ground before getting off, then hitting hard he lost the tyres on the wheels. However, on his second attempt the model got off in quick time. The flight proved good enough to win him first place in the senior event.

The B-29 built by Ed Childress, Castro Valley, California, was expertly flown. Ed, no newcomer to multi engine craft, built his plane from Boeing factory plans. Turrets rotated and bomb bays opened and closed in flight, to place second.

The man to beat in the open event was first place winner William Ogden, East St. Louis, Illinois, who entered a terrifically-detailed Focke-Wulf 190-A5. This model had span of 46 inches approximately 391 sq. inches wing area. Wing lights worked and it dropped bombs in flight.

Wayne Zinn, Evansville, Indiana, talented modeller of 14, built and flew his expertly-finished Lockheed P2V-7 Neptune to third place in the Junior event. The model was high gloss black and was built as well as many of the open class contenders.

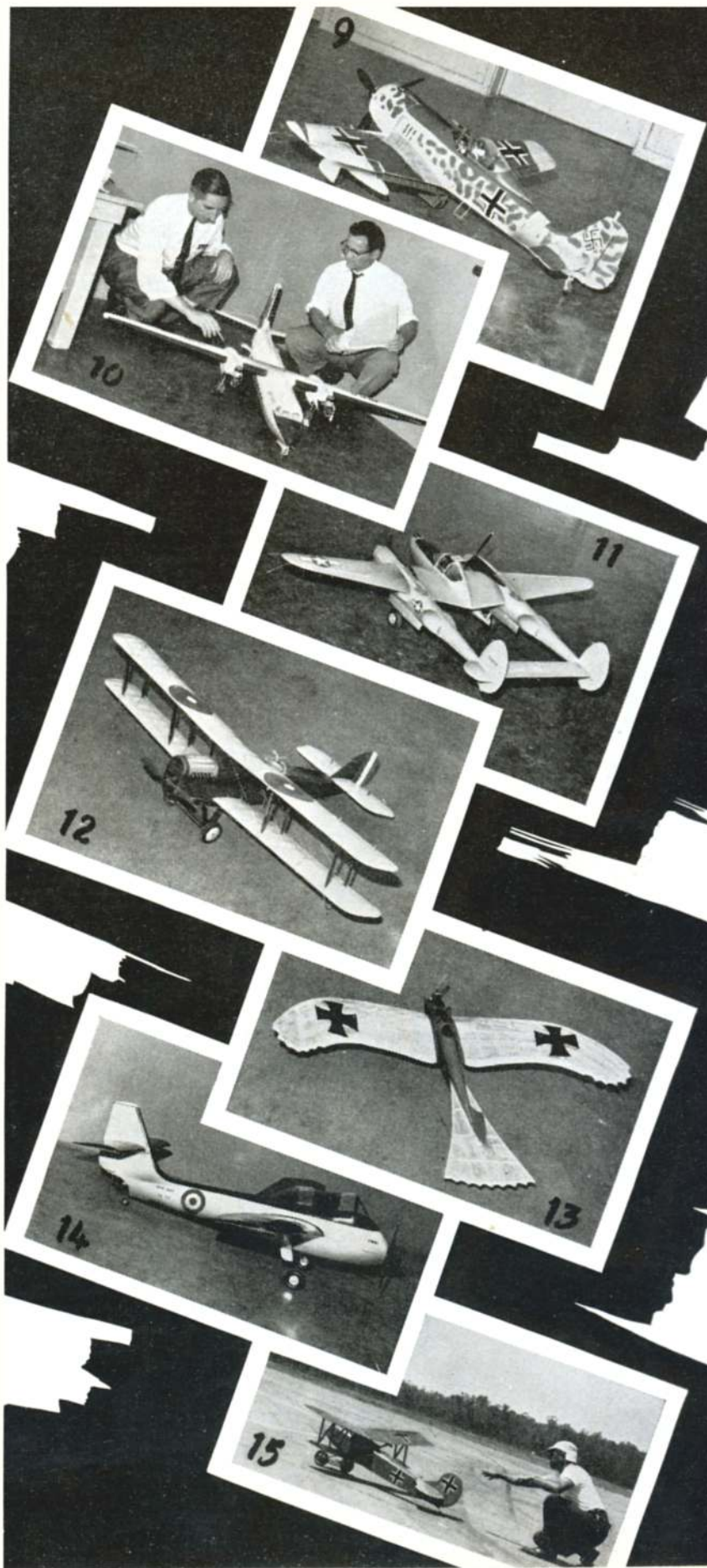
R/C scale has probably made the greatest step forward this year. Practically all the models entered flew officially and flew well. Quite an improvement over all past nationals.

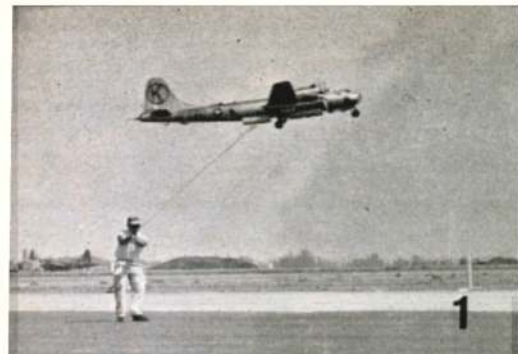
Radio control scale has no age division and the event was won by 16-year-old Robert Schultz, Los Angeles, California. His F-51 Mustang weighing 10 lb. and having a 72-inch span made an impressive flight. Powered by a Fox .59 and using an Orbit 8 receiver, this model had working flaps, aileron, rudder, elevator, two-speed engine control and steerable tail wheel.

The judges at the flying site require that all contestants demonstrate the working "Extras" on their models before and after each flight, must function perfectly before points are awarded.

(Continued on page 580)

9. C/L Focke-Wulf 190-A5 by Bill Ogden. Span 46 in., area 391 sq. in. Fox .59. Has working lights and drops bombs. First place winner in open; 10. Thankless job of judging is being done by Ken Hamilton and Gene Salvay, engineers at North American Aviation Co. They are only part of the judging team, shown judging Elbert Rutan's Fairchild F-27. They deserve a big hand; 11. C/L Lockheed P-38 Lightning by Don Yearout. Span 51 1/2 in., area 395 sq. in., 2 torpedo .35. A beautiful job; 12. F/F D.H.4 by Grange Williams, span 42 1/2 in., area 467.5 sq. in. Torpedo .09. Placed fourth; 13. F/F Rampler Taube by 14-year-old Bill Karr. Span 33 in., area 198 sq. in. Spitfire .045; 14. R/C Short Seamus by Claude McCullough. Span 62 in., area 725 sq. in. Veco .35. Mechanical pulser, Citizenship radio; 15. R/C Fokker D-7 by Alejandro Elizondo of Mexico City. Span 72 in., area 1,300 sq. in. Fox .59, weight 9 1/2 lbs. Orbit.

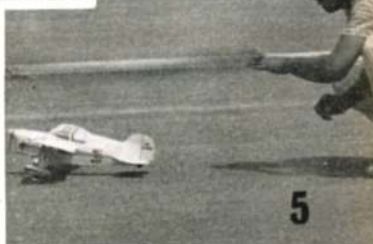




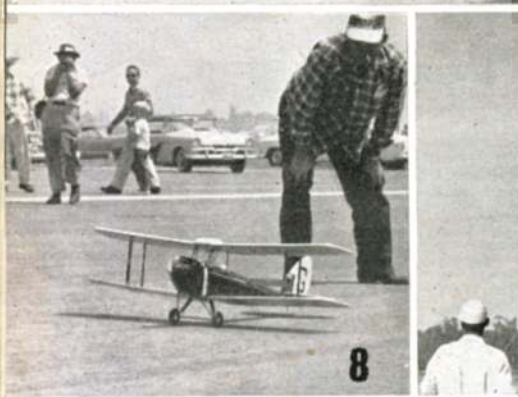
## United States NAT'S (cont.)

Dick Riggs, Seattle, Washington, PT-19a made the highest fidelity to scale points in R/C. During his flight he, too, lost his engine and had to come in dead stick, costing him valuable points.

Second place went to Reynold Van Dyke, Paramount, California, who flew his 620 sq. in. Luscombe Sedan. When Reynold completed his flight, which was done in expert form, he told your reporter that he had to sit down and get over shaking!



1. C/JL Boeing B-29 by Ed. Childress, span 7 ft., area 546 sq. in., 4 Torpedo .29's. This 2nd place winner of the open event has rotating turrets and bomb bays operate in flight; 2. C/JL Fairchild F-27 by Elbert Rutan, span 68 in., area 476 sq. in. 2 Torpedo .35 R/C, all white with green trim, off to his winning 1st place flight in Senior; 3. C/JL F-86-F by Garry Korpi, span 40 in., area 340 sq. in. Dyna jet engine. Place 4th in senior; 4. F/F Art Chester "Jeep" by Dan C. Lutz, span 27 in., area 130 sq. in. Skyfury .049. Flew fast and realistically. Seen launching in 5; 6. C/JL Macchi Castoldi 72, by Les McBrayer, wing span 32 in., area 184 sq. in. Torpedo .15, colour red, has moulded plastic pontoons, Granger Williams launching for McBrayer; 7. F/F Bleriot 4, by Walter Mooney, span 27 in., area 150 sq. in. Allbon Merlin 0.76 c.c. diesel. Walt took first place after a bad start; 8. F/F Gipsy Moth, by Bob Bolling, Skyfury .074. Workable controls from cockpit and folding wings; 9. R/C Fairchild PT-19A by Dick Riggs, span 6 ft., area 824 sq. in. Torpedo .45. Citizenship 8-channel, beautiful finish and excellent flying. Placed third; 10. R/C F-51 Robert Schultz, age 16, span 72 in., area 900 sq. in. Fox .59, weight 10 lbs. Orbit 8. Bonner servos, working wing flaps, ailerons, rudder, elevator. 1st place winner in R/C; 11. C/JL Grumman "Gulfs hawk" by Cedric Gallo-way, wing span 41 in., area 307 sq. in. Torpedo .35. Excellent workmanship, shock absorbing landing gear; 12. C/JL Art Chester "Goon", by Bob Black. Span 26 in., area 143 sq. in. Torpedo .29R; 13. F/F Stinson 049, by Delbert Swartz. Placed third.

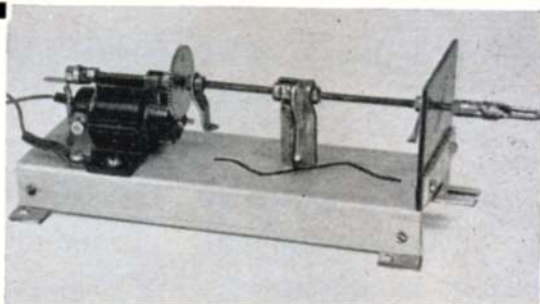


# Pye Proportional Servo

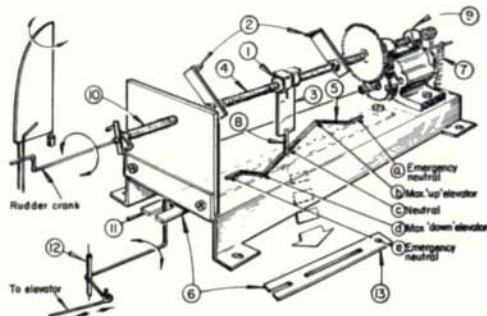
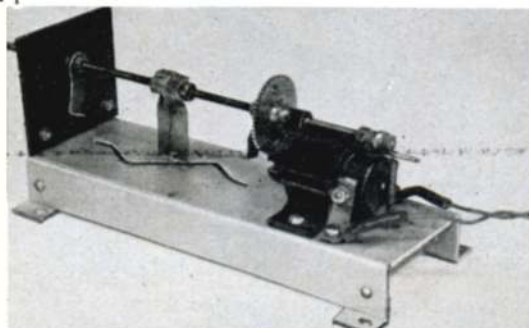
with elevator trim & fail safe features

Pages 602/3 review the commercial units — this feature tells you how to "do-it-yourself" for pulse operation

By . . . . . I. L. Pye



Pictures show standard-g geared Mighty Midget motor driving a typical "worm and nut" motion. Introduction of the serpentine cam track, however, provides a novel twist to this well-tried system



THE OPERATION OF the actuator is best described by reference to the diagrammatic sketch.

The actuator is intended to give proportional rudder, via the output shaft (10) and trimmable elevator via the output lever (11). These functions, in themselves conform more or less to standard practice. The new facility which this actuator provides is that in the event of either the receiver relay sticking "ON" or "OFF" (out of range) the actuator drives itself to neutral and safe positions of both rudder and elevator.

A brief description follows.

The servo consists of a Mighty Midget motor driving a "worm and nut" via the standard gear reduction, (9). The "worm" (4) is coupled direct to the rudder. The "nut" (1) carries a spindle (8) which runs through a cam shaped slot in the base (5). On the nut and spindle is a "catch-plate" (3).

The "spindle" (8) after passing through the cam slot (5) engages with a straight slot in a lever (6) pivoted at one end (13) and connected at the other end (11) to the elevator via a bell-crank (12).

Two adjustable pawls (2) are locked in position on the screwed rod (shaft) (4).

A bias spring on a crank (7) is located at the motor end of the worm shaft (4), which still allows shaft to rotate. The operation of the actuator is as follows.

The motor terminals are connected to the receiver relay in the normal way for mark-space systems. On receipt of normal M/S signals the motor oscillates about a mean position against the bias spring—in the normal way and controls the rudder by variation of the mark/space ratio. For normal rudder movements on mark/space, the nut (1) on the shaft (4) remains in one position, normally at the centre neutral position for level flight or shallow glide (whatever the model is trimmed to).

If it is desired to move the elevator to another "trim" position, then either all "mark" (carrier held on) or all

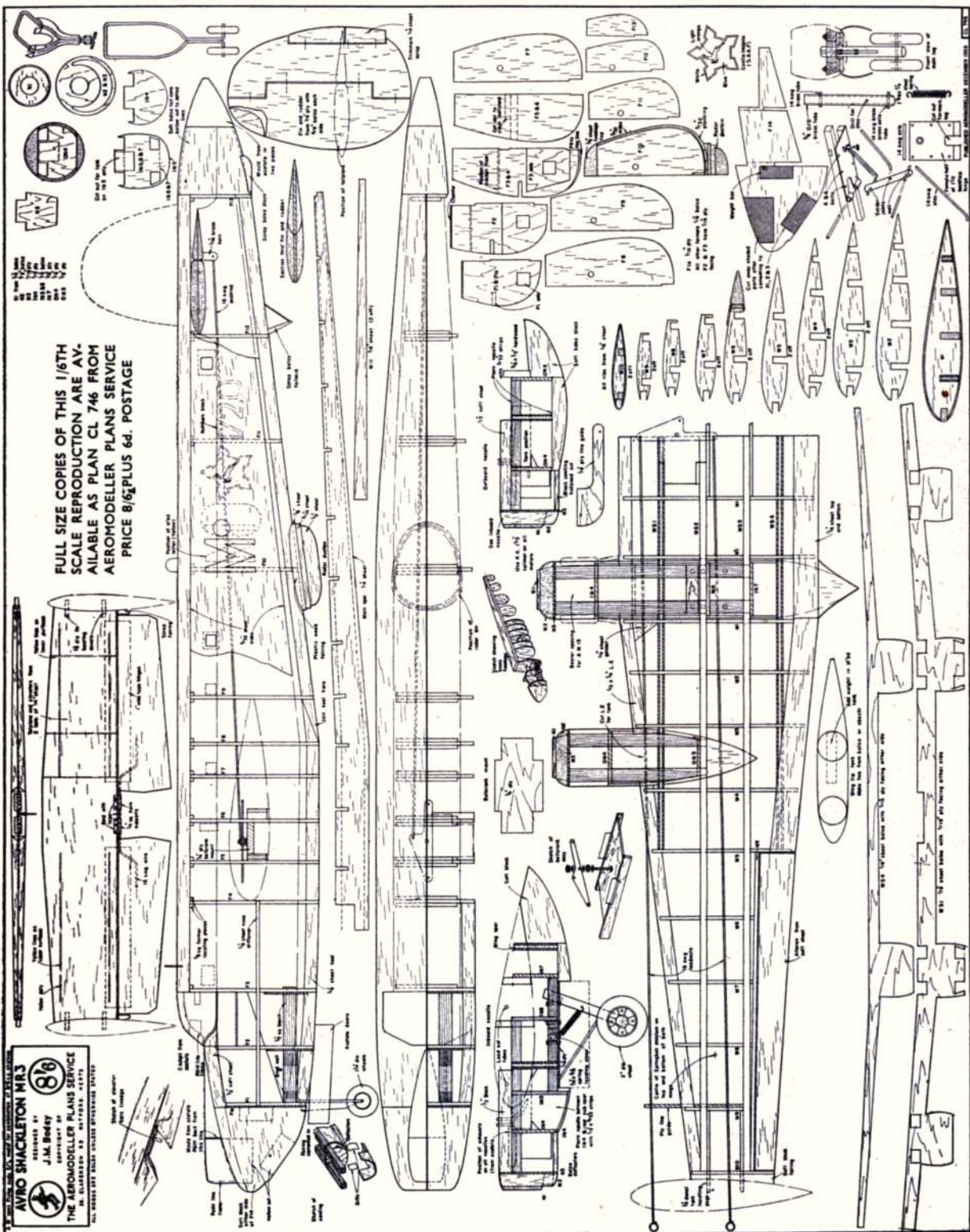
"space" (carrier held off) is sent until the new desired trim position (as judged by the model flight path) is achieved. When moving to the new elevator trim position of course, the rudder "waggles" but this doesn't worry the model, rudder control being restored as soon as Mark/space signals are sent. All that has been said above is in principle, conventional. However, although the elevator is normally *never deliberately* worked outside positions (b) and (d), in the event of either of the two possible radio failures (relay held "ON" or "OFF") the motor will drive the nut either to position (a) or (e) depending which failure occurs.

As can be seen on the diagrams, positions (a) and (e) also correspond to neutral positions of the elevator and moreover, when the nut, spindle and catchplate (3) get to either of these positions the pawl (2) will engage with the catchplate (3) so stopping the motor in any given position—which can be arranged to correspond with rudder neutral (or gentle turn as desired). In the event of a "runaway" by the motor if say the model flies out of radio range, the elevator will move from normal neutral (c) to emergency neutral (a) in about three seconds. Of course, the elevator runs through the up position as it clears to emergency neutral, but the model does not seem to mind this.

On the first radio failure with this system, the model did in fact perform two loops before everything cleared to emergency neutral. In this case the engine was still running and therefore it is intended to fit two contacts as positions (b) and (d) which will either cut or throttle back the engine in the event of radio malfunctioning—an escapement being used to do this. (A simple mechanic linkage could so be arranged.)

Finally, in the event of radio contact being regained after the actuator has run into emergency neutrals, it is possible to return it to normal neutral by sending opposite elevator.

FULL SIZE COPIES OF THIS 1/6TH  
SCALE REPRODUCTION ARE AV-  
AILABLE AS PLAN CL 746 FROM  
AEROMODELLER PLANS SERVICE  
PRICE 8/6 PLUS 6d. POSTAGE



AVRO SHACKLETON MK3  
DESIGNED BY  
J.M. BODDY  
ENGINEER IN CHIEF  
THE AEROMODELLER PLANS SERVICE  
25, BLANCKENHAY ROAD, BARNET, Herts.  
ALL RIGHTS RESERVED UNDER PATENT LAWS

8/6





**What multi could be easier to build?**

**61 inches span and designed for any combination of motors totalling 5-6 c.c.**



# Shackleton M.R.3.

by J. M. BODEY

WHEN J. M. BODEY flew the prototype for this model at the Woodford Rally earlier this year he turned many an admiring head. Already well known for his very successful *Viscount* (Plan CL 701, 8s. 6d.), Mr. Bodey has produced another winner in the "Shack" which offers so many practical features for tough construction and easy operation. The tricycle undercarriage gives terrific take-off and landings, the adaptability for all types of engine, covering a total power of 5-6 c.c., (four motors), make it really the ideal "multi" for those odd engines you don't seem to be able to keep in full employment — why not dig them out and start construction?

Building is started by cutting the  $\frac{1}{2}$ -in. sheet roof to shape as shown on plan, followed by cementing former locating pieces of  $\frac{1}{8}$ -in. sq. in. in their correct positions. When these have set, cement in formers F3-F13 in position, making sure they are at right-angles to the roof. The nose former F14 is next put in place, followed by F1a, F1, F2, and F15. Cut out  $\frac{1}{4}$ -in. ply Bellcrank support and cement firmly in position. Assemble bellcrank as shown and then add the  $\frac{1}{2}$ -in. sq. beech undercarriage bearers through F1, F2 and F3.

The wings can now be built in the normal way, packing

up the leading edge, trailing edge and W.S.3 while on the board. The wing is built up in two halves and are joined together by WS1 and WS4, after lifting off the board.

Add ailerons and then marry wing to the fuselage, making sure they are true from all angles. When this has set, add  $\frac{1}{4}$ -in. sheet keel and tailplane (which can be made while waiting for fuselage/wing unit to set).

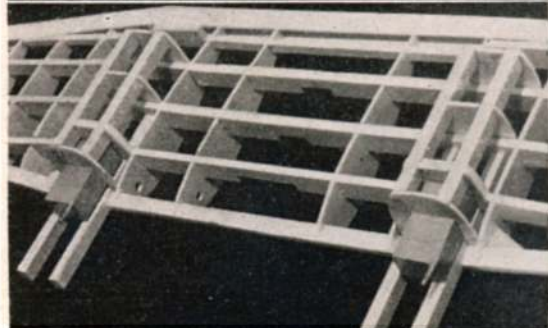
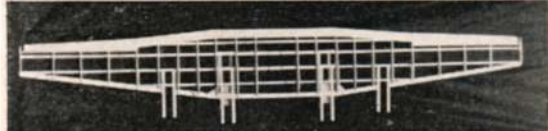
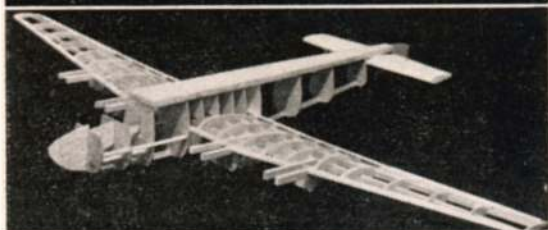
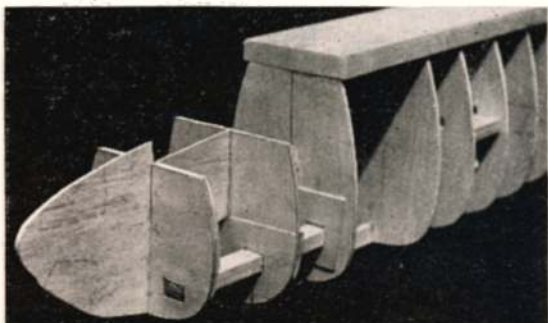
The nacelles can now be constructed on the wings as follows. Cement IN5, IN6 and IN7 for the inboard



*Ever seen a Shackleton with 2-blade props? This small distinction proves heading photos are of J. M. Bodey's prototype realistically posed and flying at A. V. Roe's airfield, Woodford. At right, Mr. Bodey demonstrates how he finds it more convenient to start a model on a small platform supporting the undercarriage.*



*Above, sprung up detail and the nose glass house on the prototype. Stage-by-stage constructional shots below show the very simple assembly specially created for those who like to build their models quickly*



nacelle, taking care they are accurate. Next thread in tank, engine bearers and U/C bearers, again taking care to be accurate. The same principle applies to the outboard nacelle. Add the leadouts at this stage and connect up bellcrank to elevators, soldering all joints well. Thread line guide on leadouts and cement firmly to W9.

Bend front undercarriage and bind to bearers, after which  $\frac{3}{16}$ -in. sides can be cemented, with windows added, to the fuselage. These are best made in two pieces as shown on the plan. The remainder of the fuselage is planked with  $\frac{3}{16}$ -in. strips, after which the nose and tail blocks can be added, remembering to hollow out where shown and weight added, and sand fuselage to a smooth finish. It is a good point here to make the main U/C unit, which is described in full on the plan, and secure to bearers with 6 BA bolts. Add  $\frac{1}{8}$ -in. ply to bearers also, and now the nacelles can be completed with the planking, soft block and cowlings. N2 can be made of balsa (hard) or hardwood. Hardwood is better, for it is much stronger. Sheet wings on top and bottom with  $\frac{1}{8}$ -in. sheet and add fairing to the rear of inboard nacelle. Next cement fin and rudders and tip tanks, not forgetting weight in starboard tank, and sand whole model to a smooth finish.

Give the model two coats sanding sealer, sanding between each, and then cover with heavy-weight tissue. Give model a further coat of sanding sealer and three coats clear dope until a smooth finish is obtained. The cockpit, tail glasshouse, front nose cockpit, window on bottom of nose, exhausts, wheel doors, blisters, all from acetate, can now be added. The "dustbin" is made up or moulded and given 4-5 coats sanding sealer. The original was finished in the colours of the South African Air Force. When all colour has been added, give model one coat fuel proofer and check for balance. Fly on 60-ft. lines, with 7 in. x 6 in. props on all motors. Speed is about 60-55 m.p.h. and all-up weight is 4 lb.

"Of course it's scale — just came out a bit heavy so I stuck a couple of Bambis in the cargo hold"



## Famous Biplanes No. 23

## HAWKER FURY

Described &amp; Drawn by G.A.G. COX

ANY SELECTION of famous aircraft from the hundreds of machines built during the last fifty years must inevitably include the Hawker Fury. Famous for its aerobatic prowess, for its service under a multitude of flags, but most of all for its appealing looks, this little interceptor is a perennial favourite of model builders. Pretty and in exquisite proportion, the Fury shares only with the Fairey Fantome and possibly the Curtiss XP 23, the honour of being the most beautiful biplane fighter.

To examine the development of the Fury, one has to go back to 1928, when a trim interceptor emerged from the factory at Kingston and was taken to Martlesham Heath for trials. Known as the F20/27, this machine had many of the features of the Fury, but was disguised by first a Jupiter, then a Mercury engine, both uncowed. In the following year Hawkers produced the Hornet—substantially the same aircraft but now powered by the new Rolls-Royce FXIIS in a close-fitting cowl. After competitive trials with the Fairey Firefly IIM, the Hornet was accepted for production to Specification 13/30 and renamed "Fury". The prototype K1926 and the first production batch had wire-braced parallel centre-section struts and fabric wheel covers, but all succeeding machines were as drawn overleaf. Only three squadrons were equipped with the Fury, Nos. 1, 25 and 43, but deliveries were also made to Cranwell and the Flying Training Schools. The decision to award production contracts was amply justified by the faster than any previous fighter, but its rate of climb and superb responsiveness to the controls fitted it ideally for interceptor duties. As an aerobatic machine it was without equal, performing the precise manoeuvres in tight formation which thrilled spectators year after year at the Hendon Air Displays. In 1933 the Furies of No. 25



Squadron gave a brilliant display of tied-together aerobatics, but even their performance was eclipsed by No. 1 Squadron's demonstration at Hendon in 1937 and later in the year at the International Air Meeting at Zurich.

Eager to improve still further on an outstanding product, Hawkers began work on a new version with a more powerful Kestrel engine. This, named unofficially "Super Fury", had wheel spats and reduced wing area. The leading edge of the upper wing was tapered, also the trailing edge of the lower wings. The N interplane struts were replaced by a Vee. Possibly the prettiest of all Fury variants, the Super Fury had a maximum speed of 245 m.p.h. After a period of testing, this airframe, K3586, was redesigned with a straight upper wing rather like the Hart. Maximum speed this time was still lower—224-232 m.p.h., depending on the version of Goshawk engine fitted. The Gladiator and the Westland rear-engined fighter were designed to the same specification, and of course, Glosters won the contract.

As it happened, the next Fury to be accepted by Air Ministry, was a direct adaptation of the Mark I. A 640 h.p. Kestrel VI engine replaced the 525 h.p. Mark IIS and this increase in power made a marked difference to performance, as the comparative tables show. The external differences were few; wheel spats were fitted, so were extra tail bracing wires, and there was a small air intake under the nose. The Fury II was ordered to Spec. 6/35, and the first production aircraft flew in December, 1936. More than seventy were built by Hawkers and General Aircraft, and another batch was delivered to the South African Air Force. Those for the R.A.F. replaced the Mark Is of 1, 23 and 43 Squadrons.

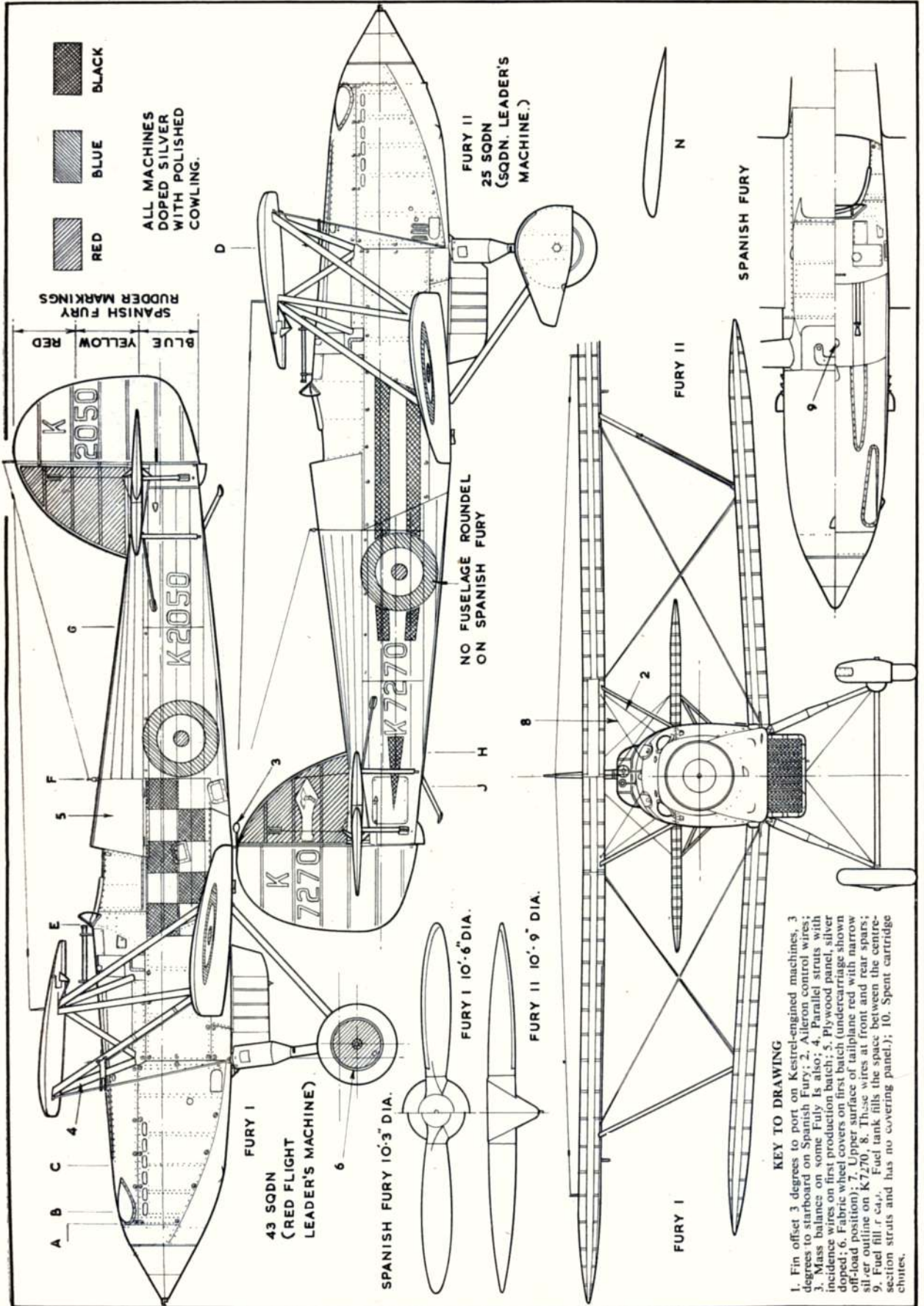
An aircraft as good as the Fury was bound to attract the attention of foreign governments, and in fact this machine established a new record for export sales. Variants flowed thick and fast from the parent company, meeting the individual requirements of foreign air forces. The Norwegians built Furies under licence, powered by

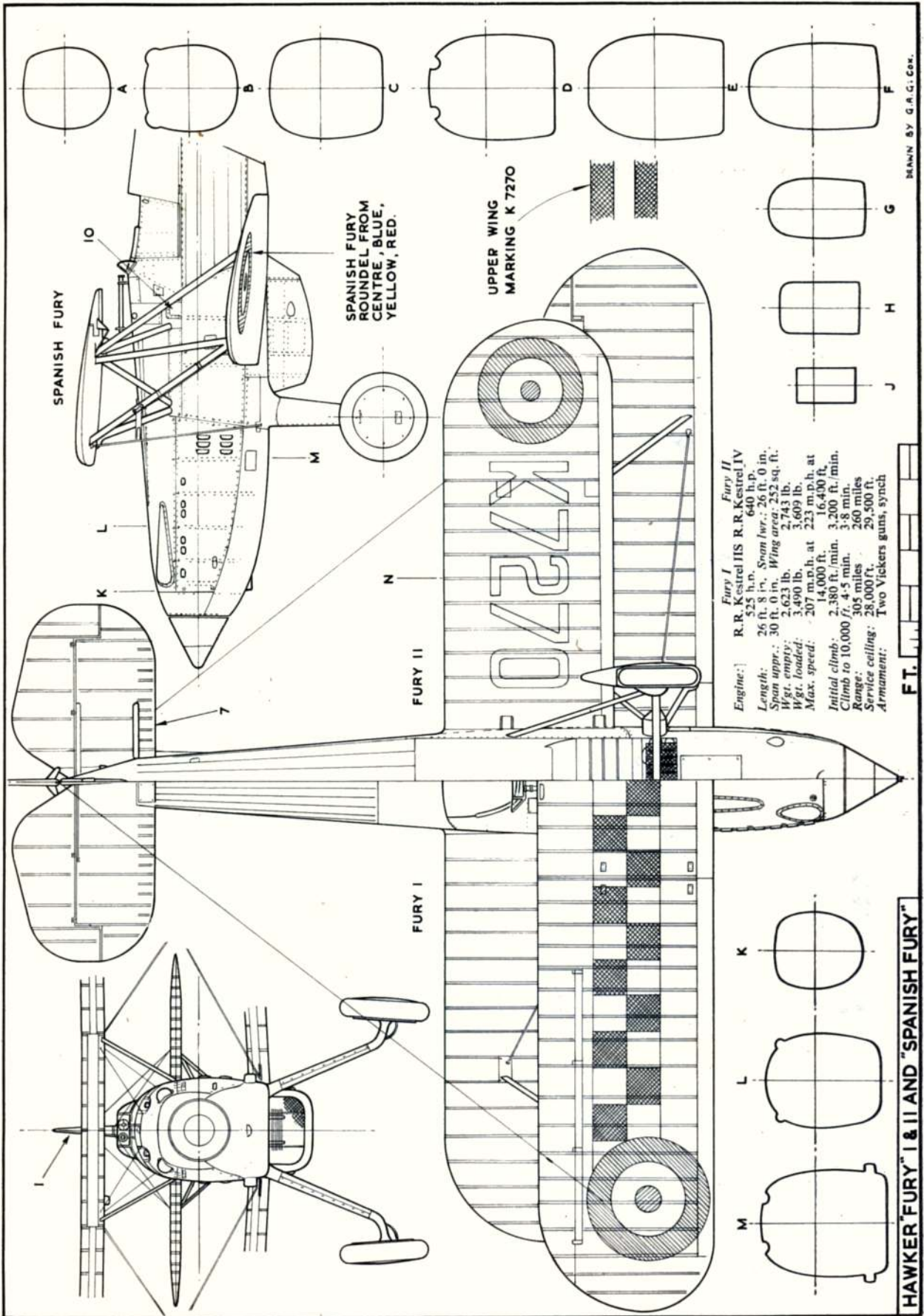
(Continued on page 588)



*Spanish Fury - this colour and markings did not last long! Dainty ulc compares with first prototype ulc, seen below, and spatted ulc of 41 Sqn. Fury II in heading*







SPANISH FURY  
 ROUNDEL FROM  
 CENTRE, BLUE,  
 YELLOW, RED.

UPPER WING  
 MARKING K 7270

**Engine:** [ ]  
**Fury I**  
 R. R. Kestrel IIS R. R. Kestrel IV  
 525 h.p. 640 h.p.  
**Length:** 26 ft. 8 in. 26 ft. 0 in.  
**Span uppr.:** 30 ft. 0 in. **Wing area:** 252 sq. ft.  
**Wgt. empty:** 2,623 lb. 2,743 lb.  
**Wgt. loaded:** 3,490 lb. 3,609 lb.  
**Max. speed:** 207 m.p.h. at 223 m.p.h. at 16,490 ft.  
**Initial climb:** 14,000 ft. 3,200 ft./min.  
**Climb to 10,000 ft.:** 2,380 ft./min. 3-8 min.  
**Range:** 305 miles 260 miles  
**Service ceiling:** 28,000 ft. 29,500 ft.  
**Armament:** Two Vickers guns, synchronizing

HAWKER "FURY" I & II AND "SPANISH FURY"

F.T.

MADE BY G. R. G. CO.

**Hawker Fury** (continued from page 585)

*Stilty use on Cranwell Fury is due to long leg travel. Below is early delivery to 43 Squadron with large wing roundels and other differences*



the Armstrong-Siddeley Panther engine. Persia bought about a dozen machines fitted with Pratt and Whitney Hornet engines and three-bladed propellers, and built others with Bristol Mercuries. Yugoslavia too, bought Kestrel-engined Furies and then built others under licence with Hispano-Suiza Nb motors. Portugal was an early customer, taking delivery of about twelve machines

similar to the British Mark I. The last service versions of the Fury had the refinement of a Dowty undercarriage and were supplied to Yugoslavia and Spain. The Spanish machines were powered by 700 h.p. Hispano engines and carried two 13.3 mm. guns, while those supplied to Yugoslavia had the 745 h.p. Kestrel XVI engine and reduced wing area and were the fastest of the whole series with a speed of 252 m.p.h.

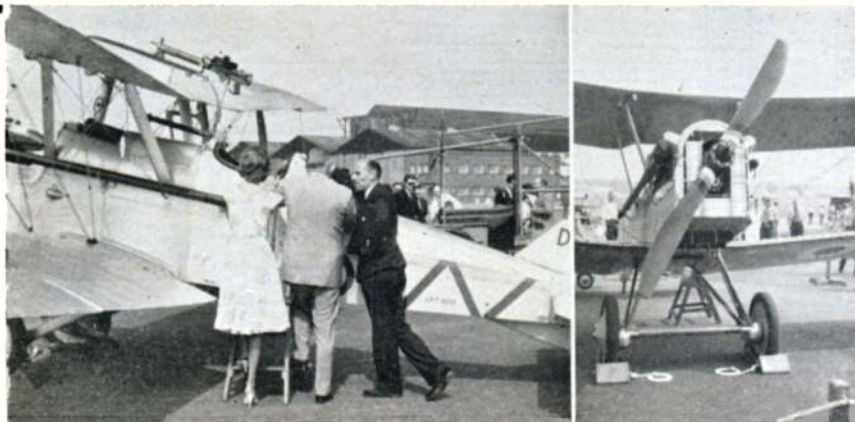
In 1938, just two years after entering service with the squadrons, the Fury IIs were retired from front line service, although some were still used for a short time for training duties. This, however, was not quite the end of the story; one machine, the final variant, extended its useful life in the employment of Rolls-Royce. It was K3586, the experimental Super Fury which was converted to High Speed Fury. Reworked as a Mark II, it went to 43 Squadron and on retirement was returned to Hawkers where it was rebuilt with reduced wing area and stressed to take the new Merlin engine. As a flying test bed for the Merlin, the last Fury paved the way for its illustrious successor, the Hurricane.

The Story of the Fury family is not quite complete without reference to its naval counterpart, the Nimrod. Although similar in many respects to the Fury, the carrier-borne version was larger, with a span of 33 ft. 6½ in. It had to carry many items of special equipment and was therefore heavier, bringing its maximum speed down to 181 m.p.h. Immediate recognition features were the long exhaust pipes, the tiny headrest and of course, a carrier arrester hook. Forty-two Nimrod Is were built, followed by thirty-six Mark IIs, which had 640 h.p. Kestrel Vs and sweepback on both wings. Nimrods could be fitted with floats or wheels, and served on the carriers *Courageous*, *Furious* and *Glorious* until 1939, when they were replaced by Sea Gladiators and Skuas.

*The writer is indebted to the Hawker Aircraft Company for the use of factory drawings and photographs for this article.*

*Note.—Readers should refer to the forthcoming Hawker Hart drawings for typical wing structure and external details.*

## S.E. 5a flies again



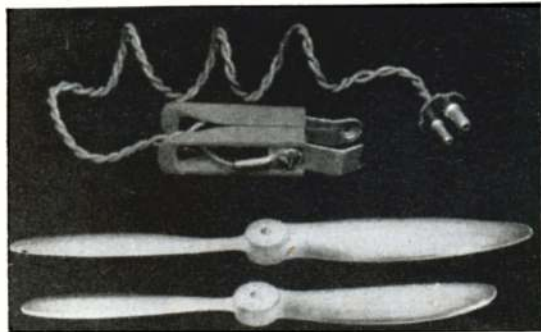
On Saturday, August 22nd, an S.E.5a took off from Farnborough and a nostalgic chord was struck for many who watched this famous fighter demonstrated by Air Commodore Wheeler and Commander Hickson.

This event crowned the enthusiastic work of the apprentices of the Royal Aircraft Establishment in rebuilding the S.E.5a which had been stored in a hangar at Baginton airport and subsequently presented by Messrs. Armstrong Whitworth to the Shuttleworth Trust.

It was fitting that the restoration of this redoubtable aeroplane should be undertaken at Farnborough where

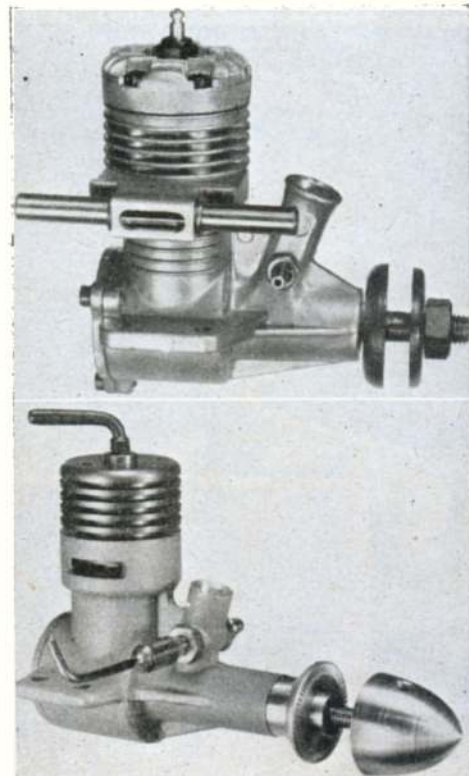
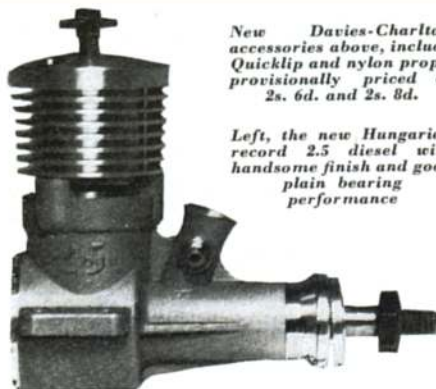
it was originally designed more than forty years ago.

Many components were replaced; in fact, all the wooden members of the airframe are new, and drawings from the R.A.E. archives ensured that the S.E.5a is authentic in every detail. Powered by a genuine 200 h.p. Hispano-Suiza driving a geared airscrew the S.E. is resplendent in silver dope and polished aluminium cowlings. The fuselage bears the markings of No. 40 Squadron, but it is a pity that the roundels, or more properly the cockades, are wrongly proportioned.



New Davies-Charlton accessories above, include Quickclip and nylon props, provisionally priced at 2s. 6d. and 2s. 8d.

Left, the new Hungarian record 2.5 diesel with handsome finish and good plain bearing performance



## Motor Mart

Japanese "Fuji" .15, 2.5 c.c. glow motor has a rather unusual appearance due to its small crankshaft and crankcase diameter. 360 deg. porting is used as on smaller Fuji glow motors



With Electronic Development's announcement of their .8 c.c. "Pep" diesel, the cloaks are at last off this company's approach to the rapidly developing small engine market. Convinced that glow plug will prove too involved a change for diehard modellers used to years of compression-ignition, E.D.'s believe that by putting out a diesel under £2 they will both supplement their range with a most useful capacity engine, and capture the conservatives. There's no denying that glow plug demands accessories: but Messrs. Ever Ready have been quick to advise their all-dry AD-4 with socket fitting to accept the Davies Charlton Quickclip which is illustrated above with the smart new prop sizes introduced for the Bantam, at 5¼ x 3½ in. and 6 x 4 in. translucent nylon.

Last month's news of the Rivers Silver Arrow 3.5 c.c. diesel is now supplemented by examination of an advance unit. Use of three exhaust ports, two diagonally forward and one facing aft was found to improve gas flow while retaining the Rivers' square bore/stroke arrangement. An interesting feature is the tapped backplate to accept a screw-in nipple for pressurising a tank. A "pressurisation" kit with patented ball valve filler for a standard tank is also to become a Rivers accessory.

Delivery of the new Cox engines, the 2.5 c.c. Sportsman at £4 15s., and Olympic at £7 13s. 6d., are announced by Henry J. Nicholls and by all accounts, these potent glow engines are substantiating our original claim that they would establish themselves in open power free flight. Quick off the mark to provide a radial mount for these Cox engines is John Tatone, the timer man from California who has produced a light alloy bearer which copes with the carburettor overhang, selling in the U.S.A. for \$ 1.75.

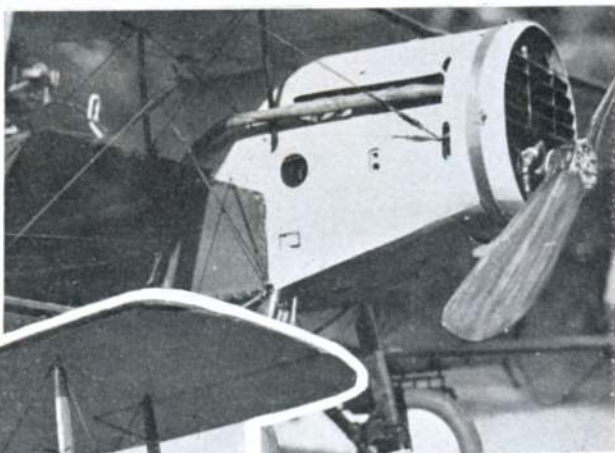
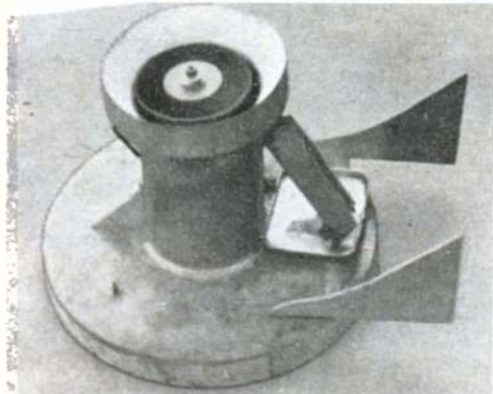
The Hungarian team race Moki diesel, indistinguishable from an Oliver except in performance, has inspired designer Kriszma to make the Record 2.5 plain bearing engine for series production. External appearance is especially impressive, the grey vapour blasted crankcase and polish-finished cylinder head are matched by good workmanship throughout. Conventional 360 deg. porting is used, and although engineered for production rather than contest performance, the Record is within 1,000 r.p.m. of the Oliver scale in our prop range. It uses three screws to retain the loose liner and cylinder head, and is thereby dependent on assembly skill for top performance; but otherwise rates high among the plain bearing 2.5s.

Surprisingly few people spotted the error in our 5 c.c. fuel consumption test tables, October issue. Mysterious difference in the fifth columns for Enya and ETA 29s should be explained by the fact that Enya's figures in the column were for 30 c.c. consumption and ETA, as noted, for 15 c.c. Following our lead in the accompanying article "Glow tests Analysed" we heard talk on the Continent of proposed low compression long range "diesel" racers using the glow plug Fox and Enya 15.

Correction: The Russian Mk. 12b was erroneously titled MK.16 last month: but it still looks like a Webra Mach 1 to us!

Beno Schlosser, who has moved from East to West Germany and is now once more in full scale production, is marketing his new .5 c.c. diesel, bottom left. Above left, is the Fox 19 R/C illustrating the comparatively small exhaust opening which is controlled by rotary valve

# MODE





# LONDON NEWS

ONE OF THE MORE interesting "Hoovercraft" sent to us in recent weeks is that by D. S. Pepper of Gosport, Hampshire, who sent a number of photographs to illustrate his successful experiment including the three at far left. In the top photograph we see the model hovering approximately  $\frac{1}{8}$  in. off the ground, the centre picture reveals the underside with the centre baffle-plate which is used to deflect the airflow from the impeller so that it forms a curtain, like the system on the Saunders Roe SRN-1. Static view shows the Veron Impeller and the exhaust ducting system with collector for the mess from the E.D. Bee diesel. Vital statistics are 11 in. diameter base,  $3\frac{1}{2}$  in. duct, 1 in. base thickness shaped to give an inward acting airflow or curtain, and the height of the duct 6 in. The area of the outlet in the base is variable according to the position of the baffle and the total weight is 24 oz. Fins are fitted to prevent torque spin, but other fins have been placed inside the duct at an angle to the airflow to reduce spin.

The fine collection of models, all to A.P.S. designs, seen in the next photograph come from Guernsey in the Channel Isles and were part of a fine exhibition arranged by Fletcher's, the local sports and model shop at the St. John Ambulance Hall, Rohais. The models were so glowingly praised in the local press, they attracted a great deal of attention. Naturally, control line models take precedence in this island location, but there were a few free flight models to support the show including a Mercury Aeronca Sedan on which builder J. Cocks worked non-stop for 48 hours to be in time for the exhibition. How often have we heard that same story!

Captain Milani's latest effort is an  $\frac{1}{2}$  in. scale Bristol F2b Fighter, span around 60 in. for a completely enclosed ignition Anderson Spitfire engine with full speed control. The model goes like a charm on lines and as can be seen in the photographs is detailed to the *n*th degree. Model is genuinely wire braced as the real thing and the exhaust actually comes out of the right place! Wheels are sprung in exactly the same manner as on the full size and it is thanks to a visit to the Shuttleworth collection at Old Warden Airfield that Captain Milani was able to produce such an authentic model after close study of the full size machine, which has been involved in many flying displays this season. The model is entered for the Bristol Cup at the forthcoming National Models Exhibition in London.

Bensen Gyro-Copters are in the news, several of them being built by enthusiasts and proving to be very successful in this country. Helicopter pioneer, both model and full size, F. G. Boreham has made his own miniature version of the Bensen design seen in the small photograph. Rotor diameter is 27 in. and a small 4-blade prop is fitted to the Dart diesel. Mr. Boreham is also experimenting with a twin rotor helicopter. Top right is the model we know locally as the Trinder Twin which this Secretary of Watford M.A.C. produced in answer to our challenge in June Model News. Yet to fly (after it has been on exhibition at a local shop) John's model has many practical features and no complications whatsoever. The capacious fuselage would certainly take R/C equipment for control to overcome instability should it occur.

To the right, is one outstanding exhibit at the Cheltenham Club stand in a recent hobbies exhibition at the Town Hall, Cheltenham. It is a Miles Hawk Speed 6



made by M. G. Chaplain to 1/12th scale for control line with an Elfin 149.

"Gasser" is taking on like wildfire so we thought we would show you a couple of British prototypes made to prove the design before publication. Top is one made by G. A. V. Marsh, President of Sutton Coldfield R.C./M.A.C. when fitted with an E.D. Hornet. Later it was modified as a Mk. 2 for the Enya 15 glow and by all accounts its performance has been quite impressive. The model below is one by G. Balmforth of Abington for pulse control which is also fitted with a 1.5 c.c. diesel. The simple construction is evident in this underside view where Ginger is showing his u/c modification.

Another proving Gasser (A.M.15) was made by John Dumble of R.E.P. Ltd. who used a fly-ball actuator for up-elevator. Loops and Immelmans are the admiration of onlookers and John thinks that Cuban 8's, rolls and spins are possible, landings being a dream.





*Diminutive Micromax held firm in Editorial grasp at left. 15:1 gearbox is in end section of motor case. Fred Militky launches FM251 on its superb 22 minute flight*

**BOTTOM LEFT**  
*FM248 Elektroflug held by its designer. Graupner display van in background has huge Bellaphon Tx model on roof*

## Electric POWER

GERMAN MOTOR MAKES  
NEW MODEL CLASS POSSIBLE

A MOST CONVINCING demonstration that electric free-flight will soon become reality for European modelers was given by Graupner designer and development engineer Fred Militky, during our recent visit to Germany. From a motor run of approximately three minutes, his *Elektroflug* 251 (Fred's 251st model!) disappeared over the hills on a 22-minute flight. Since then, a specially observed flight with model 248 followed by Jodel 120 lightplane, was checked at 23 minutes from a power run of 1-2 minutes. Such are the obvious capabilities of the remarkable *Micromax* electric motor, further details of which we will publish later, when we have concluded our own tests, both on the bench and in the air.

Measuring only  $\frac{1}{4}$  in. diameter, about the same length, and incorporating 15:1 reduction gears (variants have 60:1 and 4:1) the *Micromax* weighs 0.9 ounce,

and is wave wound. Hitherto, known as the *Gnom* T.03, it was not developed for models, rather it was "discovered" by a German model magazine editor, when its possibilities as a servo motor were investigated.

Fred Militky had been working on an electric free-flight research since 1941, having first real success in October, 1957, with a special motor. When the *Micromax* arrived he soon made five minutes a commonplace duration, and after lengthy experiment, he has evolved the ideal thrust/r.p.m. ratio for this tiny power house.

Propeller diameter can in fact, be anywhere between 10 and 14 in. with pitch arranged to suit the airframe. Fred's model flew away with a 14 in. prop, and since it was turning at around 700 r.p.m., one can appreciate the potentialities of such a constant power source.

Power/weight ratio is naturally critical. The 31 in. span *Elektroflug* 248 weighs  $4\frac{1}{2}$  ounces ready to fly, of which  $2\frac{1}{2}$  ounces is taken up by the motor and two 2-volt accumulators of the *Magnatex* type (*Rulag* in Germany). Wing area is 138 sq. ins., tailplane 40 sq. ins. and fuselage length 24 in. The motor is mounted under the wing, with accumulators further aft, and a shaft drives the prop on a long nose movement.

Model 251 was designed to fly either at 5.3 oz. with 6 volts or  $4\frac{1}{2}$  oz. with 4 volts. The  $\frac{1}{2}$ -oz. high camber wings are  $35\frac{1}{2}$  in. span,  $5\frac{1}{2}$  in. chord with 29 per cent. tailplane and gross area of 250 sq. ins. gives respectably low loading. No wonder that 14 in. prop took the model aloft like a rubber job!

*Micromax* units are used by the Graupner company for their proportional R/C servo, and will be sold separately at about £2 2s. 0d.

Japanese models based on the *TKK* Mabuchi AP35 motor using 6 volts, have smaller props running at a high speed, and to counter the power unit weight, increase span to 39 in. and wing area about 230 sq. ins. These motors are geared  $7\frac{1}{2}$ :1 and are available in Britain as the *Ripmax* Super Q Orbit 305. One would imagine that there would be a strong case for a delta design with electric power to obtain slower speed stability and larger chord for efficiency, plus lighter loading. Fred Militky's experiments have set our editorial test-bench a-buzzing with ideas, more on which we shall reveal when they reach fruition!



# THERE'S SOMETHING IN THE AIR

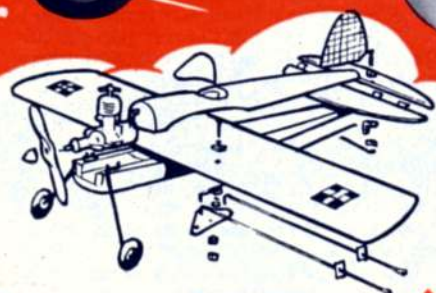
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ABOUT SEVEN YEARS AGO Croydon members became tired of breaking fuselages and motors while winding rubber models, and decided that it was time a safe winding technique was evolved to give some measure of protection. Jack North and Archie Allbone started to use a paxolin tube which slid into the fuselage round the motor during winding and promptly reduced the destruction rate for fuselages to nil.

This, basically, is the same system which has been refined and modified to a certain extent in the light of contest experience, but never seems to have caught on outside the Croydon club.

## TUBE WINDING

The Croydon "Method"  
by Jack North & Martin Dilly

Hardware required for the full "de luxe" system is:

(1) A length of 1-in. I.D. 18 or 20 s.w.g. wall alloy tube about six inches longer than the between pegs length of the models you use. Paxolin tube was found to split at the ends, so alloy is used with well-rounded edges, some people using a belled-mouth to further avoid motor damage. The motor peg end of the tube has two slots 180 deg. apart to locate on the peg, with rounded corners to ease location of the tube.

(2)  $\frac{1}{4}$ -in. diameter alloy welding rod or tube, fitted at one end with a wire loop to fit the window, and at the other end either a hook or else the type of quick-release fitting shown in the diagram; this should be the same diameter as the propeller shaft. Overall length of rod and fittings should be more than the one-inch tube.

(3) The winder. This can be as simple and refined as you care to make it; the actual details depend on the type of drill used and the facilities available. A little effort expended on the gear is amply repaid in the lack of sweat and worry at contests later.

The *tour de force* is a resettable digital counter, obtainable at government surplus stores for around ten shillings. These usually come with a short flexible drive which should be removed and replaced by a suitable wire crank as shown in the exploded view. The hub of the drill is itself drilled axially to take a wire striker which is bent after assembly to catch on the crank handle, which can be lengthened to provide greater leverage and less

operation fatigue. The counter is mounted on the body of the drill, making sure that the resetting wheel can be turned without fouling any of the mechanism. Methods of mounting have varied from dural brackets and screws tapped into the body of the drill, to blocks of hardwood and carpet thread; anyhow, the idea is that the counter should indicate the number of turns made by the crank, and not drop off at awkward moments.

Other refinements include the fitting of a suitable thrust race between the drill body and the front bevel gear, to take the pull of a fully wound motor; the front bevel can usually be removed by knocking out the

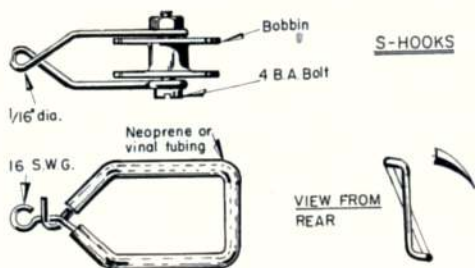
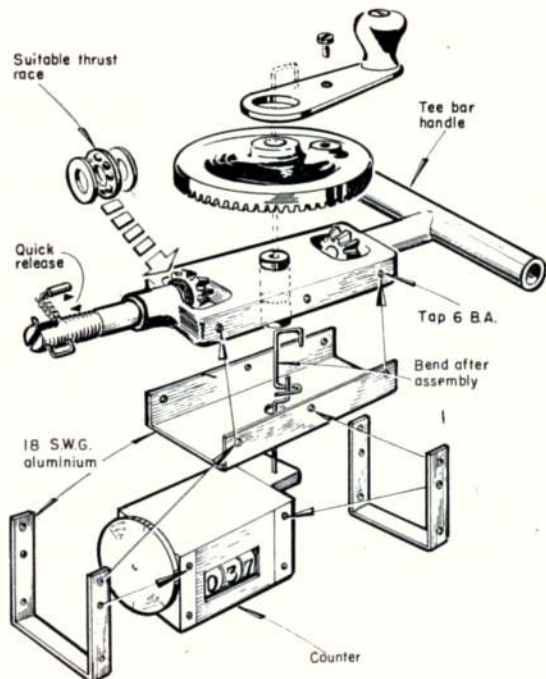
locking pin with a centre punch, in order to fit the race over the spindle of the drill. A T-shaped handle is also a useful addition (again, actual construction depends on the particular drill used) as is a quick release hook; this involves slotting the threaded spindle about  $\frac{1}{2}$  in. wide and  $\frac{1}{2}$  in. deep and fitting a spring-loaded catch as shown in the diagram and photos.

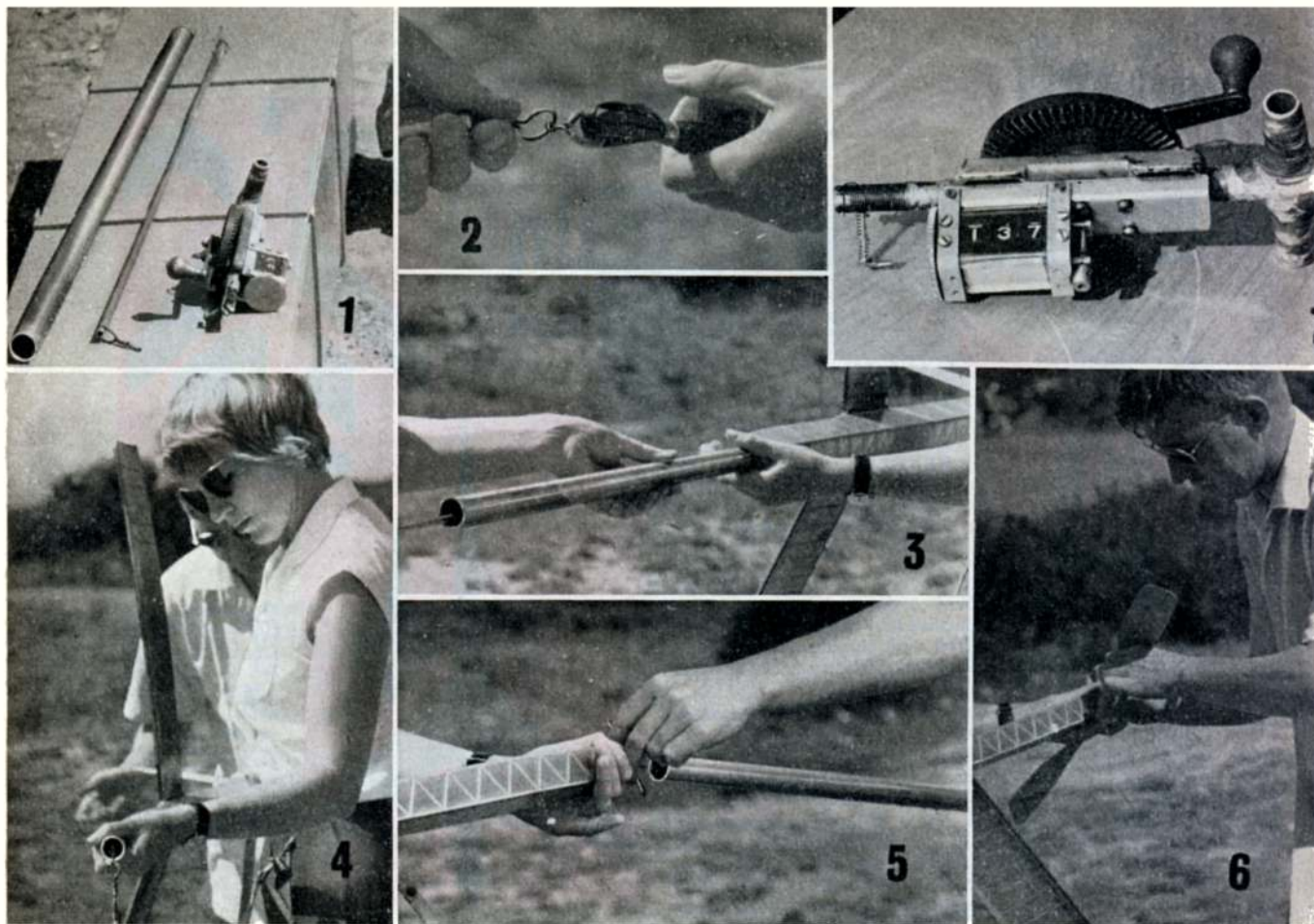
Standard Croydon winding technique shown in the photographs. First, the hook on the  $\frac{1}{4}$ -in. rod is attached to the S-hook on the motor. It is simpler if the rod is kept inside the 1-in. tube all the time and not threaded through after hook-up. The tube is slid into the fuselage, care being taken not to knock out too many spacers, and turned to locate the slots on the rear peg. At this stage the helper should take all the load on the projecting few inches of rod at the nose, the rod and winder hanging down and resting on the ground; here it is usually convenient to light the dethermaliser at this stage.

The counter having been zeroed, winding can begin, all tension being taken by the hand holding the tube, the spare hand simply steadying the rear peg for the time being. When the requisite number of turns appears on the counter (remember, these have to be multiplied by the winder gear ratio to give motor turns) and you have moved in, so that the front of the motor is just inside the tube, the helper takes all the motor tension on the rear peg, the tube is slid out of the model until the S-hook is exposed just outside the model and a length of dowel or rod is slid into the loop of the hook. The peg through the S-hook is grasped firmly in one hand, and the winding gear unhooked from the S-hook. The propeller is then hooked on, and the peg removed.

A point to watch is grit and dirt in the works; there's nothing so bad as a spattering of sand or mud on a Wakefield motor, so avoid dropping the tube on the ground or scooping up earth with it, and keep the counter clean and oiled.

On the subject of propellers, a number of people still use a non-detachable system; the Croydon method, in use for ten years or so, uses an S-hook at the front end of the motor and winding even without the tube is always carried out with the prop removed. Several types of hooks are in use, these are explained in the diagram. Factors that are important are the diameter of the small loop, which should be only a few thou. over the shaft diameter, and the kinked loops, which prevent the rubber creeping round the hook under torque.





(1) The equipment: 1-in. tube; 1/2-in. alloy rod; modified winder. (2) Winding rod is attached to S-hook on motor. (3) Tube is slid into fuselage round the motor and located on rear peg. (4) D/T is set alight while model is held by winding tube and steadied by rear peg; note prop safe in helper Sheila Merredew's pocket. (5) After winding, tube is slid back over rod, and the peg holds S-hook before attaching winding gear. (6) Propeller is hooked on by Jack North and nose block located. (7) The Croydon modified winder; details in sketch opposite

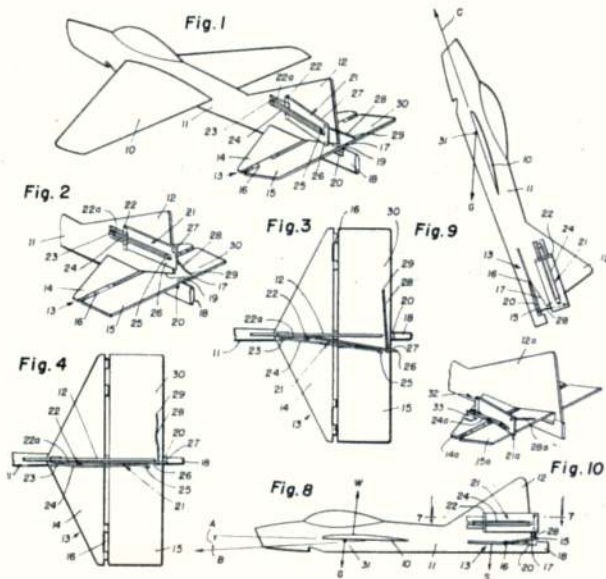
## IMPORTANT PATENTS

THIS INVENTION attacks an old problem in a novel manner and should be particularly interesting to exponents of the chuck glider and catapult. The invention seeks to change the aerodynamic balance of a catapulted aircraft so that at high speed immediately after launching very little or zero lift is obtained so enabling the aircraft to follow an arrow flight trajectory. Conversely at low or descending speeds the control provided by the invention will afford high-lift conditions.

As will be noted from the accompanying drawings, particularly Figures 1, 8, 9 and 10, the invention resides in a movable elevator which is automatically adjusted between two extreme and opposite conditions in response to the speed of the airflow part, the hinged member 21. This latter is hinged at its leading edge 22 and is biased toward an extended condition by the tension member 24. A flexible member 28 connects the tab 21 with the trailing edge of the elevator.

Under high speed conditions the tab 21 is depressed, by the resultant airflow, against the vertical stabiliser 12 and since 28 is then relaxed the elevator assumes the condition shown in Fig. 9, however, as the airspeed decreases the tab 21 moves outwardly as shown in Fig. 1 and the elevator is raised as shown in Fig. 8. It is stated in the specification of the invention that the area of the tab 21 need not be so great as to affect the directional stability of the aircraft.

British Patent 813184, Priority - 21.7.55. Published 13.5.59  
FRANK ZAIC



# Rockets in Britain

by P. J. Chapman

**SOUTH COAST MODEL ENTHUSIAST, ALSO A KEILKRAFT SALESMAN, REVEALS DETAILS OF FASCINATING EXPERIMENTS WITH HIGH SPEED ROCKETS**

BRIGHTON and district Rocket Group was formed in January, 1959, to provide a greater margin of safety which exists only in a collective and thoughtful approach to this subject as compared with the hazards and fatal accidents faced by individuals using inadequate knowledge and materials.

Initially, a policy was formed which encompassed three main phases.

- (A) Small two-foot rockets.
- (B) Hydrogen balloons for equipment testing.
- (C) Rocket-powered model aircraft.

After passing through a first series of successes and failures, efforts centred on a small two/three-foot model rocket. Casing is of mild steel and two inches in diameter, wall thickness being  $\frac{1}{16}$ -in. The nose block could be alloy rod of a tight fit, drilled and tapped to take four retaining screws. The combustion chamber is turned from mild steel and the throat diameter is never smaller than a third of the casing diameter. This is also held in place by four retaining screws and sleeved two inches to fit snugly in the casing. Fuel used, must be kept secret and the ramp was angled girder sunk deep into the ground at the required angle.

This series of rockets was known as *Pioneer*, and to give one an idea of what one is "playing" with, they reached heights of from 800 ft. to 1,800 ft., at a take-off speeds of up to 280 m.p.h.

A further yardstick of success or failure is the Mass Ratio, or simply the fact that the weight of the fuel is the same, or more than that of the casing and other hardware. The greater this ratio in favour of fuel bulk, the better the chances of success.

To be launched within a matter of weeks is the latest project, the 108 x 4 in. *Skyscraper* rocket. Although scaled up from *Pioneer* rockets, it has taken four months to design and build and weighs 120 lb. maximum. It contains a three-foot nose cone which houses thermometers, an altimeter, gravity strain gauges, and an automatic camera, and has an automatic parachute for recovery after the rocket reaches its summit.

**Indoor flying also has its hazards!**



*Components and fully assembled X-2 rocket fitted with wooden wings for a 10 degree angle launch. Speed over first half mile was no less than 240m.p.h. with an estimated 400 m.p.h. after take-off. Definitely the sort of experiment to be undertaken in the early hours!*

The *Pioneer* experiments were to discover the general configuration of the rocket, whilst *Skyscraper* is being launched to determine the G force acting on it and the equipment and to see which equipment fails and which stands the strain. The estimated G is 30/40. No fins are fitted.

*Skyscraper* will be launched out to sea at 80 degrees. At the summit the parachute will detach the nose cone and using the necessary southerly wind will float back over the land. The casing will be recovered from the sea by spotting the flotation gear installed in the rocket. Estimated altitude of this rocket is between two and three miles.

Married to these experiments have been the hydrogen balloon tests to determine the suitability of some instruments before thinking of putting them into the nose cone of rocket. There have been fourteen launches to date, but among the interesting launches was the balloon which was launched to determine whether or not radio activity existed in any strength over Brighton. The vehicle was launched from Brighton and after seven hours in the heavens landed at Spalding in Lincolnshire. The Chief Medical Officer for Health in Brighton tested this balloon with a Gieger Counter. The count was 45 per minute — less than in the local air around us . . . phew . . . !

These balloons are generally 6 ft. x 2 ft. and four or more in number. For recovery, a fuse sheds one or more balloons and the payload floats gently down to earth. This type of recovery is more easily visible than the parachute type, which after a number of lost payloads, was discarded.

Finally, the use of rockets for powering model aircraft. In view of all the other work these experiments have not

**DO**

1. Get a copy of **ROCKET EXPERIMENT SAFETY**, published by ATLANTIC RESEARCH CORPORATION, ALEXANDRIA, VIRGINIA, U.S.A.
2. Have a leader of over 21.
3. Have written permission from parents of members under 21.
4. Use only steel tubing and fitting as described.
5. Use only electrical firing.
6. Have at least six look-outs behind cover with "all clear" and "alert" flag signals.
7. Use only desolate locations with permission of landowners for tests.
8. Remember that the Police must take what action they think fit if they receive complaints.
9. Make sure that you are not contravening the Explosives Act of 1875.
10. Keep a minimum distance of 400 yards from firing point, and lying flat under cover.
11. Have firing button locked in a box and only one key.
12. Account for all members before firing.
13. Seek advice from as many people as possible before you start a group.



Author with two hydrogen balloons 72 in. x 24 in. which lift 3-oz. payload at 4 ft. per second; greatest known travel distance in 17 launchings was 140 miles, they are used for equipment testing at altitude

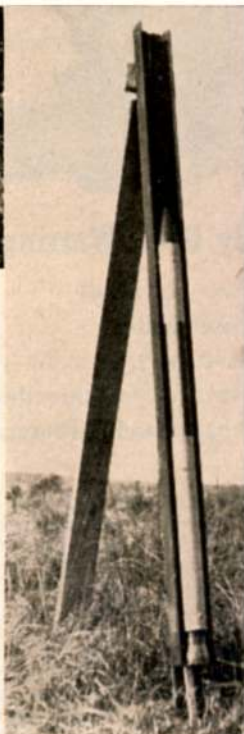
received the intensive attention needed. However, their brief history has been encouraging. A number of rocket flights have been made with diesel-powered aircraft, and all but one was successful. These were of short violent duration, whereas what is required is the slow burning sustained rocket giving medium power over 20/30 seconds.

Two speed attempts have been made with rocket models to date. These were initially (for want of a better name) the X-1, a small tailless all-metal model which achieved a disappointing 95 m.p.h., and more recently the X-2, which was a standard *Pioneer* rocket casing, to which were attached obeche wings, clamped to the casing with upper and lower alloy brackets and screwed on to the wings. The fin was a triple sandwich alloy sheet on to which was bolted the tail and auto-elevator; this lay flat under power and brought the nose up on the "glide" as the speed dropped. The model was placed on angled girder at ten degrees from the horizontal and fired electrically. It covered half a mile at an average speed of 240 m.p.h., and over the measured 500-ft. course recorded 342.6 m.p.h. This gives a speed of somewhere in the region of 400 m.p.h. at take-off. The model was recovered and the only damage was that sustained in a somewhat heavy landing.

That is briefly what has been done in Brighton during the past eight months, but before you start forming or joining a rocket group please remember that many youngsters have been killed and badly injured because they fooled about on their own. No individual has enough spare time to be proficient in all that goes into rocketry, so don't be tempted . . . your first experiment will probably be your last . . .

**DON'T**

1. Use liquid fuel.
2. Use alloy or magnesium tubing.
3. Use seamed or riveted tubing.
4. Use gunpowder, chlorates or nitrates in your fuel.
5. Aim rocket vertically. (Always aim away from spectators.)
6. Approach rocket in event of misfire for at least 15 minutes.
7. **DON'T** fool around and **DON'T** be in a hurry.



Above, vertical rocket launching ramp for the "Pioneer", with its steel casing

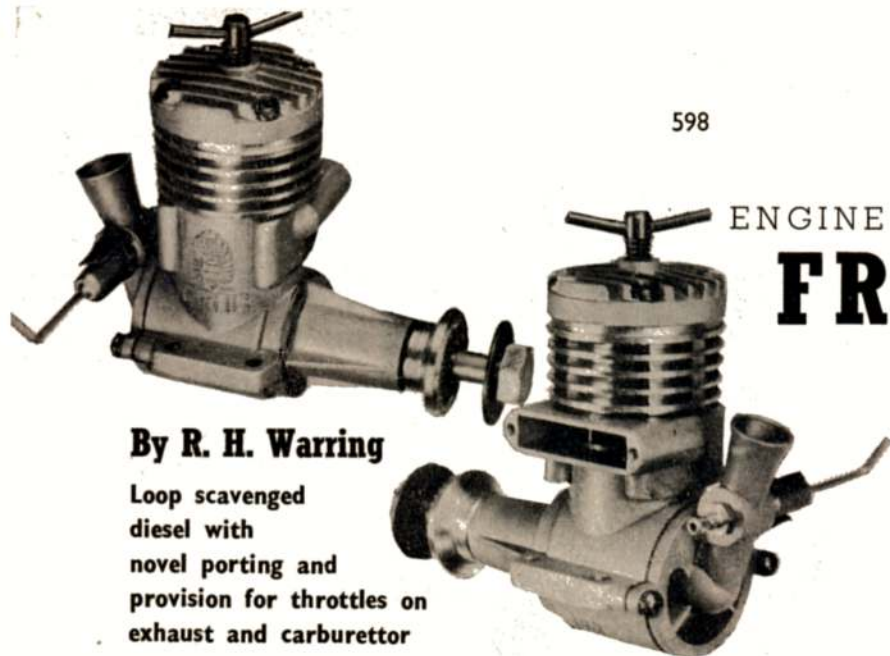


Left, shows the launching, rocket reached 1,800 ft.



Left, near horizontal launching of X-2 which weighed 3 lb. and was fitted with auto-elevator to bring nose up on the glide. Right, explosion caused when a nose plug blew after failure of a retaining screw!





By R. H. Warring

Loop scavenged diesel with novel porting and provision for throttles on exhaust and carburettor

THE NEW FROG 3-49 is obviously designed as a general-purpose engine for the larger sizes of control line and free flight models. The design incorporates a number of "different" features, notably rear induction through a drum valve and a screw-in high tensile light alloy propeller shaft. Provision is also made for the fitting of further accessories in the form of an exhaust manifold and barrel throttle, although these items are still in the course of development.

The 3-49 comes in two versions — the standard plain bearing engine, and a ball race version where a single ball race is fitted at the rear of the crankshaft. Externally the two models are distinguishable by the fact that the ball race version has a vapour-blast finish on the crankshaft casting giving it an attractive matt grey colour. Crankcase unit on the standard engine is rumpled to a semi-polished white metal finish.

Both models appear to be made to rather closer tolerances than normally associated with Frog engines. Fits, in fact, are almost tight when initially assembled and both engines require quite an appreciable amount of running-in time before properly freed-up and giving their maximum performance.

Starting characteristics are very good and both controls are non-critical. A rather unusual feature — although quite common with larger diesels — is that the 3-49 misfires if over compressed, but optimum running settings are readily established for any load-speed. Performance up to 12,000 r.p.m. plus appears perfectly satisfactory on any standard diesel fuel with no more than 2 per cent. nitrate additive, but for higher speed running an increase in the nitrate content is called for, for consistent running and non-critical needle setting. Both engines, however, peak at a relatively moderate speed (*i.e.*, around 12,000 r.p.m.) and so would not normally be called upon to run very fast.

Performance with the ball race version is definitely up on the plain bearing engine and the difference in r.p.m. with any given propeller size increases with the smaller propellers. In view of the close fitting, the B.H.P. curve given for the plain-bearing engine could be improved upon with further running time.

The engine runs quite hot, but not to the extent of

ENGINE ANALYSIS NO. 66

# FROG 3-49

## SPECIFICATION

Displacement: 3.43 c.c. (.209 cu. in.)  
 Bore: .6665  
 Stroke: .600  
 Bore/Stroke ratio: 1.1  
 Max. Power:  
 Plain bearing: .28 B.H.P. at 12,000  
 Ball bearing: .3025 B.H.P. at 12,200  
 Max. torque:  
 Plain bearing: 30 oz.-inches at 7,500  
 Ball bearing: 31 oz.-inches at 8,000  
 Weight:  
 Plain bearing: 6½ oz.  
 Ball bearing: 6½ oz.  
 Power rating:  
 Plain bearing: .082 B.H.P. per c.c.  
 Ball bearing: .088 B.H.P. per c.c.  
 Power/Weight ratio:  
 Plain bearing: .043 B.H.P. per ounce  
 Ball bearing: .046 B.H.P. per ounce

## Material Specification

Crankcase: LAC 112a alloy pressure die-casting  
 Cylinder: Steel, hardened and tempered  
 Piston: Meehanite  
 Contra-piston: Mild steel  
 Crankshaft: Hardened steel  
 Bearing: Vandervell sintered bronze sleeve. Rear bearing on ball race-engine ball race.  
 Induction: Hardened steel drum mounted in rear cover  
 Cylinder head: LAC 112a alloy die casting  
 Propeller shaft: High tensile ¼ in. diameter light alloy bolt  
**Manufacturers:**  
 INTERNATIONAL MODEL AIRCRAFT LTD.  
 Morden Road, Merton, S.W.19  
**Price:**  
 349 BB version £3 19s. 2d. (inc. P/T)  
 349 Plain Bearing £3 13s. 3d. (inc. P/T)

## PROPELLER — R.P.M. FIGURES

PROPELLER	R.P.M.	
	Plain Bearing	Ball Bearing
<i>dia. x pitch</i>		
10x6 (Frog nylon)	9,000	9,500
9x6 (Frog nylon)	10,400	11,200
8x8 (Frog nylon)	—	8,800
8x5 (Frog nylon)	11,800	12,600
12x6 (Trucut)	—	5,800
12x4 (Trucut)	7,200	7,500
11x4 (Trucut)	8,600	8,800
10x6 (Trucut)	8,200	8,600
10x4 (Trucut)	8,400	9,200
9x6 (Trucut)	9,600	10,000
9x4 (Trucut)	11,200	11,800
8x4 (Trucut)	13,400	14,000
8x3 (Trucut)	—	14,500

Fuel used: Frog "Powamix".

producing any marked falling off in power. This characteristic did, however, mean that consistent running was achieved with a slightly richer mixture setting than the minimum lean setting on which the engine could run. The effect on fuel consumption is shown on the graph, the upper line "A" representing duration on 1 c.c., corresponding to minimum lean setting, and line "B" the slightly richer setting which produced absolutely constant speed over the duration of the run.

Experiments with speed controls produced interesting results. Fitting a barrel throttle to the carburettor unit is largely ineffective without an exhaust manifold, due to the considerable amount of sub-piston induction present. The experiment was continued by blanking off the exhaust opening *completely* with a gasket cover plate and mounting an exhaust pipe in the centre of this baffle. The pipe used — ¼ in. overall diameter — was completely effective as regards sub-piston induction elimination, in that the barrel throttle now worked perfectly. A minimum idling speed of 2,700 - 2,800 r.p.m. could be set for consistent running with very rapid response to change of throttle position and instant pick-up. Exhaust pipe size used was definitely smaller than it should have been for optimum results and produced a drop in speed for any given propeller load of some 900 - 1,500 r.p.m., depending on propeller size.

Complete "throttling" of the 3-49 can also be used by blanking off the exhaust entirely — and it needs to be a very good seal to stop the engine finally with the exhaust apparently sealed off — *i.e.*, pressing a piece of flat wood over the exhaust, speed is reduced to a con-



sistent 2,500 - 2,700 r.p.m. with very quiet running.

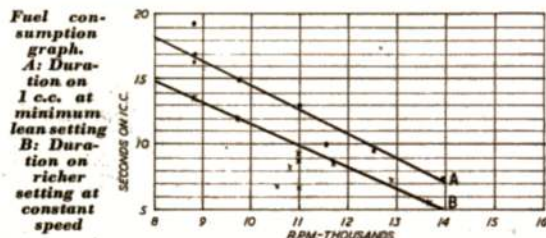
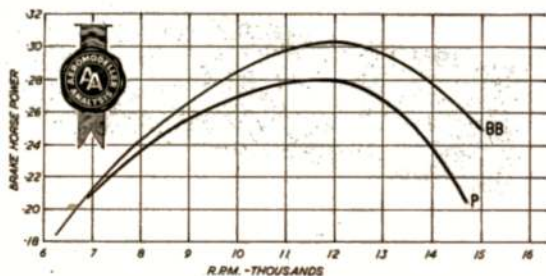
From these tests it can be deduced that a combined exhaust fitting and barrel throttle is best for speed control and should prove positive and reliable in operation. The exhaust stub is already dimpled to locate tapping holes for an exhaust fitting which will soon be available and the choke tube casting incorporates a large section at the spraybar position for drilling out to accommodate the throttle unit.

The crankcase casting of the 3-49 incorporates a lower cylinder block with cast-in transfer passage opposite the stub exhaust, both approximately to 180 degrees opening circumferentially. The cylinder flange seats on a gasket. Fitted above the cylinder flange is a special nylon sealing ring which, when the cylinder jacket is tightened down with its holding screws, expands to produce a complete seal. Cylinder jacket and head are separate parts, the former being turned from dural whilst the finned head is a die-casting. The head has a nylon insert to provide positive locking for the compression screw.

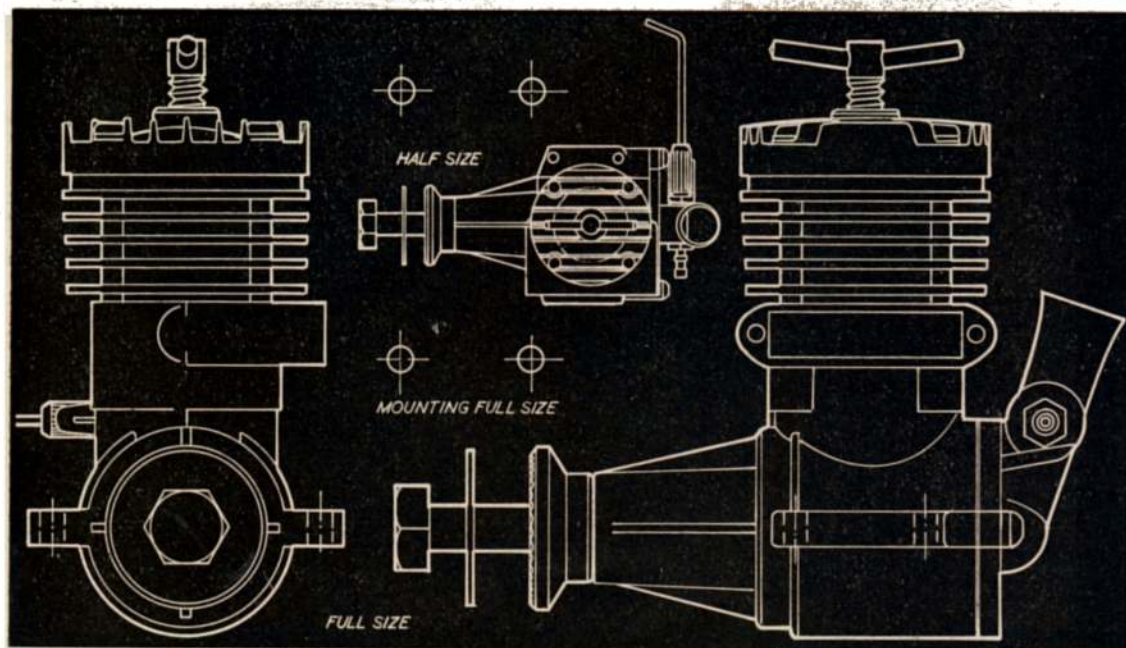
Cylinder itself is of steel, hardened and then taken back to a semi-hard condition. 180 degree exhaust porting is cut in the flange whilst the diametrically-opposed transfer is formed by five holes drilled upwards at an angle through the cylinder wall to slightly overlap the exhaust opening.

Piston is Meehanite and contra piston is mild steel. Piston is relatively shallow in depth with a conical top of appreciable height to act as a deflector directing transfer gas flow upwards and away from the open exhaust port, extreme transfer ports act as flow deflectors to aid gas movement in what is really a unique loop-scavenged diesel design. The connecting rod is a light alloy forging (the same rod as used on the 2-49) mounted on a fully-floating gudgeon pin of  $\frac{1}{16}$  in. diameter silver steel. Both con rod bearings are plain and reamed to final size.

The hardened steel crankshaft is machined with a "waisted" section and the two journal faces ground to finished diameter. On the plain bearing engine the shaft runs in a sintered bronze (Vandervell) sleeve. On the ball bearing engine the sleeve is shorter to accommodate



the race and is relieved in the bore corresponding to the land area of the shaft. The shaft is identical on both engines. Oil distribution to the bearing surfaces is provided by a half-moon cut-out or groove at the bottom of the transfer passage, this additional oilway having been found necessary to obviate any possibility of the shaft running dry. On some early production plain bearing engines a drilled hole may have taken the place of the half-moon cut-out. (continued on page 643)



# Marinecraft

# Announce

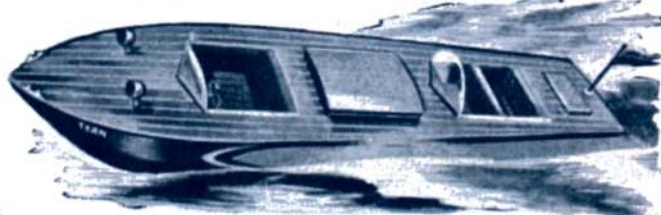
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No. 2 model 10" l.o.a.



## H.M.S. BOUNTY

No. 1 model 13" l.o.a.  
No. 2 model 6 1/2" l.o.a.



## MAY-FLOWER

No. 1 model 13" l.o.a.  
No. 2 model 6 1/2" l.o.a.



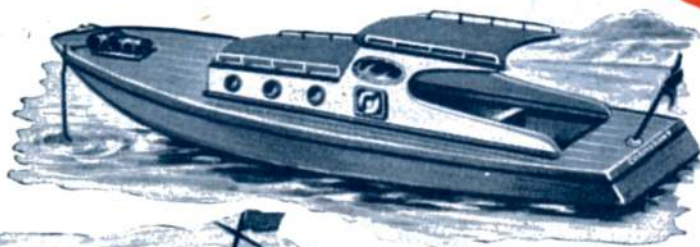
## ARK ROYAL

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No. 2 model 9 1/2" l.o.a.

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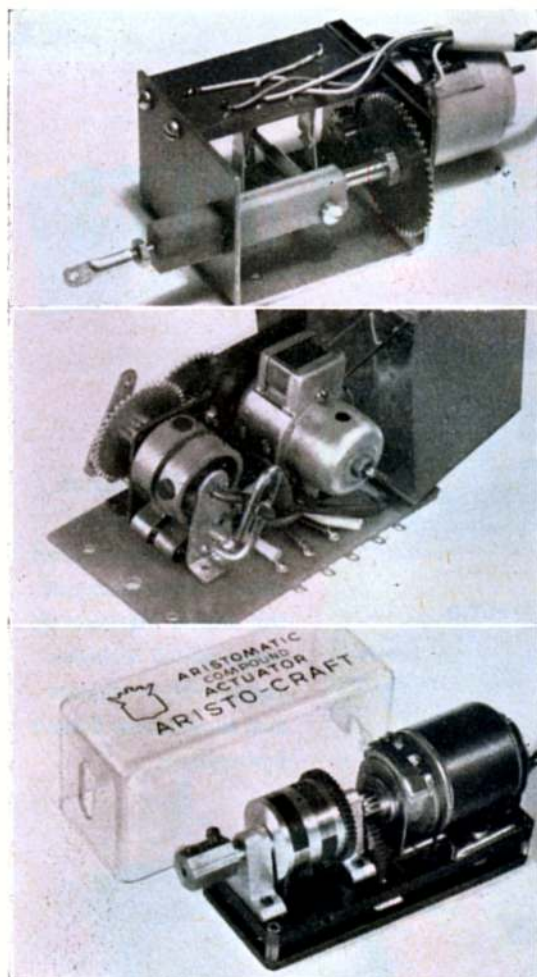
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## Servo Survey

A NUMBER of motorised servos are now available (since our last review in December, 1957) to the R/C fan and a report on performance would seem to be called for.

In order to provide a constant source, nickel-iron accumulators of 10 amp./hr. capacity were used. Two voltages and readings are given where appropriate so that the effect of falling voltage can be seen.

### Radio and Electronic Products (Omniac)

This is a useful unit and is completely satisfactory. A higher gear ratio would be a distinct advantage and a more positive fitting of the operating arm and gears would appear to be necessary. In one case vibration has affected a soft-soldered joint on one gear, and R.E.P. are attending to this by using a silver-soldered steel gear.

Self neutralising is 100 per cent. positive in action. Low current consumption makes it an attractive proposition. There is provision for replacing the cam plates, making the unit very versatile. In fact no less than five variables are possible, to suit all types of radio requirement. A *minimum* of 2.4 v. is recommended. (Price 60s.)

### Mini-Uniac

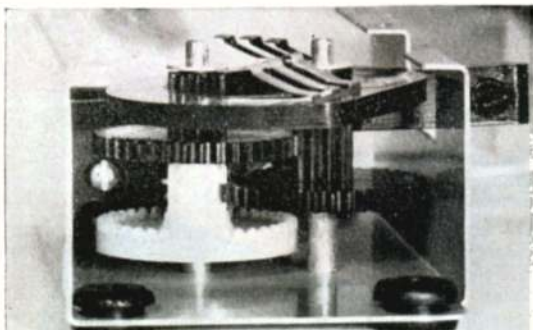
A really excellent unit. Well made and positive switching. Plenty of power for the heaviest model or for manoeuvres. The stalled current is high but at no time in operation is the motor stalled. Transit time is a little slow and could be increased by the inclusion of a smaller gear with power to spare.

### E.D. Multi-Servo

Uses the Mighty Midget motor with low current consumption. It is similar in operation, to the Olsen Servo (AEROMODELLER, November, 1958), but has a fixed switch plate and moving wiper arms. The gear ratio is higher with a corresponding increase in torque. The wiper arms, however, appear to be soft and replacement with a stiffer material would be desirable. Self-

*The Mini-Uniac, with threaded rod final drive, the Japanese Compound with leather pad stops and the Aristomatic with spring-loaded wipers on inlaid insulating panels are seen at left*

	R.E.P. (Omniac)	E.D.	Cobb Electro Compound	Bonner DURAMITE	Aristomatic Compound	Japanese Electric Compound	R.E.P. (Mini Uniac)
SIZE ... ..	1 1/5 x 2 1/2 x 2 1/2 in.	1 1/2 x 1 1/2 x 2 1/2 in.	1 1/2 x 2 1/2 x 1 1/2 in.	1 x 1 1/2 x 3 1/2 in.	1 1/2 x 1 1/2 x 3 in.	1 1/2 x 1 1/2 x 2 1/2 in.	2 1/2 x 1 1/2 x 1 1/2 in.
WEIGHT ... ..	2.75 oz.	3.25 oz.	2 oz.	2 1/2 oz.	3 1/2 oz.	3 oz.	2 1/2 oz.
TYPE ... ..	Motorised Universal disc cam; four detachable cams (P. circuit)	Motorised printed circuit switch plate (plated)	Motorised printed circuit cam	Motorised printed circuit switch plate (plated)	Motorised circular cam	Motorised circular cam with fibre insets	Motorised, Contact limit switches, Alternative switching arrangements
MOTOR ... ..	Mighty Midget —plain bearing	Mighty Midget —plain bearing	Two permanent magnet—plain bearing	Two permanent magnet—plain bearings	Permanent magnet—white bearing metal	Permanent magnet—plain brass bearings	Ever Ready. Per- manent magnet. Plain brass b'rings
Gears and Ratio ... ..	(4) Nylon and brass 49 - 1	(6) Nylon and brass 343 - 1	(4) White metal 16 - 1	(7) Nylon and final rack approx. 384 - 1	(4) Fibre and brass 25 - 1	(4) Brass and iron 20-25 - 1	5 : 1 to Threaded rod 39 T.P.1
Current { NO LOAD ... .. drain { STALLED ... ..	300 m/A 500 m/A (at 2.4 v)	300 m/A 500 m/A (at 2.4 v)	.75 amp 1.25 amp (at 1.2 v)	.25 amp .75 amp (at 2.4 v)	.5 amp .8 amp (at 2.4 v)	.25 amp .9 amp (at 1.2 v)	.25 amp 1 amp
Range of travel from neutral ... ..	1/2 in.	1/2 to 1/2 in. (3 positions)	1/2 in.	7/8 in.	1/2 in.	1/2 in.	1/2 in.
Torque { 1.2 volts ... .. { 2.4 volts ... ..	11 oz.	20 oz.	2 oz. 4 oz. (excessive drain)	.5 lb. 3.5 lb.	1 oz. 8 oz.	6 oz. 20 oz.	4 1/2 lb.
Transit time { 1.2 ... .. { 2.4 ... ..	— .6 second	— 1 1/5 seconds	1/5 second 1/10 second	1 3/5 seconds 2/5 second	1 second 2/5 second	4/5 second 1/10 second	.8 second
Return to neutral ... ..	100%	100%	Erratic on 1.2 v	100%	100%	Erratic	100%
NOTES ... ..	A higher gear ratio would be an advantage	Danger of damage to wipers if motor connected to a battery	Dual battery	Dual battery	Single battery — Erratic on 1.2 v	Excessive current drain at 2.4 v when stalled	Would function on 1.5 v. but minimum of 2.4 v. recommended
Readings at 2.4 volt unless otherwise stated							



End view of opened Bonner Duramite shows nylon gears and, at top, wiper arms on final rack and pinion. Right, Cobb Electros with exposed gears, and below, the Duramite

neutralising is 100 per cent. positive. The use of a minimum voltage of 2.4 is recommended. Price £3 10s. 7d. Cobb series (3 position SN and compound)

All three units have a very high current consumption and low gear ratio. As a result, reliability is below standard for large R/C model purposes, but should be satisfactory on smaller models. A higher gear ratio would make a significant change in performance, but the high current presents a problem. The use of 1.5 volts as recommended by the makers should not normally be exceeded. \$8.95 in U.S.A.

#### Bonner (Duramite)

This unit is outstanding in performance. The current consumption is greater than the Mighty Midget or the Ever Ready but the speed of operation would result in equal battery life.

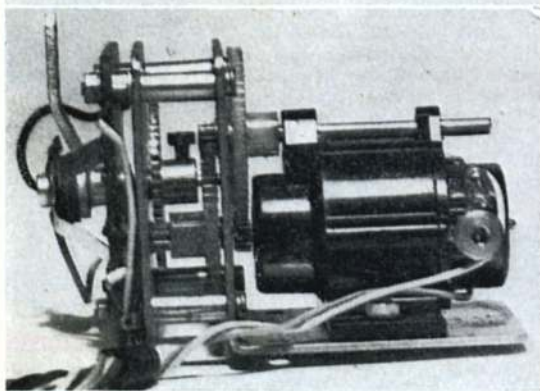
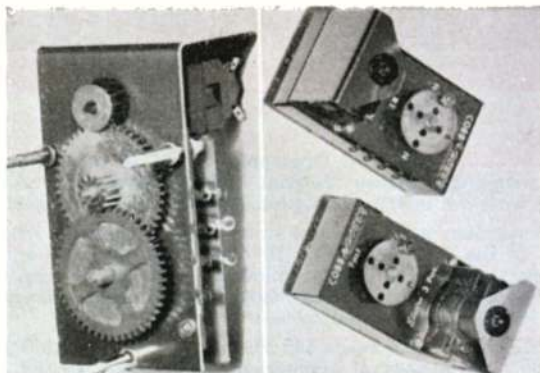
Self-neutralising is 100 per cent. positive. A minimum of 2.4 volts is recommended. A minor criticism is the use of a plastic control arm which could be fractured on impact, but no doubt Bonner's long experience has given him good reason to use a moulding. \$12.95 in U.S.A.

#### Aristomatic (compound)

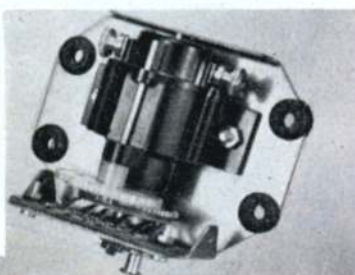
A useful unit but a little heavier than the remainder. It gives positive control and self-neutralising and is of the two position S/N type suitable for rudder or elevator. Only a single battery is necessary. Torque is not high but should be ample for all normal use. A minimum of 2.4 volts is recommended. \$10.95 in U.S.A.

#### Japanese Electric Compound

In its present form the unit is erratic in action but could be improved with a higher gear ratio. Gears are of poor quality and badly fitted and the wiper springs need improvement with plating to make for greater reliability. High current consumption is a problem.



Above, gear view of E.D. Servo, wiper board at left. Below, the Omnic opened to show wipers and four extra wiper discs for various purposes. At left, the Cobb Slimline, not tested, but checked for good centring and ample power. Note wiper baseboard



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There are over 100,000 words and 336 photographs, many never before published. A number of photographs have been selected to show insignia and identity markings used by Aces.

The book contains 212 pages, size 8½" x 11¼". It is printed on glossy Art paper, bound in stiff boards gilt-blocked and wrapped in a two-colour dust Jacket. Weight is nearly 2½ lb. Nearly 3,000 copies have already been sold. Ample stocks are available. Delivery is immediate.

**Contents:** Text and 248 large photographs illustrate 328 Squadron, Unit and individual aircraft Serial Markings of the 1914-1918 War; the "inter-war" period; the 1939-1945 War; and the Korean War.

80 drawings illustrate British 1914-1918 squadron markings. 294 drawings illustrate Insignia of World's Aircraft. 94 illustrations in FULL COLOUR of British Squadron Markings. 37 illustrations in FULL COLOUR OF 1914-1918 War Camouflage and Serial Markings. 67 illustrations in FULL COLOUR of "Inter War" and 1939-1945 War Camouflage and Serial Markings. (All Allied and Enemy.)



24 photographs in FULL COLOUR of 1939-1945 War personal insignia, and 1945-1954 period Colours and Markings. Many tables of British, French, German, Australian and American Squadron, Unit and individual aircraft serial markings. R.A.F. Unit code letters 1939-1945. Nearly 11,000 copies of this book have already been sold!

**Contents:** This is a book about the German Ace of Aces and all the famous units he commanded. The full history of the "Circus" has never before been published in England, and never before anywhere has the life of Von Richthofen appeared together with the full history of the "Circus". The story tells of Von Richthofen's life from boyhood, gives intimate sketches of his earlier days, and of how he succeeded in destroying 80 aircraft. Some 200 pilots who served under him are mentioned by name and victory scores, and the history of the "Circus" is narrated from its inception to its disbandment. Its subsequent revival in the Luftwaffe is also recorded.

There are 2-page 1/72 scale 6-view drawings with photographs, specifications, development details, etc., of each of the 12 aircraft flown by Von Richthofen and/or the *Richthofen Jagdgeschwader*.

There is also an illustrated review of all Von Richthofen's victory claims, each with a fuselage profile showing serial and other markings where applicable. Altogether 256 photographs, many never before published, have been reproduced in this book. Nearly 5,000 copies have already been sold!

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# Control-line International

## RESULTS

### Team Racing

			Fastest Heat
1. Bernard ...	Belgium ...		4.27
2. Azor ...	Hungary ...		4.56
3. Lenzen ...	Germany ...		5.03
4. Simon ...	Hungary ...		5.22
5. Varjadic ...	Yugoslavia ...		5.27
6. Contini, F. ...	Italy ...		5.27
7. Gorgocena ...	Spain ...		5.27
8. Rossi, U. ...	Italy ...		5.31
9. Tyler ...	Gt. Britain ...		5.44
10. Raattkainen ...	Finland ...		5.45
11. Lietzmann ...	Belgium ...		5.45
12. Gafner ...	Switzerland ...		5.46
13. Berselli ...	Italy ...		5.55
14. Fernandez ...	Spain ...		5.56
15. Malic ...	Germany ...		6.05
16. Ordogh ...	Hungary ...		6.19
17. Savolainen ...	Finland ...		6.21
18. Baxter ...	Gt. Britain ...		6.22
19. Knezvic ...	Yugoslavia ...		6.40
20. Papegnies ...	Belgium ...		6.40

NOTE.—Other seven teams do not appear due to retirement or disqualification.

### Speed

			K.p.h.
1. Rossi, U. ...	Italy ...		222
2. Beck ...	Hungary ...		214
3. Rossi, G. ...	Italy ...		210
4. Toth ...	Hungary ...		202
5. Batllo ...	Spain ...		200
6. Jaaskelainen, K. ...	Finland ...		194
7. Jarry-Desloges ...	France ...		191
8. Hagberg ...	Sweden ...		187
9. Deligne ...	Belgium ...		187
10. Gorziza ...	Germany ...		183
11. Martinelle ...	Sweden ...		180
12. Frohlich ...	Germany ...		179
13. Hall ...	Gt. Britain ...		178
14. Savolainen ...	Finland ...		173
15. Lenzen ...	Germany ...		172
16. Jaaskelainen ...	Finland ...		167
17. Magne ...	France ...		167
18. Irvine ...	Gt. Britain ...		164
19. Stephen ...	Gt. Britain ...		156
20. Jenatton ...	Switzerland ...		148
21. Godsiabois ...	Belgium ...		137

Total best  
2 of 3 flights

### Stunt

1. Grondal ...	Belgium ...	2010
2. Egervary ...	Hungary ...	1943
3. Edinger ...	Switzerland ...	1856
4. Doring ...	Germany ...	1842
5. Ordogh ...	Hungary ...	1814
6. Seeger ...	Germany ...	1770
7. Macon ...	Belgium ...	1695
8. Horrocks ...	Australia ...	1688
9. Compostella ...	Italy ...	1630
10. Contini, M. ...	Italy ...	1600
11. Day ...	Gt. Britain ...	1561
12. Deville ...	Belgium ...	1512
13. Contini, F. ...	Italy ...	1467
14. Soderberg ...	Sweden ...	1415
15. Raulio ...	Finland ...	1233
16. Russel ...	Gt. Britain ...	1027
17. Bartlo ...	Spain ...	962
18. Skauge ...	Norway ...	425
19. Sindjelic ...	Yugoslavia ...	342
20. Oswald ...	Germany ...	58

### Criterion Points

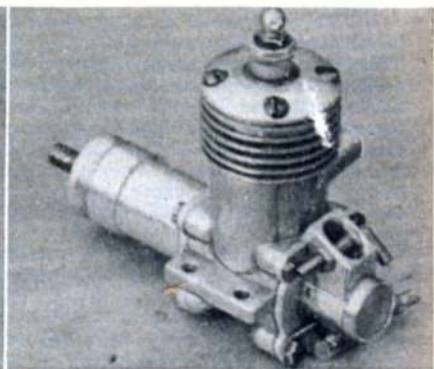
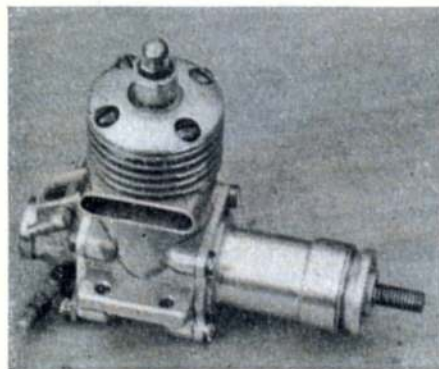
1. Hungary ...	6	6. Finland ...	19
2. Belgium ...	8	7. Gt. Britain ...	20
3. Italy ...	10	8. Switzerland ...	20
4. Germany ...	14	9. Sweden ...	21
5. Spain ...	16		

THE TENTH CRITERIUM marked a change in name, and a sharp upswing in standards for this popular meeting at the Etterbeek circles, Brussels. Firstly it was to be called the *Criterion of Aces*, so widening the scope for more International entries, and though the original plan to get U.S.A. and U.S.S.R. participation misfired, as did the arrangement to fly at the Bruges abattoirs, a lone Australian entry in the person of Brian Horrocks, made the Aces title true.

## TEAM RACE RECORDS TUMBLE AT THE "CRITERIUM OF ACES" in BRUSSELS

First class organisation by the hardworking bunch of Belgian stalwarts, Albert Roussel (Chairman of the F.A.I. models commission) and his wife; Colonel Borgniet, George Lippens, M. Bienvenu and Eric Gasee, was matched by an extraordinary high standard of flying in all classes, and it was not by a fluke that the host entry won both Team Race and Stunt individual honours decisively. The Czechs disappointed in their absence by not making it a tricorned fight in speed, throwing the MVVS engines into the fray against Moki's from Hungary and Italian Super Tigres as well as defending their stunt success of last year: but we understand that Zdenek Husicka is very ill after a heart attack and Prague organisation has more than suffered.

Surprising too, was the small participation of neighbour countries. France was nobly represented by the omnipresent Jarry Desloges and his unique engines in speed, without support in team race or stunt, and what of Holland, once the leader of our team race opposition in so many thrilling finals?



MOTORS of the MEETING — Above two views of the Beno Schlosser's new drum valve 2.5 c.c. racing engine with tapping off the valve opposite to carburettor for fuel pressurisation. Below is the winning Super Tigre G-20V mounted in Ugo Rossi's speed pan and held by the hand of its designer, Jaures Garofali. Heading shows a panoramic view of the Etterbeek C/L site.







However, the meeting lacked nothing, for thirteen nations enjoyed that spirit of fascinated animosity so typical of this Criterium, and without which we would profit little in annual advance of control line standards.

All the administrative loopholes of previous years were well and truly buttoned up on this occasion. A strict 6-metre height marker system was erected to observe team race irregularities and of the disqualifications, no one could justifiably complain, except perhaps at the final exclusion of Sweden's Rosenlund—of which more anon.

Speed saw the introduction of the new handle regulations (no projections forward of the grip), and Italian's taught everyone a new technique in leaning out a motor to peak speed.

From our vantage point in the stunt jury box, wire caged and glassed in as befits those in need of protection! We viewed the events as detached and unbiassed (as ever!) observers should, though we must confess to boredom at the conclusion of the 64th stunt flight to the same schedule almost jaundicing our views on the merits of C/L aerobatics! There were times when the Union Jack needed hoisting a little higher by our 24-person contingent, the largest of any country there, but the simple truth is that we sent our best, and though the team did its very utmost to succeed, it returned the wiser for being well and truly beaten. Representing G. Britain were Peter Wright as Manager, Baxter/Long, Yeldham/Stephen and King/Tyler in Team Race; Hall, Irvine and Stephens in speed, Day and Horrocks in Stunt. Brian Horrocks carried an Australian F.A.I. card, and could not represent G.B., but Ian Russell of Hayes, one of the many supporters nipped off, bought a Flite Streak kit, built it in an evening and qualified to increase our complement for Criterium points, a stout effort that did not go unobserved and which helped G.B. up the ladder in the Stunt results.

**FOUR FINEST MODELS** — at Etterbeek, Ugo Rossi with his "Devil" winning speed design to be included in our *Plans Service* and featured in next month's issue. Louis Grondal of Belgium with his light blue and white "Nobler" which won Stunt. Below, left, is Norwegian B. Skauge with his beautiful elliptically winged black and white stunt model which unfortunately pranged, and at right, "Startiger" by Nery Bernard, clearly a team race winner on all counts

## Stunt

If results depended on early impressions, we would have been highly placed for the first half hour of the fight programme for the stunt circle did not see a single official manoeuvre. Three came to fly and called off as attempts! As fourth man on the list, Brian Day and his elderly modified *Calamity Jane* set the ball rolling and flew the book in under five minutes. Shaky bunts and vertical eights knocked back his points to  $\frac{2}{3}$  of the possible 1,200—but the results are taken on best two of three official flights so there was still time for improvement.

In a succession of flights, several were outstanding for excellence at one particular manoeuvre: but none except Dr. Geza Egervary of Hungary and Belgian Grondal showed a clean schedule from start to finish. Egervary let himself down with shaky vertical eights and positioning so that judges could not see all of the manoeuvre: and when in his best flight he had the McCoy 35 cut before completing the clover leaf, he lost points that might well have made him ultimate winner. Louis Grondal, one of many *Nobler* adherents has a light version of George Aldrich's design for the Fox 35. He flies smoothly, with crisp pull-outs, good positioning, loops in one steady circle, eights with equal size and correctly disposed halves. His tank over-ran to lose landing points on one flight, clipping 60 certain points for a perfect touchdown (plus 10 penalty points for manoeuvre omission!) otherwise his victory might have been greater.

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HILLS MEADOW DOUGLAS ISLE OF MAN

**Control Line International (cont.)**

Swiss Hedinger in third place did battle with one of the few *Thunderbirds* (Fox 35) and placed himself high by excelling the entry at the highly pointed reverse wingover (80 pts.), triangular loops (140 pts.) and clover leaf (100 pts.). He flies fast, with motor peaking all the time.

The two German *Nobler* fliers, Doring and Seeger, impressed with low pull-outs fast, low level bunts, and good triangles, while Hungarian all-rounder, Ordogh, did well to run second to Grondal in the first round.

Brian Horrocks had a stunning red, white and blue scheme for his enormous Glo-chief 49 model, which lumbered around as though it had all day to get through a schedule. Brian improved as we went along, his last flight easily his best, and his loops a lesson for all to see. Tubby Day on the other hand, could not settle, on one flight he almost hit the ground on a reverse wingover, and actually made contact in the clover: but this was by no means exceptional and the circle witnessed several prangs of high order. Battlo usually manages to join the Etterbeek prangers and this year's was a classic—straight in off the vertical eight! Oswald of Germany rubbed nose and fin into the tarmac when inverted and the most disheartening of the lot came when Norway's only rep., B. Skauge lost control of the most beautiful stunter we have ever seen. The model was tail heavy and a U-Reely did not help; but young Skauge was told enough by appreciative competitors, not to repeat the error again. So it became a *Nobler* year, and of engines, the K. and B.45, Enya 35, Glo-Chief 49 and of course, the perennial Fox impressed for unflinching performances.

**Speed**

Had Amato Prati's soldered lead-out wires not given way early in the contest, the result might well have been an even more convincing Super Tigre victory. The Super Tigre tuners knew they had lost their better engine; and set to work making sure that the Rossi brothers placed high. They did so by running a motor and shearing the blades with a screwdriver! It took a great effort by Rudi Beck to split the lads from Brescia, who make their own speed pans, spinners and glow plugs for commercial sale, and to Ugo Rossi went the honour of 222 K.p.h. (138 m.p.h.) without a trace of whipping and this with a model to the specification once described as ludicrous and killing the class!

Turning up to 17,000 on a 6 x 8, the experimental G-20V has a standard crankcase, but ports are re-arranged with transfer opening practically simultaneously with exhaust. This is the key to complete removal of the baffle on a loop scavenged engine. Crankshaft porting is enormous and a surface jet in the short intake is pressure

fed by a tapping on the reverse side of the shaft bearing, coupled to the tank. One engine had integral fins, others a standard alloy case. All had thick liners.

Toth of Hungary completed the leading foursome with another Moki powered model, then came the "private entrants", Battlo (Super Tigre), Jasskelainen (MVVS) and Jarry Desloges with his own engines, were the only others to top 190 K.p.h. (117 m.p.h.). It was notable that the overcast first day provided best results from every speed competitor and also that the full 3-man results by Finland and G. Britain placed them higher in team positions than the countries providing fast individuals. Regularity paid off for all British reps. returned speeds, John Hall the best, though still 44 k.p.h. aft of the Italian leader. One technique seen for the first time, is the Rossi lean out by yo-yoing the model and shortening the radius by pulling back rather than leading the lines.

**Team Racing**

This was the year of elliptical wings and genuine over the 100 m.p.h. racers. Bernard (Belgium), Berselli (Italy) and Rosenlund (Sweden), each had 102 m.p.h. to their credit by stopwatch observers, and when whipped, 108 m.p.h. was the speed between stops. How else can one do the 10 Kilometre distance in only 4 minutes 27 secs. with about 35 secs. out for deceleration and two refuellings? Such was Bernard's best heat time, and he also deservedly won the final, though passed twice by Rosenlund, who was later excluded for having a fractionally oversize tank. The embarrassed checker could not say how much it was oversize—and since it had already passed scrutiny in processing, one might have expected leniency: but such are the penalties of marginal construction!

Sportsmanship in the centre disc was not often evident and in several tussles better models often came off worse for wear. Berselli's mono-wheeled Super Tigre G31 model, possibly the fastest on the field, was wrecked during practice and G.B. was lucky when Spain and Hungary did not see eye to eye and created the need for a re-run when our Yeldham/Stephen's racer had a shaft run at its first stop and had lost the seconds that count. Even then our best time of 5 : 14 by Feltham's Tyler, whipping like a demon, high as he dare and pitted fast as possible was in a race where *all* were disqualified justifiably for continual excess height over six metres.

Our sympathies go to Lazslo Azor of Hungary, twice a finalist in this annual classic, and who always manages to get a slipping compression screw in the culminating race. He retired wisely, after Beck dunked the long range design to bust the u/c and watched Bernard's superb model finish at 4 : 37. ably pitted by Henry Stouffis.



Left: Maestros at work on their engines. Jaures Garofali, proprietor of Super Tigre and Amato Prati prepare G.20V and Jarry-Desloges from Paris (right) works on his long shaft specials.

- (1) Marco Contini with his large K & B 45 Ink Spots design, very fast.
- (2) Another fast model, Hans Hedinger's Fox 35 *Thunderbird* in vivid red and white, underside is reverse scheme.
- (3) Blue and yellow are colours for Baxter's *Tigriss* here pitted by Ken Long.
- (4) Udo Doring and Klaus Seeger with their *Webra Mach 1* invincible combat models *Zick-Zack* and *Zack-Zack*.
- (5) Typical of many elliptical models is Swedish racer by Rosenlund, ultimately disqualified.
- (6) John Hall readies one of his *Deltas* with new Carter engine.
- (7) Dr. Geza Egavary and McCoy 35 stunter placed second.
- (8) Simon's racer from Hungary had inset elevators.
- (9) B. Horrocks's Australian model in vivid red, white and blue drew an appreciative crowd.
- (10) Jurgen Lensen and fast racer. *Oliver Tiger* exhaust deflected to outside of circle, in glass fibre fuselage base, ply and balsa wing for total weight 22 oz.
- (11) Reno Varjatic and *Oliver Racer* from Zagreb.
- (12) Rudi Beck placed second in speed.
- (13) Gorgocena and elliptical Spanish racer.
- (14) Berselli's jet stunter put up stimulating display of aerobatics



# PROPELLER SELECTION

This feature by Engineer E. Smirnov, well-known Soviet Wakefield flyer, has been anglicised by John O'Donnell. Although it relates to 80 gramme motors, it provides interesting theory on the key to modern Wakefield performance—the propeller.

IN ORDER TO OBTAIN a flight of reasonable duration, *i.e.*, about three minutes, from a rubber-powered flying model, it is necessary that the modeller builds a good design and takes great care in the selection of the best possible wing section, propeller and rubber motor.

In this article, it is intended to discuss the requirements for the best choice of propeller and rubber motor.

## The Rubber Motor

It is obvious that the power plant comprises a rubber motor driving a propeller. It may be remarked that a rubber motor is an exceedingly inconvenient form of power as the torque provided by the rubber unwinding varies continuously.

For the motor, a particular form of rubber is used, which is especially suitable for the purpose. Its power-storing ability is measured in lb. ft. / lb., *i.e.*, the work that could theoretically be performed by 1 lb. of rubber. As a lb. ft. is a measurement of energy where 1 lb. is raised to a height of 1 ft., the specific energy (lb. ft. / lb.) is the height to which the rubber would raise itself if all its stored energy could be converted into potential energy.

The most energy is stored when the skein of rubber is stretched to its limit, as the specific energy depends on the rubber unwinding itself.

The shorter the rubber for a given weight, the less specific energy is released. This is because during extension, friction occurs between the separate strands of the skein and consequently energy is lost.

The specific energy released in unwinding, depends on the thickness

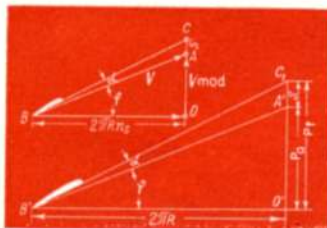
of the rubber strands and the specific energy decreases as the strand thickness increases. This is due not only to the increased friction, but also to the way the rubber is twisted. Consider a motor made up of a large number of small-section strands. In winding the skein, the individual strands are extended, those on the surface of the skein being stretched more than those within the skein. In order to avoid breaking the skein, the rubber motor is only wound to a number of turns limited by the permissible extension of the outermost strands; the more central strands are not completely extended. The thicker the skein, the greater the difference in the extension of the outer and inner strands, and the less the inner strands are used.

Thus, a large cross-section skein possesses less specific energy on unwinding due to increased loss of energy due to friction, and less extension of the inner strands. The average specific energy produced on unwinding varies with the type of rubber. For a Wakefield motor, the weight is (*was!*) 2.82 oz. and length of the rubber, 34.4 ft. The specific energy for home-produced rubber

subsequently losses due to friction inside the skein are less than with rectangular strip rubber.

The relative elongation of the rubber indicates how many times the rubber can be stretched before it breaks. The maximum possible elongation for various types of rubber varies from five to eight times the original length. The specific weight varies from 0.95 to 1.1.

There are several important aspects to be considered in the torque / turns graph. A typical example is shown in diagram 1. There are three main sections of the curve; the first shows a rapid drop in torque from  $T_0$  to  $T_{OV}$ , the second is of almost uniform torque of approximately the value  $T_{OV}$ , whilst the final section drops sharply from  $T_{OV}$  to zero. The greater the extent of the middle section, the more efficient the propeller is likely to be.



(3) Pitch of propeller:  
 $P_a$  = actual pitch of propeller  
 $S$  = slip of propeller  
 $P_t$  = theoretical pitch of propeller

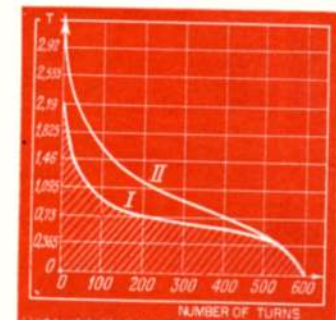
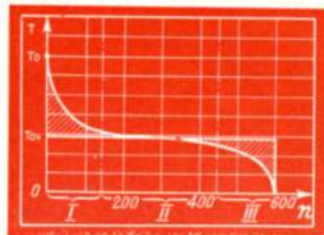
It should be noted not all the energy stored by the rubber is utilisable in flying the model, but only a fraction dependent on the efficiency of the propeller. The efficiency of the propeller is constant when the torque is constant.

When the torque changes, the efficiency also changes. The efficiency even with careful design, does not exceed 70 per cent., and is usually less than 50 per cent.

If the propeller is designed so that the highest efficiency is at the average torque  $T_{OV}$ , then with change in torque (either increase or decrease) the efficiency will decrease.

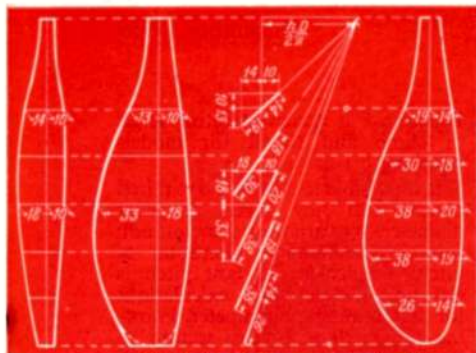
It is therefore apparent that the larger the middle section of the

(1) Typical unwinding curve



(2) Unwinding curve:  
(I) Motor made of 20 strands 1x4 mm.  
(II) Motor made of 60 strands 1.3 mm. dia.

(whose section is 1 x 4 mm.) is 1,050 - 1,125 lb. ft. / lb. For Hungarian black rubber, which is circular in section, the specific energy is 1,375 - 1,475 lb. ft. / lb. As Hungarian rubber is round in section, it has no edges and con-

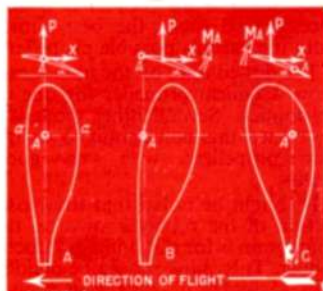


(6) Design of the propeller block

torque / turns graph, the better are the conditions for the propeller during flight.

Diagram 2 compares the unwinding curves for two different rubber motors. Curve I is for home-produced rubber, whilst Curve II is for Hungarian. It can be seen that the Hungarian is superior.

The design of a propeller comprises the determination of geometrical characteristics that will guarantee



(4) Blade Twist

the maximum efficiency when the torque is at the average value  $T_{OV}$ .

### The Propeller

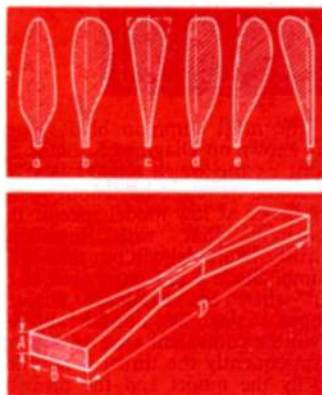
The fundamental geometric characteristics of the propeller are the pitch and blade-shape. The theoretical pitch of the propeller is the distance it moves forward in one revolution, assuming the blade sections have zero incidence.

Propellers may have constant or varying pitch along the blade. Propellers of constant pitch are called helical, i.e., all sections of the blade advance the same distance per revolution.

With non-helical propellers, the sections of the blade would advance different distances per revolution if they could move independently. Model builders usually use helical propellers as these are easier to design.

The pitch of the propeller is measured in inches. Dividing the pitch by the diameter gives the P/D ratio, which varies from 0.9 to 1.5. The lower the P/D ratio, the steeper is the initial climb of the model.

Consider a typical blade section (see Diagram 3). As this moves forward with the model, it has forward velocity  $V_{mod}$  inches per sec. Also it rotates a distance  $2\pi Rn_s$  where  
 $R$  = Radius at which the section is located,  
 and  
 $n_s$  = Revolutions per second.  
 The path of the blade is therefore along the line BA and hence makes



(5) Blade shapes and block layout

an angle  $\beta$  with the plane of revolution. If the geometric pitch angle is  $\beta$  then the blade section would advance the theoretical pitch (i.e., it does not slip and therefore does not advance less) and hence be at zero incidence and produce no thrust.

In order to produce thrust, it is necessary for the section to have an incidence angle  $\alpha$  above the pitch angle  $\beta$ .

This is similar to wing incidence, and is usually about 1 deg. to 6 deg. depending on the section. The more undercamber the blade has, the less incidence it requires.

A'C is the slip S  
 O'C' is the theoretical pitch  $P_{th}$   
 O'A' is the actual pitch  $P_{act}$

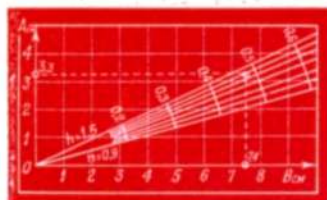
It is possible to write

$$P_{th} = P_{act} + S = \frac{V_{mod}}{ns} + S$$

or in terms of the P/D ratio

$$\frac{P}{D} = \frac{P_{th}}{D} = h = \frac{V_{mod}}{nsD} + \frac{S}{D}$$

From the above formulae, the P/D ratio is seen to depend on the velocity of the model, the diameter of the propeller and the revolution speed of the propeller. The speed of the model in flight in the first term can be taken as constant, but the revolution speed of the propeller varies considerably. If one considers the unwinding curve, it is plain that at first the torque being at a maximum, the revolutions will be highest, and as the torque decreases so will



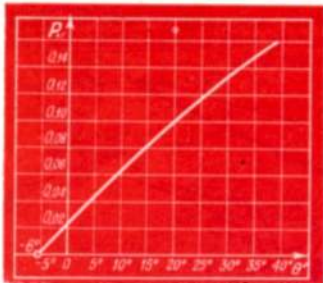
(7) Graph for determining block size

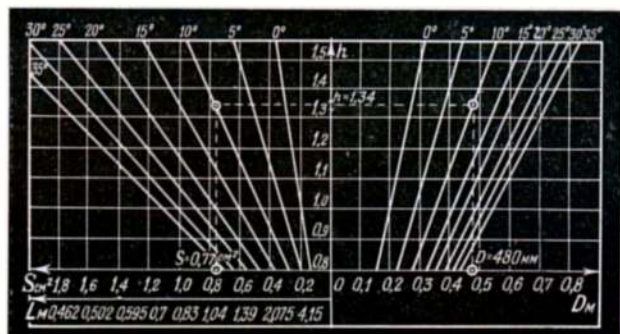
the revolutions. To have the propeller working normally, it is useful to vary the pitch of the propeller in flight. At the beginning of unwinding when the propeller is revolving fastest, the pitch must be less than at the end of the motor run when the torque has decreased (see previously quoted formulae). If pitch variation is not used then as the motor starts to unwind, the angle of incidence of the blades is too high, causing a large increase in drag and a consequent reduction in thrust. As the torque decreases below the average value  $T_{OV}$  then the angle of incidence is decreased and this also leads to a decrease in thrust. Alteration of incidence angle compared with the most efficient value, implies a decrease in the efficiency at any given speed of revolution of the propeller and of the model in flight. Can the propeller be made so as to give a variation of pitch in flight?

That it is possible to vary the pitch mechanically is not disputed.

However, it is possible to make a blade of such a shape that the aerodynamic forces whilst revolving will vary the pitch. A normally-shaped blade is shown at A on diagram 4, together with a diameter about which it is possible to consider the blade disposed. It is apparent that this diameter passes through the root of the blade where the material is concentrated. Hence on the section of the blade, aa, the lift and drag forces lie approximately on the flexural axis and do not produce a torque that distorts the blade.

(8) Determining the required thrust





(9) The Nomogram. Directions for use are in the text

At B on Diagram 4 is shown a swept-back blade which decreases in pitch with increase in the aerodynamic forces.

At C on Diagram 4 is shown a swept-forward blade which increases in pitch, with increase in the aerodynamic forces.

At the beginning of the motor run, the torque is at a maximum and the propeller revolves fastest with greater aerodynamic loads than at the end of the motor run. The blade B decreases in pitch at the commencement of unwinding, whilst blade C increases in pitch. The blade A does not change pitch. In this way, decreasing the pitch at the beginning of the motor run increases the efficiency of the propeller. This gives a considerable increase in thrust at the beginning of the flight. Approximately the same high efficiency is maintained throughout the flight. Such a type of blade, in my experience, is best employed in models where the motor run is about a minute or over. In such models, the flying speed is almost constant as the angle of climb is not too steep.

If, however, on commencement of unwinding the propeller increases in pitch, then the model must increase in flying speed for the propeller to give thrust. Such a type of propeller is suitable for models whose motor run is less than a minute, because the climb is faster and steeper, allowing it to attain a height of possibly 300 ft. However, for such a climb to be stable, special adjustments are required as the model must fly with a small incidence angle on the wing.

The most common blade shapes are shown on Diagram 5. Blade *a* is poor as too much area is near the root and therefore has about 40 deg. incidence at low model speeds. It is apparent that with insufficient thrust, the model will not take off or climb. Blade *b* has more area at the tip where the incidence angle is about 15 deg., i.e., considerably less than the equivalent area on Blade *a*. Consequently the thrust is sufficient to fly the model and the propeller is more efficient.

The triangular Blade *c* may be considered as a simplification of Blade *b*. Blade *d* is a modification of *b*. Blades *e* and *f* are typical of flexing propellers. The maximum chord of the blades is usually about 10 per cent. to 17 per cent. of the diameter.

Designing the propeller block may be done as follows: Initially, the blade-shape is decided and at least five lines drawn chord-wise. Refer to Diagram 6 for the method of drawing angles at these sections.

If the radius ( $\frac{D}{2}$ ) is drawn full size horizontally, then the vertical line should be of length  $\frac{hD}{2\pi} = \frac{P}{2\pi}$

The remainder of the construction should be apparent from the diagram.

A simplified blank that can be recommended is shown on Diagram 5. The dimensions can be selected by reference to Diagram 7. It is recommended that the blade be carved to a triangular shape and rounded off at the tip finally. Blades of this type are often seen on high-performance models.

The blade section should be thin and undercambered with sharp leading and trailing edges. In the design of a propeller, the necessary torque appears to be determined by the pitch. As already explained, the steeper the climb, the less pitch required. Also, the greater the climb angle, the more thrust required. On

Diagram 8 is a curve relating angle of climb and thrust for models weighing 8.1 oz.

It is possible to obtain the required thrust with any given propeller diameter, by variation of revolution speed. This requires alteration of pitch. To decide the best pitch is difficult. The author's calculations for determining the diameter, knowing the pitch and cross-section of the motor (or length), for a model weighing 8.1 oz. including 2.82 oz. rubber, are embodied in the nomogram shown on Diagram 9.

By use of the nomogram and knowing the diameter and average angle of climb, it is possible to obtain the P/D ratio and the cross-section of the motor. Alternatively, knowing the cross-section of the motor and the angle of climb, the propeller pitch and diameter can be found. The latter is convenient as it enables a whole number of strands to be used in the motor. It is still necessary to make the best choice from the various possible propellers.

The dotted lines on the nomogram show a typical propeller for one of my models. Several other modellers have used this nomogram to design their propellers, with very good results.

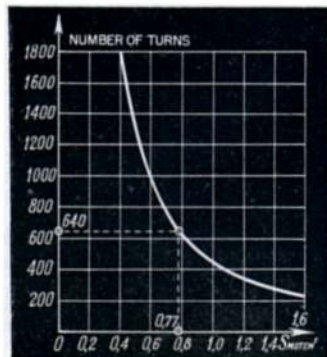
It should be noted that the cross-section of the rubber shown on the nomogram is for our home-produced rubber. This value should be divided by 1.15 to 1.2 if Hungarian rubber is used.

The number of turns that a clean, lubricated motor can be wound to, is given by the formula  $n = 5.5 \sqrt{\frac{L}{S}}$

where L is the length of the motor in inches, and S is the cross-section of the motor in sq. inches.

or by the graph on Diagram 10. Before use in a model, the motor should be check-wound to find the maximum number of turns.

(10) Maximum turns of the motor





## Ideal Engine Contest



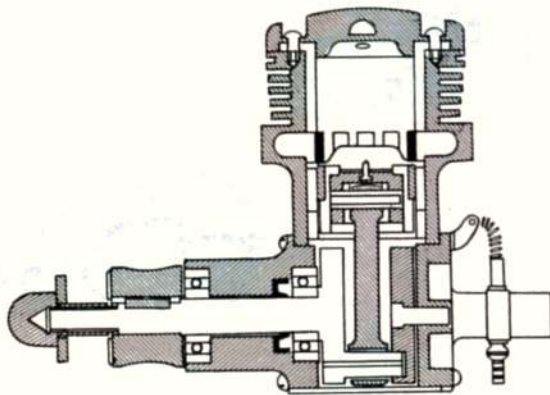
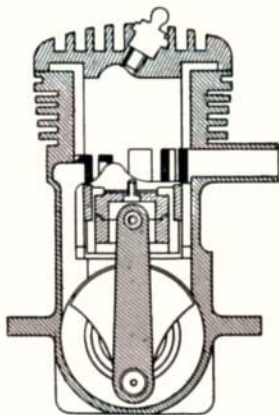
The  
STEWART  
11.6 c.c.

ALTHOUGH we said we had concluded this feature in October edition, arrival of a large package on the Editorial desk later that month made us change our minds to grant one more extension.

The engine was made at Mr. Stewart's home on a Myford ML7 lathe, except for the liner which was ground on other equipment. The piston was lapped in by hand and is made up of no less than 11 parts. They are: a split dural yoke held together by four 10 BA bolts. A dural skirt fits over the yoke and a cast iron piston ring over that. The piston crown is located by a shoulder let into the skirt and clamps down the piston ring via a bolt through the yoke. A locating pin through the skirt yoke and piston ring keep them all in position. There is also an oil-seal on the crankshaft between the two ball races.

This rather massive engine is most impressive for its fine external finish and the amount of good workmanship that has obviously gone into its production. The use of a banded piston after the style of some aero engines, shows initiative in overcoming the ever-present problem of piston rings for amateur construction. Altogether a most praiseworthy effort.

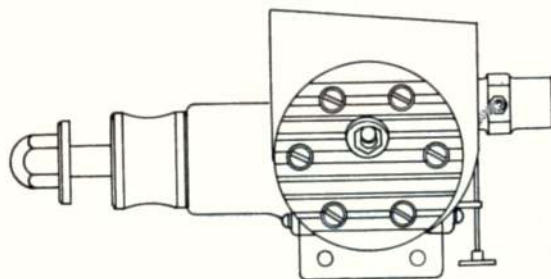
*- his half size drawing of Mr. Stewart's large engine illustrates his use of a built-up piston. Running check indicated low compression and tight shaft seal faults, restricting r.p.m. but nevertheless indicating good possibilities. Engine is destined for a twice size version of A.P.S. Fairey Gannet - 76-in. span!*



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December, 1959

# HAWKER FURY

## YOUR FREE PLAN DESIGN by Clive Hall

THE DAY CHOSEN by Clive Hall and ourselves for airworthiness tests of the Hawker Fury control line model prototype was probably the worst, if not the *only* bad flying Sunday of the 1959 summer! Moreover, the date was unlucky 13th September — Remember? When the sparrows were walking and the d/t fuse burned at twice normal rate in the fierce winds!

You can imagine what it might be like at Cranfield, where all those experimental windmills were straining at the leash to generate enough power for the City of London — and there we were — seeking shelter, with a press date looming on the horizon and a model still unchecked.

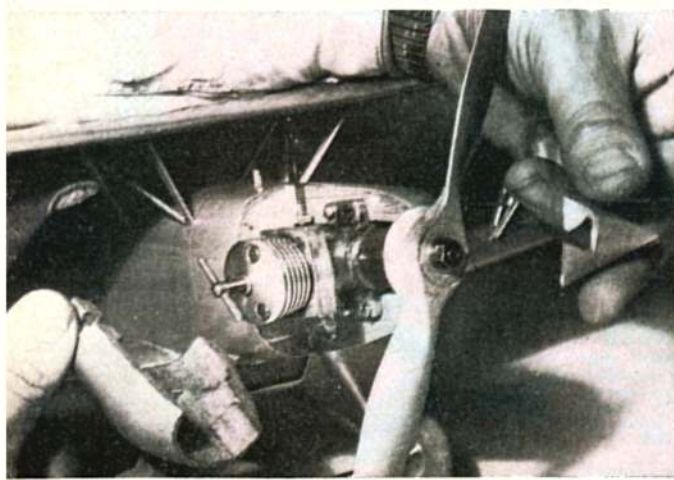
"Do we *have* to?" queried Clive — "fraid so" we insisted, so the tank was filled and lines laid out between Cranfield's hangars. Even the E.D. Fury seemed to sense doom, for it refused to start — a most unusual complaint, explained Clive. Out it came and the cause laid bare. It was the reed valve unseated. Quickly cured of this induction malady the Fury fired merrily and Clive dashed for the handle.

The silver model darted into the air. What a cracker-jack was the first impression: but when it soared up to the top of the circle, went inverted and did a sabre dance before settling down damage free — we wondered if perhaps our insistence on a test flight had been wise after all!

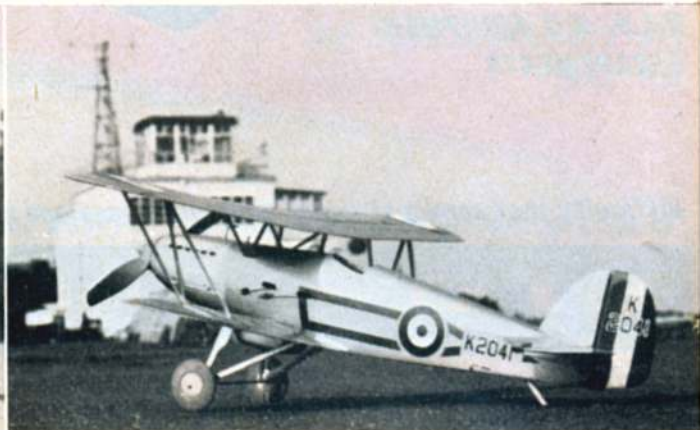
Cause of this remarkable demonstration of the model's durability was a tremendous wind gust plus a rearward centre of gravity. The latter we could cure, the former was a matter beyond control.

Off for a second take-off, *our* Fury (its appearance, static, and in the air was making us possessive) went like a bomb. It rode those up to 40 m.p.h. gusts like a true thoroughbred and returned to *terra firma* safe and sound, having soundly convinced us of its capabilities.

Yes, this Fury will be a favourite, and given better weather with a good 1.5 c.c. engine up front, it will emulate its famous full size counterpart through loops and wingovers. Clive Hall's construction system is simple and well explained on the plan so why not start now — and build a Squadron in your club for formation and tail chasing fights?



Top photo shows Clive King demonstrating the Fury in strong winds at Cranfield. The little model rides the gusts beautifully. Above: Removal of the cowling and spinner reveal the E.D. Fury 1.49 in prototype. Paper spinner is easily replaceable. Below: How about these views for realism? The Fury is easy to build and a delight to fly, also it lends itself to a variety of Squadron markings

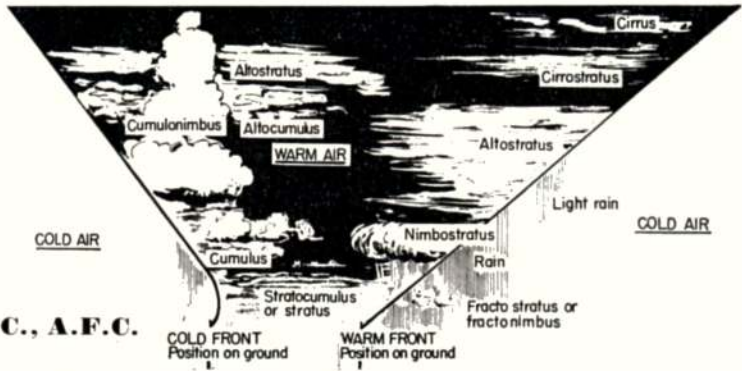
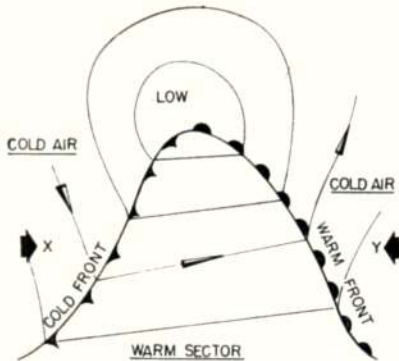


# British Weather

by S/Ldr. W. Drinkell, D.F.C., A.F.C.

ALTHOUGH SYNOPTIC CHARTS are commonly seen in newspapers and on the screens of television sets, it is most unusual to see them on the pages of a modelling magazine. For this reason I was most interested to read Naftali Kadmon's article in your October issue entitled "Riding a Cold Front". However, the more I read the article, the less certain I became that the front was indeed typical of those in the northern hemisphere, although I appreciate that Kadmon was in fact making the most of the unstable air conditions that were associated with a shallow depression and a weak cold front.

In the British Isles, the majority of our weather is associated with frontal systems passing over our islands from the Atlantic. The cold air of polar regions and the warm air from the tropics do not blend readily together and for some little known reason waves appear in the demarcation area of these air masses in that area popularly known as south of Iceland or Greenland. The wave in this demarcation develops into a depression, still with the two air masses clearly defined, and moves in an easterly direction towards Europe. The depression would look something like this on a synoptic chart:



A section through the points X and Y would show weather as above.

The onset of the warm front may be up to 600 miles ahead of its position on the ground, hence the old saying that a halo round the sun or moon means rain in twenty-four hours. The cold front only covers a distance of about 50-100 miles and the base of the cold front may overhang because of the friction between the air and the ground.

The sort of weather one can expect in a typical frontal system can be tabulated briefly as below.

I have generalised the weather that can be expected from a frontal system. Very often there are complications, the fronts become occluded, *i.e.*, the cold front catches up with the warm front and masks the situation with a combination of both weathers. Further, if the depression is deepening the frontal weather is intensified and conversely if the depression is filling in or becoming weaker the effects are less.

Returning, therefore to Naftali Kadmon's article I would be inclined to think that the front was very weak, especially as a ridge of high pressure is extending towards it from Egypt. On the other hand, knowing full well that cumulus development does occur over the Mediterranean during the night especially in this area, I suspect that the wind shift was due to the approach of the thunderstorm and not the frontal change. The rain after the wind shift tends to confirm this as indeed does the "calm" before the storm.

But the important part of this article, I think, was in the conclusion. If modellers have their eyes set on establishing records, the weather is almost as important as the model — in fact, the weather can mar a record despite the model being the best in its class. Visibility, instability, cloud and temperature must have some effect on the performance or final result, and a study not merely of fronts but of weather charts and forecasts may crown the work of months with success.

FEATURE	WARM FRONT			C OLD FRONT		
	<i>Before</i>	<i>During</i>	<i>After</i>	<i>Before</i>	<i>During</i>	<i>After</i>
PRESSURE ...	Steadily Falls	Fall Halted	Steady or Little Fall	Fall	Sudden Rise	Rises Slowly
WIND ...	Backing and increasing	Veer and increase	Steady Direction	Backing and becoming squally	Sudden Veer and possibly heavy squall	Backing a little then steadying or veering further
WEATHER ...	Light rain becoming continuous and heavier	Rain stops as front	Fair	Immediately before front, rain, perhaps thundery	Heavy rain, thunderstorms possibly	Rain stops quickly with rapid clearance behind front. Showers may develop
VISIBILITY ...	Good except in rain	Poor (Foggy or Misty)	Poor	Poor	Poor, especially in storms, but rapidly improves	Very Good

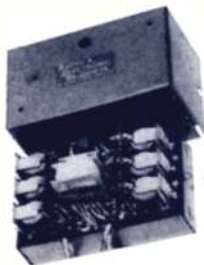
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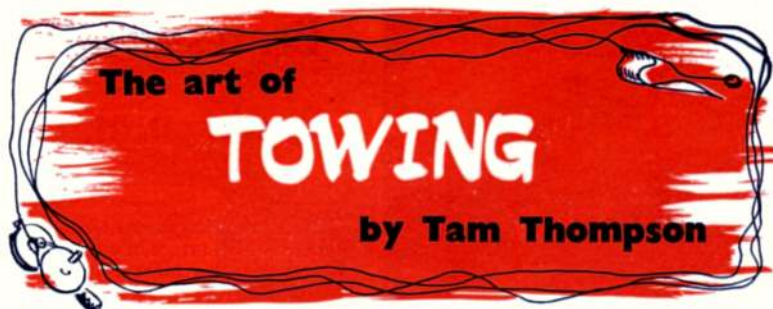
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The art of  
**TOWING**  
by Tam Thompson

THE MOST IMPORTANT factor in towing is the correct position of the towhook. *This position should be as far forward of the C.G. as possible before weaving on the line occurs.* Determination is largely a result of trial and error since hook positioning is solely dependent upon the "lifting ability" of the tailplane, an entity which is usually unknown in the case of a new model.

A tailplane of 55 - 65 sq. in. with negligible undercamber may dictate a hook position of  $1\frac{1}{4}$  -  $1\frac{1}{2}$  in. in front of the C.G., whereas a tailplane of 75 sq. in. with much flap and undercamber may call for a hook location  $\frac{3}{4}$  in. in front of the C.G. In both cases the models may be led about on the line with equal facility provided that, in each instance, the hook is in the position emphasised in the first paragraph. This arrangement will enable any model to get overhead in both windy and calm conditions.

Some points to watch should be mentioned here. A model which tows straight in calm air may weave a bit in a breeze, therefore hook positioning should be checked out in rough weather after a satisfactory "still air" setting has been achieved. Auto-rudder setting must be precise if the model is to follow on tow, e.g., a certain setting may enable the model to tow straight but may render it capable only of following the tower in a straight line or perhaps a left circle. A shade more right offset would then permit the model to be led in both directions.

Most of us have encountered the occasional calm (not "still") air contest where there is no wind to maintain any tension on the line. All tension must be supplied by running. The above-mentioned hook position will enable the machine to rise overhead, but if a downdraught is encountered in zero drift conditions it cannot be vacated because no amount of running will restore line tension.

The flyer will soon exhaust himself, and the line will remain completely slack with the model sinking rapidly. A hook position more rearward than recommended in this article (one which produces a whistling tow in a 3 m.p.h. drift) would prove most useful in such a situation, for the flyer could then restore line tension with relatively little effort. But the ability of the model to be led in any direction is completely lost. So all one can do, it seems, is keep running in a straight line which, at any rate, is the shortest exit from a downdraught.

If one releases immediately after getting overhead (in normal contest conditions) without any concern for "hunting" on the line, then there is, supposedly, a 50/50 chance of hitting lift. Thermal hunting increases the chances of contacting lift and the wind acts as a line tensioner if "down" is encountered during the search. In zero drift conditions there is no line tension to aid the flyer in running out of "down", and in the great majority of such cases it is nearly impossible to leave the sinking air. Tow control is, therefore, almost useless once bad air is encountered and you are helpless.

In zero drift conditions, thermal contact is entirely dependent upon one's choice of the time to fly. This

*This article, by one of Canada's leading A/2 exponents, a member of this year's Canadian team at the Bourg Leopold finals, is reproduced by permission from the Montreal M.F.C. Bulletin.*



**Yup! They're  
pulling a bit  
more than  
normal today!**

choice (barring the use of "pilot" models) is one of pure chance, 50/50 of hitting lift or of being totally bogged down. With the more rearward "kiting" hook set-up, the flyer increases his chances of surviving an unlucky downdraught because tension on the line is more likely to be maintained. Another advantage of this set-up is that the effect of weak thermals, which are common in such conditions, is greatly magnified, so that thermals which were not felt with the more forward hook position are now readily discernible. But it must be stressed that the rearward hook position should be used *only* in zero drift conditions.

I have often wished for such a rearward hook set-up for calm conditions, which seem to occur at least one contest every season. In the past I have always used one hook firmly anchored in the forward position. Dick Foster, on the other hand, employs a simple and effective means of hook attachment that permits movement. He screws a threaded L-shaped curtain hook into a hardwood block in the fuselage, the block drilled for a number of hook positions. When the right ones are found the remaining holes are filled; simple — no gimmickry or external apparatus.

In searching for lift on a normal contest day one must distinguish between line tension caused by wind and that caused by a thermal. In the former, the model lags behind the flyer and the line is bowed by the wind. Thermal activity causes the line to come taut and the model to rush overhead, or, sometimes, off to one side. After a little experience one can identify that insistent tug followed by the strong and sustained pull — the hallmark of a thermal.

In conclusion, there is one aspect of towing that has been completely neglected, namely, the physical condition of the flyer. He must often wade long distances through swampy air before being able to serve his model to a thermal. How many of us can run flat out during that extra minute or two which is added to the fuse for hunting purposes?



## Professionally made models

THOSE WHO CAST envious eyes on the glass-like surface of a beautifully-decorated airline office display-model of the latest jet, or who look upon the subject of wind tunnel models as something beyond an aeromodeller's reach, would no doubt be surprised to learn that the finest craftsmen in this highly specialised business of professional modelling were all amateur enthusiasts at an early stage in their careers.

There are constant openings for aspirants, able to produce accurate work to fine limits and opportunities increase annually with continual expansion of the application of models for research and display purposes.

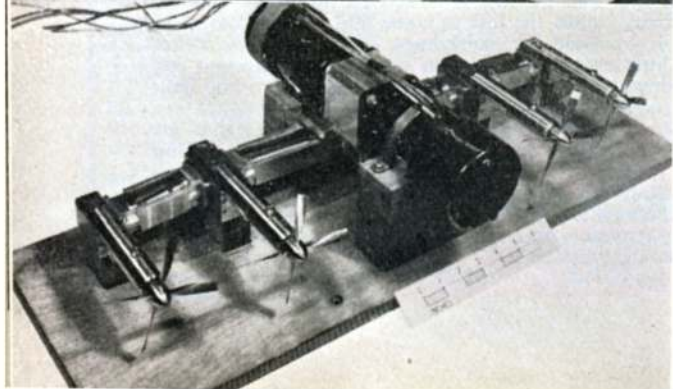
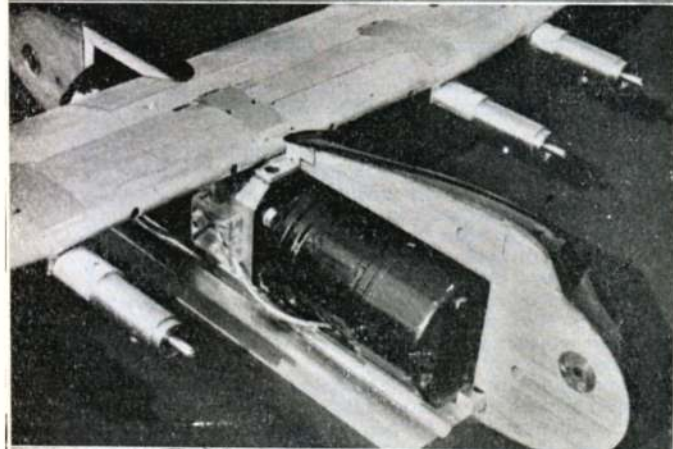
Many aircraft companies have their own special model departments. Future projects are made to scale for boardroom visualisation of design office ideas. Factory planning for production schemes, with labour and machine disposition produced in miniature is used—to save time in manufacturing aircraft—the design features such as seat planning, door opening, accessibility for maintenance, are pre-planned with model construction to prove the practicability of design. The work is fascinating and demanding of considerable skill and inventiveness.

Tunnel models are in a field apart. Machined in high tensile steel to finest tolerances, bored and tapped off for .016 in. diameter pressure plotting holes, a wing for a Mach 3 aircraft may be modelled to razor edges with no more than  $\frac{1}{4}$  in. max. thickness for a carefully-plotted airfoil. This work demands the highest skills, and the end products are invaluable to the industry. Such models, destined for the supersonic wind tunnels, have less appeal to we amateurs; but their low speed counterparts, for compressed air tunnel research, are closely akin to our interests.

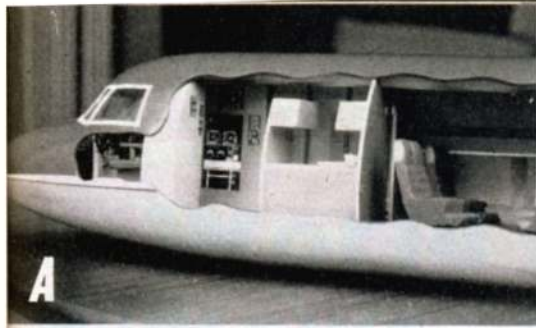
During a visit to the Armstrong Whitworth Wind Tunnel Model shop at Whitley we were able to see how an aircraft like the Argosy can be thoroughly tested through model research long before the first prototype takes the air. Fascinating projects to the same design specification were obviously discarded after tunnel checks, and such was the success of the tunnel testing on the eventual AW 650 design, that no component modifications were needed for the Argosy series. Variant fuselages for military and car ferry purposes have all been designed and tunnel-tested to full satisfaction though these have yet to fly. Such models save enormous amounts in time and finance, and at Whitley the tunnel department occupies a large number of specialists in continual research—and not only for aircraft either!

Dr. W. F. Hilton, D.Sc., Armstrong's Chief Aerodynamicist, was recently appointed to the key post in Britain's space research programme and his association with Whitley's supersonic tunnel is evidence of the type of work undertaken under his guidance. We found the model shop at A.W.'s a veritable paradise for enthusiasts,

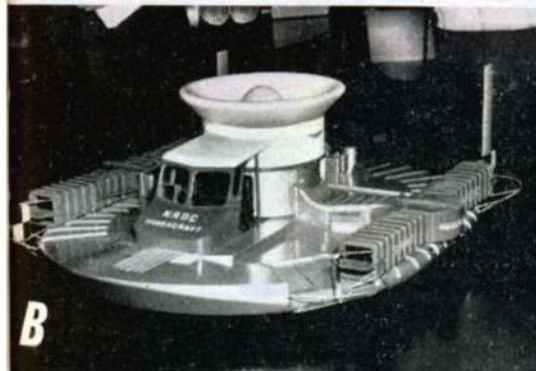
*Heading shows the Armstrong Whitworth wooden models workshop with Argosy projects in assembly stages. Left is the remarkable mechanised model wooden fuselage and metal wings, all to scale with integral motors driving scale props at scale speed. Power and shaft units at bottom show complex design which saved incalculable expense in proving the Argosy before it flew. Opposite, bottom, another mechanised Hawker Siddeley project, the AVRO 748 as displayed at Farnborough (above), and as it left the Dakiewicz-Nachtman workshop*



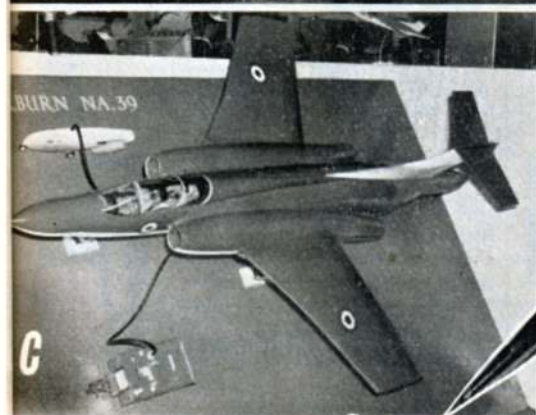




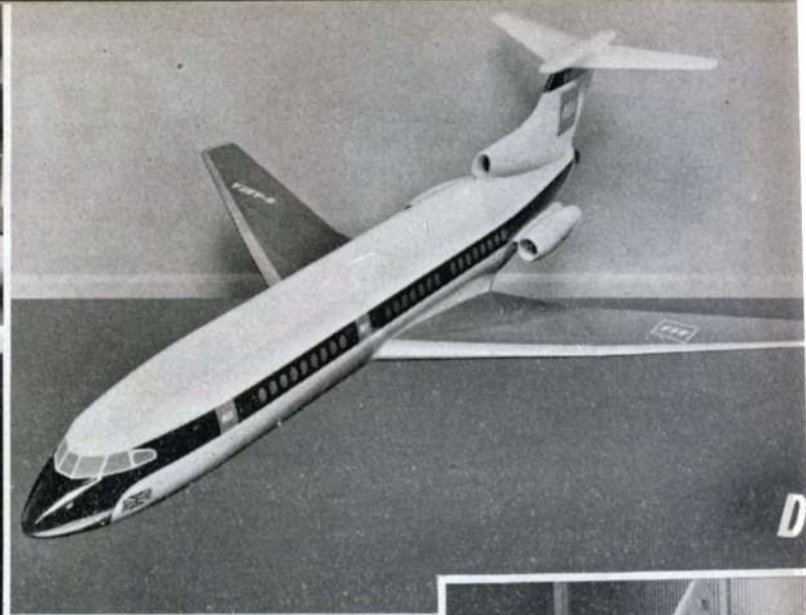
A



B



C



D



F



E

and, as a measure of their inventiveness, reproduce details of the motorised Argosy model with true scale props driven at scale r.p.m. to find slipstream effect on the boom-supported tail surfaces. Two electric motors supply power via the most complex of ball-race-supported shafts, and the whole is enclosed in a perfect scale wood and metal airframe. With such a model there are few flight conditions that cannot be simulated in the tunnel — no wonder the happy family at A.W.'s were rather pleased with the way models have played their part in the Argosy programme!

Display model companies are mostly centred in the London area and there are at least six organisations, large and small, engaged in producing the type of model seen at Farnborough each year, and in those airline offices. Well-known free-flight modeller, Laurie Barr, and the Polish M.A.A. experts at flying scale — Tony Datkiewicz and Teddy Nachtman — are engaged in their own modelling concerns, frequently applying their hobby-produced ideas (tongue and box wing root fittings, built up wings, etc.) to the larger display models such as 200-lb. Boeing 707s or DC-8s.

Trade secrets in the various processes (how do they get the people in those transparent fuselages?) are many, and opportunities abound. For the enthusiast who feels he would like to make more of his skills — and brainwork is required just as much as handicrafts — we can think of no better career.

(A) Friendship by ace Polish modellers, Datkiewicz and Nachtman, shows interior detail. (B) Saro have their own modellers for SRN.1, as do Blackburns with their product, the NA 39 in (C). Picture (D) shows Airco DH 121 by Master-models to one-twelfth scale. (E) is a DC-8 by same firm, Laurie Barr, Managing Director, checks finish on huge 15-ft. span model. (F) is the mixed metal/wood FD-2 used at N.P.L. for compressed air tunnel research





December, 1959

# World News

WHEN WE QUOTED entry figures in the German F.A.I. contests in September we did not realise that their annual champs were restricted to entrants qualifying through elims. Thus the Nats only represent about 25-33 per cent. of total contest enthusiasm.

At this year's Slope Soaring Nats, held as usual on the Wasserkuppe, R/C and magnet-steering dominated, due to new rules which combine F/F and magnet-steered models, 67 competed. Placings in R/C (single channel, 1 control) were close; 1st, Hans Schumacher (Bavaria), 491 pts.; H. J. Heidenreich (Nordrhein-Westfalen), 464, 3rd and Junior, Oskar Druner (Bremen), 441.

The new flight plan flown — after numerous modifications on the spot — was: 10 min. flying time, 10 pts. per minute, 4 circuits round two markers on the slope, 20 pts. each; spot landing in 50 metre circle, 20 pts. spot landing in 100 metre circle, 10 pts.

Combined F/F and magnet-steered winners were Helmuth Schubert and Ferdinand Kaczor, both from Bavaria and with 1,500 secs. (five flights — 5 min. max). Kaczor's model put up a fantastic flight in the third round, flying away for 57 min. and landing at the foot of the slope. First in Tailless was Rolf Claas (Hesse) with an even 500 secs. All the top places in these classes were taken by magnet-steered models, and all were around A/2 size, though rules allow up to 150 sq. dm.

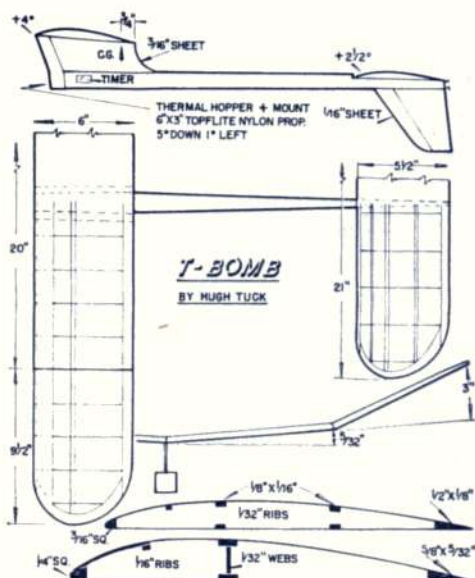
Later this year the "Coppa Bavaria 1958" — a copy of the Italian "Coppa Stella d'Italia" — attracted 76 slope soarers from Germany, Italy and Austria with magnet-steering. In spite of 5 min. maximums, 15 were



Slope Soaring is very much in the news. Bill Park sent us these views of the famed Wasserkuppe, scene of the German Nats. The lovely panorama from this flying site can be seen at top, with swept wing entries from Hamburg, below. Canadian design for .8 c.c. contest flight is apt in view of new additions to the British motor market



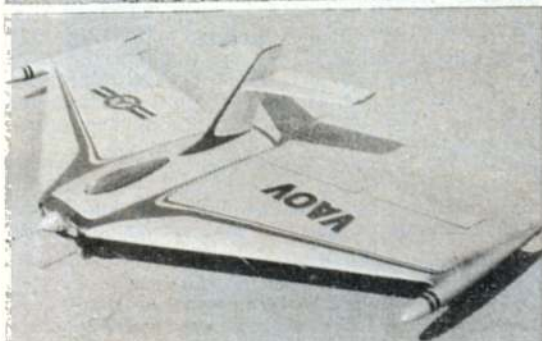
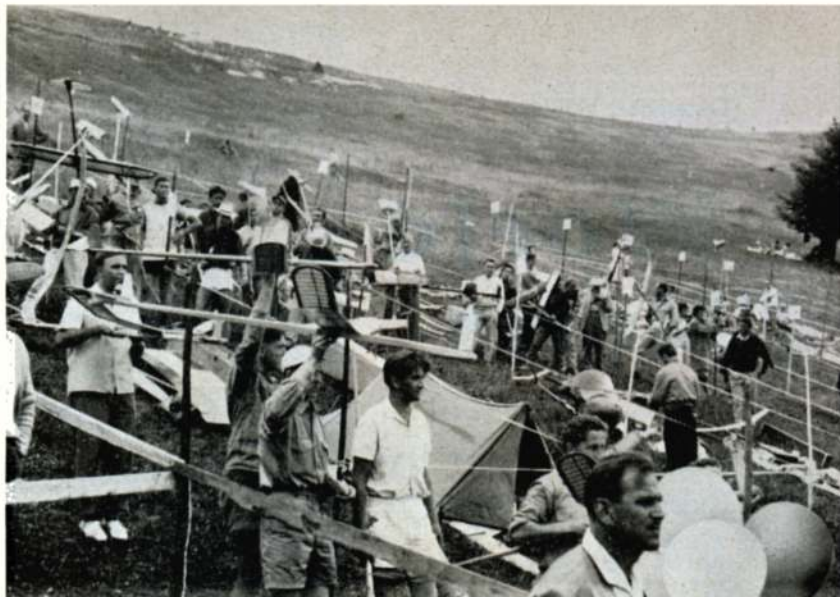
United States National Champion for 1957 was Jim Payson. He is holding his very special "65" engine sidewinder speed model, with engine blown up from Fox 39R to larger capacity. Proto speed model with a Fox 29X is on ground at left, and his Class B speed entry with Fox 29R which set a record at the Dallas Nats is at right. Jim obviously goes for swept fins!



involved in the fly-off. Winning team was Prato of Italy. At the Bavarian Championships, there were 104 entries with magnet-steering and a fly-off between 11 competitors, won by Kaczor (a pupil of Gremmer's), with a time of 10 : 12. At the "Coppa Stella d'Italia 1959" in August, fog and rain limited the contest to two flights only. A pity, since no less than seven German teams, with 35 members attended, also one from Austria. Winning team was Gersfeld/Rhon (Germany); second, Rovereto of Italy (the organising group). Next international slope contest will be in Bavaria, 1960, on August 27th/28th, on the beautiful "Hesselberg".

Championships in Hungary for free flight took place at Alag airport September 4th - 7th. George Benedek was the only Wakefielder to get five maxs for a 900 sec. total; Ordogh the same in power and S. Fulop, a new name, topped A/2 with 850 secs. Innovation was R/C, power and glider, Russian, German and the Hungarian Moki R-4 radio outfits were used. Best team race time at a special meeting a week later was 5:08 by Azor, which he improved to 5:04 the following week at the C/L Nats which were largely a victory for the Hungarian team representatives before they left for Brussels. Gombocz was unlucky in his T/R final, landing in the 92nd lap at only 4 : 15 and having a false start again to return a total of 5 : 30. Designation of the Oliver Tiger replica is the Moki TR-4. Budaors is to be the site for the 1960 World C/L Champs.

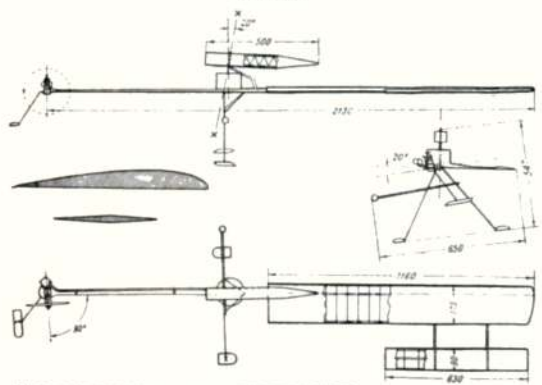
New records in Russia are 217 k.p.h. by A. Kuznetsov of Leningrad for 2.5 c.c. speed, and 603 metres altitude (1,995 ft.) with a R/C glider by Moscow's N. Dorozhin, the latter becoming a World Record. Now that they have discovered Charley McCutchen's flying machine (AEROMODELLER, July, 1954 — sounds like the original five-year plan!), one-bladed helicopters have been sprouting in the Soviet model press. One gained 500



Top, shows part of entry at "Coppa Stella" slope event in Italy, and next view is of winning Italian team from Prato at "Coppa Bavaria" in Germany. Delta from Czechoslovakia is 58-inch span for Vltavan 5 c.c. glow engine, mounted sideways in cowl



The recent demonstration tour by leading Hungarian modellers in China had a terrific reception. Crowds of several thousands queued for hours to see the shows at Peking, Shanghai, Canton, etc., and the European tourists were in turn shown Chinese modelling, including control-line aerobatics by these girls. Note the framework profile fuselage. At right is the Russian version of Chas. McCutchen's flying machine we published five years back. Refinement is a central main tank for record flight by S. Vorabver. Has a MK 12s diesel and flew for 18:40



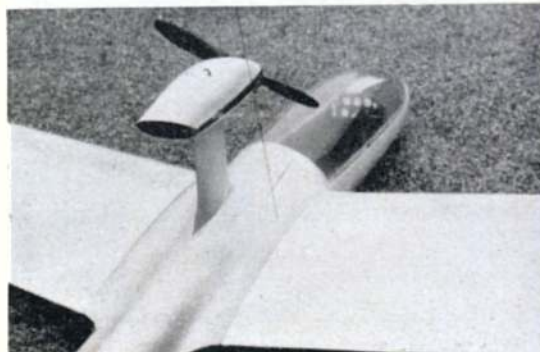
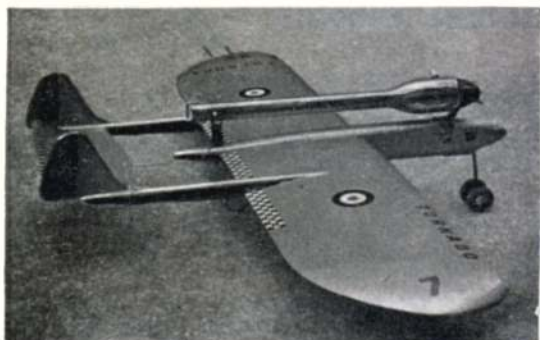


New Swedish kit for radio control is the Vagabond, being tested by manufacturer Seen Truedsson and Anders Hakansson at far left. Model is very stable and kit has highest standard of prefabrication we have seen. Glow Chief 35 powers the A.P.S. Waveguide by W. Eunnson of Footscray, Victoria, Australia, seen at right on portable workbench which travels to the field. Hill receiver is popular in this part of the world. Jet stunter below is by Dr. Conti of Pisa, Italy

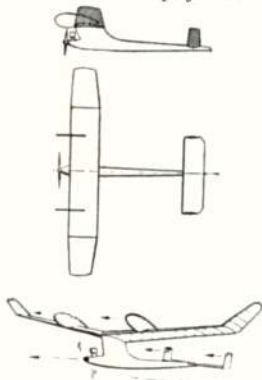
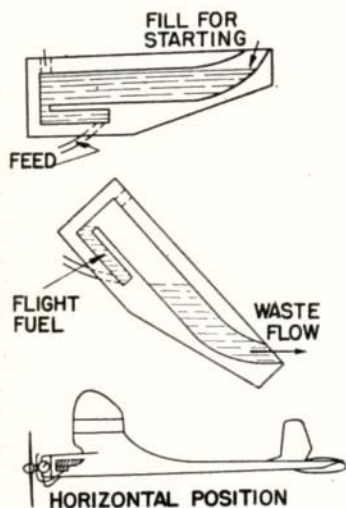
metres height, holding altitude for 17 minutes; another flew 11,920 metres (over seven miles) distance for a domestic record. Two-blade variants are appearing also in the Czech magazine, carrying a blade on the power arm. At Kharkhov, Vladimir Hajek won the free flight Criterium of Europe with U.S.S.R. leading the team points over Czechoslovakia and Rumania.

National decentralised power and chuck glider events in New Zealand provided opportunity to compare terrific weather differences at various centres. On same day Auckland was frosty, cool and still, Wellington unusually similar, 12-knot wind at Wanganui. Poor weather at Levin, too windy at Dinnevirke. Now you know which part to immigrate to!

Latest use for that spare R/C channel in U.S.A. is for combined opposite aileron and rudder to get a side-slip. Without correct balance of area's one is likely to emulate a falling pheasant; but it works when trimmed out. Bob Heise of East Bay R/C club has made an official 79-9 m.p.h. speed flight (K & B 35) and Ken Willard made history by flying a slightly modified Veco Brave on Monoline, casting loose and bring it back under R/C! Bill Williams, also of Larks, shattered onlookers when his "circus" turn discarded its wing and left the fuselage to come down by chute. (Fail-safe at last!!).



Russian power gimmicks for fuel feed and slip-stream control, below. Right, J. Nicoud of Lausanne designed elegant 126-inch glider. Has 1 c.c. power pylon for calm, detachable tips for wind



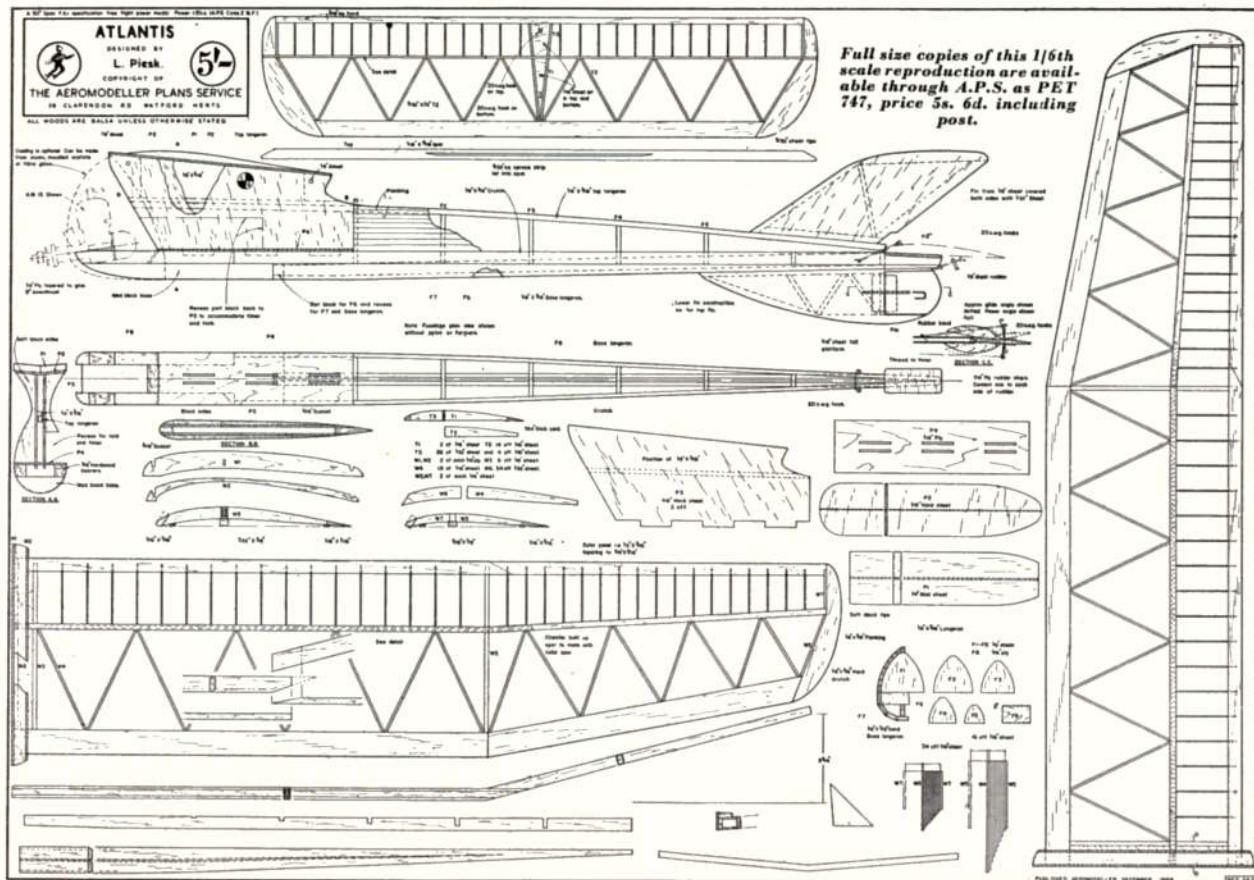


# Lothar Piesk's ATLANTIS for 1.5 c.c.

WELL KNOWN FOR his series of contest winning 1.5 c.c. power designs, Lothar Piesk of Germany was voted by us as one of those most likely to win the 1958 World Champs. Such was not to be, for his best model was knocked from his hands by a competing design, and smashed beyond repair. However, nine first places in ten contests, with a still air average of 220 to 240 seconds from a fifteen secs. engine run, is the kind of performance that all power modellers will respect . . . so here's the design, the rest is up to you!

Lothar started this layout in '56, changing shapes as the design progressed, and like many others, he had just reached the "ultimate" when that formula change came along to increase the weight. "Atlantis", the latest in the Piesk line, is now considered the second "ultimate", and no further design alterations are envisaged.

Small in its overall size, still smaller when broken down for transport, and yet capable of knocking all the giants out of competition, it has an incredibly fast rate of climb and a glide that rivals a towline model.



## Hottest 1.5 c.c. F.A.I. specification design in Europe!

The fuselage is built over a basic crutch with motor mounts, joined by a ply strengthener P.4. Leave the motor mounts longer than shown and trim later. Soft block and angled firewall can now be added to the motor mounts, and the lower fuselage T-spar and F7 fillers added. Make up the pylon assembly in stages, checking for correct angle with the dural wing tongue, then cement wing platform and fill-in firmly in place.

Now add the top planking strips alternately left and right, beginning at the crutch and working upwards. When the cement is well set, sand the whole fuselage to final shape according to the cross-section shown on the plan. Try to keep the weight as low as possible aft of F2. Final thickness of the planking need not be more than  $\frac{1}{16}$  in. at the tail.

Add hold-down dowels, tail platform and hooks. Strengthen the dowels with circles of cloth (nylon, silk, linen, gauze, etc.) to prevent them pulling out under tension. Wind a piece of linen or similar material about  $1\frac{1}{4}$  in. broad around the fuselage bottom at the firewall to protect this area in landing; the cloth should begin about  $\frac{3}{8}$  in. above the motor mounts on each side.

Keep the fin and rudder parts as light as possible. The underfin has a moveable rudder with limiting stops, rudder direction depending on the power/glide set-up desired by the builder. A timer-operated auto-rudder requires a stop on both sides. Approximate settings are given on the plan. Cement a  $\frac{1}{16}$  in. x  $\frac{1}{16}$  in. bamboo strip flat onto the bottom edge of the underfin for protection against damage in landing. Sand the fin parts before cementing to the fuselage.

Original wing construction called for two small boards (one for each wing-half), angled to give the proper tip dihedral. The plan was cut and pinned to the boards, followed by the packing shown on the plan. This method ensures greater accuracy while building and the boards can be used later to keep the wing true between contests. However, one such board would be sufficient for building purposes.

The inboard panels of the wing have a box spar to take the dural wing tongue. Bevel the leading edge about 45 degrees on the underside so that it fits snugly on the board. The trailing edge is butt-jointed at the dihedral break.

Pin the mainspar to the packing and join Rib W3 to the spar at the dihedral angle indicated on the plan. Check for proper alignment by sliding the dural wing tongue through the slot in Rib W3 into the mainspar. Add the forward half-ribs; when dry, add the leading edge. Pin down the trailing edge, making sure there is no tension on it to cause warping later. Set in the rear

half-ribs, trimming them to the correct angle at the joints. The tip panel is built in similar fashion. Build up root fitting. The two wing-halves should fit snugly together with the tongue in place.

Preparation and construction of the tail are similar to the wing. To prevent the trailing edge warping, give it a slight undercamber by placing a strip of thin card (about  $1/64$  in. specified on the original) between the front edge and the building board.

Waterspray the surfaces after covering, and pin to the building board. When dry, apply 2-3 coats of thinned clear dope, followed by 4-5 coats of normal thickness clear plasticised with a few drops of castor oil. Pin the surfaces down between coats, and allow at least 48 hours after the last coats before removing the surfaces from the board.

Weigh all parts, including motor, prop, bolts, etc., and add the required ballast to make up the minimum weight ( $16\frac{1}{2}$  oz. for F.A.I.); this ballast is about 1-2 oz. Mount wing and tail on the fuselage and move the motor and ballast on the mounts until the C.G. is correct, then mount the motor.

### Trimming

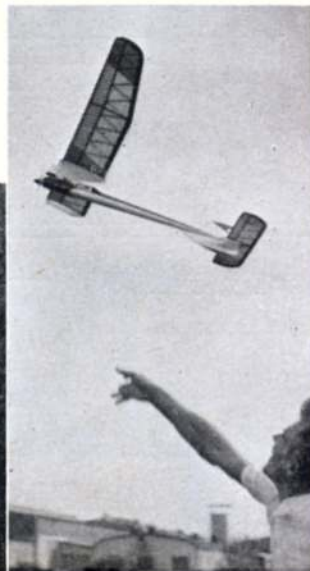
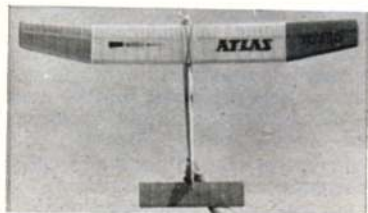
After a satisfactory glide (to the right) is arrived at through hand-gliding, try a short flight on low power with about second seconds motor run. The climb should be slightly to the right. Increase power gradually to full revs., correcting with the rudder to keep the right turn from tightening up. Be careful to make only slight changes in the rudder setting, as its effect is quite powerful at higher speed.

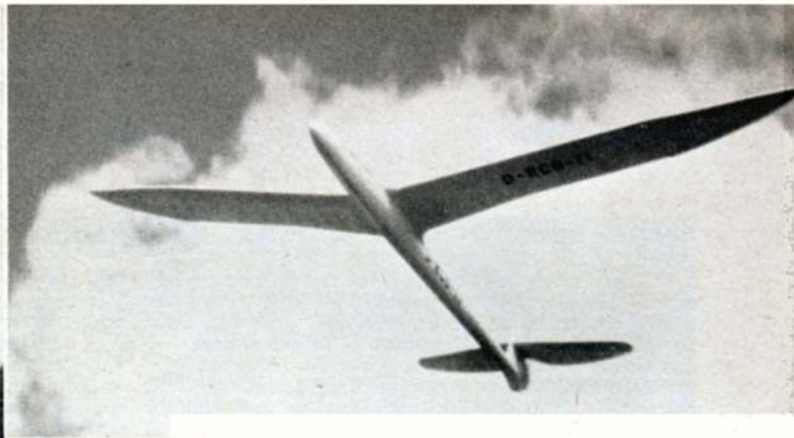
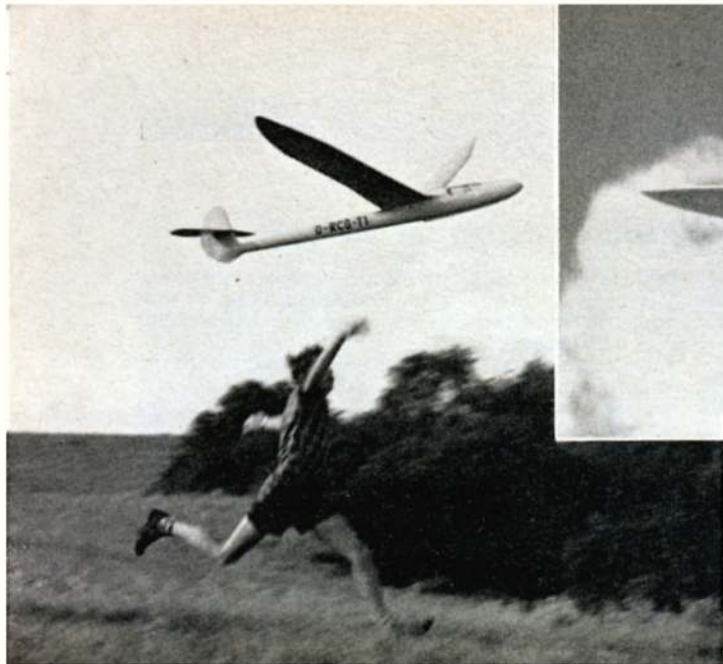
Power-stalling is cured with more downthrust; if the climb is too shallow, decrease downthrust. In wind or strong thermals, this model has a tendency to tighten up to the right in both climb and glide. Slightly more left rudder may be necessary to correct this.

The designer advises that two check flights be made before each flying session, both on about 7 seconds run, one on half power and one on full. This applies even after the model has been thoroughly adjusted, and is especially recommended after the initial adjusting.

Lothar Piesk's Taifun Hurricane powered Atlantis on local field tests. Note high standard of workmanship in these pictures.

Wings dismantle for easy transport so that whole model will pack into box about 30 in. long! Model has terrific reputation in Germany is kitted by Graupner in simplified form as the "Atlas". Our review kit needed nose ballast to balance, otherwise passed tests trouble free. Picture below shows different kit wing structure.



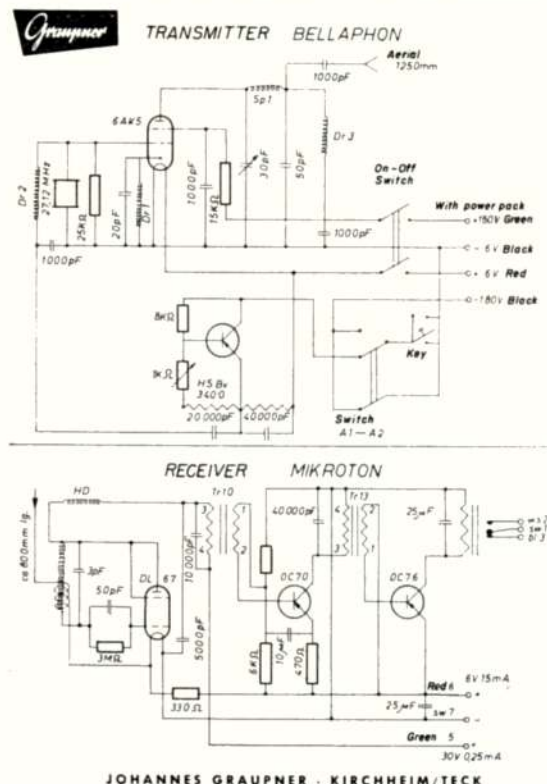


## Continental Radio Control

THE MOST IMPRESSIVE aspect of our recent journeys in Europe was that of advances in commercial radio control equipment. In general, the styling standards of transmitters and receivers—and the prices, are higher than those in Britain. Tuned filters have swept their way into all the leading designer's new creations, and exciting prospects of fully proportional joystick control are imminent. First, we review an outfit it has been our pleasure to operate over the past year.

### Bellaphon and Mikroton

This is the same combination (with pulser actuator),



used by Eugen Setz to win single channel at Hirzenhain. Our Tx is the "A" or accumulator version, and its streamlined appearance with red lustre finish and variable length plastic strap reminds one of a ladies' handbag. Dimensions are  $9\frac{1}{2} \times 2\frac{1}{2} \times 6\frac{1}{2}$  and into this small case one condenses a Scooter 6 volt 6.7 amp. acc.; a Vibrator pack to boost voltage to 180 v., and an audiotone transistorised crystal controlled MOPA Tx with switch for keying either modulation (400 cps.) or carrier only. A seven link collapsible aerial and precision microswitch complete the neatest of universal transmitters, and if ground based operation is needed to free the hands for pulse box switching, a two-pin socket breaks into the microswitch circuit.

Apart from the initial difficulty of locating a small enough accumulator, now overcome by subsequent introduction of several on the motorcycle market, no troubles occurred in our Bellaphon operation. Range is equal to that of visibility in clearest conditions, and the low acc. drain has minimised re-charging needs. A "B" or battery version, using 150 volts and 6 volts is in blue finish and by virtue of its cheaper price is the more popular.

Mikroton is a well established receiver on the Continent, neatly contained in a tape sealed  $2\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$  clear plastic case, with leads harnessed to a 7-pin plug, and weighing just under 3-oz. The only tuning control is the aerial slug and meters are not required, as is standard for a tone set. Tuning is elementary and the set stable enough never to have altered its slug setting during the year of use.

Unusual aspect is the DL 67 RF stage valve calling for 6 volts heater, but this is turned to advantage by using the same 6-v. Batteries (5, DEAC 450 in our case) for both the valve and actuator. H.T. is 30 volts, our choice resting on the B.105, although if weight were critical, the 250 microAmp. drain is low enough to permit the smallest of cells. Heart of Mikroton, as it is called in the English language leaflets put out by Graupners, is the Siemens Trs 151 x 71c., which fairly clangs inside its double casing of plastic. During the warm up, until the set gets the carrier established, the relay flutters but not enough to cause actuator switching. The only time we had any field delay with this set, was when we fitted the 6-volt battery pack in reverse polarity and nothing happened—nor was there any damage!

Using common batteries for two purposes also calls for a 1,000 mfd. condenser across the circuit, adding to equipment bulk, but not really much to installed weight.



### Ultraton

Graupner's Radio designer, Hans Schumacher, is now concentrating on tuned filters and resin blocking (encapsulating) of the circuit. In Ultraton he has produced a 6-volt, all transistor (OC 170, OC 76, OA 81) tone Rx weighing 2-oz. including the Gruner 957, 300 ohm relay. The set is cast into resin in three stages, each connected to allow manufacturer servicing and replacement of a stage if necessary. The whole is cased in a plastic box,  $1\frac{3}{16}$  in. square,  $2\frac{1}{4}$  in. deep, which is exactly the same size as for a pack of four pencils in a companion case. In addition, all-plastic (except coil parts) servo-relay has been developed to similar dimensions so that the three items can be taped together to make "Mikrokombi" a 5 $\frac{1}{4}$ -oz. complete R/C unit ready for installation. Quick blip contacts on the actuator enable a duplicate to be used for motor control so for a payload of just over 6-oz., one gets full single channel with motor control. We checked this combination set in three models at the Kirchheim/Teck factory test field. One, an A/2 at standard weight, the others were Taifun Hurricane (throttled), sport models from Graupner kits, the Kapitan Biplane and Kadett mono. One could compare them in proportions with the A.P.S. Tomboy and Bi-play, and by using 1.5 c.c. with exhaust silencer/collector to subdue the porting, perfect throttle control made slow speed passes and high speed climbs a real pleasure. Ultraton is certainly going to become a by-word in European R/C for many seasons to come.

### Polyton

If we start with the British price of this 10-channel set, at £54 0s. 0d. for the Tx and £74 0s. 0d. for Rx, matters are placed in correct perspective. The transmitter is contained within the standard Bellaphon case, has the same 6-volt acc. power feed and controls are via one universal joint stick for simultaneous, proportional rudder/elevator, the second stick for two-way motion to select proportional aileron, and four buttons for ancillaries. Four independent modulators are incorporated and channels range from 600 to 3,500 cycles per second.

Ten Gruner 957 relays, 24 transistors and the appropriate filters are contained in a  $2\frac{1}{2}$  in. square,  $2\frac{1}{4}$  in. deep plastic box with Rx components encapsulated in resin. Total weight is 9-oz. and quoted power supply—five DEAC 225's! The filters are said to be small flat discs, size of a sixpence and made by Phillips, and Schumacher's selection system is the subject of a patent.

### Typhoon

The industrious plant of Veenhoven in Amsterdam, Holland, is now engaged in full scale production of an 8-channel simultaneous control crystal stabilised set with the claim of being the first to incorporate a power transistor converter to a 6-volt battery in the Tx. Receiver is a 10-oz. unit with eight lightweight relays, Typhoon reed bank with air valves for vacuum gear, encased in an aluminium box measuring  $2\frac{1}{2}$  in. x  $2\frac{1}{4}$  in. x  $4\frac{1}{2}$  in. Typhoon vacuum pump with an extension shaft to engage on the engine, ultra light servos and an 8 in. long air reservoir are also available. To complete the installation, Veenhoven is producing his Typhoon 7 c.c. in-line twin cylinder diesel which impressed with its acceleration at Hirzenhain. Weight is 15-oz. quoted r.p.m. 7,000 on a 12 x 6 and the price about £10 10s. 0d.

### Stegmaier

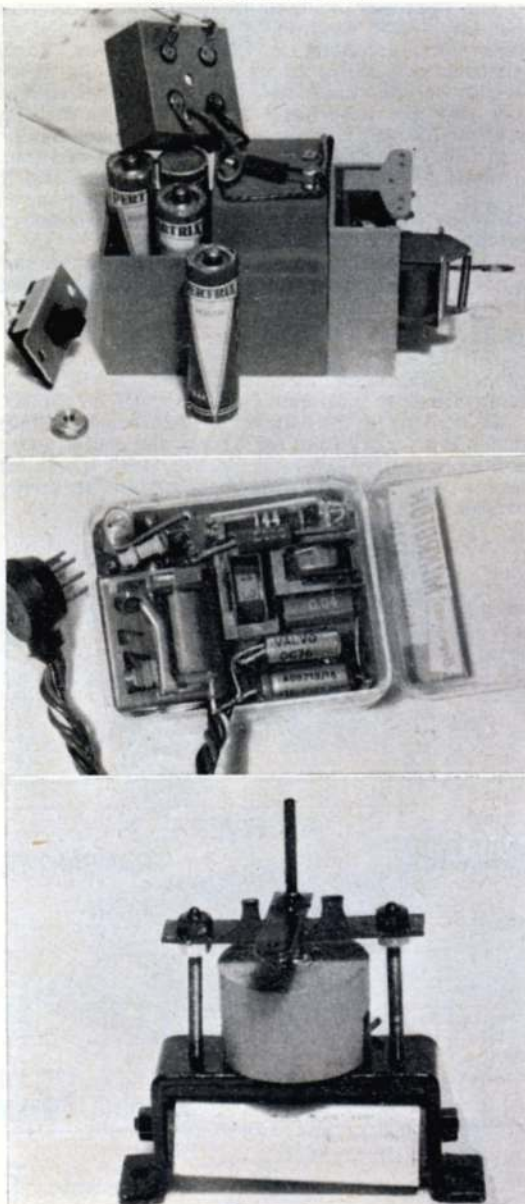
Eric Cable, Ed. Johnson and Rex Franklin have been using Stegmaier's vacuum outfit over the past two seasons and have since known the joys of trouble-free r/c operation. (That's not to say their flying has still been crash-free!)

The complete installation weight (including batteries)

of this 8-channel gear is 18 oz., which represents a saving of something like  $\frac{1}{2}$  lb. over the more conventional 8-channel electrical servo rigs. It is indeed unfortunate that this weight-saving is virtually lost if one uses the Webra Bully or Ruppert's Twin diesel. These motors are fitted with the all-essential vacuum pump, but with due respect, the weight-saving prospect of a pump fitted K & B 45 is more attractive. (Latest Ruppert twin is to be 10.5 c.c.—Ed.)

(Continued on page 632)

*Beautiful 10 ft. scale Meise for single-channel with OMU 205 typifies German R/C, is by Reinhard Trobs, Dusseldorf. Below are the Mikrokombi complete R/C unit, the Mikroton showing Siemens relay and at bottom, the Swiss Klausner magnetic actuator for pulse as widely used, and based on Howard Boys original. Magnet is Eclipse button type B, torque is excellent.*



**Continental Radio Control (Cont.)**

For the "do-it-yourself" boys, both the transmitter and receiver circuits are shown. The receiver in particular is beautifully made and compact. As for the transmitter, a peep under the lid reveals two lonely valves surrounded by the usual electronic nausea of coils and condensers and much fresh air. Where one wonders is the £30 in this? The answer, or part of it, lies in the high quality of the components. The fixed resistors and capacitors are of high tolerance and stability and cost many times more than their work-a-day equivalents. This quality is reflected in the stability of the gear, for the receiver has not been re-tuned since its initial check on arrival from Germany. As for the transmitter, tuning on the audio side is a most infrequent business.

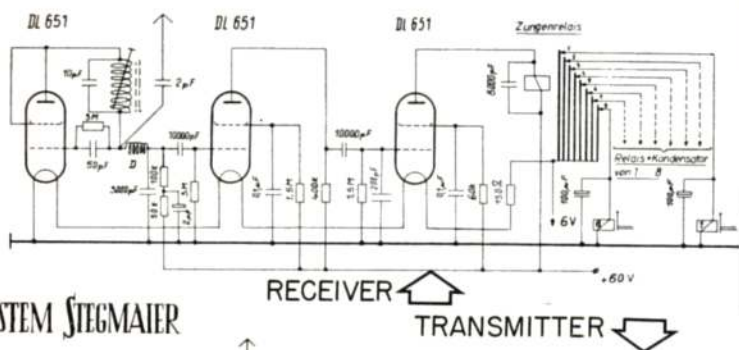
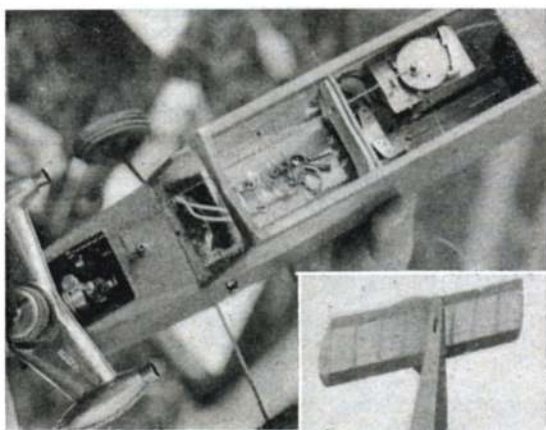
The transmitter, oddly enough, is not crystal-controlled but employs an Electron Coupled Oscillator, the next best thing, according to Professor McQue. Present manufacturers of the equipment, O.M.U., do, in fact, employ a crystal transmitter, although it is on the receiver side that they have made the biggest departure. This receiver (Model 358e) is a tone receiver and nothing more, reed unit and relays (electric operating or vacuum operating) being separately housed. This means that the receiver can be driving an 8-channel vacuum rig one day and then plugged into (say) a 5-channel conventional servo model the next.

Throughout the extensive O.M.U. range the same quality, already mentioned, prevails in both component and workmanship.

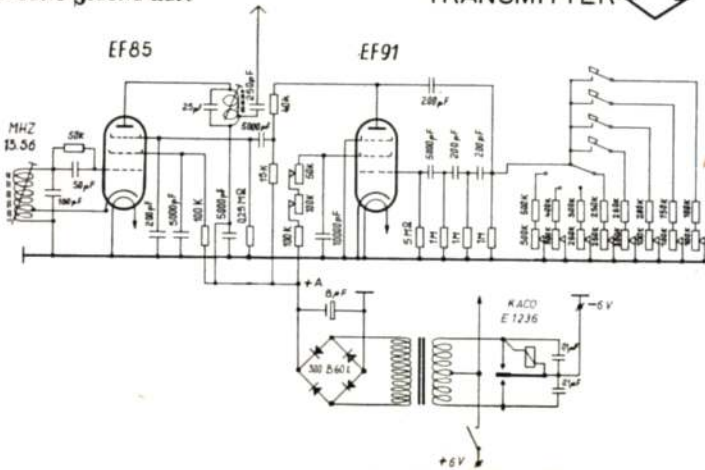
**O.M.U. 205e Receiver**

This receiver was chosen for a brief review as it probably represents the sort of receiver which is of most interest to most enthusiasts or would be dabblers.

On hooking up the batteries we are forcibly reminded that it is a far cry from the days of the double quench coil (only another 100 turns, darling, don't let the wire get too taut !!) and also from the secondary "sensitivity" control.

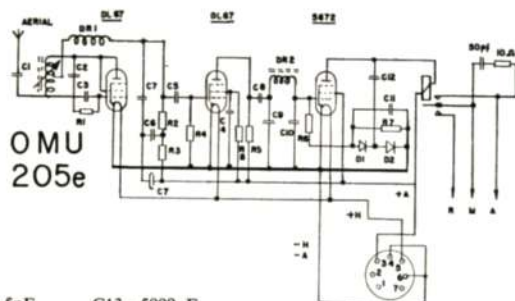


SYSTEM STEGMAIER

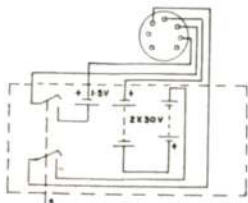


Top, how to lay a tarmac runway overnight for R/C. Scene only a few hours before Hirzenhain contest! Mikrokombi with extra motor control is seen above. Johannes Graupner personally demonstrates his products and designs. Entire model and gear came from his plant. Right, his 6-volt Tx.





- |               |                |
|---------------|----------------|
| C1 = 5pF      | C13 = 5000pF   |
| C2 = 5pF      | R1 = 2 M/ohm   |
| C3 = 40pF     | R2 = 30 K/ohm  |
| C4 = 5000pF   | R3 = 7 K/ohm   |
| C5 = 5000pF   | R4 = 10 K/ohm  |
| C6 = 10mF/70V | R5 = 800 K/ohm |
| C7 = 10mF/70V | R6 = 300 K/ohm |
| C8 = 5000pF   | R7 = 800 K/ohm |
| C9 = 250pF    | R8 = 2 M/ohm   |
| C10 = 250pF   | Dr1 = HF choke |
| C11 = 5000pF  | Dr2 = LF choke |
| C12 = 5000pF  |                |



Switching on put us in business straight away and keying the transmitter (a hand-held O.M.U. 215S model) two things were immediately apparent. First, a current rise from  $1\frac{1}{2}$  m/A to  $10\frac{1}{2}$  m/A which had the little old relay (reminiscent of the American "Jaico") clanging away like a sledgehammer. Secondly, that the set would happily follow the fastest manual pulse rate. So far, so good!

Small lad was despatched into the "bundu" with the little blue box, telescopic aerial fully extended, and briefed to pulse slowly but continually. At 220 yards he decided he'd reached his P.L.E.\* and on return to base explained that he would rather watch the needle (of the milliammeter) going up and down and listen to the relay clicking. Reviewer takes up the transmitter and departs, pulsing ponderously. At 600 yards a current rise to  $10\frac{1}{2}$  m/A was maintained; however, as this point coincided with the "local", evaluation was suspended for obvious reasons.

This is the sort of set for the "get-out-and-fly" boys, no fiddling with secondary controls, just the slug in the tank coil to tune for maximum range.

In this particular instance any further adjustment of the receiver would have been superfluous. The packaging of the receiver, on a printed circuit chassis incidentally, in a transparent plastic case has undeniable "selling" qualities. Personally we would rather see it in an aluminium case, for prang-proof reasons. (Similarly, a micro-switchette in the transmitter is considered preferable to give "feel", especially for operating a compound escapement.)

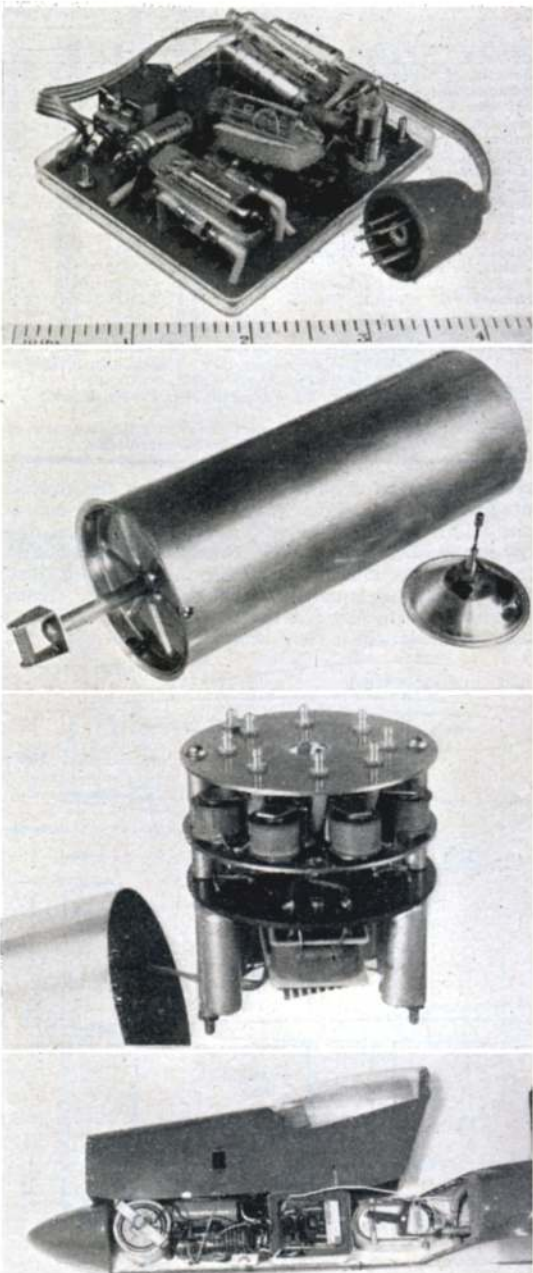
Vital statistics are as follows: O.M.U. 205E Receiver, dimensions: 3 in. x  $2\frac{1}{2}$  in. x 1 in., weight with 7-pin plug and aerial  $2\frac{3}{8}$  oz. H.T. 60 v.; L.T. 1.5 v. (Drain is 85 m/A — a nickel-cadmium cell is obviously called for here), Valve line-up DL67 (Detector), DL67, 567E.

\* Prudent Limit of Endurance.

**"Nothing like an R.O.W. Model and a calm sea—no obstacles anywhere"**



Below, the O.M.U. 205e, now has Siemens relay. Stegmaier air reservoir and servo are from light alloy pressings. Eight relay/valve bank with reed unit under are from Stegmaier Rx and at bottom, our Graupner Trabant glider test model for Mikroton, showing Deacs, condenser and batts., Rx and Telematic servo in nose under moulded cowling.



**Top twenty A/2 model specifications**

			(Square Decimetres)			All-up weight (Grms)†	Wing Plan-form	Wing Dihedral	Tail Dihedral
			Wing Area	Tail Area	Total* Area				
Ritz, G.	U.S.A.	...	29.0	4.4	33.4	415	ET	P	F
Sokolov, J.	U.S.S.R.	...	28.6	5.0	33.6	412	TT	P	V
Habib, H. M.	Pakistan	...	27.74	5.6	33.34	412	TT	F	F
Tahkapaa, M.	Finland	...	28.35	3.80	32.15	420	ET	P	F
Kekkonen, I.	Finland	...	28.28	5.12	33.40	415	ET	P	F
Buiter, A.	Holland	...	28.00	5.50	33.50	435	ET	P	F
Janssen, R.	Sweden	...	29.10	3.9	33.0	410	ET	P	F
Bulgheroni, G.	Italy	...	29.26	4.48	33.74	415	TT	P	F
Wagner, H.	Austria	...	28.9	4.5	33.4	420	ET	P	F
Ella, P.	Finland	...	29.65	4.01	33.66	415	ET	P	F
Nilsson, G.	Sweden	...	26.99	5.16	32.15	425	TT	F	F
Babic, S.	Yugoslavia	...	28.82	3.68	32.50	415	ET	F	F
Monks, R.	Great Britain	...	28.88	4.9	33.78	410	ET	F	F
Michalek, J.	Czechoslovakia	...	29.0	4.95	33.95	410	TT	F	V
Taverna, G.	Italy	...	27.60	5.50	33.10	415	ET	F	V
Hansen, B.	Denmark	...	28.3	5.5	33.8	420	TT	V	V
Thomson, W.	Canada	...	29.00	4.4	33.4	430	ET	P	F
Kunz, H.	Germany	...	29.2	4.6	33.8	420	ET	P	F
Kool, P.	Holland	...	28.38	5.08	33.46	450	ET	P	V
Horyna, V.	Czechoslovakia	...	29.10	4.35	33.45	410	ET	Y	V

\*Minimum Area 32 sq. dm. Maximum Area 34 sq. dm.  
 †Minimum Permissible weight — 410 grms.  
 CODE.—ET=Elliptical Tip; TT=Tapered Tip; P=Polyhedral; F=Tip dihedral only; V=Dihedral.  
 Note.—These figures do not agree necessarily with the designers' quotations, they have been taken from official processing measurements.

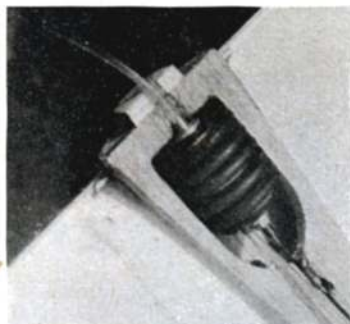
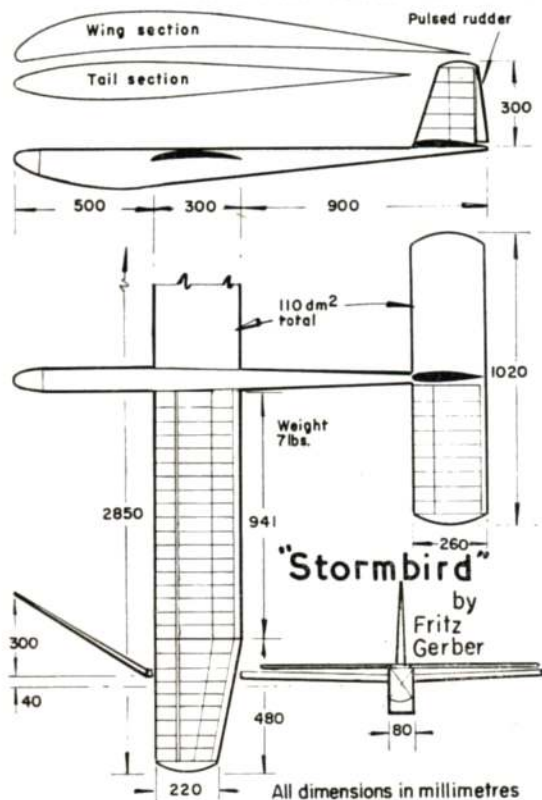
# TOP MODELS

Data from the Editor's notebook, collected during three recent International contests

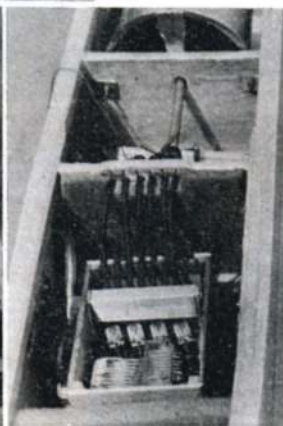
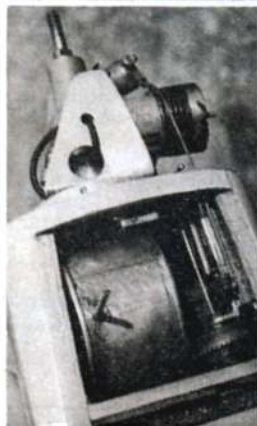
If ONE WERE to enquire as to what was the overall impression of the three major International events your editor attended in August and September, the answer would be simply, "Overwhelming". There is so much to see, to note, to learn from these congregations of the World's top modellers, that the brainbox is hard put to cope with any but the most outstanding items, and it is those which have been collected here for the

benefit of modellers who like to know more about the winners.

Above is the same type of table as produced for Wakefield and Power models last year, except that it is limited to the top twenty. Area restrictions on the A/2 are such that variations are less than in other classes: but the choice of tail percentages and planforms are of interest to would-be designers. On the following pages we complete the set of drawings down to sixth place



Far left, Swiss R/C glider champ's design for slope or toeline, bears remarkable resemblance to W. Manuel's leading British design (see p. 576). Photo detail of Bickel's model reveals tank with internal rotary tube pick-up, elevator servo and 8 reed/air valve unit, all home constructed

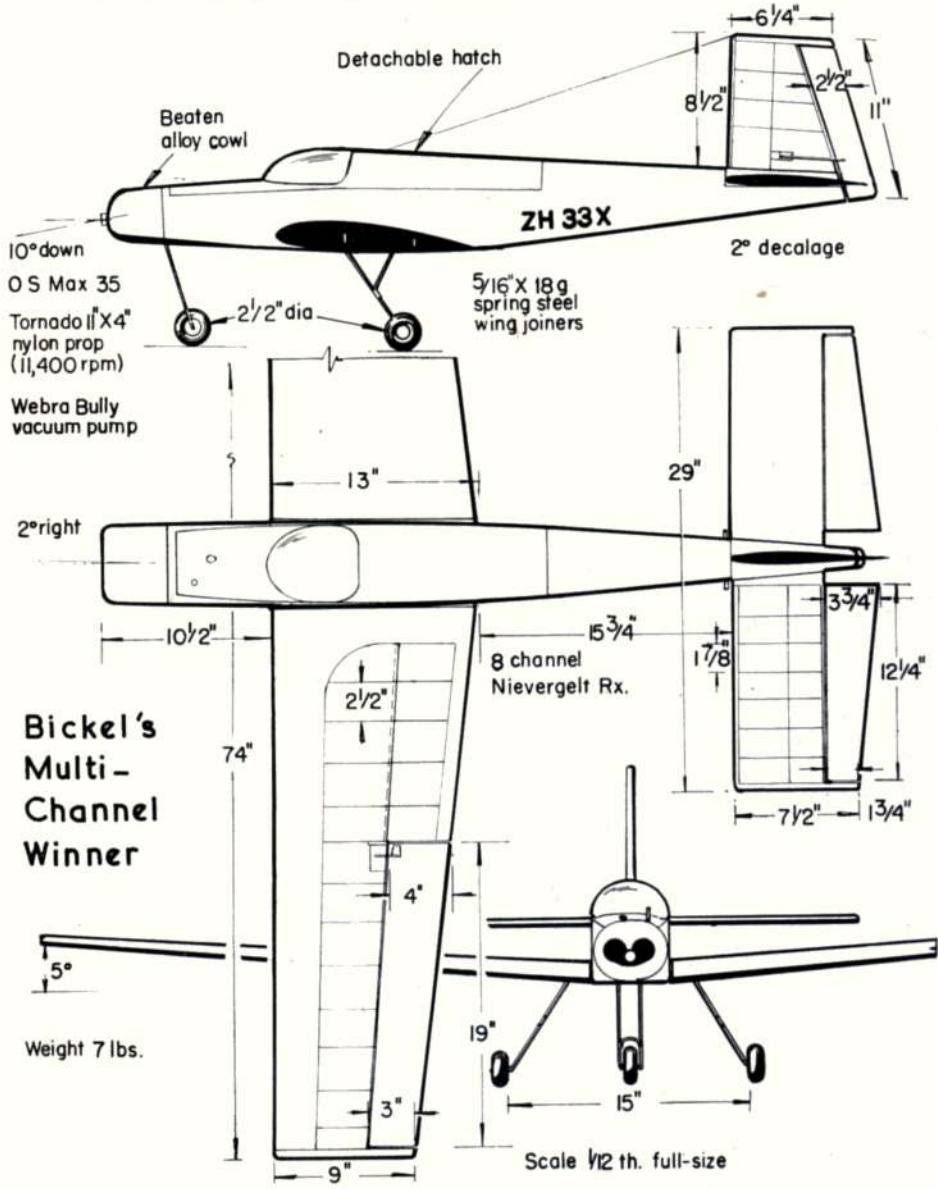
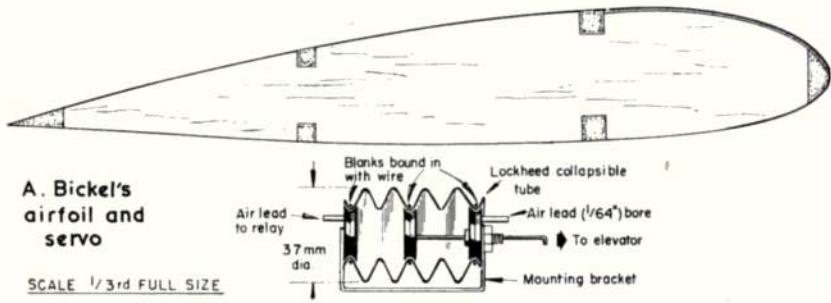


(plus Ella's 10th position model), Ritz's model previously appearing in October and, of course, Habib was flying the A.P.S. *Topscore*. So for the glider fans, there is plenty of meat for study, the only missing factor being that of physical fitness which is entirely up to you!

One last reflection on that A/2 contest at Bourg-Leopold is that it certainly has ended the fly-off farce. Strong representation from all quarters has changed the system, to that suggested in our October issue.

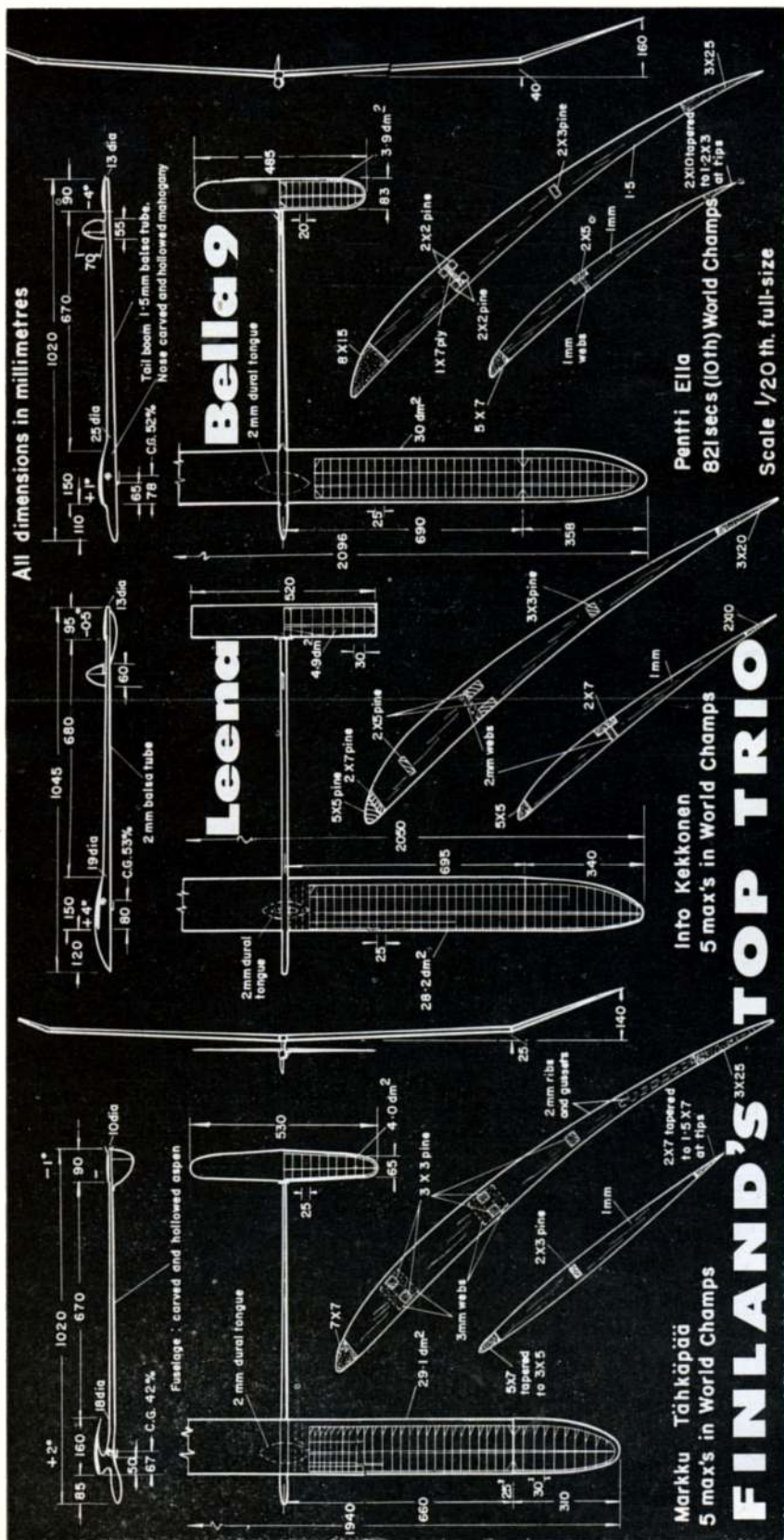
(Continued on page 638)

*Airfoil on Bickel's model was devised by Swiss Aero Club expert, Arnold Degen. Has ample thickness to accommodate vacuum servos. Alloy pressing type is used in this wing, with more powerful rubber sleeving type for elevator, as sketched. Bickel will eventually use this type servo throughout*



*Stilty undercarriage is to take those "plop it down" Continental spot landings. It allows ample prop clearance even when legs are fully deflected. Bickel is a road vehicle repair shop foreman, which accounts for excellence of the beaten alloy cowling and other machined components. He has not been flying multi-channel for long, and manoeuvres cautiously high. Finish in white top, blue cheat line and cream undersides with Swiss emblem on fin could not have been more characteristic of his native country. Neat feature is that main u/c gear plugs diagonally into lower wing surface and same inconspicuous rubber bands retain wing halves on fuselage as well as the undercarriage.*

Weight 7 lbs.



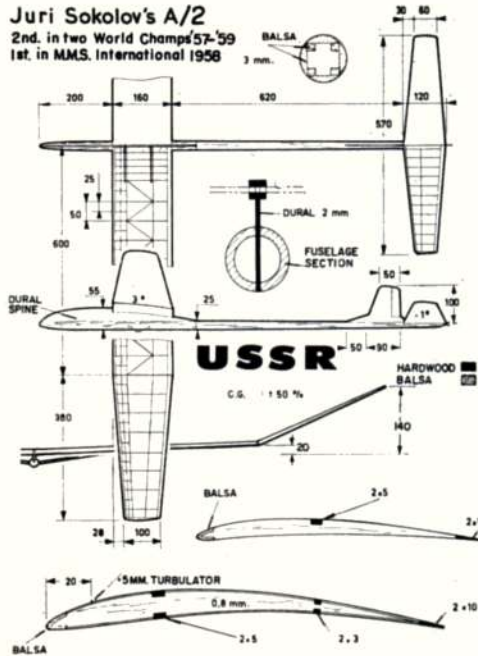
MARKKU TAHKAPAA has been a leading Finnish model designer since 1947. Aged 27, he has made so many A/2 gliders he cannot recall the precise number, but it exceeds 50. Twice the Finnish champion, his models were only just completed in time for the World Championships, consequently he used a symmetrical tailplane to make trimming easier and now has lifting tail with larger area for ultimate performance. A skilled craftsman in wood he carves and hollows the aspen fuselages for his gliders from start to finish in four hours. Markku has also been one of the leading Finnish "milers", his best time for the mile is 4:15, so A/2 towing is naturally a relaxation for such an athlete.

**Models & Personal Data**  
INTO KEKKONEN has been flying A/2 for the last two years, is now 18 and as a junior was one of the leading Finnish A/1 experts. At his very first A/2 meeting he missed the fly-off by 0.2 sec. in the finest ever Finnish A/2 contest, recording a time of 899.8. His models are noted for their excellent stability and it was a great pity that both first model and reserve were lost at Bourg-Leopold prohibiting Into from competing in the fly-off for which he qualified with five maxes. Into is a keen cross-country runner, again a fine example of physical fitness.

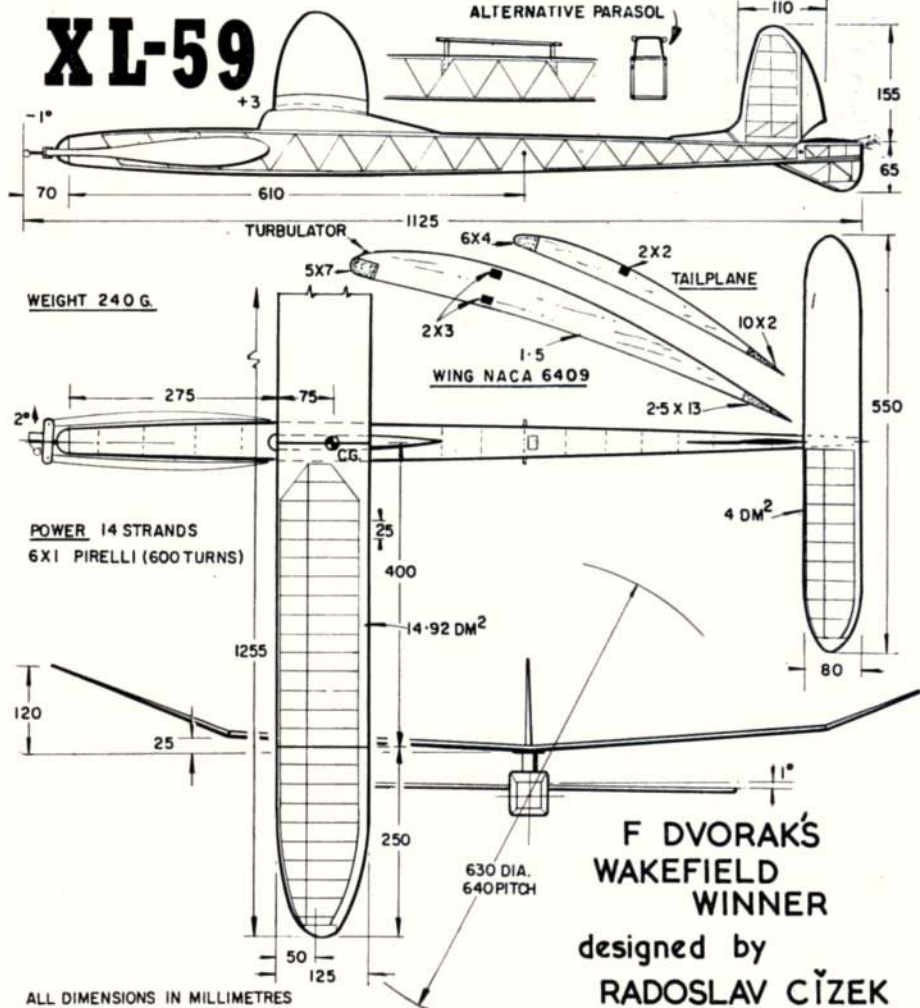
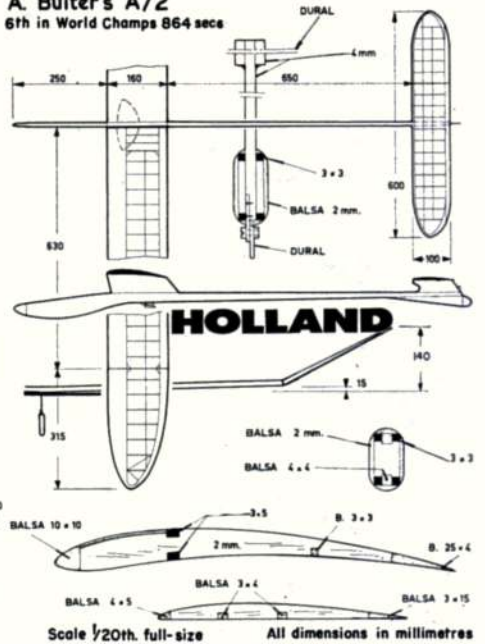
PENTTI ELLA has been flying A/2 for four years and is now 21. His models have always been admired for their beautiful yet practical lines and under good conditions Bella-9 is capable of a 3-minute average. Despite its small tailplane, it is astonishingly stable in gusty conditions due to the small inertia of moments. Pentti is a keen yachtsman operating the "Lightning" class. Add to the physical attributes of these three leading Finnish modellers the weight-lifting and swimming prowess of their expert Manager REINO HYVARINEN and one begins to understand how five flights are a relative nothing to these spartan Nordics!

**Juri Sokolov's A/2**  
 2nd. in two World Champs 57-59  
 1st. in MMS. International 1958

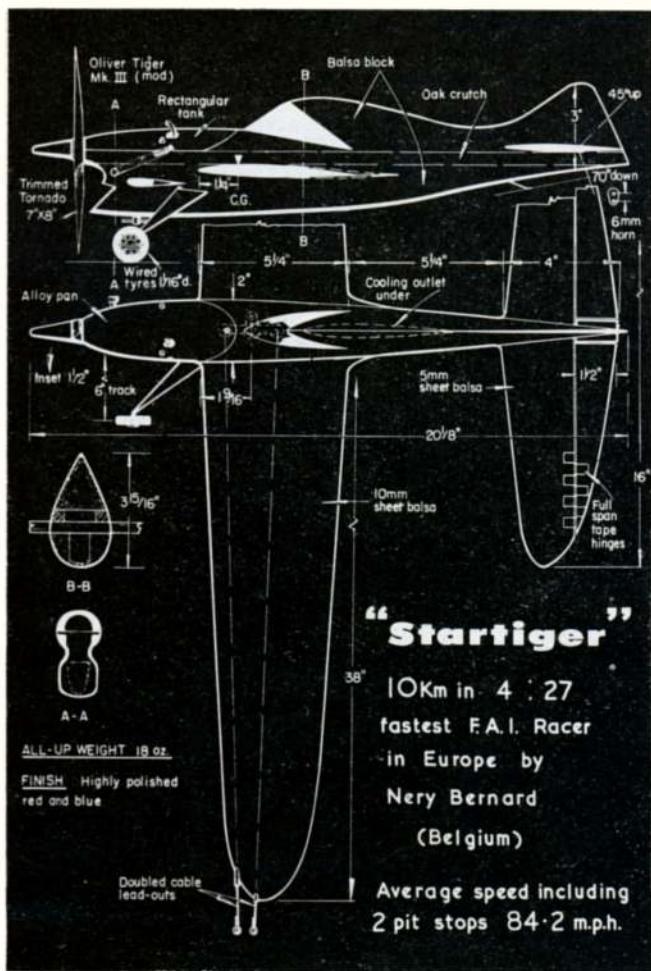
*Juri Sokolov deserves equal merit with Ritz for absolute top performance at Bourg-Leopold. He is a master at the art of tooling, a brilliant constructor and moreover, a sociable sportsman ready to exchange ideas and genial hospitality. He has not changed his design much over the past five years, except for airfoil and structure. Buiters' model was unconventional by virtue of the high wing mounting on a pylon, and similar tail position, result being low centre of gravity and fine stability in bad weather. It is a classic example of a well-trimmed model surpassing those with more refined features but less air experience*



**A. Buiters' A/2**  
 6th in World Champs 864 sec



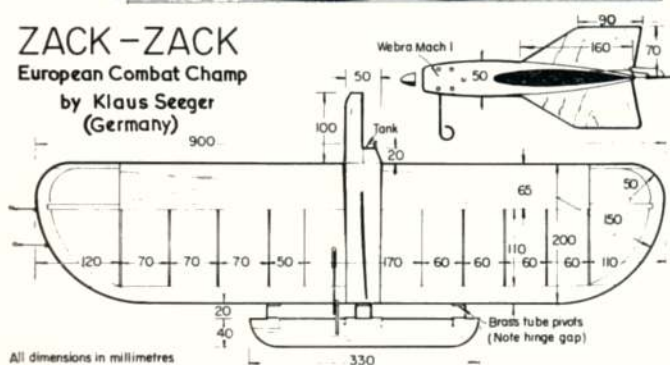
*The XL-56 Wakefield design by Radoslav Cizek is already an established favourite in AEROMODELLER Plans Service. This latest version for 1959, together with 1958 data is incorporated on the same drawing D.690, price 5s., together with the new propeller profiles, revised fuselage structure, etc. Note how the top and bottom of the fuselage are covered with sheet but not the sides. Cizek's own models have had sheet covering on the sides for the motor length as a measure of protection and to come up to weight. Dvorak had the alternative open parasol wing mount on one of his models in France; but the pylon would seem to be favourite. As a functional design of fine proportions, XL 59 is free of frills and has more contest successes in Czechoslovakia than any other Wakefield*



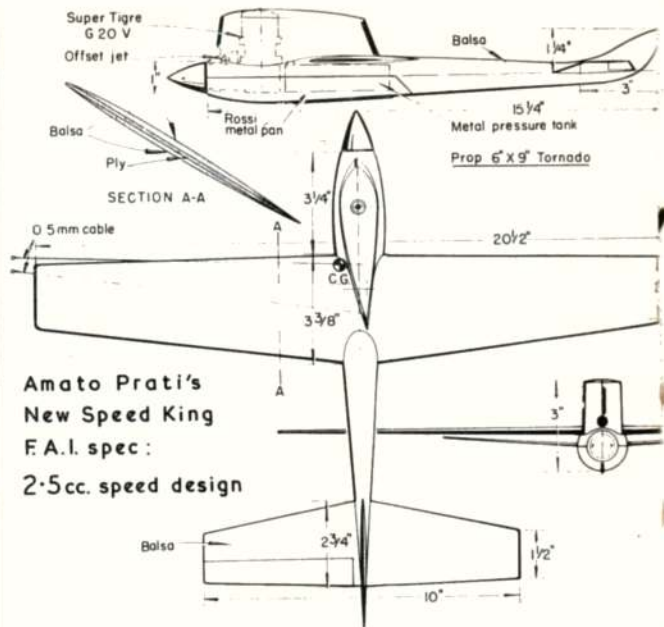
Detail of Bernard's light alloy mounting pan for the Oliver Tiger Mk. 3 and Edmond's type rectangular tank mounted diagonally for gravity feed



### ZACK-ZACK European Combat Champ by Klaus Seeger (Germany)



All dimensions in millimetres

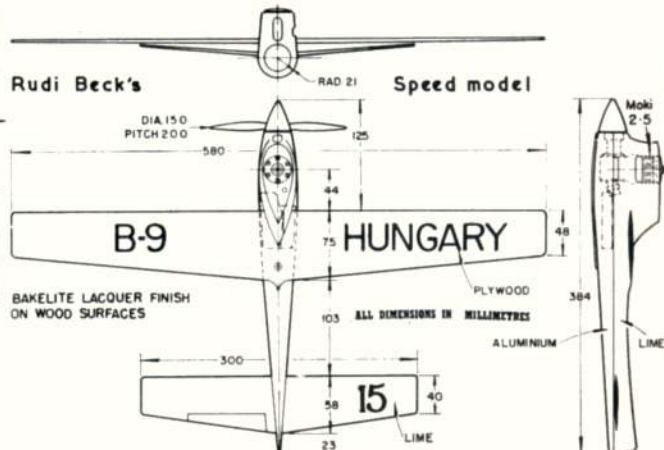


### TOP MODELS *Continued from page 635*

Next port of call was Hirzenhain for radio control. Commercial sets are viewed on pages 630-633; but this does not cover the extensive use of pulse systems for single and vacuum for multi. Transistor pulse boxes are used by the Swiss, with Klausner magnetic servos derived from Howard Boys' original which appeared many moons back in *AEROMODELLER*.

Vacuum, once the prerogative of the Stegmaier's now comes in Swiss and Dutch versions. Bickel's winner had an internally tensioned air reservoir and a novel elevator servo. All Alf Bickel's gear was home-made, with Rx by Nievergelt. We chased the model down to his Zurich flat to get the sketches, and were amazed to see how much he produces from three heavily-populated rooms. Incidentally, it is illegal to run an engine within even a reasonable distance of habitation in Zurich — by police order. The low-wing design is none too easy to fly, it seemed happiest when inverted, perhaps due to large downthrust angle.

In Brussels it was the year of ellipses for team racers, Noblers for stunt, and large hinge gaps for combat elevators. The Germans seem unbeatable at combat, having just the right temperament, and fast, manoeuvrable designs like the Zack-Zack. An air gap of about 3/4 in. between wing trailing edge and the distance not only provided slot effect but also increased elevator leverage. Most of the time the German pilots watch the opposite model and simply weave theirs into attack. Team race talk centred on Bernard and queries were made concerning his "Fina" oil company transfers on the model. However, the fuel formula was not forthcoming. We do know he uses Avtag aviation paraffin, not the lamp variety.





# Christmas Issue

Full-size working drawing of TUG *CERVIA* given free with every copy to make up into a 28-in. l.o.a. model, ideal for radio control operation, or free running. Power can be diesel, electric, or would be delightful under steam! Normal selling price of this free plan 8s. 6d.

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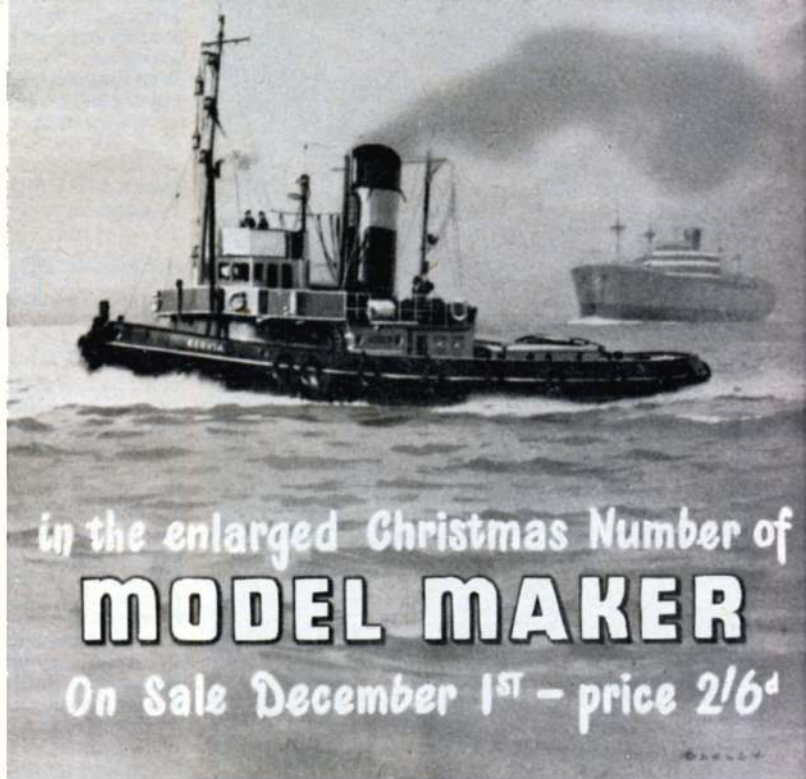
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# FREE PLAN

for this 28in.  
model **TUG**



## WHAT BETTER

number to start **MODEL MAKER** with than this enlarged Christmas Issue? On Sale December 1st, price 2s. 6d., it is a bumper number to secure and treasure with its detailed free plan and feast of material. Have you tried the latest craze of electric model car racing — it's a "must" for aeromodellers? What about a boat for a change? You can try your hand at something different in modelling nearly every month with the bright, imaginative, vivid editorial content of **MODEL MAKER**. Leading model magazine of its kind in the world, **MODEL MAKER** is there for you to enjoy!



THE FIRST STEP towards improving plastic model aircraft is the study of as many photographs and drawings of the real aircraft as possible. From these, many details can be seen which are not included in the kit, but which can, nevertheless, be made from scrap plastic or cardboard. Decide also the exact colour scheme you intend to use. This may not be in accordance with the scheme suggested with the kit, but with the aid of coloured photographs, advertisements, etc., aim at realism. On small 1/72 scale aircraft, cockpit interiors are extremely small, therefore it is better to concentrate mainly on the exterior finish, but make and fit the parts that are visible through the canopy, using scrap plastic if necessary. However, on larger 1/72 scale and most 1/48 scale models, much detail can be incorporated in the cockpit. Some pilot figures are well moulded, but poor examples are best replaced by figures carved from wood or omitted altogether. The colouring should be accurate—the Mae West (yellow) parachute harness (khaki) and flying suit (light blue) each painted appropriately. Even switches on the instrument panel can be represented by coloured dots. All this work helps to eliminate the "black-hole" appearance that cockpits may take on the finished model. The transparency of the canopy can be improved by polishing with a light grade metal polish.

## IMPROVING

□ The fuselages of single-jet models are best "blanked-off" with cardboard bulkheads, as nothing is more unrealistic than daylight showing through from front to rear. These bulkheads ought to be far enough away from the jet openings so as not to be readily seen. The inner walls of the fuselage should be painted before assembly—for instance a white plastic jet pipe interior looks completely wrong. On multi-jet models, such as the "V"-bombers, dummy engines can be made so that when looking into the wing intakes, the appearance is not that of a gaping hole. A piece of card cut to fit inside the intake can have concentric circles drawn upon it in ink to represent the front of the engine. A dome added to the centre of these circles and painted, say silver, will give a three-dimensional effect when enclosed in the wing. Card can also be used to divide the intakes into two parts, leading back to where the front of the two engines are positioned. Wheel wells can also be blanked off with cardboard and of course, all painting inside the wings carried out before assembling the halves. It is advisable to paint as many parts as possible before assembly. Mainplanes and fuselage usually have to be fitted before painting, but pilots, wheels, undercarriage legs and other small details can be dealt with more easily when they are assembled to the model. For small details such as warning notices, emblems, etc., a small amount of paint diluted with suitable thinners can be successfully applied with a mapping pen in the same manner as ink.

If joints cannot be made without leaving a gap, even after careful filing, this can be remedied by filling with *Alabastine* or similar material, and lightly sanding when dry. Take care to wipe away immediately with a damp rag any excess that may have got on to other surfaces. Generally, all plastics look better when painted, and large

*Left, top to bottom: F-100D Super Sabre in "Skyblazer" decor, from Lindberg 1/48th kit, note tailfin star detail. Complete with Edo floats and latest Cessna paint scheme, is Monogram 1/36th scale Cessna 180. Grumman F-6F Hellcat in late 1945 markings, from Lindberg 1/48th kit, has accurate rivet and u/c detail. Monogram Super "G Connie" resplendent in T.W.A. finish. At bottom is Frog Supermarine Scimitar in 1/72nd scale, 804 Squadron markings, having numerous stencil detail on upper surfaces*

outer surfaces are best covered as quickly as possible with a large brush lightly loaded with paint. It is better not to leave any one part of an area too long before the rest of it is painted, or the first area may get tacky and the rest of the paint will not quite fuse with it. A join is then evident when the paint dries. When quite dry, and before transfers are applied, the painted surface can be wax polished—but care must be taken here to rub lightly or paint may be removed from the high spots.

A study of full-sized aircraft will show that there are a multitude of instructions and warning notes stencilled over its surface, and simulations of these adds greatly to the realism of the finished model. Here again a mapping pen can be used, and a series of long and short wiggly lines represent these instructions very effectively, provided care is taken not to make this imitation lettering too large. Colour coding these instructions is a problem, but here coloured photographs or advertisements can be of great assistance to the modeller. Large circles such as black or brown dielectric panels can be drawn successfully with ink compasses using diluted paint, the centre of the circle being filled in with a brush. Wing walks, or any long straight lines can be very neatly ruled with a draughtsman's pen charged with diluted matt black paint. A transparent set square makes this task easier,

## PLASTICS By R. H. Williams

as there are no hidden surfaces. Edges of green or black anti-dazzle panels look neater when ruled—the main area inside being filled in afterwards by brushing.

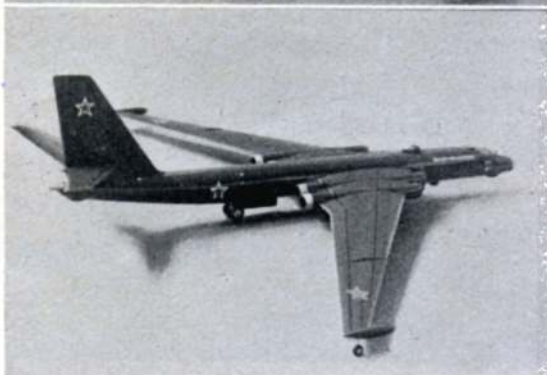
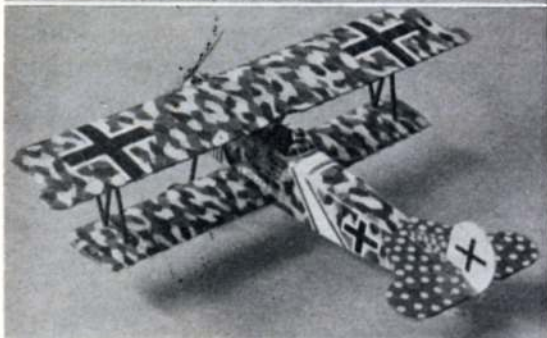
The grain in wooden propellers of older aircraft can be imitated by painting first with a light shade of brown, and then before allowing this to get too dry, paint darker brown grain lines down the length of the propeller, using a very small amount of paint. With practice it will be seen that the latter colour just blends at the edges and gives a more satisfactory effect than separate lines of paint.

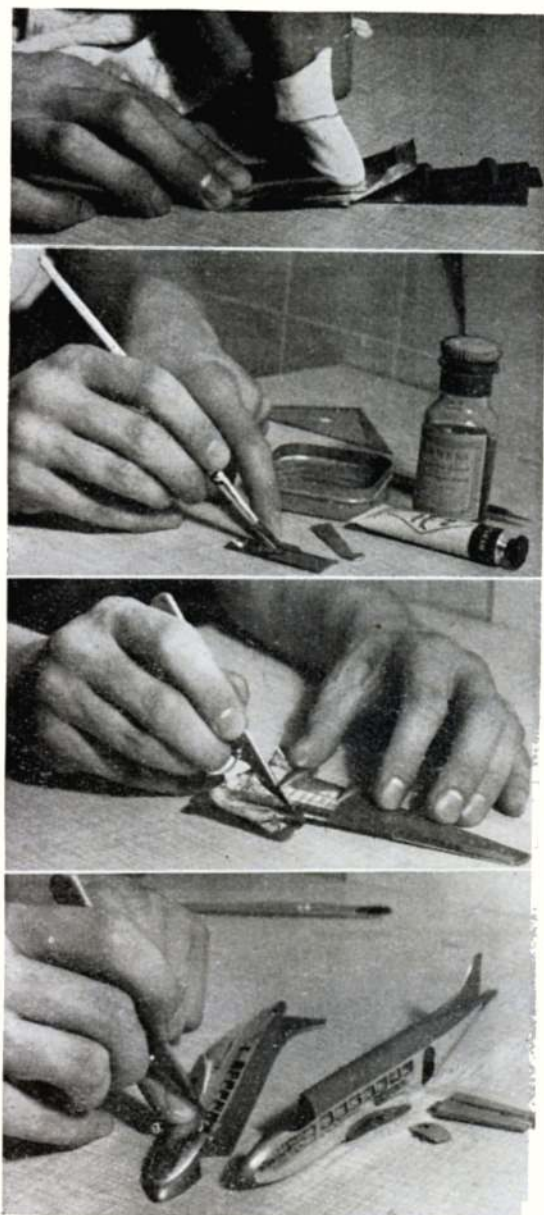
Real aircraft always have their dirty areas, such as exhausts, and the sooty effect can best be created with a stipple type brush. Very little paint is required, and it is best to rub the brush on a piece of paper until nearly all traces of the paint have gone, then apply the remainder in the appropriate place on the model. A matt black gives the best results, but only a very light smear should appear, or this patch will dominate the colour scheme. Silver paint is not always satisfactory when covering large areas, especially when it is to represent aluminium finishes. Success can be achieved however, by using aluminium foil rubbings glued in position. The result is one that is extremely satisfactory to the modeller. Small areas can be covered with this foil where appropriate, and this gives some experience of using the material before attempting the complete covering of a model.

"Polyfoil" aluminium kitchen foil is the best material to use for covering all, or part, of a model, applied with Goodyear "Pliobond" adhesive cellulose thinned down so that the mixture can be applied with a brush.

Plastic kits which have raised rivets are easier to cover than the smooth-surfaced type, as these slight protrusions help to hold the foil in position when taking rubbings, and also to position the rubbing when gluing. Cut generous amounts of foil when making rubbings—the

*Right, top to bottom: Merit 1/48th Avro 504K, in war-time colours. Note bracing detail as with Curtiss Jenny below. Metal-covered cowl on latter looks most realistic. From 1/48th Lindberg kit. Merit 1/48th Fokker D VII in "lozenge fabric" colour scheme. Revell "Bison" bomber shows unusual u/c layout of this aircraft. Beautiful Martin B-26D Marauder is from Aurora 1/48th kit*





*Above, top to bottom, taking rubbing on one half of wing before assembly of model. Foil is rubbed lengthwise, taking care that formed rubbing does not move. Next, applying adhesive with brush on to foil, not to plastic as might be supposed, to allow for alignment when foil is in place. Trimming of foil is done with knife, lower surface trimmed flush, upper surface has 1/16th inch overlap for painting and folding over to hide wing join. Cutting out windows on fuselage of demonstration model, which incidentally is Airfix Heron*

excess being useful for handling. Place foil over the component and with a soft cloth, gently rub lengthwise, increasing the pressure as the foil begins to mould itself round the shape. When one end is formed, care should be

taken to ensure that the partly formed rubbing does not move. The foil sometimes tends to stick to the fingers and lift, but by stroking the fingers sideways rather than pulling them up, this slight adhesion will be broken without moving the foil.

With large wings or tails, take rubbings before cementing halves together, as the moulding can be laid on the flats for this work—whereas they will be unsteady if the surfaces are curved. The excess foil round the rubbing is best left alone until after the glueing operation, as it serves for handling the flimsy rubbing. Large rubbings can be made on the flying surfaces. Fuselages are best dealt with in halves, because they can be laid on their flat centre edge to take rubbings. The thing that determines the size of these rubbings is the change in section of the plastic. Pointed noses for instance may need four small rubbings, or wrinkles will occur if it is attempted to bend the foil too many ways at once. It will be necessary in some cases to trim the rubbing to act as good locators. It will be necessary in some cases to trim the rubbing to correct size before assembling, and a useful tool for this job is a Swann Morton knife. With care, the rubbing can be cut while still in position on the plastic fuselage. If possible, leave extra foil somewhere for handling. The rubbings over the top and bottom of fuselages are best taken after cementing the halves together, but make sure of a good smooth joint or this will show on the rubbings.

The diluted "Pliobond" can be painted on the inside of the rubbing, using a large soft brush, for this must be done quickly. Mix only enough adhesive for the operation in hand, as the mixture soon gets tacky and useless. Do not apply adhesive to plastic, as this melts the surfaces before foil is applied, and no movement of the latter can be made, should it be necessary, once the tacky surfaces are in contact. By placing the treated rubbing on to the plastic, any slight alignment can be made before finally smoothing down with a cloth. The whole operation must be completed as quickly and carefully as possible, as it is practically impossible to remove the rubbing once positioned, and in any case the surface of the plastic would then be permanently spoiled. Flying surfaces are best covered in the following manner: underneath first, then with cutting tool trim excess foil from edge. Cover top, and trim excess foil away, leaving about 1/16 in. to overlap bottom covering. Paint this overlap with adhesive, and rub down over this surface. The joint is then almost undetectable. Fuselages are covered in a similar manner. Panels can have a slight overlap, as this is not too obtrusive. Windows can be cut out easily with the cutting tool. Skill will soon come with practice, but patience is necessary as this is slow work. Do not handle the part once a metal panel has been assembled, as the plastic stays soft for several hours, and the surface can easily be marked. It is best to plan the work so that several panels can be fixed on different parts in one evening, and these are best left to dry until next day. Cover as many pieces as possible before assembling the model, this being the easiest way to work.

Transfers do not readily adhere to the polished surface of the foil, therefore cut stencils of the insignia by placing a piece of tracing paper over the transfer, and after marking round with a pencil, roughly cut out the shapes. Place this stencil in position on aircraft that marking will take, and with clear varnish paint through stencil cut outs on to the foil. These clear varnish patches will keep the transfers on to the foil without leaving unsightly excess round their edges.

Metal foil covering is a rather slow process, but when the first model stands gleaming before the modeller, his patience will be well rewarded.



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IN PRACTICALLY ALL FIELDS, in which occurs a high rate of innovation, there can be found some means of "title deeds registration". Aeromodelling is the exception.

First, the name problem itself. Naming new models can be a problem, but frequently one has to build new models to match an outstanding name inspiration! It depends on the normal scope of words as used by the designer and his associates. Also upon the diversity of their hobbies — or sub-hobbies — and fields of interest.

Some suggestions are: Power models — F.A.I. By definition, a new rule power model has become comparatively a missile, and the "International Contest Ballistic Missile" term fits the tag I.C.B.M. nicely. If — as the writer — the builder is a rocket and space fan, one is left with "ATLAS" and "TITAN"; "Atlas" is out, by previous usage, so Titan it is! An open class model — "Lightweight Rules Ballistic Missile" or L.R.B.M., only one name available — BLUESTREAK. Test vehicle for that layout, of course, is the "BLACK KNIGHT".

Anagrams, and anagrams of initials, can give some fascinating "sound combinations". NERPSEV is verbally produced to include the capitals of its classification — New Rule Power System Evaluation Vehicle. There is one name that really means something.

Having accepted the name *Titan*, we find a great number of planetary bodies (*Titan* is a moon of *Saturn*) which have been neglected as name sources. *Callisto*,

*Io*, *Europa*, *Jupiter*, *Ruea*, *Triton*, of the outer planets — even *Pluto* itself. They're all unassociated at the moment.

The writer tends to deify the Wakefield as a class. Hence the successful Olympus series, the daddy of the lot being the old Mk. 4, which hangs on the bedroom wall with *Zeus* across the wings, and freshly changed flowers! Retired, of course. The new series is the *Paranoid*, being defined as a person with a "persecution complex". With four rule changes in as many years, wouldn't you have one? The following fields are suggested as interesting names, any one of which could provide enough names for a lifetime:

Classical Greek — *Olympus*, *Zeus*.

Astronomy — *Titan*, *Ceres*, etc.

Science Fiction — *Nomad*, *Demolished man*, *Mutation*.

Psychology; Science — Penguin dictionary of each makes wonderful light reading!

Functional — *Maxis*, by guess who.

Source of Inspiration — e.g., *Rheinland A/2*.

Evolution — *Amoeba*, *Cro-Magnon*, etc.

Gimmick! — *Hangover A/2* (named because of tow, mainly); *Suspender*, open glider; *Normaliser*, 2.5 c.c. pylon power; *Sanforiser*, 1.5 c.c. pylon power; *Economiser*, 1.0 c.c. pylon power.

Modern Jazz — *Yardbird*, 36-in. rubber; *Suncat*, open glider.

The choice is wide open, and in spite of there being no registration system, few duplications are noted on the flying field where names are actually employed on wings. Pity is that so few modellers seem to be able to pick on a name, so why not follow these suggestions and christen your creation? A. ANDERTON

## ENGINE ANALYSIS : FROG 3-49

(Continued from page 599)

The shaft terminates in a sharp taper immediately in front of the bearing and is drilled and tapped to a depth of approximately  $1\frac{1}{4}$  in. to take the  $\frac{1}{4}$  in. diameter high tensile light alloy propeller shaft. Crankshaft diameter is  $\frac{3}{8}$  in. diameter over the journal faces. The crank web is purely circular and the integral  $13/64$  in. diameter crankpin steps down at the end to .115 in. diameter to engage the rear rotor drum valve.

The rear assembly consists of this drum valve turned integral with a  $\frac{7}{16}$  in. length of stub shaft  $\frac{3}{8}$  in. diameter, machined hollow to a very thin wall section and drilled with a  $\frac{1}{4}$  in. diameter port. This stub shaft length forms the valve and is hardened and ground to finish. It runs in a plain bearing in the crankcase rear cover, the bearing length being reamed to size. Induction is down the choke tube opening into the back of the crankcase cover, through the hollow stub shaft (drum), opening into a port in the top section of the inside of the cover. The complete back cover unit is a single casting, attached to the crankcase by two screws. Port opening, is, of course, directly into the crankcase and the induction period better than could be obtained with a front shaft valve, moreover, the drum valve is easier to produce than a disc valve.

Maximum performance of the ball race engine, as measured on test, was just over .3 B.H.P. maximum, at 12,200 r.p.m. The plain bearing engine peaked at almost exactly the same speed, but at the lower figure of .28 B.H.P. Although neither figures are exceptionally high in terms of specific output they are extremely good for a general purpose 3.5 c.c. diesel and accompanied by first rate handling and running characteristics. High torque output is sustained well down the speed scale and performance on very large propellers remains excellent. Maximum torque output is achieved between 7,000 and 8,000 r.p.m.

Summarising, the 3-49 appears to be an excellent sport or control line engine for models demanding a little more power than given by the best of the 2.5 c.c. motors, and it gives that extra power at a quite moderate speed, which means that a fairly large propeller can be used to take advantage of higher propeller efficiency. Either version of the 3-49 appears an equally attractive proposition and in paying a little extra for the ball race version you do not also get something more in the way of performance. Both engines, too, have a hallmark of quality about them which is carried down to the use of Phillips head screws and spring washers for assembly and nylon threadlock for the comp. screw.

ONCE MORE we offer our service of providing a complete four-page index for AEROMODELLER, Volume 24, of the last year. It is available only from the editorial offices for a nominal charge of 6d. per copy: but we must also request supply of a suitable stamped and addressed (2d. stamp for U.K. readers only) envelope preferably measuring  $6\frac{1}{2}$  in. x  $9\frac{1}{2}$  in. so that we can despatch the index with only a single fold.

This is also the ideal time of the year to consider binding your copies into a handy reference work. The price of binding in handsome red cloth covered stiff jacket with title gold blocked on the spine is only 15s. Copies should be sent to us well packed with the covers removed if not required to be bound in. Alternatively we offer the "Easibind" folder specially prepared for AEROMODELLER which takes the 12 copies plus index at 12s. 6d. per folder.



Forresters exhibition in Nottingham (see report) included two fine low wing R/C models by Geoffrey Pike.

WHILE COMMITTEES BATTLE over next season's contest programme, juniors while away their club hours wondering what to ask for at Christmas. This aeromodelling game never changes from year to year, does it? Here's hoping all of you get what you want (deserve?) and may the best lad win that club raffle!

### Southern

UNITED SOUTHERN A.C. had a five-club meeting on Goodwood racing circuit — model flying, not car driving — and though C/L was rained off due to soggy streamers, free flight prospered with wins for Horsham and Men of Kent reps. Another meeting took place on November 1st at the same venue. WORTHING M.A.C., now called "Bald Eagles" for some obscure reason, have a keen C/L interest, member John Bashford has a cast alloy fuselage pan for his 35 combat model which should impress — if it hits. At EAST GRINSTEAD, more long flights, Smith's A/2 disappeared into the blue on September 13th — shouldn't have flown in such wind! WOKING chuck gliderers turned up at Croydon Gala loaded; but no event! So by inveigling Surbiton and Tonbridge, they run their own — result, a win for John Barker at 102 secs. Indoor R.T.P. is regular at Woking's Co-op Hall on Fridays. LEATHERHEAD M.F.C. are going for combat *seriously* (who doesn't?) next year, but they'll have to hold wings in place tighter than those on M. Dias's racer did at Westham.

### Western

SWINDON M.A.C. has written four times in eight weeks asking the S.M.A.E. for its Area Secretary's address — without reply!! How on earth can they hope to get in touch with other clubs if this state of affairs prevails? In case other Area clubs are in similar difficulties, your Secretary is: D. A. Wilson, Esq., Woodlands Cottage, Wrington, Somerset.

### South Western

PENZANCE Grammar School has an active group of keen youngsters, intending among other things to be first to achieve flight refuelling with control liners. A scale Noratlas will fuel a Mercury Picador.

### London

North London S.M.E. exhibition was a well-planned affair which I regretted missing; 1,500 others enjoyed the show at Southgate which included a handsome aero section as well as live steam loco and rail racing cars.

How right is the London Area newsheet when it says "The entire movement is run by a handful of people who get no thanks but who have to dodge the bricks when things are not so good". But then — isn't it the same in all voluntary organisations? And not unique to Great Britain, either?

George Fuller of ST. ALBANS M.A.C. collected a 1st with John Simeons 2nd in Power at the Tangmere Rally — George's son holding the lucky raffle ticket, too! Same day at Ivinghoe, D. Edwards took 1st in open slope soaring using his successful "Woggis" creation. Members were bright and early (6 a.m.) at Chobham on October 11th and by 8 a.m. Fuller and Simeons had full max's. George followed up with a 12:06 fly-off time and went back to the home ground at St. Albans for the rest of

the day. All-Britain trophies are wanted back Now — holders should contact D. Tipper. "Highfield", St. Albans Road, Hatfield.

In FELTHAM EAGLES, Nicki Risi has been whipping up to 108 m.p.h. with his racer—pity isn't it that whipping is now to be banned internationally!

At last the CROYDON GALA results:—

<i>Rubber:</i>			
1. J. O'Donnell	Whitefield	9:00+4:42	
2. E. Thorpe	Derby	9:00+3:10	
<i>Glider:</i>			
1. R. Monks	Birmingham	9:00+ :10	
2. J. O'Donnell	Whitefield	9:00+ :28	
<i>Power:</i>			
1. J. Wisher	Surbiton	7:50	
2. P. Muller	Surbiton	7:14	
<i>Slope Soaring:</i>			
1. I. Baguley	Hayes	2:11	
2. G. Fuller	St. Albans	1:15	

SIDCUP A.S. has Mike Bassett at the Secretarial reins now with interests intensified in Team Racing (*Naich!*). May be they'll hold a rally for control line next year. Their annual exhibition for Sidcup Handicapped Scouts takes place on December 12th in Woolwich Baptist Hall. HAYES topped the area in the Farrow Shield and Ian Russel showed the flag with his quickbuilt *Flite Streak* in Brussels (see page 607). Though pressed into service and out of practice, he still beat a number of the selected internationals. WANSTEAD M.A.C. is going again with regular meetings in spite of sudden rises in cost of room hire. They hope to get a Wanstead Flats rally in the programme for 1960.

This is also location of a new club, the SQUARES, a stunt group with angular ideas, catering for modellers in the East London area. Disconnected stunters should contact GRA:8138. CRYSTAL PALACE M.A.C. is recruiting—and negotiating with Croydon Corporation for a field (The airport?). They have a clubroom and if you want to join, write to 144 Church Road, Upper Norwood, S.E.19. WEST LONDON M.A.C. had a fine display at Fulham Annual Show with R/C models and a Hawker Hind framework attracting the Mayor on his rounds. A.P.S. *Aiglet* has been chosen for the winter "one-model" contest.

### South Midland

HIGH WYCOMBE is coming to the fore in multi-R/C through 15-year-old (this month) Paul Rogers, who is chasing the experts despite only starting to model with a *Veron Deacon* 12 months back. He lost that on its first flight, built a *Junior 60*, then 6-channel *Uproar* and now a *Smog Hog*. Incidentally, it wasn't Paul in our pic. of the S. Midland Rally, October issue, the low wing belongs to Frank Knowles, who won at Tangmere. Paul won at Cranfield, with the *Hog* in Rudder only. NORTHAMPTON M.A.C. had John Patterson (Mr. Solarbo), up for a talk and have also been engaged in a postal comp. with WELLINGBOROUGH, their neighbours, and Scots lads at Dunfermline and Kirkcaldy. Pity more clubs don't get down to this—try a few of the addresses quoted over the past year in these columns if you want keen competition. STEVENAGE is a keen group despite flying field problems. School play grounds are impressed for team race practice. Not only were all six club models pranged or lost at the team event, but the Comp. Sec. also got his trousers alight with a d/t fuse—bet he popped!

### Northern

E. LANCS. M.A.C. outing to Northern Gala was a good day for the lads, although no prizes came their way. E. Lord missed third in PAA load by 3 secs. in his first PAA Comp.; A. Garnett was in glider fly-off with *Inch-worm* and A. Buckel was high in power. Club winter rally is to be for open free flight R/C with 1/4A combat, on December 6th at Walton Spire, all welcome and hot meals at a local cafe!

### North Eastern

GOATSHED KNIGHTS of Gateshead have a fine new transfer and are running a contest for C/L events every two weeks with points going to individual championship. They correspond with Glendelg Club in Australia and meet regularly at the Parachute Assn., Leopold Street, Fridays and Mondays. Such keenness has that lad Eddie Black from Glasgow, he deserves his successes, especially the Rush Trophy at the NOVO CASTRIA M.A.C. Rally, Newcastle, in August. Eddie cycled to and from the events (a mere 286 miles round trip) took 1st in glider and rubber (beating John O'Donnell in the process). There were 68 competitors in the four events held.

### East Midland

FORESTER (Nottingham) M.F.C. took part in the City's Ideal Home Competition. Geoff Pike's *Astro Hog*, B. Tozer's *Rattler* and T. Woodward's *Sopwith Scout* were among interesting exhibits, but best of all was the new Pike creation, "*Shock Wave*", an 8 ft. 6 in. low wing 10-channel R/C design with retracting u/c. Club uses the local aerodrome by arrangement with Sherwood Flying Club and non-members are abusing the privilege. If they want continued use of the fine facilities, they had better join up.

### North Western

Club free flight champ. for fifth year at SHARSTON is E. Helliwell, with D. Nunnally leading the C/Liners for the first time. An entirely new model design for revolutionary power is being made by E. Prince—it has long strips of rubber which are wound up, tight, then released to drive the prop. Such a power plant is new to Sharston, and I suspect, might be to many clubs these days! PRESTON D.M.F.C. got to the Area finals in team race "more by luck than judgment", but eventually wrote the model off, including Oliver Tiger.

### East Anglia

Mick Smith, popular Comp. Sec. of NORWICH M.A.C., was hooked by womanhood twice over when his financee lost her first model an A/2 on its very first flight. He'll have a job living that down! The Area held Championships at Debden, ANGLIA placing 1st and 2nd in glider, senior section, 2nd in Junior, also similar places in combat. CAMBRIDGE are having a spot of by-law bother after years of accident and trouble-free flying. If the Council adopts the by-law, it will hit the Club badly, and thanks to energetic representation, there is hope of an amiable settlement with better understanding of models on the part of Council officials.

### Midland

LEICESTER M.A.C. report financial success with their C/L rally and that Lord Gretton has requested a repeat performance for Battle of Britain Sunday in 1960; the club has full winter programme arranged including film shows, socials and sales. BRIERLEY HILL aeronauts boost their club recover of contest models as helping them to beat the fly-off blues. But for a bug in treasurer Mick Wilkinson's model, they ought to have ousted their neighbours, Birmingham and Coventry in a recent event.

Continued on page 646

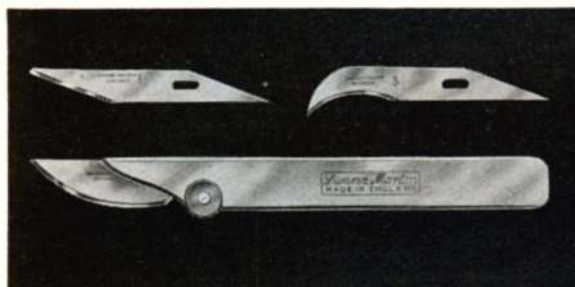
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FROG SCALE TEMPEST	48/2	A.M.15	57/10
FROG C/L CHIMP 22"	14/6	A.M.25	66/5
FROG C/L HORNET 21"	24/6	A.M.35	69/6
K.K. HALO 42"	19/9	COX PEE WEE	51/3
K.K. CAPRICE GLIDER	15/9	E.D. Bee 1 c.c.	52/6
K.K. SPECTRE 41" Stunt	37/6	E.D. Hornet 1.46	54/4
K.K. TALON 32" Combat	24/6	E.D. Racer 2.46	76/9
K.K. GAZELLE 28" Stunt	19/10		
K.K. DEMON 30" T/R	29/6		

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**Club News** (cont. from 644)

**EVESHAM M.A.C.** had their annual championships at Wellesbourne on September 27th. A. Andrews who won power, lost his *Calypto Major* 25 minutes upwards, then the d/c worked, taking another 10 minutes to descend! At the same venue, the **MIDLANDERS** held their glider contest, Ashcroft setting a new record of 6:03 with his *Topscore*.

Strange happenings are happening in **OUTLAWS (CANNOCK) M.A.C.** One combat weary type, for want of something better to fly, recently turned up with a two-year-old A/2 which, D.T. less and in perfect condition promptly turned in a 14 minute flight, yet came down no more than a mile away. A fortnight later, suitably imbued with free-flightitis, said model was entered in the decentralised C.M.A. Cup and somehow turned in 7:32.

Following a complete re-organisation of the committee **WOLVES M.A.C.** is once again getting on its feet after a long absence from contests. The club congratulates B. Horrocks on his performances in his first competitive season in England, well done Brian!

**SUTTON COLDFIELD R.C. M.A.C.**, still only months old as a club, are pleased with Ray Crabtree's first in single-channel at the I.R.C.M.S. rally **WELLESBOURNE**, and Ian Robinson's equal first, same class, in the Southern Counties Radio Rally at Middle Wallop. First sign of autumn is a cascade of "Cascades" based on the Wright relaytor. Three variations have appeared already—anyone like to count my pulse?

**Wales**

**CARDIFF M.A.C.** expedition to Llangyndir on October 20th, discovered the field swathed in low cloud! One glider and three members were lost before the retreat, but the members were recovered.

**Ireland**

At the Irish Free Flight nationals, on September 27th, at the Carragh, some

spectacular flights were made when F. Pollicki launched his Oliver powered *Eureka*. J. Sullivan won the admiration from Cork to place first in glider and power.

*Rubber:* 1. J. Carroll 2. J. Boylan  
*Glider:* 1. J. Sullivan 2. J. Carroll  
*Power:* 1. J. Sullivan 2. F. Pollicki

**Scotland**

**DUNFERMLINE** demanded a return control line competition after the postal event (reported by Northampton) and won the class A and ½A team race events. Ron Frazer gave an impeccable demonstration display of multi-channel radio flying at the Scottish Gala. During the flight pattern he completed three beautiful loops and then succeeded in scattering the large crowd on the runway, with his touch and go's. He really put his *Smog Hog* through its paces, so proving the reliability of his "home built" receiver and joystick operated transmitter.

**Services**

Second F.E.A.F. championships held at Seletar, Singapore, brought teams from Changi, Seletar, Hong Kong, and Tengah. The team from Ceylon were unable to attend. Corporal Godden of Changi, forgot to set his timer, and his model was last seen just below a cumulus cloud at about one thousand feet climbing rapidly, engine off towards the mainland of Malaya!

**Pen Pals**

Three for those who like overseas correspondence, Alfred U (yes, that's all!) of RBL 566, Stanley, Hong Kong, wants pals in U.S.A. and U.K., 15-years-old, keen on R/C. Fred Murphy, 1541 Manchester (That's a natural!), Westchester, Illinois, U.S.A., wants pals in the U.K.

Ekrastian Ravel, 14 bis Rue Mirabeau, Angers (Met. 1), France, is interested in gliders and free flight and wants a pal to correspond in English.

The CLUBMAN

**SM&E Results****Keil Trophy**

31 Clubs entered	
1. Surbiton	48-00
2. East Lancs.	45-32
3. St. Albans	44-43
4. Ashton	40-34
5. Coventry	38-18
6. Wigan	36-03

**Farrow Shield**

29 Clubs entered	
1. Coventry	44-32
2. Birmingham	43-25
3. Leamington	43-07
4. Hayes	41-07
5. Croydon	39-10
6. Surbiton	38-31

**Frog Junior Trophy**

20 entries	
1. A. Tossell	Port Talbot 8.07
2. C. Jackson	Chorlton 8.06
3. G. Moore	Port Talbot 6.46

**Pluge Trophy**

1. Baildon	1344-243 pts.
2. Surbiton	1281-214 "
3. Coventry	1173-994 "

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S. Catchpole, 57 Melwood Drive, Liverpool 12.

**BISHOPS STORTFORD D.M.A.C.**

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B. Wicklow, 8 Coodarragh Park North, Belfast 14.

**LARNE M.F.C.**

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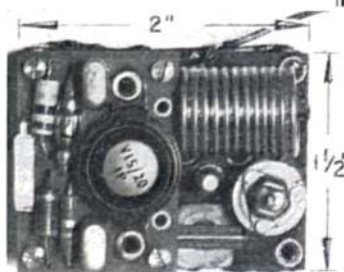
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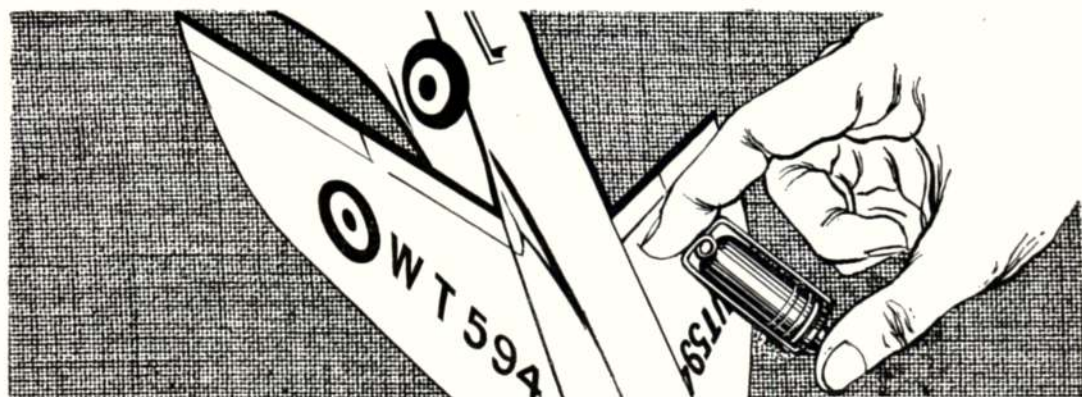
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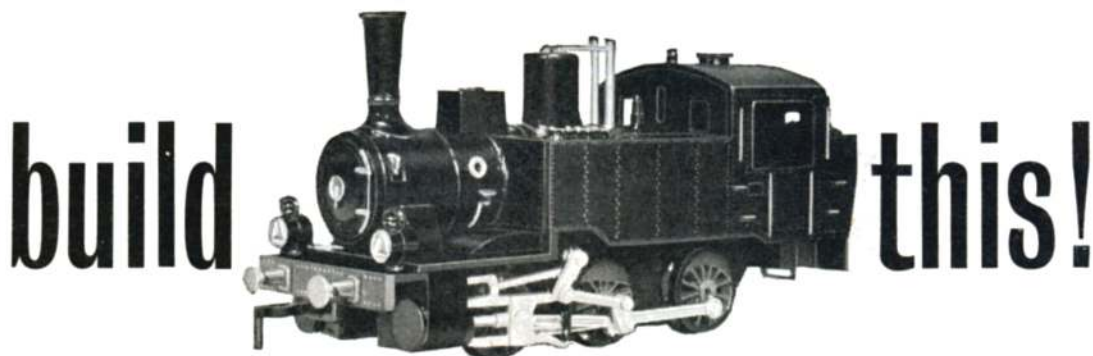
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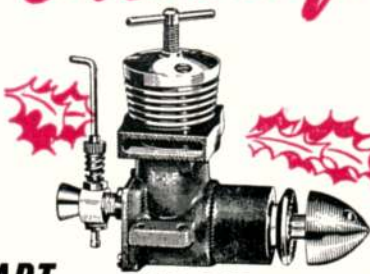




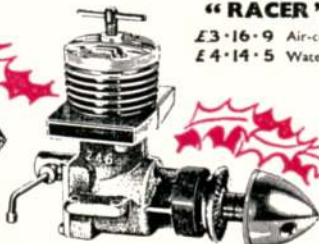
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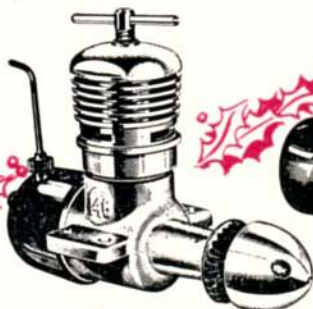
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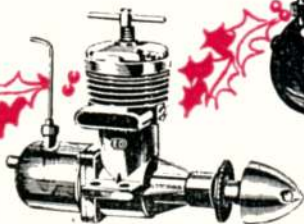
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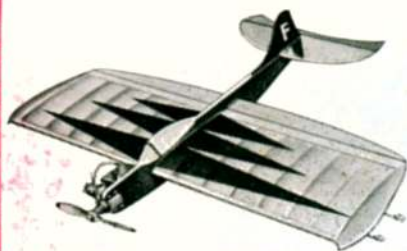
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