December 1972

Aero Modeller

MODEL ENGINEER EXHIBITION 1973

15p USA & Canada 75c.

INCORPORATING
MODEL AIRCRAFT

MAP HOBBY MAGAZINE

De Havilland 88 COMET scale drawings

TWO FREE PLANS INSIDE

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Circa 1916-18

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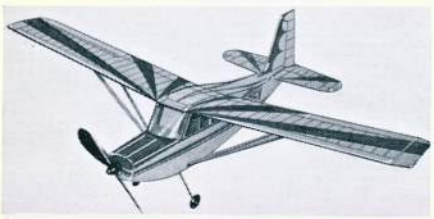

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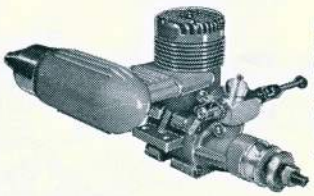

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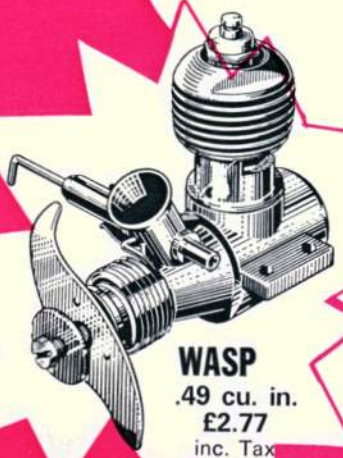

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INCORPORATING
MODEL AIRCRAFT

December 1972 Volume XXXVII No. 443

CONTENTS

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The Editor and Staff of Aeromodeller send seasonal greetings and best wishes for a happy and prosperous New Year to all our readers.

on the cover

Sole remaining example of a De Havilland 88 Comet Racer is the 'Grosvenor House' as exhibited at the Shuttleworth Collection, Old Warden, Beds. Since first appearance in 1934, G-ACSS spent 3 years in the R.A.F. as K 5084, became 'The Orphan' in pale blue decor, then 'The Burberry'. After establishing London-Wellington-London records, it was stored until restoration by D.H. Tech. School, Chester for the 1957 'Festival of Britain' and in the process acquired several detail differences. An expensive major re-build would be needed to make it airworthy. **Air Portraits** *photograph.*

next month

Plans for a free-flight scale model of the **PZL Wilga 35.** Start of a new series aimed at the **beginner** to Aero Modelling – irrespective of agel **Gadget Review** provides more hints and tips from readers' experience. Regular features include **Aircraft Described, Flying Scale Column, Latest Engine News, Free-Flight Comment.** All these plus other articles in the January issue, on sale December 15th.

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9 x 6 ...	46p	9 x 7 ...	46p
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10 x 4 ...	52p	10 x 5 ...	52p
10 x 6 ...	52p	10 x 7 ...	52p
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11 x 7 ...	57p	11 x 8 ...	57p
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2mm (14swg) 36p
3mm (12swg) 36p

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15mm ...	14p	20mm ...	19p
25mm ...	25p	30mm ...	32p
35mm ...	38p	40mm ...	44p
45mm ...	49p	50mm ...	56p

Nylon True-Spin

25mm ...	34p	30mm ...	39p
35mm ...	45p	40mm ...	53p
45mm ...	62p	50mm ...	69p
55mm ...	78p	60mm ...	87p

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50mm (2") 30p

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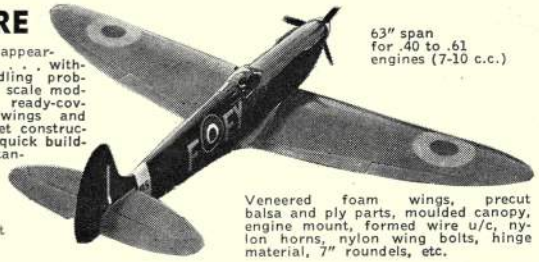
Kits include ready-built veneered foam wings, all balsa and ply parts precut, canopy, tank, formed u/c, nylon engine mount, horns, etc.

SPITFIRE

Realistic scale appearance for R/C . . . without the handling problems of many scale models! Features ready-covered foam wings and simple all-sheet construction for very quick building. Uses standard size spinner and wheels. Wing area 700 sq. in. Flying weight 6½ lb.

£20.95

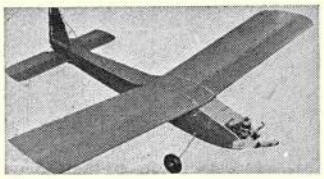


63" span
for .40 to .61 engines (7-10 c.c.)

Veneered foam wings, precut balsa and ply parts, moulded canopy, engine mount, formed wire u/c, nylon horns, nylon wing bolts, hinge material, 7" roundels, etc.

THE NEW GENERATION

of 'DAZZLERS'



FOUR NEW SIZES – all now with nosewheel undercarts and other detail design changes, etc. They fly EVEN BETTER than before. These de-luxe kits include veneered STYRO-TRU foam wings, pre-cut balsa and ply parts, and hardware.

FOR SINGLE-CHANNEL R/C
All new **DAZZLER 30** ... £4.60
All new **DAZZLER 36** ... £5.95
All new **DAZZLER 42** ... £7.40

FOR MULTI & PROPO R/C
DAZZLER 48 (48" span) £9.50
DAZZLER 54 (54" span) £11.70
DAZZLER 63 (63" span) £13.90

NOTE: 'First generation' DAZZLER kits may still be available at some model shops – wonderful value at the old prices!

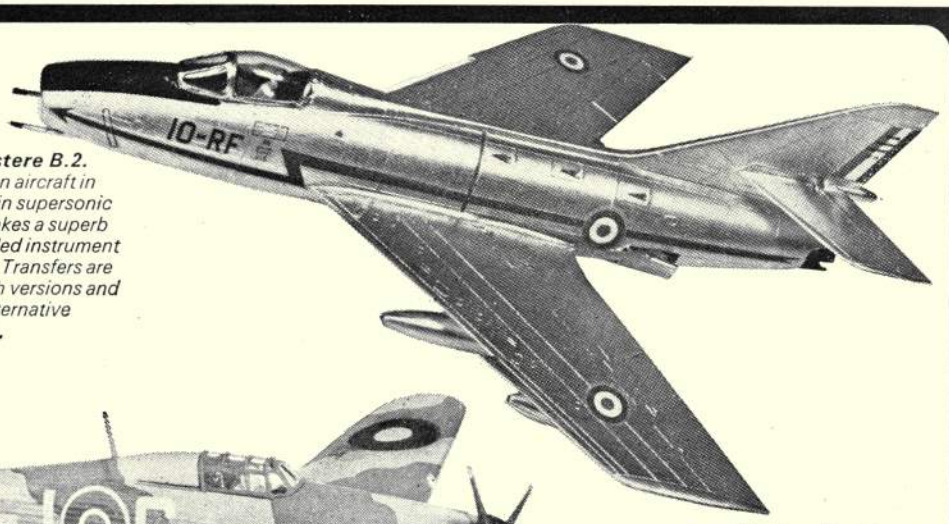
FOKKER EINDECKER "KWIKFORM" KIT

for RUDDER, ELEVATOR and THROTTLE . . . or Single-Channel RUDDER only.

Span 56". Length 39¼". For 3.5-5 c.c. engines. This superb kit contains veneer-covered Styro-Tru wings . . . glass fibre tape for wing joining . . . all balsa and ply parts cut to shape . . . preformed undercarriage . . . hardware, etc., also NIEUPORT 17 £16.80, SOPWITH SWALLOW £15.70.

SEE THEM ALL AT YOUR LOCAL MODEL SHOP!

AIRFIX NEWCOMERS



Dassault Super Mystere B.2.
This, the first production aircraft in Western Europe to attain supersonic speed in level flight, makes a superb Airfix model with detailed instrument panel and airbrake bay. Transfers are included for two French versions and two Israeli as well as alternative armaments. ***Price 35p.***

Hawker Hurricane
Here is a completely new model of the famous World War II fighter – with all the optional extras! Choose Mk.I, Mk.IIB or Mk.IV. Complete with two sets of markings, this accurately detailed kit includes rockets, bombs, long range fuel tanks and the famous 40 mm tank busting cannons. ***Price 25p.***

M-551 Sheridan
This U.S. Army armoured reconnaissance vehicle uses the Shillelagh guided missile system and conventional 152 mm gun. A new Airfix model, it shows particularly fine surface detail, including trenching tools and movable 7.62 mm machine gun. ***Price 25p.***

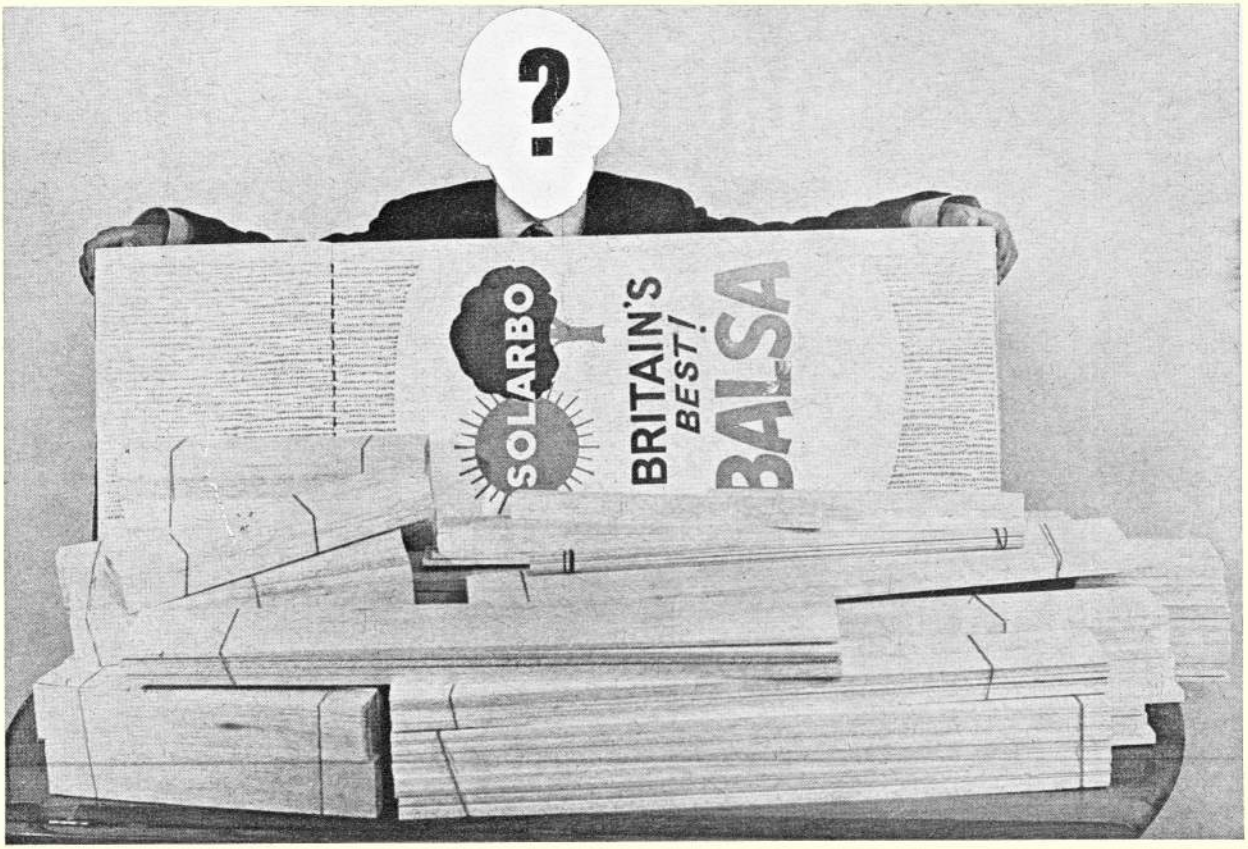
Morris Marina – 1.8 T.C.
A completely new model of a completely new car from British Leyland! Comprehensive 88-part kit with well detailed engine and interior – right down to gear lever and handbrake! ***Price 35p.***

The world's biggest range of construction kits

Don't miss these Airfix publications!
Airfix catalogue *– 64 full-colour pages 15p.*
Airfix magazine *– a 'must' for modellers. 15p monthly.*
Airfix books *– 'HMS Victory', 'Mayflower' and Spitfire' – all available now!*

AIRFIX

SOLARBO



Now here's a chap with plans for the Christmas break! He's obviously setting out to build a large all-sheet model (or two!). And he's off to the right start by making sure that it is all Solarbo Balsa. He's bound to need some strip sizes as well, but perhaps he is going to cut those himself from sheet. A lot of aeromodellers prefer this. It means that you can 'match' strips perfectly, cut from the same sheet. Just remember that strips will always seem lighter and softer than the initial sheet, when it comes to selection.

There are a lot of advantages in building up a good stock of balsa. You can take your time over selection for individual jobs. But be sure your stock is all *top quality aeromodelling balsa* to start with. Which means Solarbo Balsa, of course. Anything less can be a poor investment. Happy Christmas!

Solarbo BALSA

ALWAYS ASK FOR IT BY NAME

SOLARBO LTD.,
COMMERCE WAY, LANCING, SUSSEX

Graupner

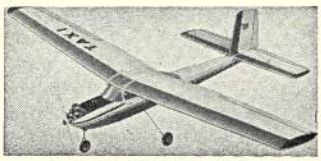
BO 209 MONSUN ... £2.95
All-sheet 21½" span scale model for rubber power. Complete kit. One of the latest additions to the Graupner range featuring the latest ideas in prefabrication.

ALSO

MINI-PIPER Quickie ... £5.90
Diecut all-sheet model. 29" span.

AMATEUR ... £7.65
43¼" span. Kit includes full-length diecut balsa fuselage sides, diecut sheet and ply, shaped wire parts, wheels, hardware, etc. Takes engines up to 1.5 c.c. for **free-flight** or radio control. One of the **best** sports-type power models available today, with semi-scale appearance and a proven flying performance. Ideal as an R/C trainer.

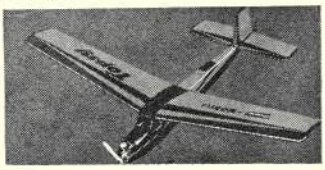
TAXI £12.80
Kit includes die-cut balsa-ply and ply parts, preshaped engine mount, bulkheads and fairings, milled stripwood, shaped wire parts, scale-type wheels, cement, covering material, decals, etc. . . . 'Quick-bild' plan and separate R/C INSTALLATION PLAN. Wingspan 59". Engines .15 to .35. Ideal for 2- to 8-channel R/C.

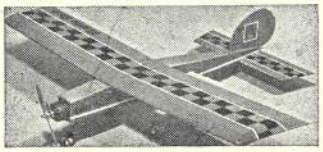


CESSNA 177 CARDINAL £29.40
A truly SUPERB prefabricated kit with injection moulded plastic fuselage, foam wings and tail. Span 61" for 5-6 c.c. motors. This kit is an outstanding example of modern design and use of mixed materials – plastic, foam-plastic and wood – with all parts fully shaped. The most advanced production of its type!

TOPSY 32" span £3.45

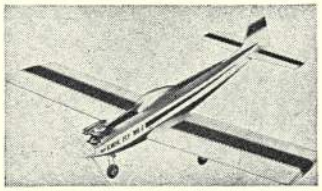
Topsy is a long-time favourite in the Graupner range for **free-flight** sports with engines up to 0.5 c.c., but is equally **suitable for rudder-only** R/C (engines up to 0.8 c.c.). Kit contains quickbuild plan, printed and die-cut balsa and ply, shaped wire undercarriage, RECORD wheels, tissue, cement, decals and **miscellaneous parts.**

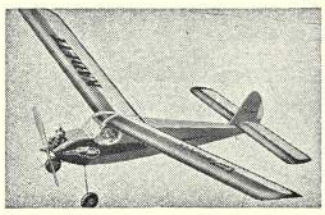




MIDDLESTICK ... £15.65
Wing span 55". Length 38¾" overall. Wing area 611 sq. in. Tail area 124 sq. in. Weight approx. 3¾ lb. (up to 5 lb. with radio). Suitable for .40 engines. Assembly time is reduced to a minimum with plenty of precut parts, including precurved, preglued fuselage sides.

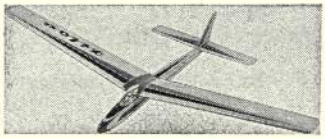
KWIK FLY Mk. III £19.65
This kit makes an authentic duplicate of Phil Kraft's WORLD CHAMPIONSHIP winner. Kit includes glued and curved fuselage sides, shaped wood parts, diecut balsa and ply sheets, formed undercarriage wheels, canopy, hardware, etc. 59½" wingspan. Wing area 657 sq. in. Engines up to .61. Acclaimed as the Finest Kit yet for R/C 'multi' or proportional.





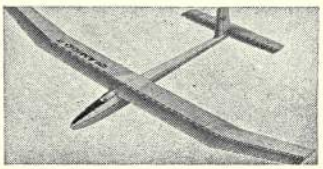
KADETT £5.40
High wing F/F sports model, in the traditional style. Kit is complete down to hardware, wheels, adhesives, decals, etc. A popular favourite for 'Sunday flying'.

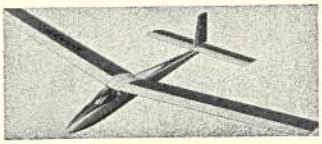
NEW GRAUPNER KITS
TERRY 41½" span power £9.85 and the magnificent 90½" span **AS K14 SAILPLANE** – the most advanced kit of its type yet produced! (Price £41.60). Check both at your local model shop!



FILOU SAILPLANE £4.85
50" span sports-type sailplane which converts to auxiliary power (pylon mount 92p extra). Kit contains quickbuild plan, printed and die-cut sheets of balsa and ply, canopy, wire parts, tissue covering, decals and miscellaneous items. Model also recommended for R/C flying.

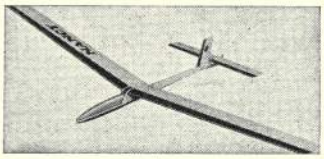
AMIGO 2 £8.30
Here is a real contest-type sailplane, 78¾" span and total area 694 sq. in. Extensively prefabricated, the kit includes die-cut and printed balsa and ply parts, milled and slotted stripwood, ready-formed tow hook, canopy, tissue covering, decals, etc., etc. The Amigo 2 also adapts readily to pylon power and is ideal for R/C (R/C installation plan included).

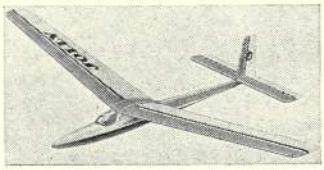




DANDY £6.90
A kit designed for rapid assembly with die-cut sheet, preshaped fuselage parts, milled and slotted stripwood, canopy, cement, tissue covering, decals, etc. Span 63". Total area 540 sq. in. Can be converted into a powered glider with pylon mount (92p) and 049 engine.

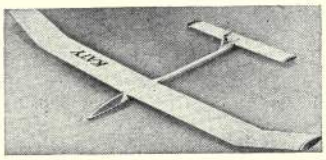
NANCY £4.15
Another design in the popular A1 class. Span 48¾". Kit includes milled fuselage nose section, die-cut sheets, milled stripwood, preshaped wire parts, tissue, adhesives, decals, etc., plus a two-colour exploded drawing and plan. Quality of the prefabrication is exceptional! The Nancy is also complete with auto-rudder and dethermaliser.





Also JOLLY A1 £3.55
A 45" span Quickie model. This kit is extensively prefabricated and very complete. Model takes pylon mount for conversion to power. (Recommended motor Cox Pee Wee.) Kit contains quickbuild plan, printed and die-cut balsa, ply parts, strip, dowel, wire parts, tissue, cement, decals, etc. Pylon mount kit is **92p** extra.

KATY A2 £8.15
Ultra modern towline contest glider. Quickie kit includes milled fuselage nose, wing fairings and other parts moulded in plastic, die-cut balsa parts and all other items needed to complete this super high-performance model quickly and easily. Conforms to A2 specification and includes all the latest ideas in design. Wingspan 67¼". Length 39". A very complete and recommended kit.



CIRRUS £18.75
Giant 118" span. A fabulous kit with finished fuselage mouldings in ABS plastic, precut wood parts, complete hardware, moulded canopy, control horn, cement, covering material, etc., etc.
Also **CUMULUS** 2800 ..... **£41.60**
110" span. Injection moulded parts. Ideal for R/C!

FOKA (SCALE GLIDER) £14.80
Wingspan 102". This outstanding kit includes a Finished One Piece Fuselage moulded in high-impact plastic with other parts in balsa and ply (mostly fully shaped). Also prefabricated wire parts, canopy, hardware, adhesives, covering material, decals, etc. Detailed plan plus an Overlay Plan showing R/C installation. Also

BEGINNER 38" span £2.70
UHU Mark III 43" span ... £2.80
FOUGA SYLPHE (Jetex) ... £1.78

Graupner Tow Handle & Line 38p
Tempo Geared Winch £3.90
Full-length Pilot Doll 96p
Top Edge Nylon Hinges 80p

SEE ALL THESE DE-LUXE KITS AT YOUR LOCAL MODEL SHOP !!

Note: Some prices and specifications may be subject to change due to our policy of continual improvement, and also fluctuating exchange rates, etc.

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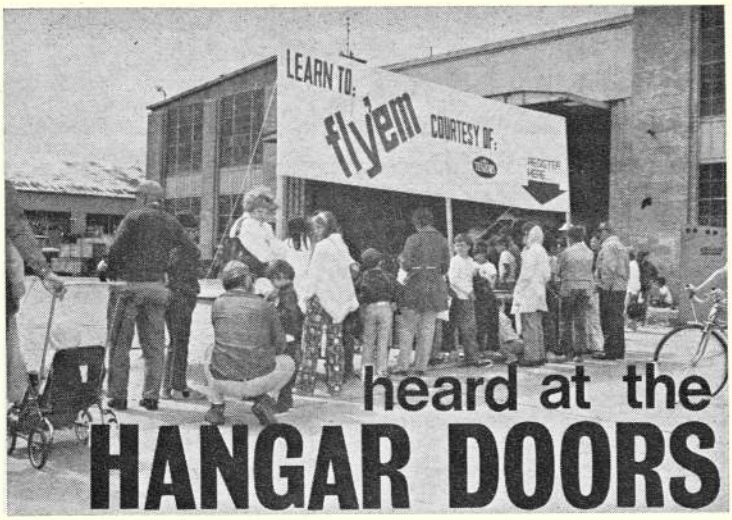


Manufacturers' sponsorship promotes interest in Junior modellers attending the U.S. Nationals – a wise move, for today's youngsters are the senior modellers of tomorrow.

RON HINKS, for many years a stalwart of the model trade, and a very keen free-flight enthusiast, passed away on 3rd October, aged 66. Ron had represented the country in the Wakefield team of 1949, and was closely connected with early developments in kitting of models with die-cut parts. His Luton Model and Timber Supply store became a very popular centre of activity. Ron's courage in overcoming loss of speech following an operation for cancer of the throat was an object lesson to everyone. His determination enabled him to restore conversation in a seemingly miraculous way, and to maintain his zest for outdoor recreation.

Our sympathies are extended to his wife, Bessie, and sons Alan and Stuart. The shop will continue under Stuart's management, maintaining the tradition so well established by a true modeller in all senses of the word.

LOST any good models recently? Mr. Manders, of 17 Aylesbury Street, Wolverton, Bucks., has found three models near Ivinghoe Beacon over the last year. Two are radio controlled, one free-flight. If the owners can supply evidence of identification, then Mr. Manders will be pleased to return them.

ANNUAL GENERAL MEETING of the Society of Model Aeronautical Engineers will be held on 2nd December at the Grand Hotel, Leicester, at 1.30 p.m. Following official business, there will be an informal discussion period. Club delegates, be sure to attend in order to have a say in the future of *your* Society. A prizegiving dinner-dance will be held at the same hotel from 7.30 p.m. until midnight. Tickets cost £2.50 per person and there are a restricted number of seats available – so book yours now by sending a cheque or postal order (made payable to S.M.A.E. Ltd.) to S. A. Wade, Records Officer S.M.A.E., 39 Beacon Drive, Loughborough LE11 2BD, Leics.

FOLLOWING the highly successful *'Easter Expo'* at Sywell this year, Model and Allied Publications Ltd., in conjunction with the Barnstormers Air Display team, are organising a second grand show in '73. Once more there will be a Trade Show for exhibitors to display their wares, together with non-stop model and full-size flying displays to entertain and inform the crowd – a highly successful P.R.O. exercise. Remember the dates: April 22nd-23rd.

WORLD CHAMPIONSHIPS dates for 1973 are confirmed as 14-19th August for F/F at Wiener Neustadt, Austria, and 11-16th September for Radio Control Aerobatics at Gorizia, Italy. Czechoslovakia has made an offer to run control-line in 1974, and the U.S.A. has offered to organise a Championships for Scale, or R/C Pylon, or perhaps a combination of both, with other possibilities of Indoor and/or R/C Helicopters.

LOOKING BACK on a busy year, we reflect on several influential achievements which deserve recognition. Dieter Schlueter for his helicopters: Bill Giesking and Thomas Koster for variable-camber wings: Jim McCann's carbon fibre propellers and the acceptance of rapid curing expoxy adhesives which have transformed model building techniques. In the field of propulsion, the honours must be shared for we find the Mabuchi rechargeable electric unit made for Mattel's SuperStar as meritous as the Bill Brown CO_2 motor, the O.S.-Graupner Wankel and the incredibly high powered contest-category .15s and .40s.

1972 has seen many innovations – here's to 1973!

Let 'em go! Rick Shea, Kevin Parks and Dave Purdam launch their 'Delta Darts' – a scheme devised by the A.M.A. to encourage Juniors to take an interest in aeromodelling.

IRONMONGER F.A.I.

Want a combat model capable of out-turning the opposition, yet strong enough to take all the rough and tumble? Try Richard Evans' hot-rod and join the winner's rostrum!

IN MY FIRST SEASON of flying combat seriously, I was unfortunate enough in one competition to find myself drawn against John Dixon, who was at the time one of the better combat fliers in the country. Four minutes, four cuts and a spate of hairy flying after the beginning of the bout, I came to the conclusion that the design of my model needed changing a great deal in order to compete with the higher aspect ratio wings that were beginning to appear. John was kind enough to send me a plan of his model, which was then known as the *Warmonger* and my present model eventually developed from this over about four seasons. It is interesting to note that Frank Dowling's *Liquidator* was also influenced by the *Warmonger*.

Many dimensional modifications to the original model have in fact been tried but I will only mention those that have turned out to be the important ones.

Firstly the root chord was increased by two inches which certainly improved the turning ability but also made the model very sensitive to small elevator movements and necessitated moving the engine forward of the leading edge to obtain a favourable centre of gravity. Obviously weight needed removing from the rear so all but four inches of centre sheeting were disposed of. The length of elevator was gradually cut down from 11 in. to 8½ in. in order that more elevator movement could be used without causing the model to shudder during manoeuvres.

Many different wing sections have been experimented with, but I eventually came to the conclusion that a ⅞ in. wing and 1 in. centre section was best for all round use. I did in fact build a series of ¾ in. wings and although these were certainly fast in level flight, manoeuvring in strong winds caused them to be blown into the ground if one wasn't too careful.

The actual leading edge, which was solid on the original model, is now much lighter due to the use of hollow preformed wood backed by $\frac{1}{16}$ in. sheet and strips of spruce. It is with this that construction should start. At this point it is worth mentioning that all balsa used should be the lightest available unless otherwise stated.

Cut the L.E. to length on the plan and back this with $\frac{1}{16}$ in. sheet, setting the grain diagonally. When the glue has set, follow up with $\frac{3}{16}$ in. sq. spruce top and bottom. This unit should be allowed to dry at least overnight.

Turning to the trailing edge, glue a strip of ¼ in. x ⅛ in. spruce to the edge of a sheet of ¼ in. x 4 in. balsa and hold in place with adhesive tape. While drying, the shape can be drawn out, also at the same time marking the rib positions and taper line. After cutting out this can be put aside with the L.E.

Dope both sides of a sheet of ⅛ in. balsa, allow to dry, and then cover with lightweight tissue using another coat of dope as the adhesive. From this cut all the ribs apart from the centre rib and outboard tip rib. A piece of ¼ in. O.D. brass tube used as a punch is very useful for cutting the leadout holes in these and also makes for a stronger job. Cut the centre rib and outboard rib from hard ½ in. and ¼ in. balsa respectively.

Taking the leading edge again, apply glue to the rib positions and fit the ribs in place. These should be a push fit, but if not use pins. Slot the T.E. in place but do not glue. Now, viewing from the rear one can remove any warp by twisting. With the T.E. unglued leave to set and do not touch again until completely dry. Only then should the T.E. be glued in place.

At this stage add all gussets and both tips remembering that the outboard tip is a sandwich of $\frac{2}{32}$ in. hard balsa and $\frac{1}{16}$ in. ply. This is very strong and adds the small amount of tip weight necessary. Fit the $\frac{1}{16}$ in. ply bellcrank mounts into their slots and then the bellcrank itself with leadouts from heavyweight Laystrate, bound and soldered to 20 swg wire. The use of cup washers for attachments of leadouts and pushrods is advised due to its ease and general neatness.

The tank is made from the traditional Colemans Mustard tin. It should be cut down so that with the lid on it is a push fit between the centre and first outboard

Shape may seem familiar, but this model is certainly among the best of the current crop of flyers. Lightweight is the secret to real success – do not add any unnecessary weight.

rib. It is advisable to solder the interior end of the feed pipe into position in order to avoid any possible misalignment from the centre line. The tank should be securely glued in position and a piece of $\frac{1}{8}$ in. sheet set vertically behind it.

The centre section can now be sheeted noting that it is not recessed but laid directly on top so producing the deeper centre section. When fitting the curved gussets glue them in position as full triangles and only cut the curves when completely dry.

Now turn to the pod. Accurate construction and good joints here are important to the strength of the model, and a weak pod will often cause engine vibration. Cut the ply strengthening piece as a full rectangle and epoxy the unshaped bearers in place. Mark the engine position so that it fits right up to the leading edge and then drill the engine holes $\frac{3}{32}$ in. Screw four 6 B.A. bolts and washers into the holes from the back and when nearly up tight cover the remaining threads and heads with epoxy. The front block, the doubler and L.E. spacer can now be fitted along with the pieces of $\frac{1}{16}$ in. balsa stuck to the inside of the bearers to pack out the wing pod joint. The whole pod can now be sawn, planed, and sanded to rough shape. Care should be taken with the fitting of the pod to the L.E. itself and is probably best finished with a round file. Epoxy the whole unit in place using the adhesive generously around the $\frac{3}{8}$ in. gusset at the front, and forming fillets around the bearers. Lastly drill and fit a $\frac{1}{8}$ in. dowel to pass through the rear of the bearers and to pass through the bellcrank mount. This completes the actual construction.

Sand the whole model smooth and apply a coat of dope. Sand again when dry and cover the whole pod and adjacent wing with 4 in. wide gauze bandage. This should be given enough dope to fill the pores.

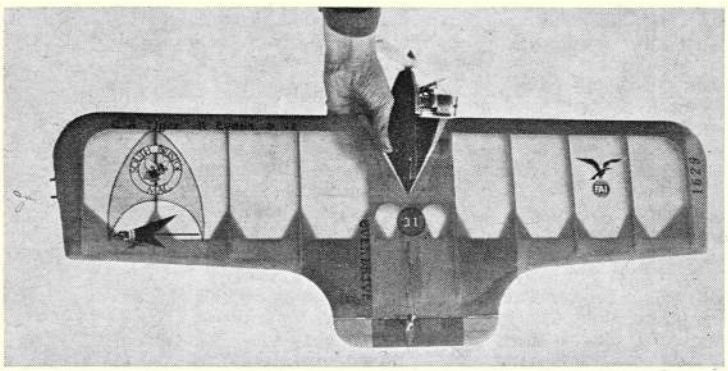
Cover the model with one piece of medium weight nylon applied wet. This, may sound messy but pulls up very tight when dried out and stops a lot of the unattractive sagging between ribs. Five coats of slightly thinned dope should be given all over and one extra one to the engine bay. Fuel tubing over the engine bolts stops clogging the threads with dope.

The elevator, cut from $\frac{1}{8}$ in. hard sheet and covered with tissue can now be fixed in position using close-weave nylon hinges. Glue the ply strengtheners in place and fit the Micro Mold elevator horn onto these. Bend the pushrod to give equal up and down on the second hole down from the top. This has proved to be a very satisfactory elevator set up. Fuel proof thoroughly and the model should be ready to fly. All up weight should be 16 oz. or less.

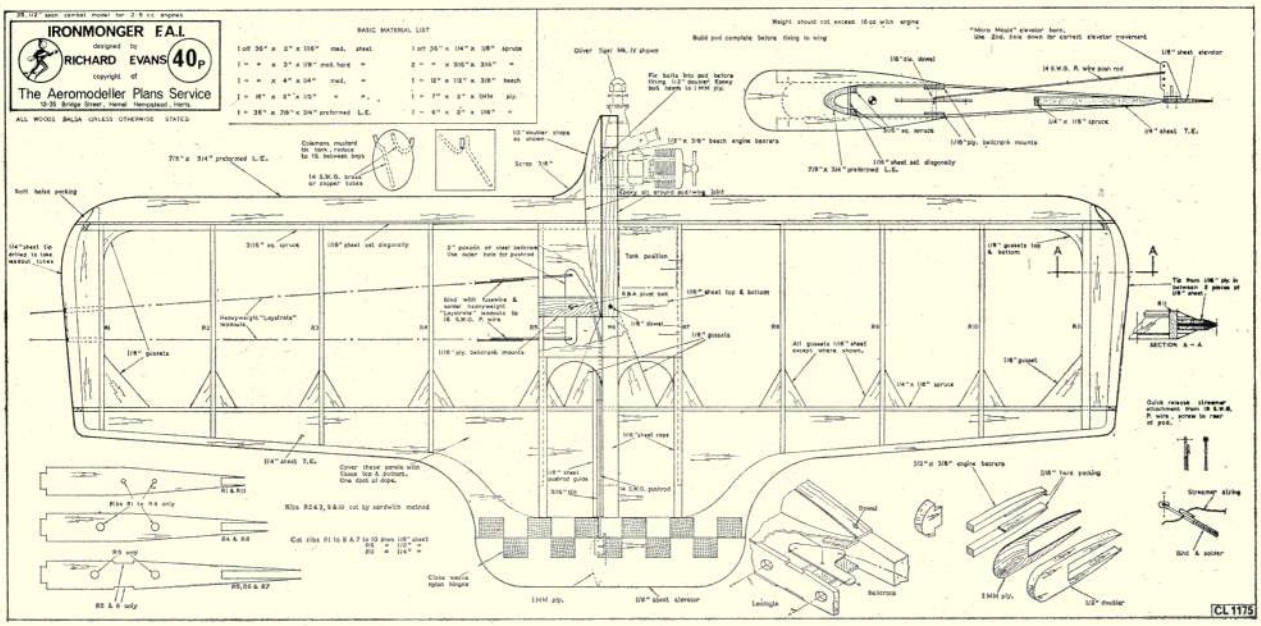
Check the C of G and if within $\frac{1}{8}$ in. either way test fly the model. It is quite possible that it will turn tighter in one direction than the other. This can be adjusted by shortening or lengthening the pushrod to give more or less up or down, as required. By doing this the flying

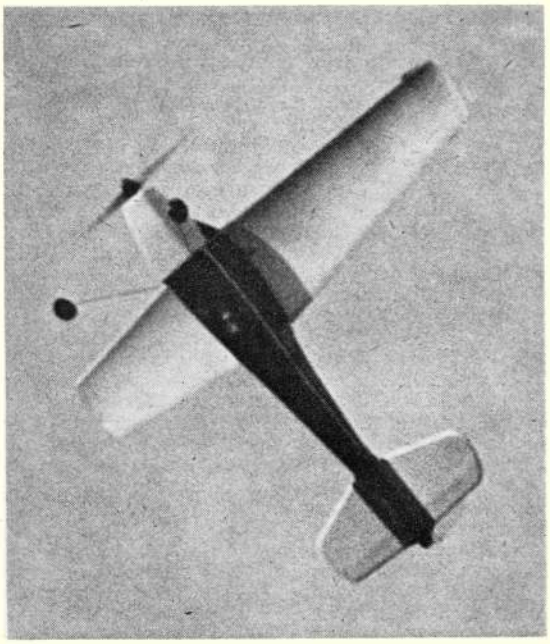
Continued on page 692

Hold it up to the light, not a stain and shining . . . . . ! Transparent nylon finish reveals the well-braced structure of this design. Richard won the Dutch International event with this design, in addition to his many 'home' successes.



FULL-SIZE COPIES OF THIS 1/6th SCALE REPRODUCTION ARE AVAILABLE AS PLAN No. CL 1175, PRICE 40p PLUS 5p POSTAGE, FROM AEROMODELLER PLANS SERVICE, 13-35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTS.





Mattel's almost ready to fly SuperStar

switch 'n go electric model revolutionises model flying for the youngsters

— reports Ron Moulton

AT THE RISK of exposing oneself as an aged old timer, fit only for retirement, I feel obliged to launch myself backwards in reminiscence before describing this new electric powered model.

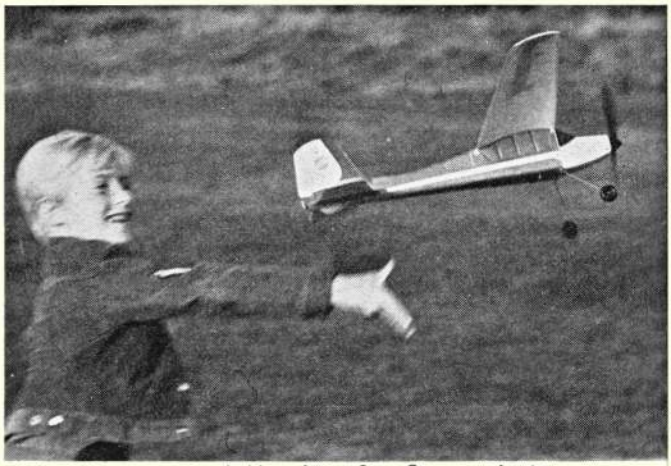
I well remember my first model. One of them had been hanging for weeks in the back of Miss Ramsey's toyshop window and was the reason for many delayed after-school teas. When father eventually agreed to spending his six shillings (30p), I became the very proud owner of a bright green, oiled silk and varnished spruce, *Warneford Nipper*. It would fly as long as the rubber motor ran, and could cover all of 150 ft. in one hop. Like many others of my era, I learned all my basic trimming procedures with this simple model which always flew successfully. Much later, I recall the sense of pride when I joined the 'minute' graduates of my club with a 30 in. *Cruiser Pup*. To fly a whole minute with this little model which could be carried to the park in a little more than a shoe box was a mark of success in aeromodelling.

Progress

The younger reader might well wonder what these 40 and 34 year reflections have to do with Mattel's *Super Star*. The answer could be condensed into 'an illustration of progress'. For in one full swoop the SuperStar provides (a) a powered ready to fly that is reliable, easy to fly and can cover 400 yds. in one hop; (b) a model that can easily exceed one minute's flight duration, (c) an electric powered model of advanced concept that operates like a rechargeable milk delivery cart, and (d) a programmed steering system that in calm conditions, enables the flier to contain his activities in comparatively small flying areas.

In short, the SuperStar introduces so many advances in one small airframe that one simply cannot help feel that the air minded youngster 'never had it so good'. And I speak from experience – over ten years of it, in a struggle to solve the difficulties of electric powered flight.

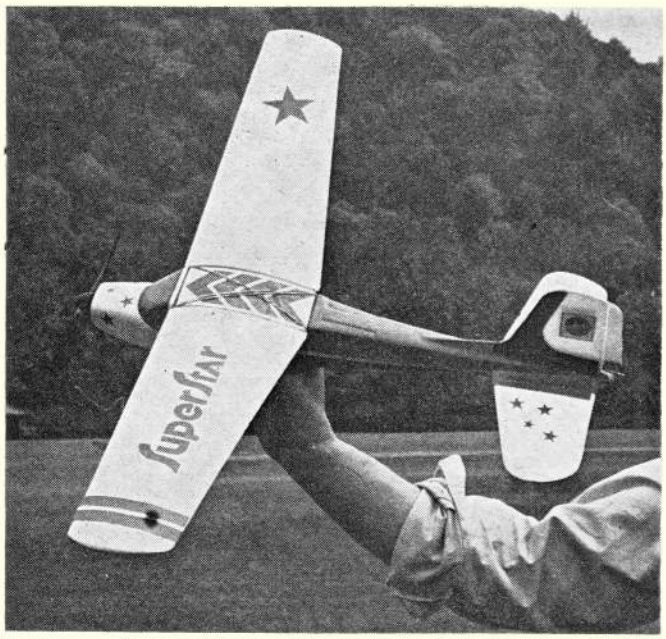
When a 5 ounce foam winged ready to fly out-performs a sophisticated built up lightweight in which four different types of power source have been tried, the effect is sobering to say the least. Here's one modeller who would like to see the originator of SuperStar named and given full credit for a break-through in what will inevitably become a whole new era of powered model designs.



Left: Airborne and climbing fast, SuperStar accelerates rapidly as the coarse pitch 7¼ in. diameter propeller takes hold. Above, Jonathan releases into a left turn, the best natural flight pattern to cope with high torque. Wing has ready-formed airfoil camber and required no adjustment of incidence angle.

One hour assembly

Assembly of the Super Star parts takes about one hour. The instructions must be carefully followed at each of the stages. Heart of the model is a pre-assembled power unit which incorporates a cam driving device for rudder control and the pair of rapid re-charge Nickel Cadmium cells. These are supplied 'flat' – (without charge) and one needs a 996 type Lantern battery of 6 volts to act as a



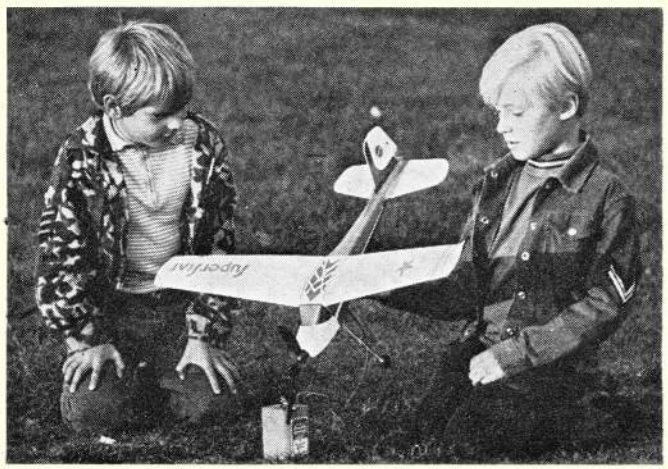
Above, the red, white and blue natural decor is enhanced by P.V.C. stick-on emblems provided in the assembly set.

field accumulator. Special connectors are supplied to hook up the battery to the internal cells and experience shows that the 7¼ in. prop is driven for one-third of the duration of the charge. In other words, a 60 sec. charge gives 20 secs. of power. As the power runs out, any of four shaped flight plan cams can be used to vary the pattern and though at first the rudder seemed ineffective, we discovered that adjustment (and longer power runs) produced a programmed 'figure of eight' or 'slalom' as required.

Indoor tests

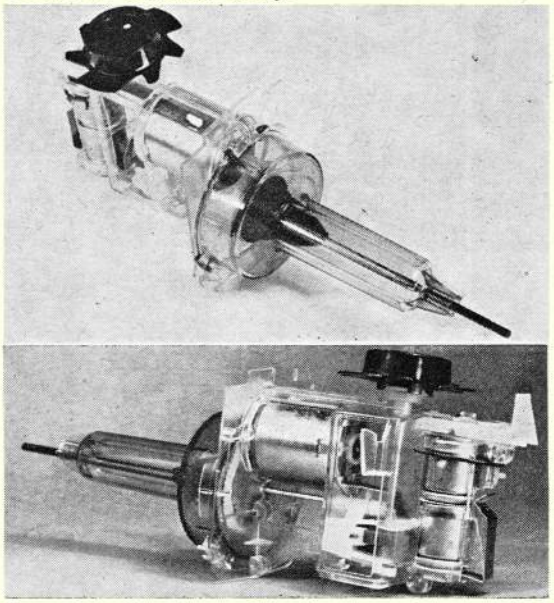
First tests were made inside the shelter of Cardington's vast Airship sheds where the effectiveness of the 26 in. span, 104 sq. ins. high density foam wing with its elementary cambered surface was most impressive. Confidence progressed to a 3 minute charge which gave a fine 65 seconds flight in the local park at about the thirtieth launching, and the battery still seems to have lots of life left. Initial thrust is at least equal to that of a sports ·049 internal combustion engine.

Below: Waiting for the charge. A simple jack plug into a fuselage socket connects the internal cells with a 6-volt lantern battery. A 90-second charge gives 30 secs. motor run.



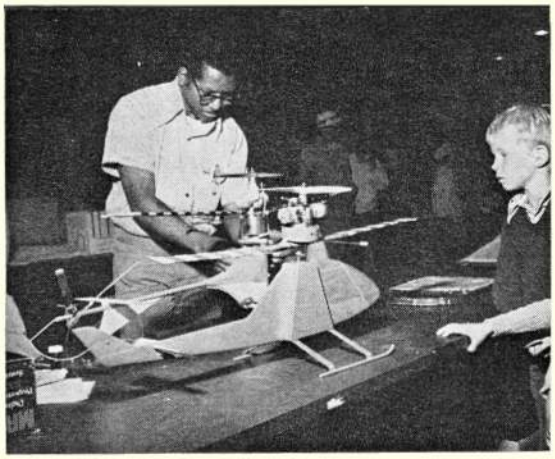
Wherever it has been seen flying, the SuperStar has attracted tremendous interest. Experienced flyers always ask if the power unit is to become available separately. Since it is included in the spare parts list, we are able to answer in the affirmative and since the power unit is complete, as illustrated in the two photographs below, all that one would have to provide for a self-designed model would be the Polarised charging jack plug.

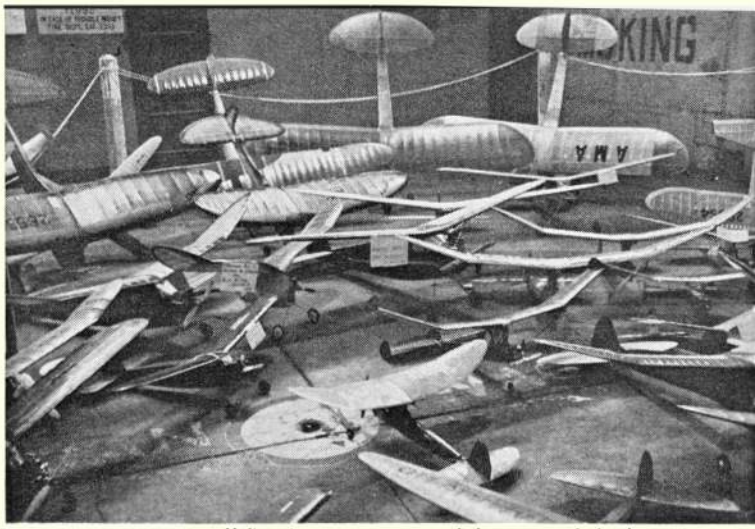
However, it is not our purpose to describe how one can use *parts* of this revolutionary new model; but instead to thoroughly recommend SuperStar as an *ideal* approach to model flying for the 8-year-old and upwards. One of the most satisfying reactions to this field-charging electric flyer actually came from a 7-year-old in a local park, the young lad asked 'How does the electricity from the big battery get into the motor in the model?' This spontaneous and intelligent question illustrates just one facet of what could be learned from operation of the SuperStar. It took just two flights for these primary school test pilots to comprehend the action of the rudder and flight plan, and as for the usually quite tricky techniques of hand-launching, the adequate thrust from the prop assures any anxious parent that his offspring will be able to release the SuperStar safely.



Heart of the SuperStar, a Mabuchi motor and two rapid re-charge nickel cadmium cells encased in a complex clear plastic framework moulding. Motor drives a geared shaft with shock-absorbing rubber diaphragm connector. At rear are two cells and switch, with one of four rudder cams shown fitted in these pics. Driven by auxiliary gear train, the cam programmes the flight plan.

Selling at £8.98, SuperStar is not cheap, until one rates the cost per flight against its equivalents. With spare motor/battery cell units available at £4 from Mattel, it's predictable that we shall be seeing much more of the SuperStar and its innovations in 1973 – and not always in the hands of youngsters either!





Helicopters were very much in vogue – indeed, 1972 should have been named the 'year of the model helicopter'. Above left is Philadelphia's Sam Booker with a Du Bro 'Whirlybird' in the background and a home-brew control-line machine in front. Above, in the land where 'everything is new', much interest is shown in the Vintage cult – nice range of oldies here, mainly with original spark-ignition motors.

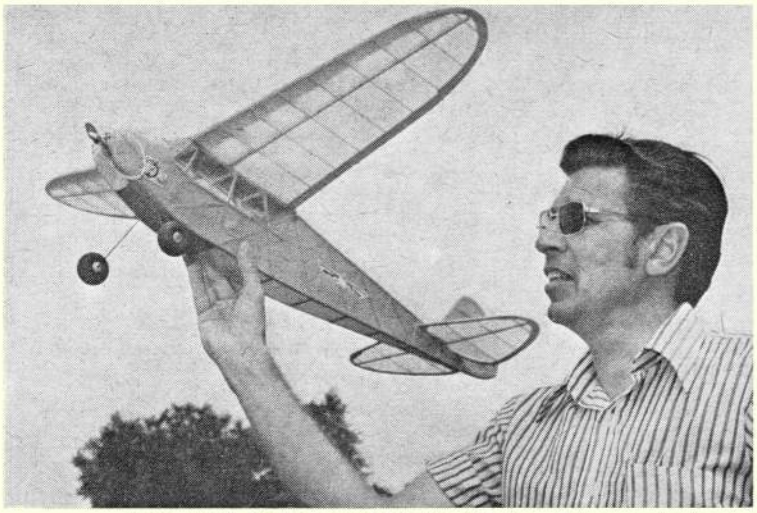
SEEN AT THE

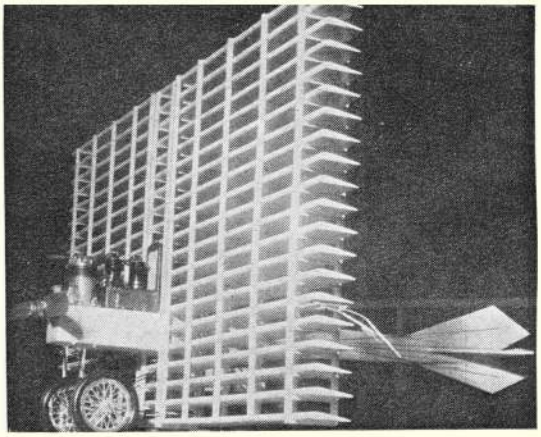
Dick Stouffer provides an insight held at Glenview

Left, how's that for a 'different' scale subject? Milton Grimes produced this superb R/C version of the Fouga Cyclone 'jet glider'. Unfortunately, it proved to be grossly underpowered and was unable to take off on its own. Hand-launched, it stayed just above the point of stall and was extremely difficult to control. More power!

Right: Beautiful radio-controlled ¼th scale Navy Douglas A.D. by Bud Nosen has all the 'usual' works, including retract undercarriage, flaps, sliding cockpit, etc., all of which contributed to the rather excessive weight of 14 lb. for its 76 in. wingspan. A.M.A. rules permit these overweight monsters. Surgical clamps seen emerging from the cowl are strictly non-scale! Model built from Complete-a-Pac plans.

Below, Roland Boisjoly likes noise! His Ford Trimotor has a pair of David-Anderson 2.5 c.c. diesels in the nacelles and a Fox 35 in the nose, all unsilenced. All controls operate, while undercarriage is sprung in full-scale fashion. Nice subject for control-line, but corrugated finish must be time-consuming. Ideal application for a trio of Wankel engines! Below, right: Americans like their free-flight models big! Keith Ward gives a push to his 34½ in. span Gere Sport, powered by an O.S. Max 15 and tipping the scales at 47 oz.

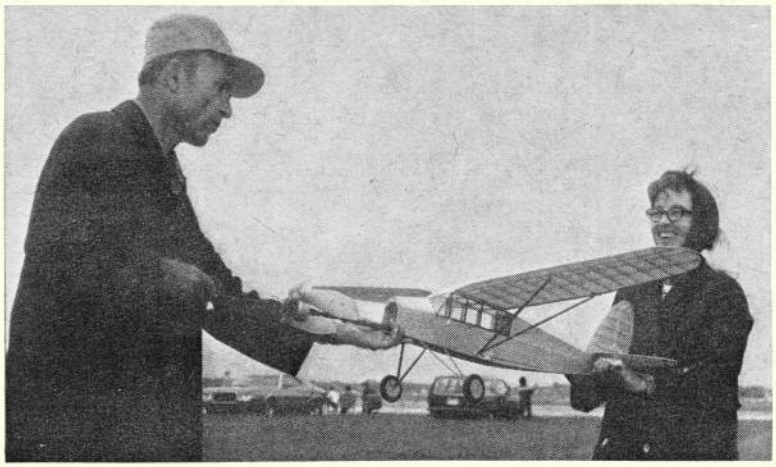




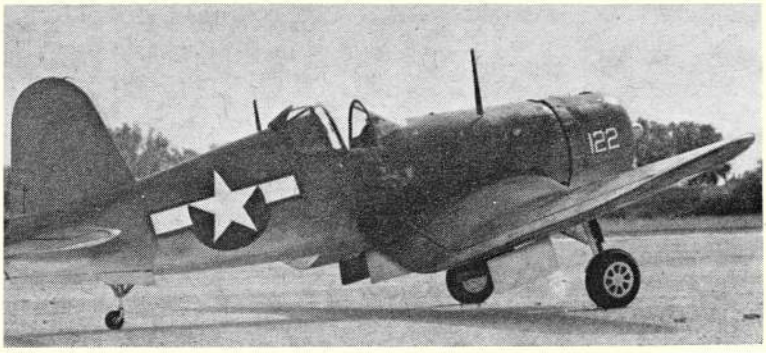
Above right: You've got to believe it folks, but that is scale – all twenty wings of it! This control-line Phillips Multi plane has a Fox 59 to drag it around – drag being the operative word! Above is Ted Schwerzer with a half-sized version of a Scientific 'Mercury' old-timer, but the Tee Dee 020 power seems slightly out of character.

U.S.A. NATS

on the week-long annual jamboree Naval Air Station

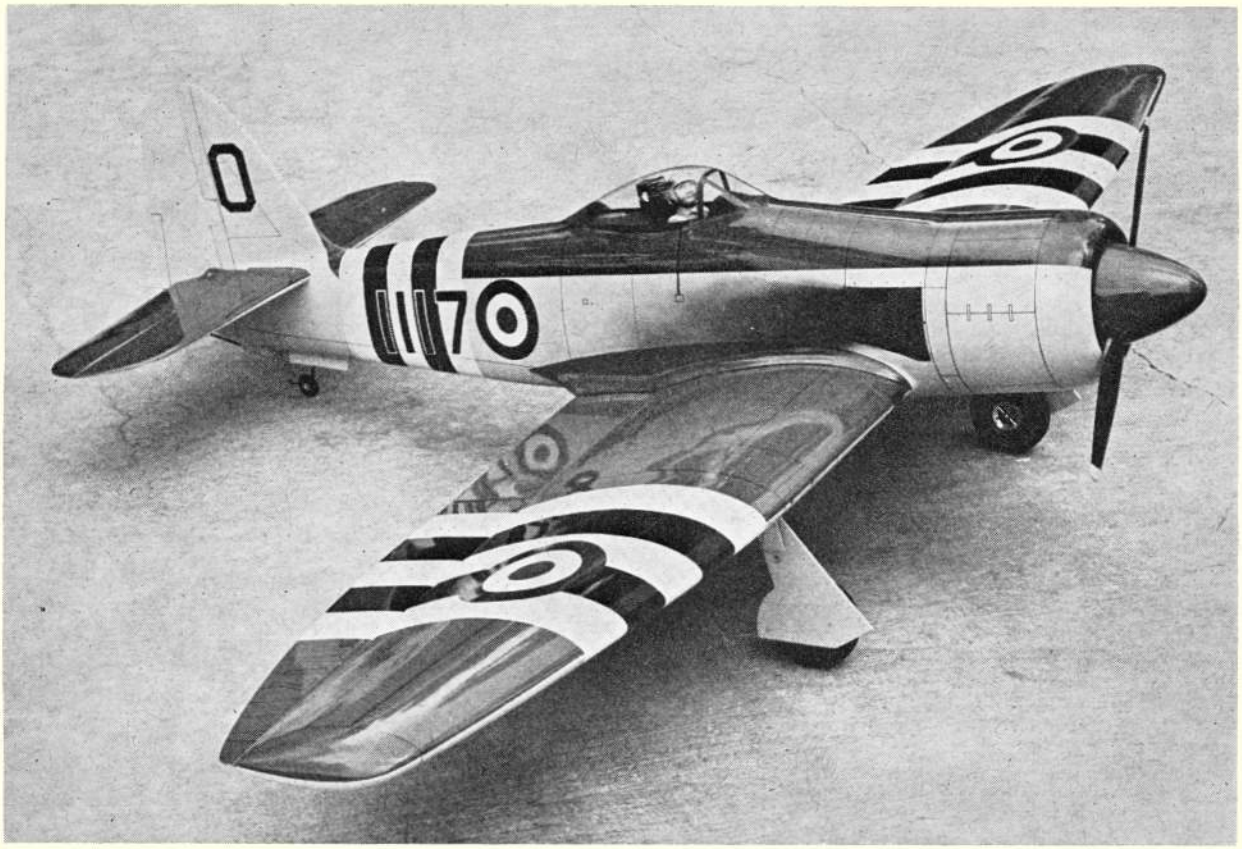


Right: Don't know why you're laughing madam – if Carl Miller's hand slips when the motor is fully wound, it's gonna hurt! Rubber-powered scale is by no means dead – as evidenced by this large-scale D.H. Puss Moth. Rubber-powered models of this nature are most rewarding to fly, and fly with uncanny realism – plus silence.



Left, the F4U Corsair has always been a popular R/C scale subject, but few have as much realism as Bob Karlsson's superbly-'weathered' replica. Scale is 1¾ in. to the foot, power, an O.S. 80 and weight 13 lb. Retracting undercarriage is to Bob's own design and construction. Fuselage features polystyrene foam construction.

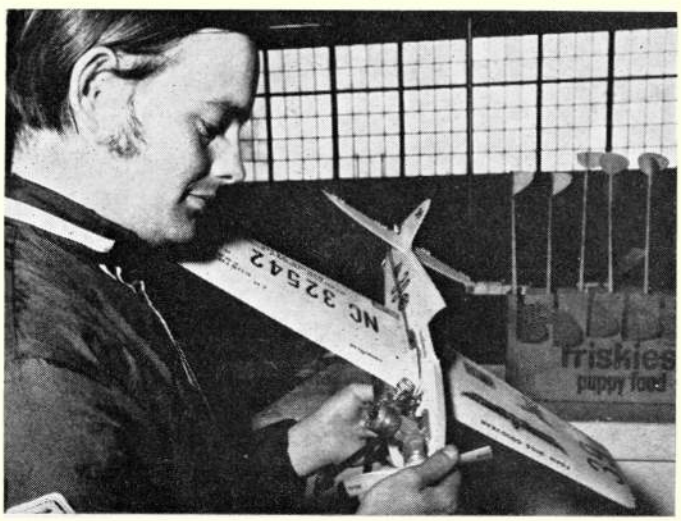
Below left, who needs 'gas' power anyway? Nice rubber-powered Folkerts Racer, built by a rather damp-looking Ralph Kuenz. Unusual subject, but extremely practical with its relatively high wing position and long fuselage (ideal for carrying sufficient motor length). Darkin Mathews prefers the 'messy' approach, however, for his Locining M8 – Cox power in this instance. Scale in all its many facets has a big following in the States, ranging from the ultra-sophisticated, all-working R/C jobs to the most basic indoor 'Peanut-Scale' models.



CONTROL LINE NEWS

Goodyear in the States

Matt Smith, writing in Bill Northrops' excellent magazine *Model Builder*, provides interesting comment on profile – scale racing in America. Evidently, the initial supremacy of the Super Tigre 15 is waning, with Rossi, Kosmic and TWA coming to the fore using fuels with up to 50% nitromethane content. Speeds are definitely on the increase, with Roger Paschal recording a genuine 100 m.p.h. in traffic with his Rossi-powered machine, while Ron Esman (former rat-race champ.) has been timed at 106 m.p.h. – and remember, the Americans use a two-wheeled undercarriage! Matt himself is obviously a 'thinker' – and an original one at that! His current project is a low wing *Little Tom*, featuring magnesium motor mounts and a completely glassfibred cheek cowl. The wing is cut from expanded polystyrene foam and is covered with 1/64 in. plywood, motive power being provided by a *fully-piped* TWA, running on suction feed. A fuel-switch is employed to provide the rich 'on the pipe' needle setting – this being actuated by the 'up-line', while the 'down' line shuts off the engine and returns the fuel switch to the lean setting necessary for take-off. Certainly progress is taking this class out of the simple, basic model category for which it was originally intended.



Jim Hojnacki flew this Kosmic-powered Arander Goodyear model at U.S. Nats., and in common with many others uses a foam-core wing. Top competitors all used Rossi 15-powered models.

Polyoxy Oils

Always on the lookout for ways of improving engine performance, Dave Clarkson and John Daly have recently been experimenting with substituting Shell Polyoxy oil for the traditional castor oil in their team race diesels, and found an increase in range and elimination of overheating 'cook-ups', etc., when using a 25% oil level. However, the motor wore out in double quick time! The key to this sad

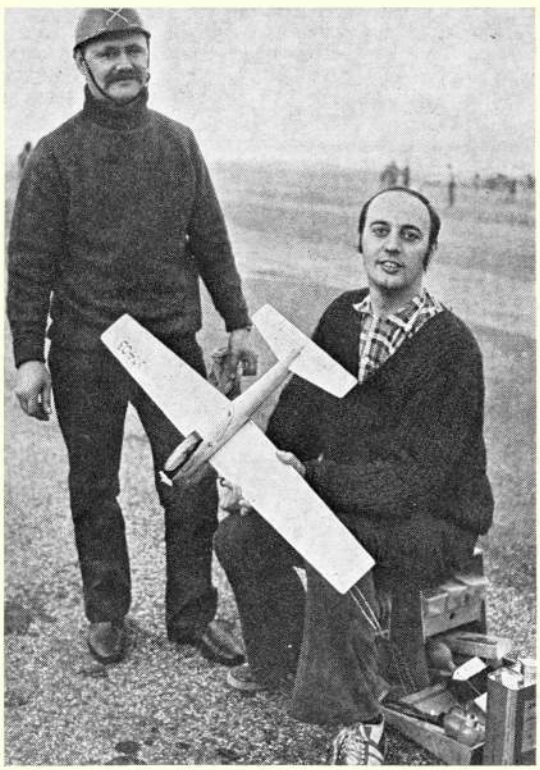
Right, Harvey Dickinson of Hollywood with a pair of aluminium-skinned foam wing Goodyear racers. Note inverted engine on the right – an increasingly-popular installation in the U.S. Tank fairs-in the cylinder nicely.
Al Rabe won the Open Stunt event at the U.S. Nats., with the semi-scale Sea Fury seen in heading picture at left. It's a big beast – having a wingspan of 62 in., and powered by a Super Tigre 60 turning a Rev-up 13 x 5 in. prop. Silencer (venturi-type) is totally enclosed within the 7 in. diameter cowling, and landing gear is fully 'shock-absorbing'. Wing detaches and the model features adjustable tipweight, noseweight, leadouts and control surfaces.

feature appears to be that polyoxy oils dissolve lacquer slowly and that instead of having a constantly replaced lacquer-to-lacquer wearing surface in the piston/liner as found with castor lubricant, the polyoxy oil gives a metal-to-metal wearing surface in the piston/liner since a) little or no lacquer is formed using such oils and b) what lacquer is formed is instantly removed by oil solvent action. Of course the metal/metal surface wears and since metal is not replaced, rapid wear results. The interesting conclusion is that for running-in motors a polyoxy oil-base fuel will give rapid running-in whilst lubricating the motor beautifully and enabling very cool running; also with motors like the MVVS which are very prone to rapid and excessive lacquer build-up using castor-based fuels, a mixture of castor and polyoxy oils *should* control the lacquer problem and yet allow sufficient lacquer to be formed to prevent the motor from 'clapping'. They intend to try this in their new Team Race motor (still an MVVS) and we look forward to hearing of the results of their experiments.

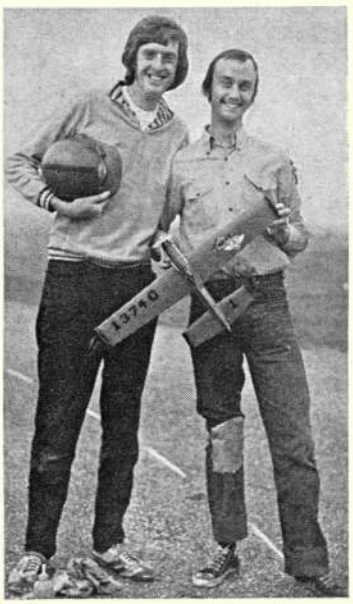
Northern Gala

Thanks to E. H. Davies we have a report on the 'big' meeting from the North – the Northern Gala – which was held under excellent weather conditions at R.A.F. Rufforth on Saturday, 7th October and brought entries from far and wide especially in the Handicap Speed event, where Ron Irvine flew his Miebach-Rossi 15-powered F.A.I. model into first place. Over at the Team Race circles, Messrs. Clarkson/Daly from Stockport achieved first place in the Goodyear event in what turned out to be a continuation of the previous weekend's battle at the Topcliffe Goodyear marathon, against Heaton/Ross and Cooke/Everitt. This latter team were struck by bad luck early in the final when their Oliver Major's con-rod broke, leaving them stranded at 15 laps. The Novices' Goodyear final was fought out between Crampton/Gray from Rotherdale, and Goddard/Whincup from Wakefield, who emerged as the eventual winners, whilst 3rd placers, Pickles/Rhodes from Wharfedale retired at 186 laps, when

Second-placed in the F.A.I. event at Rufforth were Jack Muncaster and Bernie Langworth (seated – pilot's perks, Bernie?). Witnesses at the one-hour Goodyear marathon were amazed at the dexterity with which Bernie managed to munch his 'butties' while flying!



Combat finalists at Northern Gala were Ray Ambler (left) and eventual winner Mick Tiernan. His swept-forward trailing edge model may seem familiar – in fact, the wing planform is very close to that of the 'Peacemaker'! Full-circle development!



Left, Messrs. Gardner and Wilson won the ¼A team-race event at the Northern Gala. Motor, as always, an Oliver Cub. Perhaps the biggest drawback to ¼A is that there is only the one suitable engine at present available – quite a contrast to F.A.I. racing, where there are at least half-a-dozen motors with good potential.

Right: A novice's final was held at the Rufforth Goodyear meeting, won by Goddard/Whingup with their ETA 15-powered 'Ginny'. The Goodyear racing League Table system instituted by John Horton, has done much to encourage the enthusiasm of both beginners and experts to score points.

their motor came loose from its mountings.

The class 'B' final looked most promising at the start with all three teams using large-capacity glow motors, in true big banger style, although unfortunately only Heaton/Ross seemed to have their model sorted out, flying the last 60 laps of the race solo, to win comfortably at 7:06·2, but their luck did not hold in ½A team-race, when halfway through the race, they had the misfortune to damage their undercarriage. Pit man, Malcolm Ross, miraculously managed to bolt everything back together in time to bring their model home into a very respectable 2nd place behind winners Gardener/Wilson from Tynemouth.

F.A.I. team-race proved a hard-fought battle with five teams recording under 5-minute heat times, the fastest of the day going to Joe Devenish and Les Davey with 4:37·8 s. The pair held their form in the very quick final, to come home 1st in 9:42·5, Joe's H.P. 15 performing as faultlessly as ever. A clear 18½ secs. behind were Jack Muncaster and Bernie Langworth – Jack having produced yet another beautifully-finished racer, intended for the cancelled Team Trials, with a much reworked Super Tigre G.20 up front. In 3rd place and only 3 secs. behind Muncaster/Langworth were the very active Heaton/Ross team, once again stricken with bad luck, when pilot Derek Heaton clipped the prop, requiring Malcolm Ross to perform his second rush replacement job of the day. Had this not happened they may well have made first place, certainly taking second.

Combat, run by members of the Tynemouth and Wharfedale clubs, brought Mick Tiernan from Leicester and Ray Ambler from Preston together in the final, Tiernan emerging as eventual winner, using a mylar-covered swept forward trailing edge model of his own design, with the inevitable Oliver Tiger up front. This has performed extremely well this year, and should prove quite a threat to the big names in '73.

IRONMONGER FAI

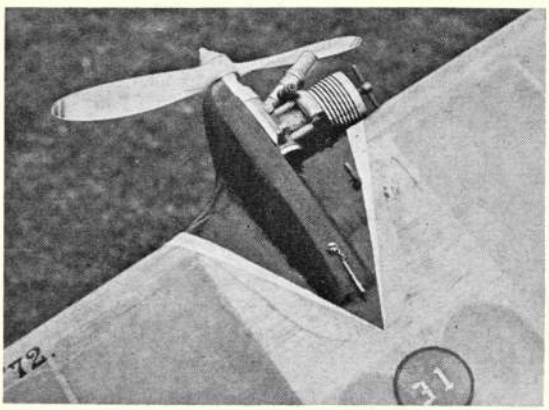
Continued from page 685

characteristics of the model can be improved quite noticeably.

A word about motors. As anyone who has frequented the combat circles should know, the Copeman tuned Oliver Tiger has dominated this event for many years and looks like doing so in the future. It is not the most powerful of 2·5 c.c. motors but for all round performance and reliability it cannot be beaten. A good example should fly a combat model at something over 75 m.p.h. Models can be made to go much faster with the use of glow motors but unless they are fully sorted out can produce endless problems. The only person in this country who uses a glow powered combat model with success is Mick Davies but he has a very experienced pit crew who know the quirks of the motors very well.

My model was developed around the Oliver Tiger and I suggest that for competitions this motor should be used. Once one owns two of these motors it is possible to have several seasons flying with little extra outlay in this direction.

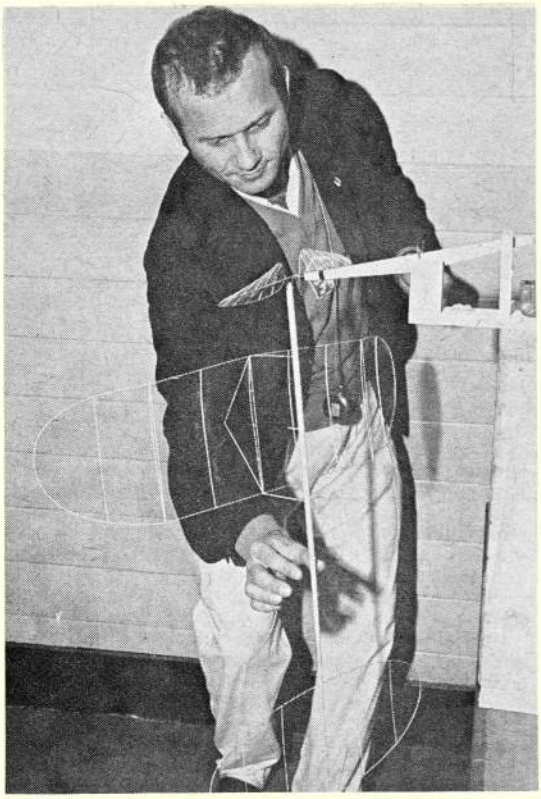
Combat flying is a most rewarding branch of the hobby



but one cannot expect success immediately. If you are willing to build half a dozen models a year, enter at least as many competitions, practising every weekend as well, you could be winning within a couple of years. I hope you give it a try.

John O'Donnell reveals the

WORLD INDOOR CHAMPIONSHIP TECHNICALITIES



K. Rybecky 'weighs in' on the simple scales which gave a 'go or no go' result. Weighing models at one gram is not as easy as one would think, and great accuracy is essential for a World Championship event.

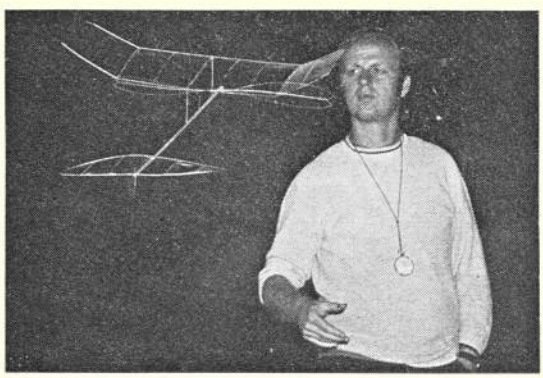
THE 1972 WORLD INDOOR CHAMPIONSHIPS were the first to be held under the one-gram-minimum weight rule. This concept caused considerable controversy amongst Indoor enthusiasts both before and after the rule was passed in haste 'on the rebound' following the 1970 Championships in Rumania. There had been a very high mortality rate amongst the models in the salt mine, due to a combination of draughts, no balloons, rough surfaced walls, and extremely light airframes. It was postulated that a (relatively) more substantial model would have less performance, fly faster, and therefore have less collisions and survive them better.

As with many other rule changes in aeromodelling, the results have not been quite those intended or expected. The modeller has merely changed his approach and design to suit the new rules. It is no secret that the way to Indoor success is to build the models light! the obvious answer to a mandatory weight requirement is to make the model bigger – and this is exactly what has happened. As there is also a maximum span of 65 cm, the desired effect had to come from an increase in wing chord. Whilst the previous winners by Jim Richmond and Jiri Kalina had chords of 5½ inches or thereabouts, most of the 1972 entrants were greater by a couple of inches or more. 'Pete' Andrews' winning design had 8 in. chord and this was by no means exceptional.

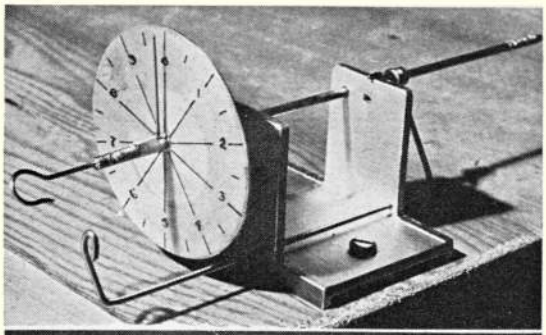
Although low aspect ratio is usually considered inefficient, whatever is lost through tip votices etc., is more than compensated for by the substantially reduced wing loading. The models have changed in other ways of course. To preserve a reasonable moment arm it has been necessary to lengthen the fuselage, usually by way of a longer tail boom. Tailplanes have grown to match the wings. The real surprise is that the propellers have also become bigger and, in fact, are now of the same sort of size that were employed on the 'old' 90 cm. span models. Rubber cross-section has been increased to turn the longer props.

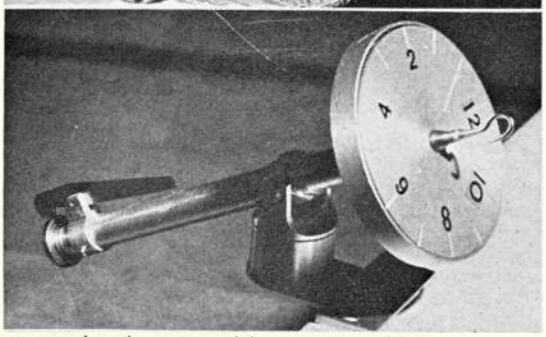
The overall effect of all these developments has been to counteract most of the aims of the rule changes. With the preceding Championships being held in different venues with different rules and under different 'weather' conditions, results are not directly comparable. Nevertheless it would seem that there has been no significant change in performance and while there might be a tendency for the 'general level' to be catching up with the leaders, this could well have other explanations. The one-gram models, though being much bigger and higher powered would seem little stronger than their predecessors. Certainly there were still instances of spectacular (if heart-breaking) structural failure on power-burst, particularly in the contest's final stages when fliers went 'for broke'. As an aside I would add that I see no reason why Indoor **should** suffer attempts to make it 'easy' via legislation – in particular at World Championships level.

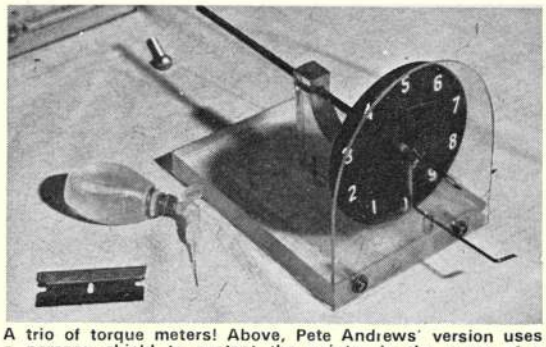
As with outdoor categories, there is obviously the temptation to build up to weight rather than down to it. The vast majority of this year's entry was comfortably over the one-gram requirement when check-weighed and I only saw one example of a model with ballast! This was by S. Kujawa – and had a piece of $\frac{1}{32}$ in. sheet balsa



Kalina, shortly after having released his model. Note how the unbraced tailplane deflects – increasing its incidence – under the effects of the initial 'power burst'. This provides a nose-down moment to prevent power stalling.







A trio of torque meters! Above, Pete Andrews' version uses a perspex shield to protect the pointer in the event of a motor breakage. Above left, is Canadian Mike Thomas' example. Second piece of wire is for release of the torque wire so that it can revolve freely and enable turns to be unwound from the end (or all) of the motor. Below left, Czechowski's meter is mounted on a universal pivot.

cemented to the motor stick so as to provide the necessary weight.

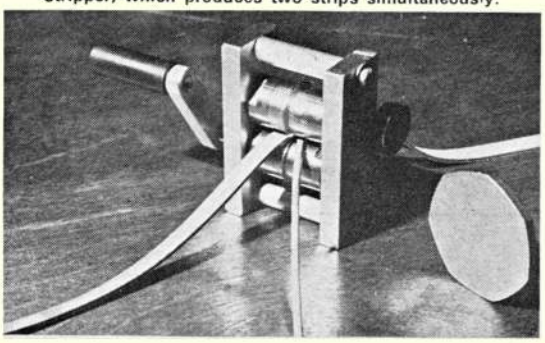
The 65 cm. wing span limit is judged as the **projected** measurement, i.e. the true tip-to-tip dimension rather than the 'plan' size before dihedral has been incorporated. As indoor models deform under flight loads, even with the quite extensive bracing employed, the span when 'at rest' can be more than in flight and with models built right to the limit this small effect can be critical! However neither the rules nor the officials stipulated just how span should be measured. Consequently a number of fliers **inverted** their models for the span-check so that, the unbraced tips would droop to advantage.

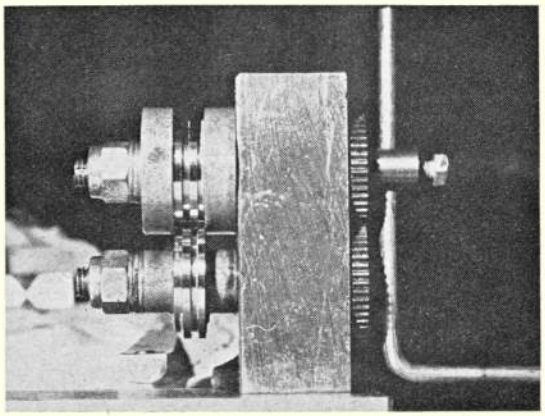
Designwise, most models followed fairly traditional indoor lines – apart from the low aspect ratio of course! Wing tip shapes are blunter than was the case before span limitations – but the vast majority are still 'rounded' or 'elliptical'. Kalina provided the most distinctive exception with an almost 'squared off' tip shape. The qualification in the description is necessary as the front 'corner' was rounded off, whilst the straight line portion was angled slightly relative to the model centre-line. Mike Thomas had the only straight dihedral model in a field of tip-dihedral or polyhedral designs, while the German-style of elliptical dihedral seems to have disappeared! Whilst fins are usually rear mounted, several models had them forward of the tailplanes, and at least a couple had the fin above the tail.

There were only two models that were noticeably different from all the rest. One of Boyd Felstead's Australian models had a geodetic wing – possibly intended to resist transit warps as much as in-flight flexing. The real novelty came from Italy's Carlo Cotugno in the shape of a twin tail boom model. The booms splayed out from the rear of the motor stick to meet the tailplane about a third of the way along the semi-span. Whilst the tail had thicker ribs at these stations it was nevertheless **cantilevered** on the ends of the booms. The fin was centrally mounted above the tail and affixed solely by its leading edge. Whether the tail and fin were intended to deflect on power-burst is a matter for conjecture, but to get this model into perspective it should be remembered that it exceeded half an hour!

The most crucial part of an indoor model is the prop/rubber combination. Propellers are universally of the single spar variety, and the trend to longer diameters has already been mentioned. Deformation under load is not only inevitable but is commonly used to control the power burst – unless the prop is specially designed with excess area behind the spar, it will flex to more pitch under load, hence reducing the r.p.m. and reducing the initial rate of climb. Andrews even went

And now a pair of strippers – rubber variety, that is! Below is the version made (and sold) by Czechowski of Poland, which is fully adjustable to cut any desired width. 50p piece shows size! At right, is Laurie Barr's 'Rotosheer'-style stripper, which produces two strips simultaneously.





to the extent of using tapered section ribs on his props to control this flex or flair.

An alternative method of control appears to be used by the Czechs. They scorned the use of wire bracing on their tailplanes which consequently appeared very flexible compared with the commoner braced examples. From observation, the tailplane increases in incidence with the 'high' speed of the power burst. This produces a similar effect to an outdoor V.I.T. in providing a nose down moment to prevent power stalling.

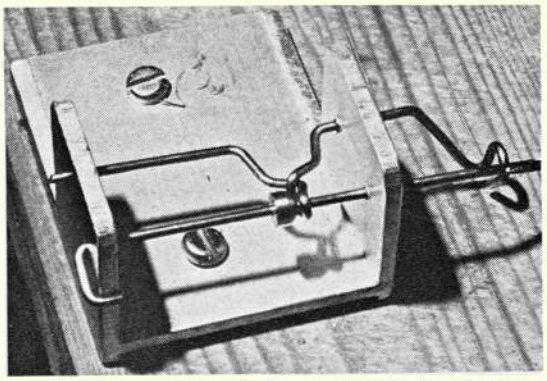
Even with a 'good' propeller the modeller still has the problem of finding a motor appropriate to the height available, and other relevant-flying conditions. The most obvious variables of the rubber are its cross-sectional size and the length of the loop employed. The narrow widths of rubber required are obtainable either by purchasing them from specialist suppliers (who cater solely for the Indoor Market), or by stripping one's own from normal size Pirelli.

A variety of rubber-strippers were seen at Cardington. There were relatively simple devices in which a razor-blade slit the rubber as it was pulled through a suitable guide, but this approach is something of an art as it is easy enough to produce uniform strip, but very difficult to predict the exact size obtained! An 'engineering' solution appeared some year ago in the form of a device called the Roto-shear. This consisted of a set of intermeshing discs which acted as a set of rotary scissors. Varying the thicknesses of the discs permits a range of rubber sizes to be cut and a number of fliers have made copies of this device.

Operating on much the same principle was the stripper of Poland's R. Czechowski, where rubber is fed through an adjustable guide so it passed between a pair of rollers each carrying a sharpened cutting disc. The guide is adjustable by turning a couple of screws. The recommended procedure is first to remove and discard a narrow strip from one edge of a length of Pireili 6 x 1 mm. (or 4×1) strip. Then the guides are reset to suit the reduced width and the desired size rubber is stripped from the cut-edge size. It was explained that commercial Pirelli strip has a slightly irregular (or wavy) edge, the effect of which is magnified if included in the much reduced size strip that is needed. Czechowski sold a number of these strippers during his week-end in Cardington!

Producing the right size of rubber is only part of the problem. The next task is to evaluate its 'quality', or its suitability for its envisaged use. This is conventionally done by **measuring** the torque exerted by the motor in a fully or partly wound state. There were a number of torque-meters in evidence and they are rapidly becoming an essential part of the serious Indoor flier's equipment. (Erv Rodemsky even sells meters as part of his *Aero-lite* line of Indoor model supplies). The *modus operandi* of all these devices is straightforward enough – a piece of piano wire a few inches long is restrained at one end and attached at the other to the wound rubber motor. The wire twists until there is sufficient torsional resistance to balance the torque exerted by the rubber. By attaching a pointer to the wire so it revolves over a circular scale, the deflection can be observed and quantified. Torque is measured in inch-ounces (or the metric equivalent) and the wire dimensions **can** be arranged so that the scale reads directly in these units.

Various refinements to the basic idea can be seen in the photographs. Andrews' meter had the torque wire enclosed in a length of tube, and had the pointer protected against motor breakages by a clear plastic shield. Mike Thomas used a latch on his torque meter that freed the torsion wire and let it revolve freely. By gripping the wound motor close to its end, and then running off the few turns adjacent to the hook, the motor can be removed for transfer to the model. The other end of the motor is held by a 'stooge' similarly equipped with a release latch. The use of very small 'o' rings at the end of the motor is an alternative to such measures!



Another Mike Thomas gadget – a 'stooge' (rubber motor holder). As with his torque meter shown opposite, it has a piano wire release arm.

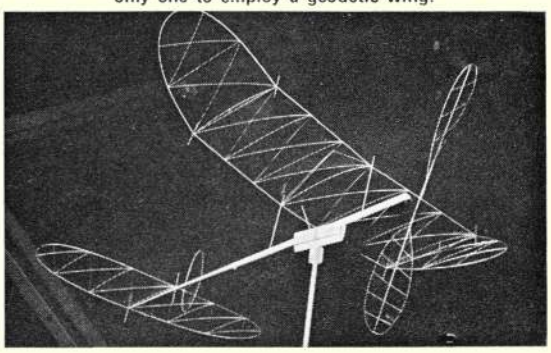
The ultimate in refinements on torque meters came from Czechowski however. His meter was mounted on a universal joint so that it could move till the torsion wire was in line with the rubber. The same precision miniature engineering extended to this modellers winder and balance – all in all a most impressive collection.

Intelligent use of these meters can enable the flier to predict what will (or should) happen in flight. That this is far from a theoretical notion was shown by the carefully written notebooks in which a number of competitors recorded details of their props, motors and performances.

Comparison of the numbers involved reveals that the American models would climb on a torque value that would scarcely cruise (fly level) a British model. This observation was reflected in the Americans' use of larger size propellers on smaller rubber. The reasons for this phenomenon are probably still being debated amongst the British Indoor specialists!

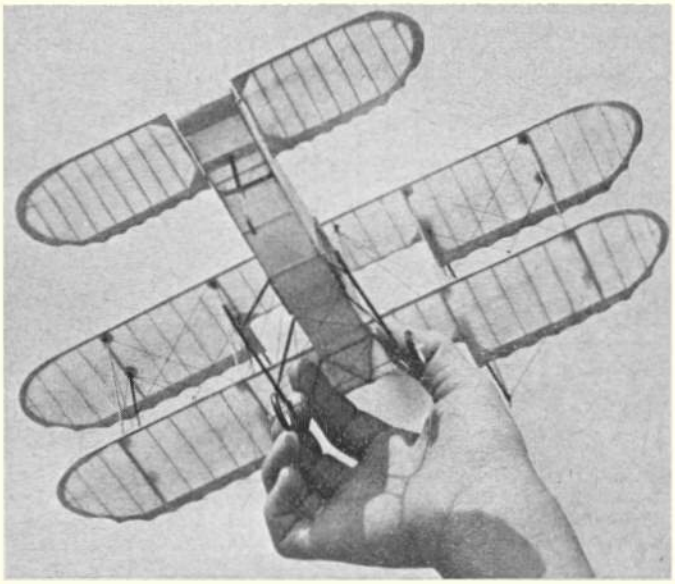
If the uninitiated feel that the techniques and methods described are rather extreme then they are probably correct. But competition Indoor flying is specialised and extreme – especially at World Championship level. This is not to say that it is beyond the abilities of 'mortal man'. Sal Cannizo, who placed fifth and showed remarkable consistency, secured his place in the U.S. Team in his first year of Indoor Competition!

Most-travelled models of the meeting were Australian Boyd Felstead's machines which was flown proxy by Manny Radoff and his 'team manager' Erv. Rodemsky. This model was the only one to employ a geodetic wing.



FLYING SCALE COLUMN

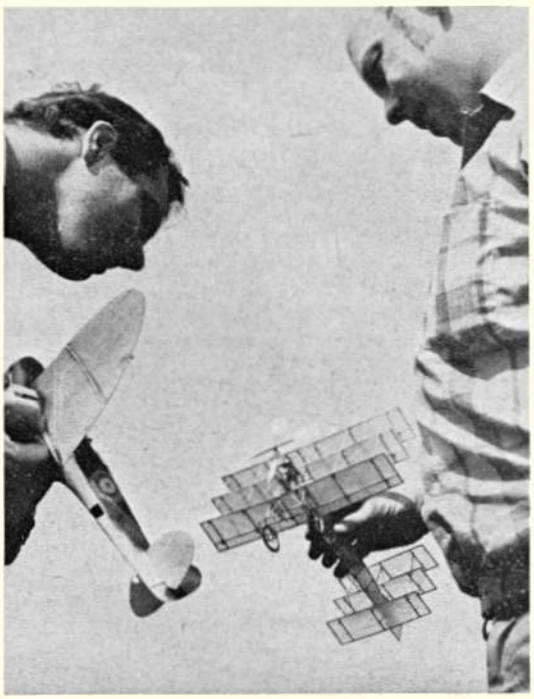
by Eric Coates



Harold (Bill) Warner flew this rubber-powered SE-1 Canard 'Peanut Scale' at the U.S. Nats., but it came to a sad end. It terminated its best flight by gently gliding into a settling pond of a sewage disposal plant. Hasn't been the same since, now lacking the sweet smell of success.

SUNDAY 24th SEPTEMBER saw the principal Autumn event in the scale modeller's calendar – the *S.M.A.E. All Scale Meeting* held, as usual in recent years, at R.A.F. Little Rissington. Unfortunately, or as some officials would say, fortunately in view of the weather, I was out of the country at the time and could not attend. I am, therefore, indebted to Terry Manley for a brief report on the free flight side of things.

Terry reports a very cold and rather windy day, (the airfield being situated on the top of the Cotswolds is rather prone to this kind of thing). Nevertheless a very large crowd was in evidence, about twenty free-flighters were to be seen but only five braved the elements in the competition; four of whom qualified. Judging from the results Terry won by a mile and three furlongs! A very potent contest model is his D.H.4. – it always scores a high static mark with its excellent detail, particularly in the engine bay region and being a steady stable flier, in any weather condition, can always be relied upon to return a useful flight score. Very nice to see young John Neate, schoolboy son of well-known R/C scale enthusiast Peter Neate, entering the contest field for the first time. A very creditable effort for one so young, we old men will have to watch out in a year or two!



Results

			Flight	*Static*	*Total*
1.	T. Manley	*D.H.4*	469	797	1266
2.	J. Palmer	*1½ Strutter*	409	402	811
3.	D. Carpenter	*Thomas Morse*	180	450	630
4.	J. Neate	*Aeronca C-3*	250	163	413

To judge from conversations in the last month, all the 'bods' who attended the Cardington Indoor Scale Meeting found it a real success. I am sure we shall see many new models built this winter for future meetings and I therefore, intend to devote the rest of my column this month to small rubber models suitable for hangar flying.

Now, I am no expert on the subject and indeed until I built the KeilKraft *Hurricane* last year I hadn't built a rubber scale model for over 20 years, but I can draw comfort that there must be many other scale flyers, particularly of radio models, who know even less about the subject than myself!

In my youth there were many ranges of rubber powered small scale kits available to produce models of between 12 and 20 in. span. One seems to remember them through the rose tinted mists of time to have been superb replicas of the real thing. One glance at a preserved plan, from virtually any of these ranges, in the harsh fluorescent light of today, however, is enough to convince one that

Dale Sebring (Spitfire) checks out Avro triplane by Bill Stroman of NAR Flightmaters, Los Angeles, U.S.A. Covered with condenser paper, flies well only in dead calm. Rubber power. Sebring's Spitfire is all-balsa, with fuselage made in halves formed over a mould.

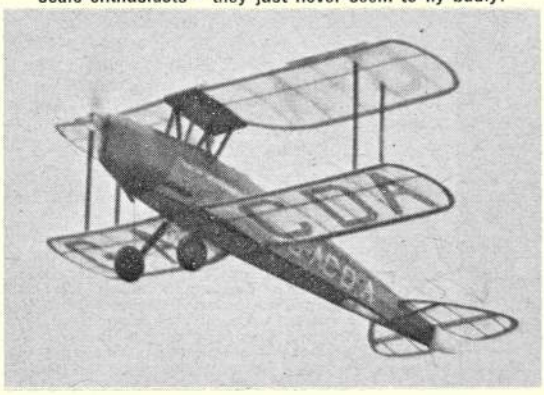
they were a mere travesty of a replica – not even accurate in outline. They had one great attribute, however, not possessed by the kits offered today – they were light, and as such performed well.

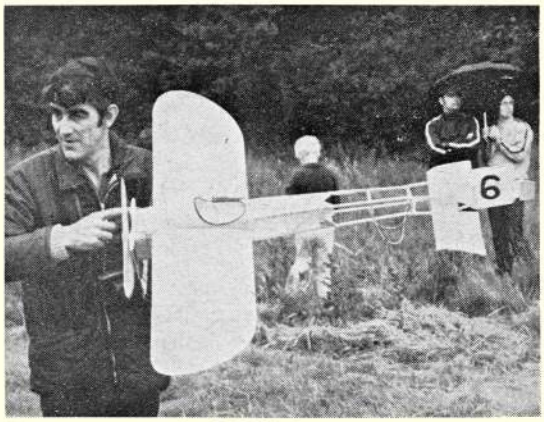
What of the small kit models available to the British modeller today? There are two ranges, by the two leading manufacturers *KielKraft* and *Veron*, plus a variety of rubber scale kits of American origin. These latter are rather larger than their British contemporaries and being intended for multi purpose use; i.e. control line, F/F power, Radio (?) as well as F/F Rubber. They have a structure more befitting a wooden battleship of which Nelson would have been proud! Therefore, to say the least, their indoor performance as rubber models would be rather disappointing.

Both the K.K. and Veron ranges are extensive; many models featuring in both ranges. They can all be made to fly – some obviously better than others, but all tend to be rather heavy in construction and flying performance can be improved considerably with one or two judicious improvements. All rubber powered scale models tend to be tail heavy, much more so than powered models. Therefore, try and pick a long nosed design – short nosed radial engined machines are the worst choice. A lot of the models feature sheet tailplanes but a built up (dare I say it?) open framework will lighten the tail end; but watch the warps. If you can look inside the kit before purchasing take careful note of the printed sheet. Some kits, sad to relate, occasionally have 'heart of oak' variety of sheet. This virtually makes the kit useless for our purposes. You can throw away the strip wood and replace it for a few pence, if it is unsuitable, but not the printed sheet.

The one item which it is essential to throw away, if any sort of duration is to be achieved, is the diminutive plastic propeller. Incapable of absorbing the power of more than two strands of $\frac{1}{16}$ in. square rubber – a quick buzz and the power run is exhausted – totally useless for our purpose. A large diameter (the undercarriage legs usually limit the diameter of the prop) paddle blade is what is required to absorb the torque and give a power run of about 30 secs. The usual material for rubber model propellers is soft balsa although for scale models, I recommend medium to hard balsa. This may be harder to carve but it will result in a stronger prop, particularly if the blades are carved thin, with plenty of undercamber to give maximum thrust from a limited diameter while the extra weight of the harder balsa is, of course, an advantage for the tail heavy model. For the *Hurricane* I carved the prop down from a 12 in. plastic prop, as

Terry Manley's rubber-powered 18 in. span Tiger Moth is a versatile machine, being the model which he flew at the Cardington Indoor meet, and seen here flying in the open air at North Luffenham. The 'Tiggy' is always a favourite for scale enthusiasts – they just never seem to fly badly!





Fine performer at the Old Warden meet was this rubber-powered military Bleriot. Flies lazily on its large prop – and thus most realistically. Is rubber power having a comeback? Let's hope so – no noise or fuel-proofing problems here!

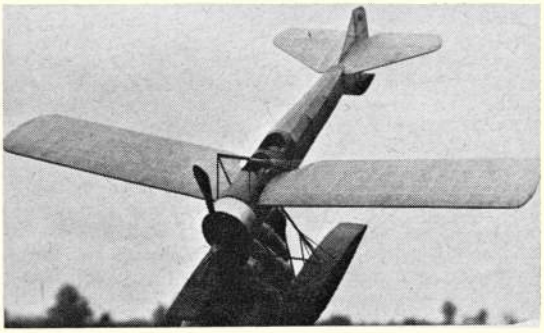
supplied in the *Senator* kit. These are obtainable separately from model shops at about 12p each and are quite easy to work with a sharp knife and sandpaper. The finished *Hurricane* prop is $6\frac{1}{2}$ in. diameter with $1\frac{1}{4}$ in. wide blades about $\frac{1}{16}$ in. thick at their greatest point. It has survived many prangs and never broken. It is very heavy but despite the 18 s.w.g. prop shaft, brass bush, thrust race and sheeted nose it still needs weight in the nose! I did retain the all sheet tailplane but cut it down in size as I didn't think it need really be half the wing span as indicated on the plan. Power is supplied from two strands of $\frac{1}{4}$"x 1/24 in. Pirelli 14 in. long. Such niceties as free-wheels and pre-tensioning can be forgotten as the model is back on terra firma before the power run is exhausted. This combination was producing R.O.G. flights of about 35 secs. at Cardington, on 350-400 turns. I have found the best trim for the *Hurricane* is to turn to the left just as on a power job. I have noticed that Doug McHard uses a similar trim for his low wing machines too – a little washout on the port wing helps to keep the wing from digging in during the initial power surge.

Don't be put off by the scale modellers traditional distrust of low wing machines. In this small size and rubber powered, they seem to be much easier to trim than their larger powered brethren. W.W. II fighters seem to make better flyers than W.W.1. biplanes. The drag of wires in the small scale seems to be out of all proportion to the lift produced by the wings. I find, however, that the *Hurricane* performs far better with the undercarriage fitted than without it, the C.G. being lowered and the lateral stability being increased accordingly.

Years ago when rubber was the prime motive power for scale models, gearboxes were in common use. To younger readers this may sound surprising, thinking such things belonged to motor bikes and cars etc., but not the humble rubber model. These were lightweight step-up ratio boxes to allow the propeller to spin faster than the unwinding rubber. This enabled a smaller prop, more in keeping with scale diameters, to be used. More often than not double drive gears were used allowing two rubber motors, revolving in opposite directions, to be fitted. This not only reduced to more handable proportions the size of motors but helped eliminate the torque reaction. These gearboxes were usually in models around 40 in. span. I have to hand an old gearbox found in my scrapbox which I seem to remember, was fitted to a *Miles Messenger* of about 38 in. span; built from an

Kreider-Reisner KR21 rubber scale model of 13 in. span weighs less than ½ oz. This 'Peanut Scale' job was built by Bill Warner of Arleta, California, U.S.A. Spinner on the exhibition prop shown angled on back face to compensate for right and down thrust.

Below right, John Blagg built this Deperdussuin Seaplane, which was seen at the Old Warden Scale Meet this year, built from Colin Tissiman's 'Flying Aces' plans. Neat, unusual subject.



Aeromodels kit a quarter of a century ago! It has twin input shafts driving ⅜ in. gears meshing with a ¼ in. gear on the prop shaft. This gave, of course, a 1½ : 1 step-up ratio. It may well be worthwhile reviving these ideas for modern indoor models using smaller and lighter gears of course but I am afraid at the moment I have no idea where to obtain these items today. Perhaps readers more in the know would care to inform me. I am sure a geared model would give an improved performance as well as allow a more realistic flight prop to be used. The extra weight in the nose would also be far more use than plasticine.

To return to the small kit models, which is what we are chiefly concerned about at the moment, I had my best success from the old *Airyda* range produced just after the war and retailing at 2/6d each. I am sure that many older readers will remember with affection these excellent kits. Unfortunately I do not have any of the old plans to refer to, so I cannot vouch as to their accuracy, but they were light and flew well. Some of the models, however, of this and earlier eras are being revived by Colin Tissiman of Sheffield; whose advertisements regularly appear in the classified section at the back of this magazine. Mr. Tissiman has recently sent me examples of what he has to offer. Amongst these were plans and printed sheet for the range of *Aer-o-Kits* which were manufactured in Sheffield during the war years. The sample kit boxes supplied have that nostalgic grey utility look about them. The wide range of models are far from accurate and realising this an instruction booklet has been prepared, by Mr. Tissiman, which details individual modifications to the various models to make them more realistic. Also the booklet gives many useful hints on construction of small rubber models with particular reference to propeller and nose-block assemblies.

In addition to the Aer-o-Kits Mr. Tissiman can offer several of the famous pre-war American *Megow* and *Flying Aces* plans. These vary in accuracy but generally are better than the Aer-o-Kits. I think Mr. Tissiman's finest offering is his recently designed ½ in. – 1 ft. *Albatros C* 1 two seater. This is accurate and has plenty of detail shown on the plan – it should be an ideal 'Cardington' subject.

To the experienced true scale enthusiast, however, he will eventually wish to design his own indoor flyer. I think we scale modellers have a lot to learn from the indoor duration boys in this field. I have just been looking through the catalogue of *Micro-X Products;* the American firm specialising in indoor model materials. This was given to me by Laurie Barr; who also advertises regularly in the 'back end'. This little book describes many items such as small section rubber (I don't really think the ¼ flat I use is the ideal size for indoor), Jap tissue in many colours, Teflon washers and fine wire. All these items can be obtained through Laurie Barr.

Well, I hope this disertation inspires a few more to have a go at an indoor model. They certainly are a big change from 5 channels and 10 c.c.; but a well worthwhile diversion. One can become very stale only pursuing one narrow branch of the hobby.

Scale technical committee chairman Dennis Thumpston winds his KeilKraft 'Stuka', which he flew at the Cardington Meet. He also achieved the unfortunate distinction of being the only entrant who did not make a qualifying flight! This was due to two factors: the hardness of the concrete floor, which did the spats no good at all, and also the model proved rather overweight.

topical twists

by 'Pylonius'

illustrated by 'Sherry'

'That's not a red flag he's holding up, it's a white one!'

Pile-In Racing

It was a clash of colours at the International Pylon Race, with Bob Violett being closely chased by Phil Greeno, but while it was Violett who came in at the end, many of the greener flyers came to a violent end at the pylons. At these critical turning points there was a definite lack of colour in the strained faces of the flagmen who soon came to realise that remote control racing was more a matter of luck, or rather ill-luck, than judgement. In fact so miscontrolled were the screaming missiles round the corners that the flagmen, rather than have their flags at half mast, withdrew their labour in the face of such appalling working conditions. Reading the headline, *Pylon Men go on Strike,* many fearful citizens reached for their candles.

I, personally, view the advent of pylon racing with the greatest of misgivings. If the multi radio model could be called the movement's prehistoric monster, the pylon model could be termed its Domesday Machine. It's not so much that I would deny the right of the pukka model flyer to go to such kamikaze extremes if he so desires, but I do take objection to the thrill a minute seeker, who, before progressing to go-kart racing or parachute dropping, scorches through the model world to leave in his wake a ruinous situation of banned and battered airfields.

In a way, though, pylon racing could be beneficial. It might provide a suitable outlet for those blasé types who have largely exhausted the novelty and thrill potential of their overpowered radio models and are left with the thin comfort of dive bombing any spectators foolish enough to hang around. It is quite possible that a damaged, or even destroyed flagman might not cause such a public furore as a citizen likewise. Given a piece of nifty spadework it might even be possible to hide the evidence from the insurance companies.

Throw Away Lines

We live in an age of the disposable article. The number of things which are used once and then discarded is growing daily. It all began, I think, with babies nappies, and may well end with the developed occupiers of same becoming disposable, too. The only purpose a human being will serve is the pressing of a computor starting button, and we are coming very near to this in our highly electronic model movement.

Use and lose being the current motto, not only of the free-flighter, we began to wonder if the disposable model aeroplane was a real possibility. Nothing loth we took the suggestion to an expert on disposables. He mused awhile:

'*I suggest you make it of paper. Say a form of tissue.*'

'*But that wouldn't be very rigid, would it?*'

'*Perhaps not. But then you could stiffen it up with a cheap, simple framing. A softish wood might be the answer – say Balsawood.*'

'*But what about propulsion?*'

'*Well, an engine would not be all that disposable, but a carbon fibre/plastic one is a possibility. No, you would have to kite the model up on string, or you could use twisted rubber bands driving a pair of paddle shaped propeller blades.*'

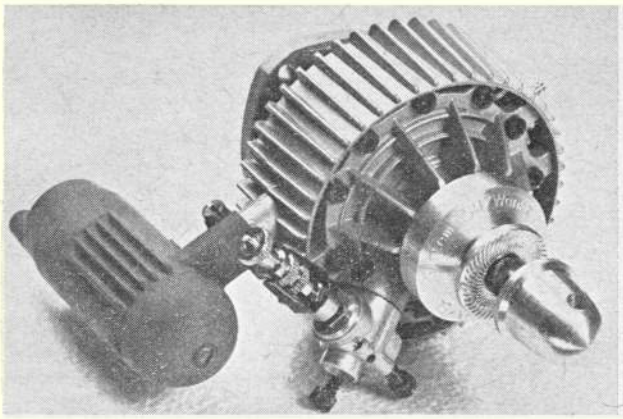
'*I think this is where I came in.*'

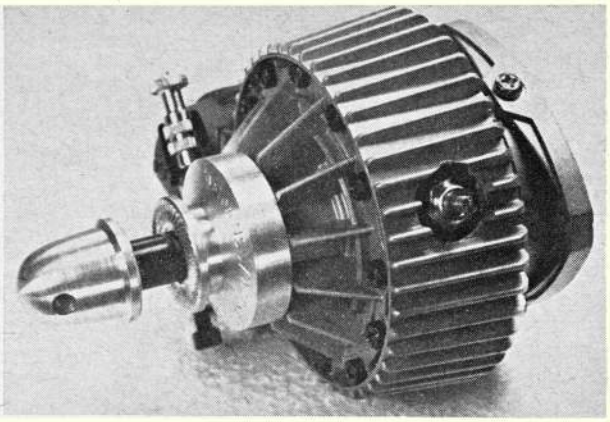
Grabfield Rally

After visiting one of our major rallies it occurred to me that the model flying excursion was as dead as a day trip to Southend. The time when the model club, from the contest tiger to the remotest paper member, set out in festival mood for a jolly day at the model fair, is now long past; just a fond memory, like pre-motorway Chobham or someone entering a contest for fun.

Perhaps it has to do with the car taking over from the more gregarious coach. Much of the spirit of those old meetings was the curiosity and enthusiasm of the younger members who learned much on the rally field and even more in the coach. But now the airfield distances are beyond the reach of the pushbike, and coaches and buses a rare phenomenon, it is more or less only the car owner who can be a model flyer. Another factor in the spread of model flying being mostly a middle-aged one is the astronomic state of club fees – in fact, an honorary club membership has been given to the first man on the moon. But even if the youngster has a rich uncle who will buy his way into the club he will hardly get to a comp. It is not just a question of a cheap whip round for a coach. Quite apart from the petrol costs, you have to pay your way into the airfield, and at some of the major rallies this has reached cheque book proportions.

Altogether the situation for the young model builder eager to earn his wings is pretty grim. Now and again we see the mature model flyer proudly watching his son take his first fledgeling hops, but mostly model flyer's progeny are usually put off model flying by the way mum nags at dad over it.

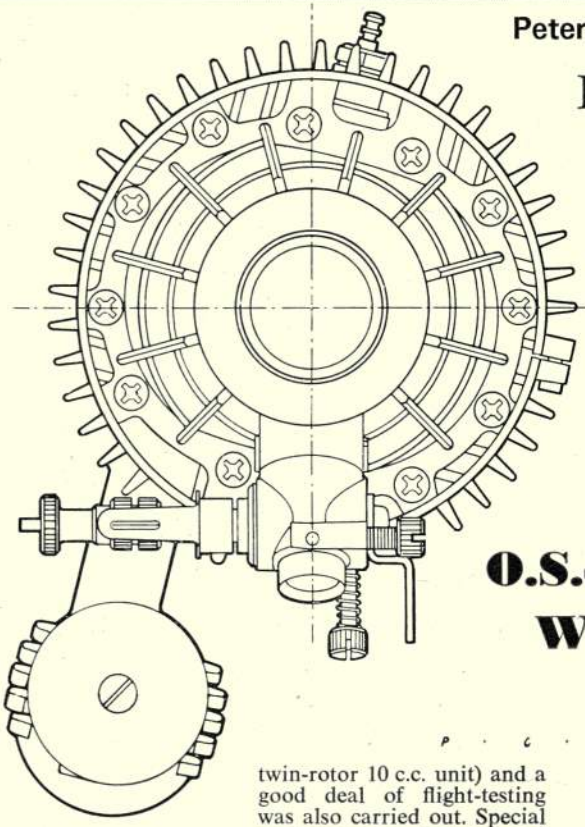




Translating original German research into a practical production model engine was an outstanding technological achievement by the Japanese O.S. company, who have now succeeded in developing the engine to a high level of performance and reliability. Distributed in the U.K. by RipMax Ltd., O.S. Wankel motor is almost vibrationless, very powerful and, with small O.S. silencer, remarkably quiet.

Peter Chin

ENG



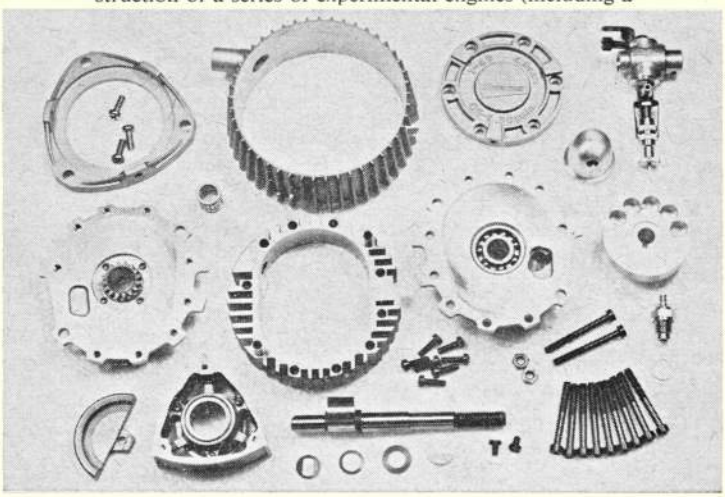
O.S.-GR
WAN

THE O.S.-GRAUPNER 5 cc Wankel engine was the world's first production model rotary combustion engine and is still the only motor of this type on the market. It is a remarkable piece of model engineering and is almost certainly the most outstanding technical achievement of the past forty years' commercial model aircraft engine manufacture.

Approximately ten years of research and development is at the back of the current O.S.-Graupner Wankel motor. The decision to investigate the feasibility of a production model engine based on Felix Wankel's then new and revolutionary i.c. engine was taken by the German Johannes Graupner company early in 1961. Design work was carried out by Ing. Schaegg, one of the leading German engineers associated with full-size Wankel engine development. That the task was not an easy one is demonstrated by the fact that Herr Schaegg took three years to evolve an engine that would actually run and another two years were to elapse before a redesigned version of this succeeded in flying a radio-controlled model. A further improved model followed in 1967 and Graupner's interest in Wankel engines was then, for the first time, revealed with public demonstrations of a 'Taxi' R/C model fitted with one of these motors.

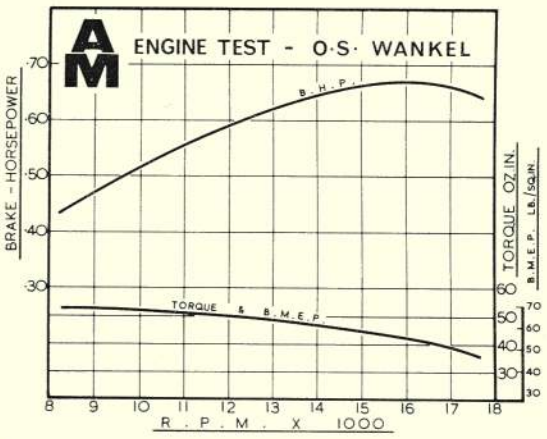
Having got thus far, Graupner's next problem was to find a company capable of producing the engine commercially, including redesigning it for production, evolving the special techniques necessary for its manufacture and continuing development aimed at raising performance. The O.S. company of Japan was invited to take over the project and, for the next two years, the resources of the O.S. Experimental Department were almost entirely devoted to this work. The first year was occupied in the construction of a series of experimental engines (including a twin-rotor 10 c.c. unit) and a good deal of flight-testing was also carried out. Special machinery was designed and built in order to deal with the new production techniques involved and, in the summer of 1969, a pilot run of 50 pre-production units was made. One of these units was received by the writer for test purposes and, in November, 1969, this motor was used to make the first Wankel-engined R/C model flights in the U.K.

Regular production began with a batch of 200 engines having a modified shaft and bearing set-up. Then in 1970 a substantial step forward was made in the engine's



Parts of the current production version of the O.S. Graupner Wankel engine. Production requires working to much closer tolerances than for orthodox engines.

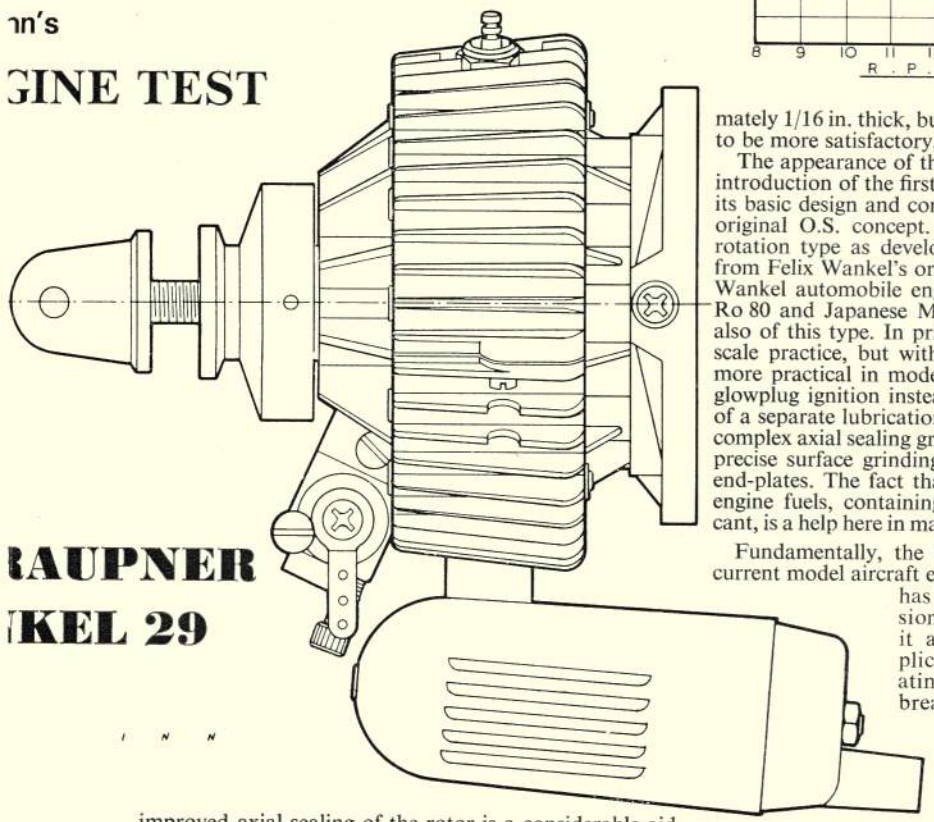
power output, starting qualities and throttling capabilities with the adoption of differential axial cold clearances. The purpose of this was to compensate for the uneven heating of the rotor housing that is a characteristic of all Wankel motors. On the induction and compression side of the O.S. trochoidal rotor housing, the cold clearance between the rotor and the housing end-plates is now between ·008 and ·010 mm. greater than on the expansion and exhaust side. Axial clearance (cold) on the expansion and exhaust side is held to the absolute minimum and is approximately ·002 mm., or less than one-ten-thousandth of an inch. The effect of this modification has been to reduce gas blow-by around the expansion area and thereby maintain a higher power output. At the same time, the



ın's

GINE TEST

RAUPNER
KEL 29



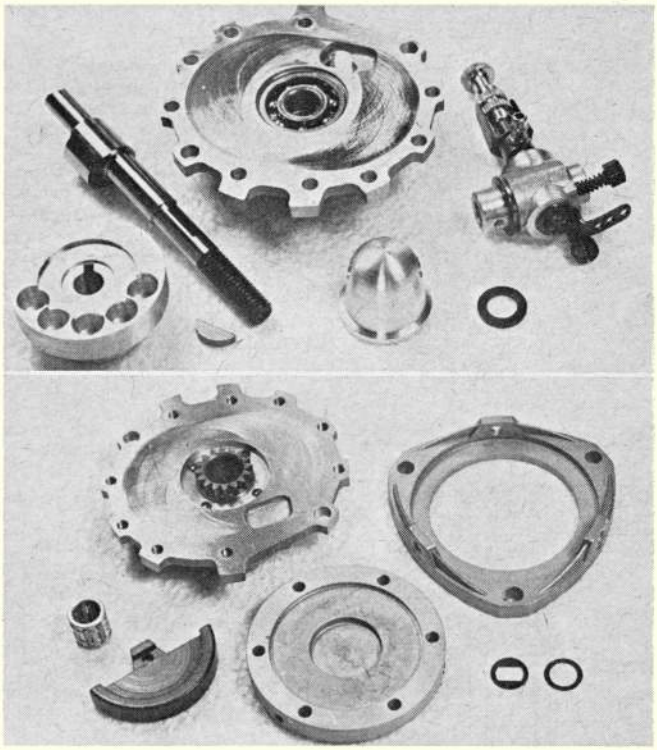
improved axial sealing of the rotor is a considerable aid to hot restarting and to idling and throttle response. Other improvements incorporated in the 1970 model included an inclined induction port, a reshaped exhaust port and a new glowplug especially developed for the engine by O.S.

During 1971, some further modifications were made. These included revised induction porting with the intake ports completely reshaped and placed closer to the periphery of the chamber to give a very much longer induction period. Induction now extends through approximately 330 degrees of shaft rotation or 60 to 80 per cent longer than for a typical high-performance, two-stroke, reciprocating piston model engine. For 1972 a further change was made when an aluminium alloy wearing surface was adopted for the rotor housing end-plates. Formerly these were coated with a metal-sprayed steel surface approximately 1/16 in. thick, but the alloy surface has been found to be more satisfactory, as well as less costly to produce.

The appearance of the motor has not altered since the introduction of the first production O.S. version, nor has its basic design and construction been changed from the original O.S. concept. The engine is of the planetary rotation type as developed by Dr. Ing. Walter Froede from Felix Wankel's original design. Current production Wankel automobile engines, such as the German NSU Ro 80 and Japanese Mazda RX-2 and RX-3 units, are also of this type. In principle, the O.S. unit follows full scale practice, but with some simplification to make it more practical in model sizes. These include the use of glowplug ignition instead of spark ignition, the absence of a separate lubrication system and the elimination of a complex axial sealing grid on the rotor in favour of highly precise surface grinding of the rotor and rotor-housing end-plates. The fact that the engine uses normal model engine fuels, containing heavy concentrations of lubricant, is a help here in maintaining a good axial seal.

Fundamentally, the Wankel motor, unlike all other current model aircraft engines, is a 'four-stroke' unit and has induction compression, expansion and exhaust phases, although it achieves this without the complication of valves and valve-operating gear. Instead, the engine breathes through ports that are opened and closed by the triangular - shaped rotor which replaces the reciprocating piston of an ordinary engine. The rotor moves around a lozenge-shaped chamber, mounted on an eccentric, while rotating about its own axis, its movements phased by an internal ring gear and a fixed pinion. The output shaft rotates three times per full revolution of the rotor, during which time each flank of the rotor goes through a full cycle. Therefore, a single rotor Wankel engine produces a power stroke for every revolution of the shaft as does a two-stroke motor and so has an advantage over a single-cylinder, reciprocating four-stroke which has a power stroke only every other shaft revolution.

The most-commonly quoted advantages of the Wankel motor, compared with a four-stroke reciprocating motor, are its fewer working parts, its compactness and lighter weight and its smoothness. Compared with a typical miniature two-stroke, it is neither simpler nor lighter, but



Right, eccentric shaft and front-end parts including rotor chamber front plate, combined front counterbalance and prop driver and orthodox O.S. carburettor. Below right, are the rear end parts showing rotor chamber back plate with phasing gear fixed pinion, caged needle-bearing, rear counterweight, rear cover and radial mounting ring.

it has a compact and convenient shape for most model aircraft installations, is a vast improvement in terms of reduced vibration and, as we shall see in a moment, offers highly competitive performance at considerably lower noise levels.

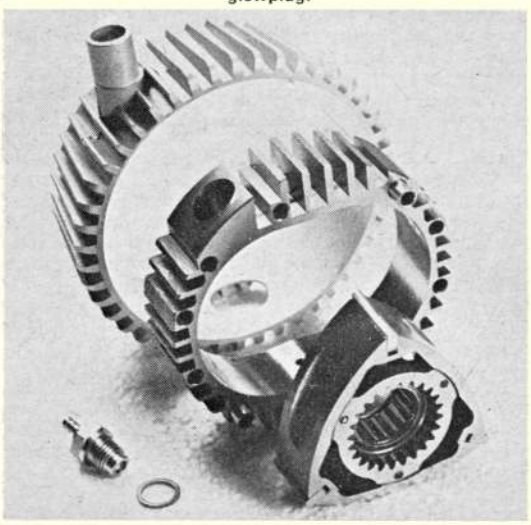
Performance

The O.S. Wankel is very easy to install via its alloy ring mount and can be rotated to any position convenient to carburettor, silencer and plug location. The carburettor, incidentally, is of the orthodox barrel throttle pattern with adjustable airbleed and is similar to the carbs fitted tothe O.S. 20 and O.S. 30 R/C engines.

With any model engine, it always pays to go carefully when the motor is brand new, using plenty of oil in the fuel and setting the needle-valve for cool, rich running initially. This procedure was also followed with our test model Wankel, using a 70/30 blend of methanol and castor-oil, running rich and limiting the first few runs to a minute or two with cooling-off periods between each. After about 20 minutes of running time had been accumulated, the Wankel was gradually leaned out to its maximum for brief periods and then, towards the conclusion of the initial running-in period, we switched to our standard fuel containing 5 per cent pure nitromethane. This gave a slight increase in power and considerably less critical needle-valve response.

The Wankel has very docile handling qualities. To hand start the engine we found it best to first prime all three chambers by injecting fuel into the carburettor intake while turning the prop through three complete revolutions. The more recent O.S. Wankels have much more positive hand-starting characteristics than the early models but, in general, we would favour the use of electric starting. This gave instantaneous starting on test, with no preliminaries other than to open the throttle about ¼ open and to momentarily choke the intake for a cold start while the starter was turning. For hot restarts, a mere touch of the starter was all that was necessary to unfailingly bring the engine to life.

'Piston and cylinder' of Wankel engine are its triangular rotor and epitrochoidal housing. Note internal-tooth phasing gear, needle-roller bearing, outer cooling ring and special glowplug.



SPECIFICATION

Type: Single-rotor, planetary rotation NSU/Wankel System with glowplug ignition and throttle control.

Swept Volume: 4.976 cc. (0.3034 cu.in.) per output shaft revolution.

Checked Weights:
354 grammes (12.5 oz.) less silencer
385 grammes (13.6 oz.) with silencer

General Structural Data

Machined cast-iron *epitrochoidal rotor housing* extensively finned and incorporating peripheral exhaust port and 2.2 mm. dia. ignition hole communicating with glowplug socket. Pressure diecast aluminium alloy *rotor housing front plate* incorporating front bearing housing and intake port. Pressure diecast aluminium alloy *rotor housing back plate* incorporating rear counterweight housing and containing phasing-gear fixed pinion and rear bearing. Case-hardened steel *eccentric shaft* running in two 7 mm. i.d. ball-journal bearings at front and one 6 mm. i.d. caged needle bearing at rear and with 12 mm. o.d. eccentric. Shell-moulded Meehanite *rotor*, fitted with special cast-iron *apex seals* each backed by two high carbon steel leaf springs. Rotor fitted with 24-tooth ring gear and mounted on eccentric shaft by means of 12 mm. i.d. shell-type needle-bearing. *Phasing gears* of case-hardened nickel-chromium steel. Lead-filled counterweighted machined aluminium alloy *prop driver* keyed to shaft with Woodruff key. Steel rear *counterweight* keyed to rear end of eccentric shaft and fastened with single screw. Pressure diecast aluminium alloy *rear-housing cover* secured with six screws. Pressure diecast aluminium alloy *carburettor* body with ground brass throttle barrel, plated brass jet assembly and adjustable airbleed and throttle stop. Rotor housing and end plate assemblies aligned by tubular steel dowels and tied together with eleven screws. Pressure diecast aluminium alloy finned *cooling ring* with integral exhaust stub for silencer fitting. Pressure diecast aluminium alloy *radial mounting ring*.

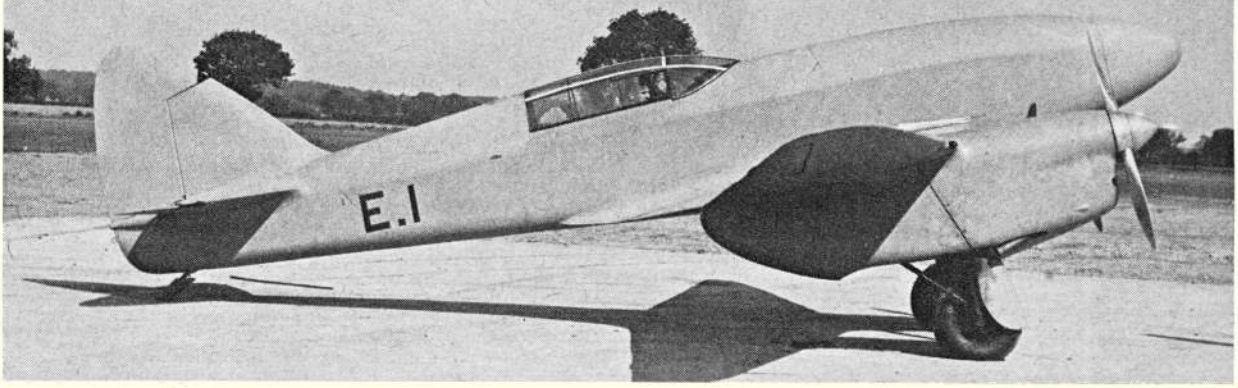
Special Accessories
(i) O.S. Wankel expansion chamber-type silencer (Part No. 41835007)
(ii) O.S. Wankel special extra long reach 1.5 volt glowplug (Part No. 71614001)

TEST CONDITIONS:

Running time prior to test: One hour.
Fuels used: (i) 70 per cent methanol, 30 per cent Duckhams' Racing Castor Oil (Running-in).
(ii) 5 per cent pure nitromethane, 70 per cent methanol, 25 per cent Duckhams' Racing Castor Oil (Test).
Glowplug used: O.S. Wankel type as supplied.
Air temperature: 11 deg. C (52 deg. F).
Barometric pressure: 29.70 in.Hg.
Silencer: O.S. Wankel expansion chamber as supplied.

De Havilland D.H. 88 Comet

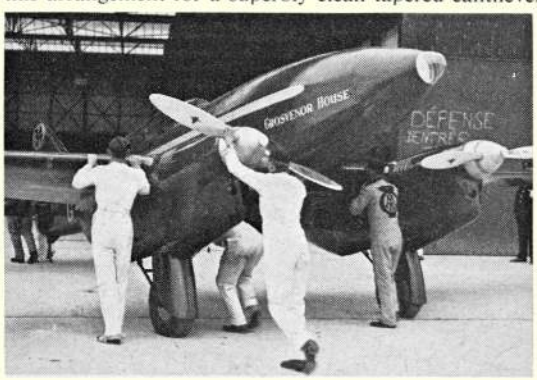
Aircraft described No. 218



Geoffrey de Havilland's sleek racer, which was the forerunner of the Mosquito Bomber, described and drawn by HARRY ROBINSON

WHEN FORMULA and conditions for the *MacRobertson International Air Race* were announced late in 1933, no British aircraft having the necessary combination of range, speed and reliability existed. It was typical of Geoffrey de Havilland that he should then say '*We can't stand by . . .*' and so there appeared the extraordinary advertisement in *Flight* and *The Aeroplane,* 'inviting orders for a limited number of the *de Havilland Comet* long-distance racing aircraft'. Design thinking centred around two of the new Gipsy Six engines, a speed in excess of 200 m.p.h. and a minimum range of 2,600 miles, with controllable pitch propellers essential to lift the inevitable heavy fuel loads and the crew of two needed to take turns over the very long stages of the race – London to Baghdad, the first compulsory stop, is some 2,550 miles. Low drag, essential for both long range and high cruising speed, was achieved by placing the pilots in tandem and using a thin wing of relatively high aspect ratio, with some kind of trailing edge flap essential to keep landing speeds within safe limits.

Early layouts showed a wirebraced wing and fixed undercarriage but Chief Designer A. E. Hagg abandoned this arrangement for a superbly clean tapered cantilever wing of stressed-skin construction and a fully retractable undercarriage. Although Hagg was convinced of the value of controllable pitch, doubts about the suitability and even availability of Hamilton-Standard propellers caused the French Ratier propeller to be ordered as a standby. The Ratier was a simple, two-pitch type developed for use with small in-line engines and possessing a blade form well suited to the Gipsy installation. Compression ratio of the new Gipsy Six was raised from 5.25 to 6.5 by machining the cylinder head and fitting new pistons, while engine drag was reduced by modifying valves and pushrods to reduce valve cover depth and by relocating the carburettor intake immediately behind the propeller. Experiment showed that supercharging would be no advantage for the stage lengths of the *MacRobertson* – with increased power more fuel could be lifted but would then be consumed more quickly with no increase in range.



First consideration in designing the Comet was to avoid take-offs and landings, since almost all flying hazards occur near the ground. The required range could only be achieved with a long-span wing cruising at a high lift/drag value and consequently a thin airfoil and low incidence were essential. No existing method of construction, in either wood or metal, could provide the needed strength for the proposed cantilever wing and from this necessity Hagg and his small design team evolved a wooden carapace construction in which bending loads were taken by upper and lower skins of diagonally cross-laminated spruce with three light box spars acting solely as shear members. Because compressive strength of the unsupported spruce planking was an unknown quantity a half-size model of the one-piece wing was built and tested to destruction. Graduated planking thicknesses were then determined from test failure loadings. Span/depth ratio was 50, a figure not repeated until Hagg's *Airspeed Ambassador* appeared in 1947

Three continuous box spars formed from birch

Heading picture shows the prototype Comet with Hamilton props. At left, 'Grosvenor House' at Mildenhall before the race. 'We're using French propellers, but you French keep out of here!'

Left: 'Excuse me sir, but you can't park that aeroplane here!' 'Australia Anniversary' is seen at Croydon on March 15th, 1938 just before Clouston and Ricketts flew it to Wellington, New Zealand. Below is 'Grosvenor House' repainted in R.A.F. Silver and now bearing the numbers K5084 – seen at Hendon Display in 1936 with enlarged cooling intakes. *Flight photographs.*

plywood webs with spruce flanges were situated at approximately 21, 40 and 65 per cent of the chord with a spruce stringer added between each pair of spars to give some support to the planking and reduce buckling. Ribs were birch plywood with spruce uprights, corner blocks and capstrips. Spruce planking two inches wide was glued and tacked diagonally across this spar-rib framework with a second layer laid at right angles to the first. The inboard portion of the upper surface was reinforced by a third and fourth layer so that at the root where compressive loads were greatest the thickness was approximately $\frac{9}{16}$ in. Thickness of the underside also decreased from root to tip where both surfaces were about $\frac{1}{8}$ in. thick. Forward of the front spar the wing was plywood covered with a further spanwise stringer for support. Aft of the rear spar the plywood covering of both surfaces extended to just outboard of the nacelles while from there to the ailerons, fabric was used, since plywood thick enough to give the necessary smoothness would have been far too heavy. The long narrow ailerons, of modified Frise type, were plywood covered to maintain torsional stiffness with mass balance weights inside their leading edges.

Aerodynamically, as well as structurally, this wing was unique. Its R.A.F. 34 airfoil, a thin, low drag section with reflexed trailing edge, was set at approximately one degree incidence to take full advantage of its high L/D ratio. Planform was slightly swept for the correct relation between centre of lift and centre of gravity while the aspect ratio of 10 gave low induced drag and the sharp taper was accentuated by long pointed tips.

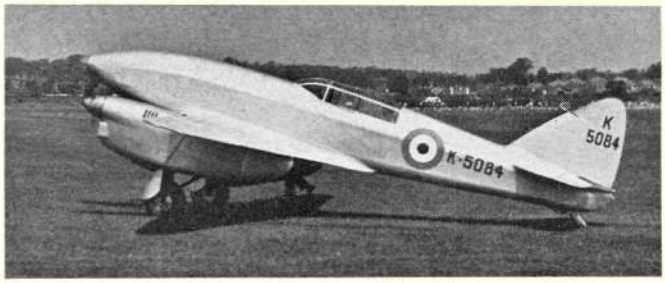
Inboard of the nacelles the trailing edge swept round in a wide curving fillet that sloped upwards to accentuate the reflex curve of the airfoil and minimise interference drag with the curving vertical sides of the gracefully streamlined fuselage. Built around a conventional truss of spruce longerons, uprights and crossmembers with a number of heavy plywood bulkheads located where stresses were highest, the flat sides of the fuselage were covered with birch plywood while double-diagonal spruce planking similar to that of the wing was used to accommodate the double curvature of the rounded upper and lower deckings.

Both integral fin and one-piece tailplane of characteristic De Havilland shape were constructed about two light solid spars with plywood ribs similar to those of the wing and plywood covering. Rudder and elevators were of similar construction and covering with bob-weight mass-balances. All three control runs included the standard De Havilland differential control whereby oversensitivity at high speed and extreme control column movement at low speeds were avoided. Flying and engine controls were fitted to each of the tandem cockpits with initially an instrument panel in the front cockpit only. Air brake, wheel brake and undercarriage retraction controls were also fitted to the front cockpit only, so that all take-offs and landings had to be made from the front seat.

De Havillands had no experience of retractable undercarriages and as speed of construction was essential the Comet's undercarriage had to be 'a cycle mechanic's job'. Built of welded steel tube with shock absorption by rubber blocks in compression to avoid machining and operated by an endless cable from port to starboard nacelle via the control handwheel in the front cockpit, this system was simple, strong 'and it worked'. Rotating the handwheel shortened the retracting screw-jack which 'broke' the hinged drag struts, swung the main legs aft and raised the wheel. Brakes could be locked on together for parking or operated separately by the rudder bar for taxying. A tailskid was fitted since it was lighter than a wheel, offered less drag and acted as a brake on landing with no danger of shimmy.

Three Comets were constructed at Stag Lane and the first to be completed was Bernard Rubin's G-ACSP. Disassembled and transported to Hatfield by road its first flight, carrying B-Class registration E.1, was made by Chief Test Pilot Hubert Broad on the morning of September 8. Insufficient time or suitable weather remained to carry out consumption tests but fortunately few modifications were needed. As expected with the sharply tapered wing and pointed tips, wing-tip stall was sudden and fierce. The aircraft was very sensitive laterally and steel springs were added at the bottom of the control column to provide built-in feel. Undercarriage retraction was adjusted so that the main legs, instead of being vertical when fully extended now sloped aft about five degrees, thereby reducing loads on the tailskid. It was decided to fit a landing light to the nose, increasing overall length by some 7 ins.

During construction Hubert Broad had objected to the lack of visibility from under the low curving windscreen, Hagg retorted '*How do you know if you've not flown it?* But in flight Broad '*couldn't see out of it*' so windscreen and canopy over the front cockpit were raised one and a half inches. This improved the view a little but because the air brakes of the Comet proved too small so that a nose-high altitude was essential to keep down the approach speed it was still necessary to approach the landing field at right angles, sight up the runway and then turn in.



GRATEFUL THANKS TO:
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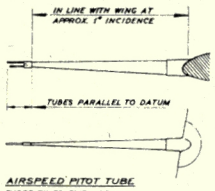
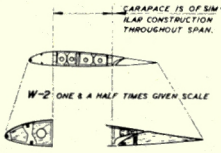
SEE THE AEROPLANE, 31st OCTOBER, 1934 FOR DETAILS OF GIPSY SIX R ENGINE.

TRAILING ENDS OF FUSELAGE STRIPES ARE UNCERTAIN & PROBABLY FADED DURING THE MACROBERTSON RACE.



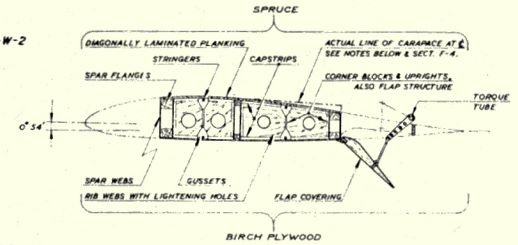
AIRSPEED PITOT TUBE
THREE TIMES GIVEN SCALE



ONE & A HALF TIMES GIVEN SCALE

NOSE & AILERON DETAILS
THREE TIMES GIVEN SCALE

RAF 34 AEROFOIL. ALL VALUES ARE PERCENTAGES OF CHORD													
STAT'N	1·25	2·5	5	7·5	10	15	20	30	40	50	60	70	80	90	95
UPPER	1·97	2·83	4·11	5·05	5·87	6·98	7·72	8·33	8·08	7·22	5·83	4·31	2·70	1·26	0·64
LOWER	1·63	2·14	2·81	3·23	3·55	3·91	4·16	4·33	4·33	4·11	3·69	3·09	2·30	1·34	0·76



WING SECTION AT AIRCRAFT CENTRELINE. SHOWN AS TRUE & COMPLETE RAF 34 AEROFOIL.
UPPER SURFACE BETWEEN NACELLES & AFT OF 40% CHORD IS IN FACT MODIFIED TO SUIT REFLEX CURVE OF FILLETS AS SHOWN THUS - - - - - - - -
NOTE SHAPE OF REAR SPAR SHOWN IN SECT. F-4, ALSO SECTS. F-5 & W-1 ON SHEET 1.
STRUCTURAL DETAILS ARE TYPICAL.
STRAIGHT-LINE TAPER OF WING EXTENDS FROM CENTRELINE TO TIP SECT. W-2 AT LEFT.
ACTUATING LEVERS OF AIR BRAKES ARE LOCATED 18" EACH SIDE OF AIRCRAFT CENTRELINE.
SECTION IS ONE & A HALF TIMES GIVEN SCALE.

FUEL TANKS FILLER CAPS COLOUR CODING
FORWARD TANK (128 GAL) - - - BLACK
MIDSHIPS TANK (110 GAL) - - - WHITE
AFTER TANK (20 GAL) - - - RED

FRONT INSTRUMENT PANEL
TWICE GIVEN SCALE

REAR INSTRUMENT PANEL
TWICE GIVEN SCALE

INSTRUMENTS ON MAIN FRONT PANEL ARE NOT SHOWN IN COCKPIT VIEWS AT RIGHT.

PANEL COLOURS
FRONT PANEL - - - - - - - MATT BLACK
REAR PANEL - - - - - VARNISHED TIMBER
INSTRUMENTS - - BLACK BODIES, DIALS, WHITE MARKINGS.

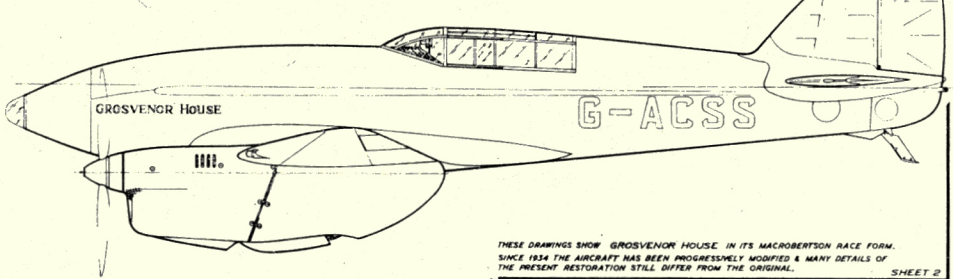
F-6 LOOKING FOR'D
WITH WING FILLETS & CONTROLS ADDED

COCKPIT COLOURS
ALL SURFACES - - - - - - - - - - PLAIN VARNISH
SEATS - - - - - - - - - - - - - - BLACK
THROTTLES, CONTROL LEVERS & UNDERCARRIAGE WHEEL - - - NATURAL ALLOY
KNOBS & LEVER TOPS - - - - - - BLACK VULCANITE
TOP DECKING FROM WINDSCREEN TO FRONT PANEL - - - - MATT BLACK

AIRCRAFT COLOURS
ENTIRE AIRCRAFT INCL. TAILSKID - - - - - BRIGHT RED
REGISTRATION, STRIPING & "GROSVENOR HOUSE" - - - - - - - - - - WHITE
RACING NUMBER - - - - - BLACK ON WHITE GROUND

DATA
WINGSPAN - - - - - - - - - - - - - - - 44'-0"
OVERALL LENGTH *(INCL. MOORING RING) - - 29'-8"
TAILPLANE SPAN - - - - - - - - - - - - 12'-2"
WHEEL TRACK - - - - - - - - - - - - - 9'-8"
PROPELLER DIAMETER - - - - - - - - - 6'-9⅝" (2m)
GROSS WING AREA - - - - - - - - - - 292·5 ft²
NETT WING AREA - - - - - - - - - - - 188·5 ft²

*ORIGINAL LENGTH OF E.1 (G-ACSR) BEFORE FITTING NOSE LANDING LIGHT WAS 29'-1".



THESE DRAWINGS SHOW GROSVENOR HOUSE IN ITS MACROBERTSON RACE FORM. SINCE 1934 THE AIRCRAFT HAS BEEN PROGRESSIVELY MODIFIED & MANY DETAILS OF THE PRESENT RESTORATION STILL DIFFER FROM THE ORIGINAL.

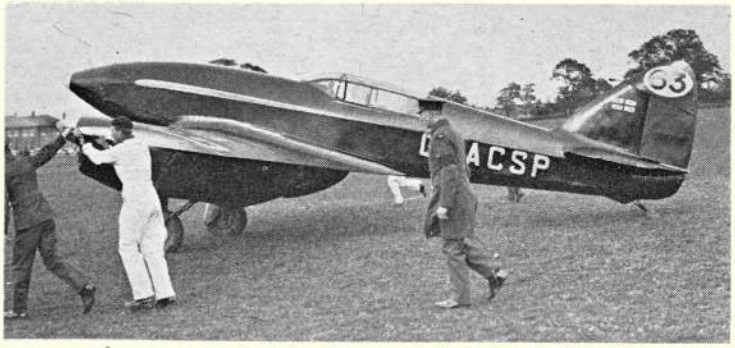
SHEET 2

0 1 2 4 6 8 ft

D.H. 88 COMET "GROSVENOR HOUSE"

Left, the Mollisons' 'Black Magic' at Mildenhall before its name was applied and shortly before the race, presumably having just made a test flight.

Right, Bernard Rubin's all-green aircraft at Mildenhall shortly before the race.



FULL-SIZE DYE LINE PRINTS OF THE 1/24th SCALE ORIGINAL PLUS A REPRINT OF THIS FEATURE, ARE AVAILABLE AS PLAN PACK No. 2149 PRICE 50p PLUS 5p POSTAGE FROM AEROMODELLER PLANS SERVICE, 13-35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTS.

For adequate cooling it proved necessary to change from Hamilton Standard to Ratier propellers, which in turn necessitated a special adaptor to the Gipsy crankshaft spline and improvising the Hamilton spinners to suit. Considerable difficulty was experienced in getting the pitch-change of both propellers to function simultaneously, occasionally even to function at all, but the Ratier expert was finally able to achieve a satisfactory level of reliability. Use of controllable pitch propellers enabled loaded weight to be increased by a calculated 1000 lb., mostly in fuel: empty and loaded weights were respectively 2930 lb. and 5550 lb.

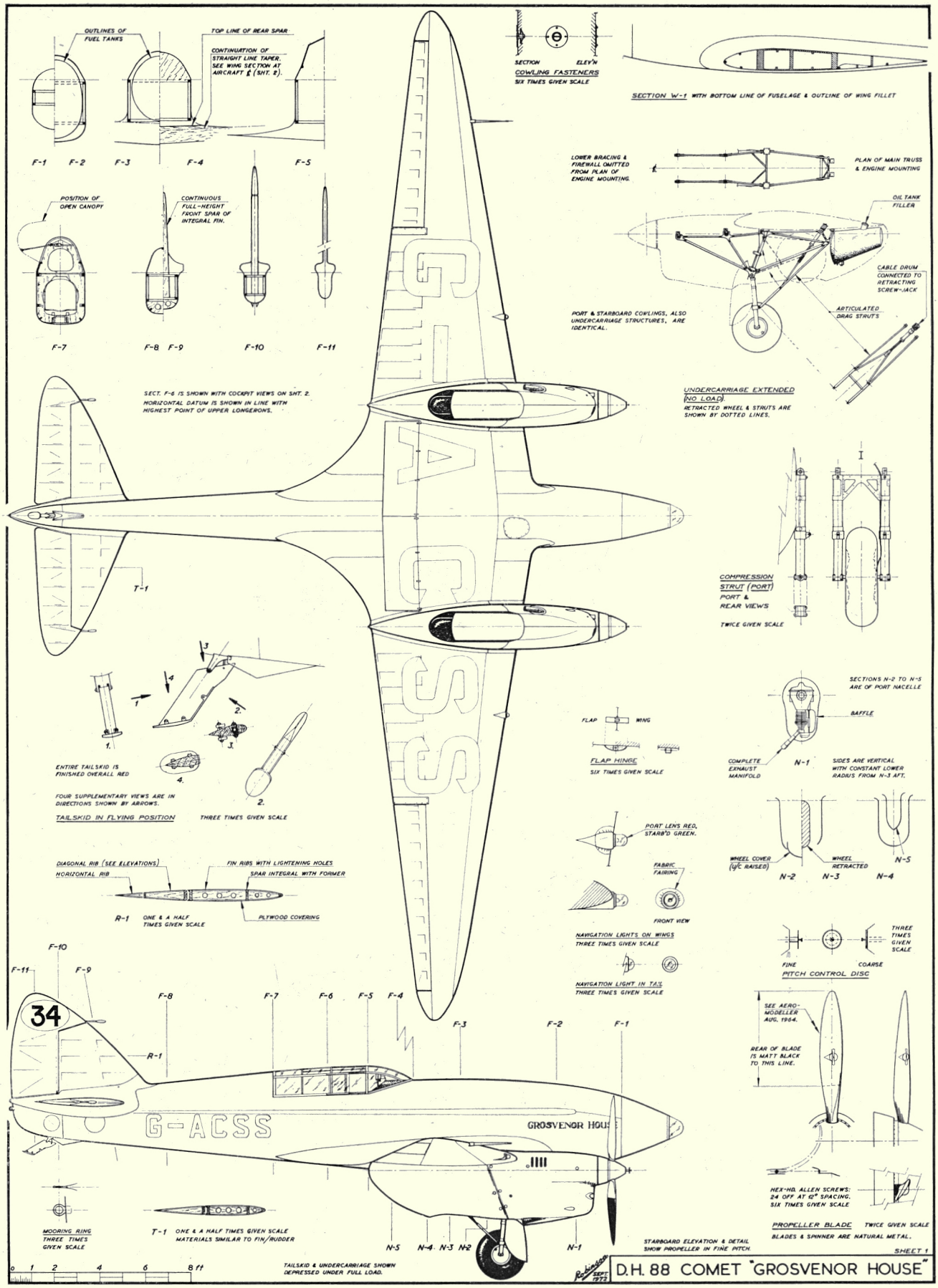
G-ACSP and G-ACSS were completed with landing light and raised cockpit canopy as well as the modified undercarriage and Ratier propellers. A rudimentary instrument panel was fitted to the rear cockpit and additional instruments in the front cockpit of all three machines, all to individual requirements. G-ACSS, owned by former racing motorist A. O. Edwards, managing director of Grosvenor House Hotel, was finished in brilliant scarlet with white trim and lettering. Scott and Campbell Black spent much of the short time available practising take-off and landing technique and running fuel consumption tests which showed the need for a last-minute mixture adjustment on the eve of the Race. That same night larger oil tanks were fitted to all three Comets which were then overweight and had to be refuelled with petrol of lower specific gravity. The story of the victorious flight to Melbourne of G-ACSS, the unfortunate retirement of the Mollison's *Black Magic* at Allahabad and the cautious fourth place of Ken Waller and Cathcart Jones in G-ACSR has been told many times with a detail impossible here.

After returning to England G-ACSS joined the R.A.F. as K5084 and was exhibited in overall aluminium finish at the 1936 R.A.F. Display at Hendon. Rebuilt for the Paris–Damascus Race of 1937 as *The Orphan* and finished in 'morning mist' and blue, G-ACSS finished fourth, later placed twelfth in the King's Cup Race, as *The Burberry* set a number of records from Croydon to the Cape and return, then in 1938 as 'Australian Anniversary' established further records between London and Wellington. Stored at Gravesend during the War G-ACSS was restored by De Havilland's Technical School for the 1951 Festival of Britain and now rests in honourable retirement with the Shuttleworth Collection at Old Warden. Propellers, cowlings, undercarriage fairings, cockpit canopy and other details are unfortunately not as the original but the thoroughbred lines of A. E. Hagg's brilliant design are in no way diminished while the success of his long-range low-drag formula and the structural innovations proved by the Comets for use in later designs continue to confirm the rightness of Geoffrey de Havilland's decision 'not to stand by'.

* * *

The author wishes to thank C. Martin Sharp, Esq., for permission to make extensive use of his book *An Outline of De Havilland History,* in preparing this account, also A. E. Hagg, Esq. who provided further details of design philosophy and Capt. Hubert Broad who supplied information on testing, handling and early modifications.

The eventual race winner 'Grosvenor House' in its red and white livery, seen at Mildenhall prior to the start of the race.



Winner of the aerobatics event, by quite a large margin was Louis Van der Hout from the Netherlands with his large-area, Veco 45-powered machine. Same model as he used at the Helsinki World Champs.

BOCHUM INTERNATIONAL

September 23-24th 1972

BRITISH MODELLERS are joining the Continental 'contest circus'! For several years now modellers, mainly those with free-flight interests, have attended Open-International meetings and now this welcoming trend is spreading to the control line enthusiasts. Latest Channel crossing competitors were speed enthusiasts Pete Halman, Brian Jackson and Gordon Isles backed by supporters and helpers Gordon Farnsworth, Mike Smith, Bill Firbank and Ron Irvine, the latter sidelined due to lack of time available between the Trials and this meeting to prepare his models.

An uneventful drive from Ostend to Bochum followed-well almost uneventful, if you discount a speeding fine, a 'ticket' for parking and the separation of one car from the convoy of three in Belgian fog! Naturally, that car's driver (Brian Jackson) was the only one who knew the the location and name of our hotel . . . . ever tried locating an orange Volkswagen in a large German town? Not easy!

The contest site itself was quite a revelation, being situated on one of many car parks spread around an enormous out-of-town hyper market – a shopping centre where one could literally buy anything from a needle to a car. This enormous complex closed after midday on the Saturday, permitting practice on a 'first-come-first-served basis. The organisers speedily erected a safety fence for the team race-speed circle, using masking tape to indicate circle markings. A stunt circle was likewise marked out alongside. The speed with which the car park was transformed into a contest site was remarkable (indeed after the comp. all traces were gone within an hour) and could provide food for thought 'at home'.

During the day contestants arrived from Belgium, France, Denmark, Switzerland, Holland and Austria as well of course from the host country Germany, to make it a truly international affair, which promised to be of a high standard. Naturally, with the World Champs held so recently, there was unlikely to be any new advances or techniques especially as so many of the faces present were the oh-so familiar ones!

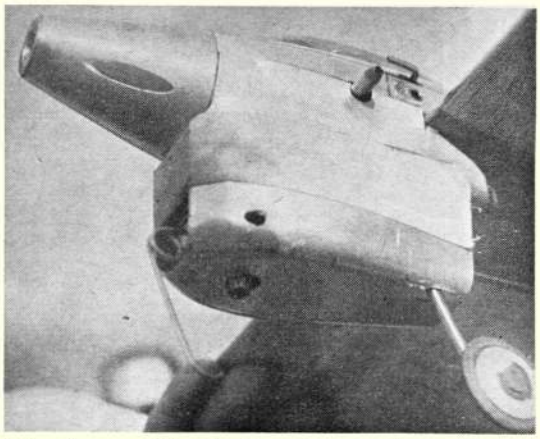
Speed attracted eighteen entries, and as is common at present, was virtually a one-horse event or a Rossi benefit! Three rounds were run over the two days, being interspersed by the team race fliers who used the same circuit. Only half the competitors recorded flights in the opening round, which saw local man Jurgen Lenzen record 244 km./hr. with his Miebach Rossi powered *Kingfisher* model, which he used to place third at Helsinki. Close behind were the Swiss flyers Bilat and Brechet, the former using his usual model, drawn in the October issue. The second round saw even fewer official flights, although this was not helped by the contest director's interpretation of the rule book – he started the three minute period from the time the competitor entered, the circuit, not from the moment the starter was first engaged, thus often allowing the competitor less than two minutes in which to record a flight. The final round saw Loius Bilat record 243 km./hr. – just 1 km./hr. short of Lenzen's only 'official', which bettered his World Champs flight of 240. Second member of the 'Miebach Speed Team', Emil Rumpel achieved 236 with similar equipment to Lenzen, and placed fourth.

Our own lads were still down on their luck with regards speed and could place no higher than seventh (Pete Halman) although Gordon Isles, competing rather than organising for a change, recorded his personal best flight of 227 km./hr. Brian Jackson could not reach his best form, and had to rely on an elderly 'Pink Lady' after breaking his new lightweight model at the Trials.

Of the eleven entries in Aerobatics, seven were 'regular' competitors in World Championships and International meetings, and thus the final results proved to be rather predictable! Not only were the faces familiar, but so too

At left is Jurgen Lenzen, winner of the speed event, with Emil Rumpel, who placed fourth. Both are members of the 'Miebach Speed Team' and used identical equipment – Miebach-tuned Rossis in asymmetric models which are covered entirely with lightweight glass-fibre cloth.

Nose of the Bugl racer – Paul's own machine pitted by fellow Austrian Baumgartner. Note the tape used to blank off the cooling duct of the metal cowl which is retained to the aluminium crutch by springs. Undercarriage leg is clamped to the crutch by means of a grub screw.



were the models, with the most outstanding exception being Claus Maikis who produced a new model in addition to his distinctive *Commodore*. This was based on a Midget Racer, and named Lariot after a famous German cartoonist. Finished in orange and white, trimmed with black, it was most attractive and when fully 'sorted' should be very competitive. He was in the minority in using a '35' for power (in his case a Fox), most preferring ·40 to ·49 cu. in. engines in large wing area machines. The winner, being decided by the best two out of three flights, proved to be Louis van der Hout with the same *Spider* model he used at Helsinki, followed by Billon of France, with a Merco 49 powered *Olympus*. Paul Tupker once more used his Nobler-based machine (how old is it now Paul?) to push Bert Metkemeyer and his well known *Trianic* into fourth spot.

Team race should have provided good times, considering some of the top names who had entered and the ultra smooth tarmac surface combined with calm weather. However, this was not entirely so, the fastest heat of the meeting being recorded by Bugl/Baumgartner (no prizes for guessing their motor!) at 4:32. Fellow Austrians Fischer/Nirtsche using identical equipment were just a second slower, while Dutch teams Visser/Buys and Metkemeyer/Metkemeyer were not far behind. As in Speed, nothing 'new' was to be seen, with the exception that Paul Bugl had fitted a needle bearing big end to his motor – and a magnificent bit of engineering that entailed! Marshalling standards varied, some blatant whipping going unchecked, while at other times it was harshly penalised. All in all the standards were not as high as they should have been – indeed it was possible to qualify for the semi-finals with a heat time of 4:54.

The Austrian challenge disappeared in the semis when Fischer/Nirtsche's lines snagged on the ground causing the model to run in at a pit stop, while Bugl/Baumgartner had similar difficulties. Of the seven Dutch teams present, five qualified for these semis – quite an achievement. Rumpel/Lenzen who had been going well with their Super Tigre G15 diesel conversion, were slowed by some 'bumping' in the pilots circle, and were also hindered by a motor slightly reluctant to restart, thus missing the final.

The final itself then brought together the Metkemeyer brothers and Visser/Buys together with Ole Hasling pitting for one of the Geschwendtner brothers – all using Super Tigre engines, the Dutch preferring dieselised G15, the Danes a S.T. 15 RV. The race itself proved relatively uneventful – only Visser-Buys suffering a missed pit catch with the attendant losss of time taking the model back to the appropriate segment. The net result was a clear win for the Metkemeyer brothers – indeed a repeat of their previous year's success.

All in all, a most enjoyable contest, run in a most friendly style and without the 'pressures' of a full International status meeting. Indeed, well worth a visit by more enthusiasts next year.

RESULTS

Speed

1. Lenzen (W. Germany) 244 km./hr. *Miebach-Rossi*
2. Bilat (Switzerland) 243 km./hr. *Rossi* 15
3. Brechet (Switzerland) 240 km./hr. *Rossi* 15
4. Rumpel (W. Germany) 236 km.hr. *Miebach-Rossi*

Aerobatics

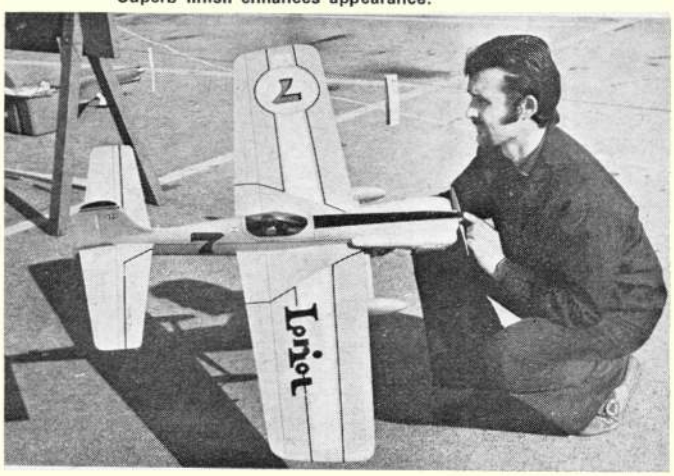
1. V. d. Hout (Netherlands) 2210 pts. *Veco* 45
2. Billon (France) 2073 pts. *Merco* 49
3. Tupker (Netherlands) 2015 pts. *Fox* 35
4. Metkemeyer (Netherlands) 2005 pts. *Super Tigre* 35

Team Race

1. Metkemeyer Bros. (N'lands) *Super Tigre G15 F.I.*
2. Buys/Visser (Netherlands) *Super Tigre G15 F.I.*
3. Hasling/Geschwendtner (Denmark) *Super Tigre G15 R.V.*

Team race winners once again were the Metkemeyer brothers, Bert and Rob, with their 'Turtle' racer. Motor starts life as a Super Tigre G15 glow run-in in a speed model, then is converted to a diesel and fitted with a Cox carburettor.

Claus Maikis' latest stunter is most attractive, resembling a Goodyear racer. Starboard cheek cowl detaches to give access to the Fox 35 and tank, which is removed sideways. Superb finish enhances appearance.



The designer with his chuck glider which has proved so successful this year – including winning the Nationals 'Hand Launch Glider' event. Simple construction makes it ideal for novice or expert alike, while it must rate as one of the cheapest contest models possible! Note appropriate footwear to provide good grip for the all-important launch.

HAVING BEEN aero-modelling for some 27 years, I have flown all types of free flight contest models, but my main interest has always been the chuck glider. Experiments with many different designs and flying techniques have revealed that the main problem has always been fuselage breakages, and to alleviate this, balsa, spruce, pine and mahogany in various shapes and thicknesses have been tried. I have also used ¼ in. beech dowel, but none of these have proved to be satisfactory – this being before the days of glass fibre tubes.

About six years ago I built an American design the *Little Monster*, this had a balsa fuselage with a flat top surface, with the wing and tailplane attached to the top surface. This fuselage shape has proved to be entirely successful, and fuselage breakages are now very rare. This model is a much developed version of the *Little Monster* designed to suit my own launching techniques.

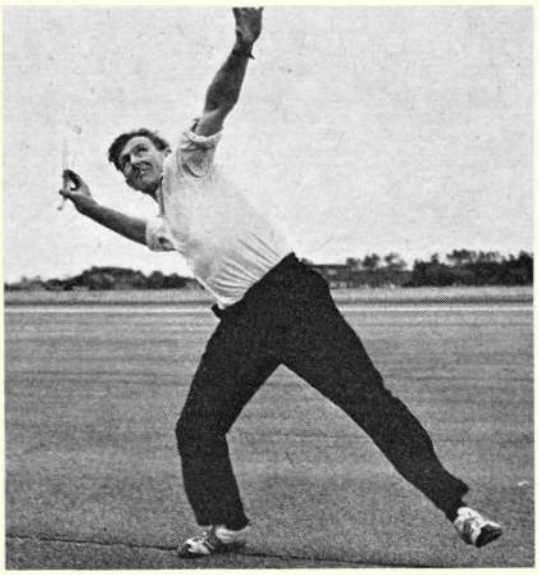
Wood selection for the fuselage is very important; it should be hard and straight grain which I prefer to cut from 1 in. x ¼ in. strip. Cut this strip to the correct fuselage length, measure ¼ in. from the top at one end and a ¼ in. from the bottom at the other, make a diagonal cut between these marks, and that makes two fuselage blanks. Balsa material for the wing should be medium light straight grain balsa, a sheet of ¼ in. x 4 in. x 36 in. should weigh approx. 3 ozs.

The tailplane and fin are cut from light, straight grain, and all wood should be springy. If one edge of the sheet selected for the wing is harder than the other, then use the hard side for the leading edge.

Continued on page 712

YOUR *TWO* MONSTER

an 18 in. span chuck glider designed by Roy Clark



Don't forget to let go, Roy! Launch is made after a run-up of approximately 14 strides, then maximum effect is put into reaching altitude. Roy flies 'tactically', launching several models to test the air before making an official flight.

NIEUPORT 11

a delightful, simple semi-scale free-flight model of 24 in. span, designed for .3-.8 c.c. engines by G. E. WHITEHEAD

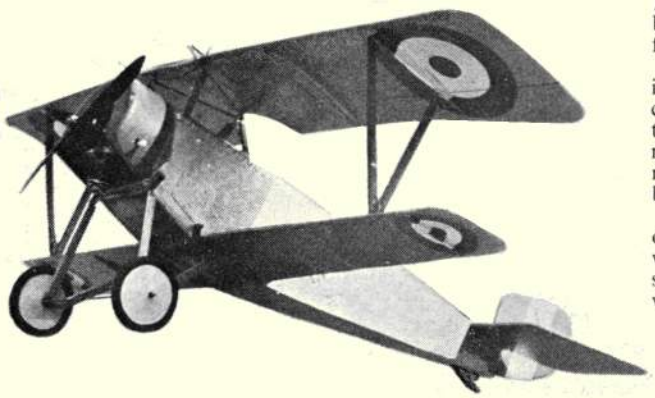
The designer with his attractive little free-flights – with a flight performance to match. Construction is all-sheet for speed and ease of construction, but this does not detract from its appearance. An 049 engine provides ample power.

DURING the critical period when the Fokker Monoplane reigned supreme over the Western Front, the Nieuport 11, its diminutive size earning it the nickname Bébé (Baby), armed with its single Lewis Gun, performed valiant service. It was flown by many celebrated French squadrons and pilots, including Guynemer and Nungesser. The little Nieuport was also the first combat aircraft to carry the famed 'Escadrille Layfayette' into battle.

This simplified model has all the agility and grace of its full-size counterpart despite the all-sheet construction which greatly eases both the building time and effort needed to produce such a replica. Beginner or expert alike will find much enjoyment with the fine flying performance of this 'Class II' model, which looks so realistic in the air. The sweepback of the wings combined with the small amount of (non-scale) dihedral, provides plenty of stability without recourse to such 'artificial aids' as pendulum control.

FREE PLANS!

Cut out all fuselage parts and bind the cabane struts to formers F2 and F3. Score the sides at F4 as mentioned on plan, by pressing the edge of a ruler along the line into the wood. Then bend the sides, without cracking them, over the edge of a table. Using an impact adhesive, glue the 3/32 in. sheet doublers in place and add the bearers if used. Next, cement F2 and F4 in place between the sides and join the tail end, all in one operation, and check for squareness. Note that if a radial engine mounting is being used, then F2 is set to give the required down and sidethrust angles. When set, add all remaining formers and the stringers, followed by 1/16 in. sheet cockpit coaming and 1/32 in. sheet bottom (not forgetting the 1/16 in. sheet doubler at tail). The 1/16 in. ply undercarriage support comes next.



Make the cowl by wrapping two 1/16 in. laminations around a 1 lb. 'Tate and Lyle's' Golden Syrup tin, then fitting the 3/16 in. face plate. Bend the u/c wire as shown in the perspective view on the plan. The rear struts are supported by the lower wing bands.

Wheels are built up for lightness, and are made with 1/8 in. sheet 'tyres' on a 1/16 in. ply disc, with brass bush bearings and postcard cones. All strut fairings are made from postcard.

The wings are cut from medium grade 1/8 in. and 3/32 in. sheet and are cambered by wetting the top surface and cementing the ribs in place. When set, join the panels with the requisite dihedral, and then remove the centre ribs and reinforce with 1 in. wide tape. Bind on the interplane strut retaining tubes and add the celluloid reinforcement to the bottom wing strut anchorage hole.

Sand the tailplane and rudder, and cover these and rest of model with lightweight Modelspan tissue, doping on with banana oil to prevent warping – two coats are sufficient. A thin, sprayed coat of silver follows overall, while the cowl is red, and the wheel discs white. The

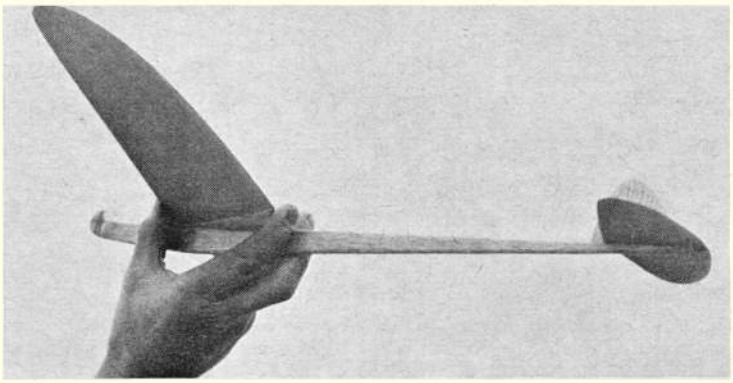
Indian's head (Seminole) is great fun to paint, so don't miss it off! All struts are brown. Strictly all the edges of the wings, fuselage and tail should be outlined in black, but this uses up yards of masking tape!

First flights should be made on low power, with the propeller fitted on backwards to reduce thrust. A D.C. Merlin was used on the original – because it is the smallest engine that the designer possesses – and this easily overpowered the 7 oz. original. This power was used because the fitting of single-channel radio control is contemplated as a future development. However, for free-flight, anything from a Cox 'Pee Wee' to a 0·5 cc diesel is more than adequate.

A left-turn on power and glide is the trim to aim for. When this is achieved, open the 'taps' and get performing some free-flight aerobatics, then you will understand why it is much less harassing to fly a simplified (50-foot rule?) scale model!

MONSTER

Continued from page 710



Note the somewhat unconventional grip which Roy uses – first and second fingers either side of the fuselage, with the thumb on the leading edge of the port wing. Try it – it helps gain height!

Cut the sheet to the length of the wing and find the middle, then using a square, mark a line across the centre either with a hard pencil or ball point pen, using plenty of pressure while doing it. Use the marked surface for the bottom of the wing – this will make it possible to cut the wing in the centre after carving the top surface to shape. Cut out the wing to the outline shape and taper the tips to $\frac{1}{16}$ in. thick. Carve and sand to section, (a razor plane and good sanding block make this much easier and give a better section than carving with a knife). Now split the wing in the centre, place the root of one wing half at the end of the building board, and prop up the tip $2\frac{5}{8}$ in. Using the end of the building board as a guide, sand the root to the correct angle, to suit the dihedral. Repeat with other wing half and join together with 5 minute epoxy resin.

Cut the fuselage to shape and mark wing, tailplane, and weight positions. Leave these surfaces flat and sand the other corners round. By this time the wing should be ready to fix to the fuselage. Cut a shallow V in the flat position for the wing, and glue wing in place, again using 5 minute epoxy. The tailplane is cut from $\frac{3}{32}$ in. sheet as is the fin. Note that on the fin the left hand side is left flat, the other side is sanded to section (for left handers the right hand side should be flat and left hand side should be sanded to section).

Throwing tabs should be hard $\frac{3}{32}$ in. balsa and should be epoxied into position. All joints should be strengthened with small fillets of epoxy resin.

Finish and sand model with fine garnett paper, and dope with mixture of 50-50 dope thinners plus about 1 teaspoonful of castor oil per $\frac{1}{4}$ pint; approximately four coats will be needed. Sanded with fine garnett paper between each coat, this builds up a considerable thickness of dope. The final finish is achieved by using very fine wet and dry paper used wet, after this use Holts Rubbing compound applied with a damp cloth. This brings a high gloss finish. I do not usually dope the nose section until the rest of the model is finished as this leaves something to hold onto while doping and sanding.

Cut the nose weight from a stick of solder or cast from lead, bind to the top of the fuselage and epoxy into place. Dope and finish nose and apply a good wax furniture polish to the whole of the model.

Trimming

For a right handed thrower, warp the trailing edge of the left wing down approx. $\frac{1}{16}$ in. and warp in slight left rudder. Test glide to get a reasonable glide and now the hard work begins.

The model should be held with the fuselage between the index finger and second finger, with the finger tips resting on the throwing tabs. The thumb should be in front of leading edge of left wing.

Monster should be thrown as hard as possible in a steep right hand bank, and upwards at a 60 degree angle. It should climb in a steep right hand turn and glide left.

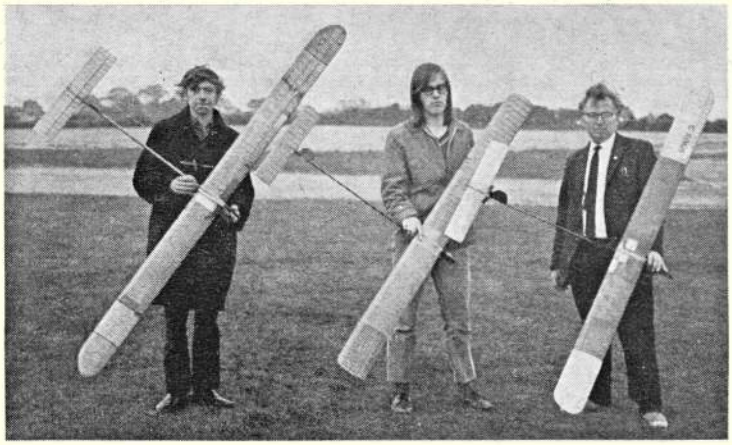
For left handed throwers, the right hand wing trailing edge should be warped and right turn applied to fin. After the climb has been sorted out, the glide may be improved by filing the lead weight, but aim to achieve the best climb first by warping the trailing edge of the tailplane and wing.

I like a long run up when launching and run approximately fourteen strides to achieve the maximum speed for launching. The launch itself is a sort of underarm javelin throw – put all the effort available into the launch, but don't forget to follow through after.

Lots of practice is needed to achieve consistent results but it is well worth all the effort.

As for contest flying I can't really say very much as I have only just started again after a long lay off from competition (but not from aero-modelling) and I am out of touch with thermal finding techniques, but I have managed to win the three contests entered this year including the chuck glider event at the British Nationals.

If the model is flying well and suddenly seems to go off trim this is usually caused by down draughts – under these conditions the model feels very hard to throw, but in good air it seems very easy to launch.



John O'Donnell's

FREE FLIGHT COMMENT

FIRST THINGS FIRST' is a good principle – but one that can be interpreted in different ways. Normally I deal with contests in their correct chronological sequence – but it would seem appropriate this month to make an exception and give priority to the Team Selection Trials.

The first half of the Trials was held in August. As recounted in last month's 'Comments', good weather had given high scores and close placings – leaving many competitors well within 'striking distance' of a team place. Much was going to depend on the climatic conditions of the second Trials, as rough weather would cause scores to open up, and give a real chance to those originally placed well down the list.

Predictably enough, the attendance at R.A.F. Stubby on the weekend of 30th September – 1st October (for the second Trials) was well down compared with six weeks earlier. Understandably those who had real trouble in August were disinclined to travel long distances merely to 'go through the motions' of another seven flights.

Those 'still in the battle' were soon to find that the weather was very different from the first Trials. Saturday, 30th September started cool, overcast and murky – but with only a light breeze. Lift proved to be more plentiful than might have been expected but it was weak, short-lived and difficult to detect with any accuracy. Mistakes in picking the right moment to launch started to become common – but usually gave mediocre flights rather than any real disasters.

As the day progressed the breeze freshened and conditions became a bit brighter, with lift becoming rather easier to find. Both Wakefield and A/2 started to show changes as several well-placed competitors dropped quite a lot of time and there was a continual reshuffling of the top positions.

In glider, Messrs Cordes, McNeil and Thomas all managed four maxs a piece on the Saturday – and there were several others with three maxs plus a near-miss. In contrast Tony Young could not achieve a single max and dropped from first place to right off the leader board. Wakefield was less dramatic although only Ron Pollard was able to prevent it becoming a London Area monopoly.

Power, with its substantial reserve of performance, was untroubled by the weather, and most of the top contestants were able to record treble maxs on the Saturday. The only real casualty was Fred Chilton, originally fourth who had a sub-minute flight to finish off his hopes. The top trio of Mike Green, Phil Ireland and Roger Baggot remained unchanged with a still-perfect score – now ten maxs each.

Sunday morning certainly brought the 'winds of change' with a vengeance. It was windy right from the start with models clearing the drome in a lot less than three minutes. The initial three rounds or so were also misty. At this stage the visibility was marginal for maxs, even with the allowed use of binoculars, and a number of models were clocked off below three minutes.

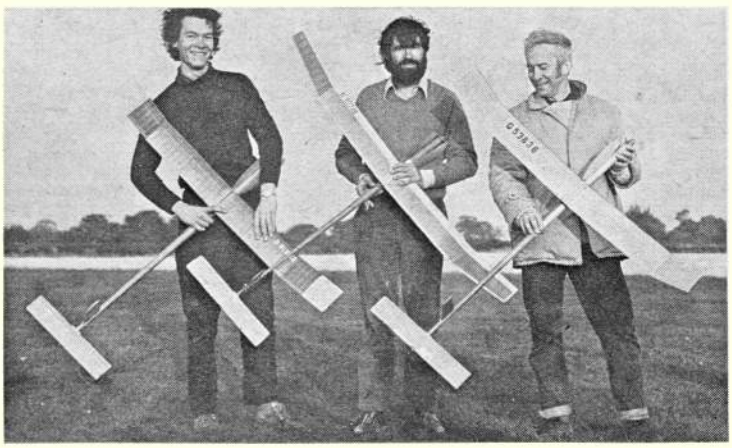
The wind obviously troubled most of the Wakefield and A/2 contestants, with less at stake I suspect very few would have flown at all! Many Wakefields had pattern-problems, or undue sensitivity to turbulence, and only really climbed if they were launched into lift. Towline instability and/or weak wings soon proved to be the undoing of a lot of gliders. Very, very few fliers could do more than tow 'up and off'. Even the release gave trouble to some due to the difficulty of slackening the line enough to release the ring *and* the auto rudder -cum-timer pin.

Rather less affected were the F.A.I. Power models – apart from those that used a straight climb *without* sufficient horsepower to haul the model up regardless of wind effects. The easy procession of maxs, very soon ceased, with Roger Baggot over-banking his model on launch and scoring under a minute. Phil Ireland lost a few seconds early on the Sunday morning when his model disappeared O.O.S. whilst still well up. This proved to be his only real 'mistake' of the whole Trials, and still left him in eventual first place. Phil Green was the only person to have eleven straight maxs, but he failed to keep up the pace on both his next two flights and finally finished up in fifth position.

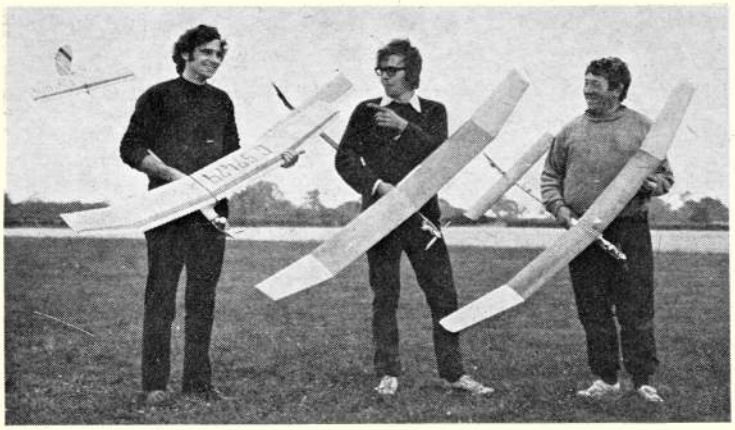
Meanwhile other power competitors had been plodding on steadily and now found they really did have a chance. The most consistent performance came from Ray Monks who made no mistakes at the second Trials to record the only 21 minute score of the week-end. He had some very long flights and spent most of the Sunday on 'recovery'. One retrieval was fortuitous in that the model was lying unnoticed in a garden right in the centre of the downwind village. All his efforts paid off to the tune of second place.

Roger Melville and Tony McCombie had both made up a lot

Heading picture shows the glider team selected for the 1973 World Champs being composed of (l. to r.) J. McNeil, John Cooper and, of course, our columnist J. O'D.



Wakefield Trio for the forthcoming World Champs, to be held once again at Wiener Neustadt, from 14-19th August, will be (l. to r.) Messrs. Keynes, Mabey and Spooner.



Our interest in the Power event in Austria next year will be looked after by Messrs. Melville, Ireland and Monks (the latter on extreme right) having represented this country on an untold number of occasions, indeed, he is almost a 'fixture' at any World Champs!

of ground and were jostling for a Team place. They both had trouble in locating their first-line models and ended up flying reserves. This proved to be Tony's undoing as his spare was not a match for his very fast Rossi model (notable for also using one of clubmate Laurie Burrows' glass-fibre fuselages). On the other hand Roger managed two maxs with his back-up model to clinch third place in the team.

Both Wakefield and A/2 had sensational scenes in their final rounds. Most of those still in contention for the rubber event waited till near the end of the last round for some encouraging indications from the Croydon club's bubble machine. Eventually the bubbles rose and several fliers promptly launched-only to find that on this occasion the oracle was very wrong! Apart from there being no lift, the air was very turbulent. Ron Pollard did a 100 second flight to lose both his lead and a possible team place – very disappointing after being at the top for several rounds. Worse flight of all was by Dave Hipperson whose model wallowed about to barely fly out the turns to make scarcely half a minute in the air! All he needed at this stage of the game was a 2¼ minute flight and he would have been in the team. These disasters left the way open for others. John Mabey (who had four early flights under maxs) and Bryan Spooner (with leeway to make up from August) both finished in fine style to place first and third. In between came Ian Kaynes to complete Croydon's 'clean sweep' in what they like to call FIB. Ian had by far the best Wakefield total of the Second Trials with six maxs and a final 2:30 – quite remarkable flying in the conditions. Success did not come easily as both Mabey and Keynes crashed a model immediately after launch whilst the former also lost another.

A/2 went topsy-turvy in Sunday's wind – and in the last round in particular. Some very good flying throughout Saturday and in the first Sunday round had brought Messrs. Cooper, Cordes, Madelin, McNeill and Thompson up to the top of the list. The penultimate round saw the picture start to change. Both Tony Cordes and Gary Madelin made two minute odd flights, whilst Don Thompson was done in under a minute and a half. A handful of maxs came after other competitors.

The final round proved to be both decisive and controversial. There had been a very high attrition rate in glider, and there were probably only around 20 or so fliers still trying. After hovering all weekend just below the top positions, I knew that my only hope was to fly in different air from those above me! There was a slight lull in the wind just after the start of the 14th round and I was the only one to launch. It wasn't quite a max due to the model disappearing behind the airfield's control tower – but it was sufficient to assure me of a place. Lift was very scarce at this stage and most fliers apparently waited a long time in the rain. There were several dreadful flights of little more than a minute, some from good launches, by Cordes, Madelin, Thompson and Barnes. Right at the end came two good flights; two minutes plus by John Cooper and the round's solitary max to the credit of Jim McNeill. Both were 'second attempt' following line breaks on their initial launches – and were more than good enough to bring them up to first and third.

This however, is far from being the end of the story. John Cooper had suffered a second broken towline, and there were several witnesses willing to testify that his model had been trailing the tow-line pennant (and hence at least part of the line) whilst being timed. As there was a team place involved there was naturally a lot of comment. There was no official action until Tony Cordes submitted a 'protest' in writing, countersigned by witnesses. Tony was in fourth position and obviously standing to gain. This situation always prejudices a protest, but apparently no one else would make an official complaint.

When Cooper found his model he discovered that the tow-ring was no longer on the model's towhook, and that the broken line and pennant were merely looped round the ring. He called George Lynn to verify this; and claimed that F.A.I. rules should apply, that the model had been released *prior* to the line re-attaching, and that the flight should count in consequence.

George Lynn who was contest Director would not make a decision and said the matter would have to be referred to the S.M.A.E. Council. It did however transpire that there was no agreement as to *which* rules were being used at the Trials! The S.M.A.E. rulebook and the F.A.I. Sporting Code differ in detail, and treat the case of a hooked tow-line in diametrically opposite ways. By British regulations an attempt *cannot* be counted should the line break. Two such incidents give a zero score for the flight. On the other hand the F.A.I. make no distinction between broken lines and normal launches, merely stipulating that timing starts with the release of the model from the 'launching cable' and that a certain size pennant must be fitted to facilitate observations and timing.

The problems of broken towlines has been with us for a long time. Although the S.M.A.E. rules are quite explicit on the matter, many modellers seem unable to accept the rules as written. There is a strong emotional reluctance to discount a max made from a line-break or to give (or accept!) a zero when it happens twice! Reluctance to work 'to the book' is symptomatic of our present lax attitude to contest organisation. Other instances could be quoted from the trials. One glider flier was *allowed* a third attempt, following first a towing and then a very short flight off a broken line. The full story came out from the timekeepers *after* the decision. Although his extra attempt gave him a max, it was fortunate that the next flight was down in 50 seconds or so, otherwise there would certainly have been another protest. There were frequent mutterings regarding deliberate line 'touching' in A/2, intending simply to ensure the participants had another try if the model failed to max. The technique is legal, but is clearly undesirable if skill is to be the criteria. More disturbing were persistent, but unofficial, complaints of generous timekeeping and the resultant advantages to the 'favoured few'.

Before going on to describe the winning models it is appropriate to report the eventual outcome of the protest made at the Trials. George Lynn wrote to tell me that the S.M.A.E. Council Meeting of 21st October discussed the matter for 40 minutes before reaching a majority decision that Cooper's flight should stand.

Because of the other alleged irregularities' it was even suggested that the whole of the A/2 Trials be reflown next year! Regardless of one's views on the Council's decision and I cannot see how it agrees with **either** rulebook I am sure there is plenty to be learnt from the whole unfortunate incident.

John Mabey flew three models at the Second Trials – and then produced a 'bitsa' for the group photographs! All the models follow conventional modern practice – apart from his use of a *helical* pitch 560 x 720 mm. propeller. Motors are either 14 or 16 strands dependant on quality. Both the model used for the last flight and that photographed utilised Laurie Burrows glass-fibre tubular fuselages. Ian Kaynes had a Murrey Stringer prop assembly on one model – but broke the hub across a lightening hole in a crash on the Sunday. His favoured motor tube construction comprises two layers of $\frac{1}{32}$in. balsa, spiral wrapping in opposite directions and with glass-fibre inside. He uses a 560 x 700 mm. propeller, again helical, and standardised as 16 strands throughout. Bryan Spooner flew both hit high aspect ratio models (as seen in the 1970 Trials and subsequen. Finals) on the Saturday and his so-called 'windy-weather models'

This in fact is the first model he built in England after returning from Germany in 1968. It has a Hofsass wing cut in the centre and rejoined with plenty of polyhedral. Wing section on all his models is the Thomann F4. Propellers use Schwartzbach's pitch distribution (normally 730 mm. at 60% radius) but with a straight centre-line on the blades. All three members owed their success to the bubble-machines operated by Jack North and John Woodhouse at the First and Second Trials respectively. For those interested 'Palmolive' gives the longest lasting bubbles!

John Cooper's A/2 design is very straightforward and shows much *Rolling Stone* influence – but with a glass fibre rod fuselage. Compared with Dave White's APS design, John has changed the wing section and added more span. After losing a model at the first Trials he built a replacement in just three days. He used a 20 lb breaking strain nylon line. and now knows it isn't enough! Jim McNeills' *Scotch Mist* design appeared in the 70/8 issue of *Free Flight News* and is unusual in having a wooden fuselage with a very low, almost rudimentary pylon. Wing section is from an early design of Tony Cordes – with the undercambered T.E. straightened out! Jim's flying at the Second Trials must have been inspired – as he only dropped a little below seven maxs and that was on visibility. His piece of luck came when he broke a line on the very first flight, but the remnants and pennant stayed on the model. My pair of A/2s must be familiar to all in the English Contest circuit – and are the same models taken to Finland in 1965 and the States two years later! Aerodynamics apart their most unusual feature is a pivoted towhook system that works the timer and rudder without extraneous pins and the like. This permits an instantaneous release merely by letting go of the towline ('sans' winch I would emphasise), and trimmed correctly, permits a 'catapult' launch with a considerable gain in height. Combined with strong wings and a 33 lb. line, this system really paid off in Sunday's wind.

The final power team was a Rossi benefit. Phil Ireland used but one model for all 14 flights – all sheeted and with a flat-bottomed version of Verbicky's wing section (minus 10 mm. off the T.E.). Hardware comprised a Rossi 15 (with a 6.5 mm. i.d. venturi and Rossi glow heads), Top Flite 7 x 4 in. nylon prop., Ray Collins pan, and a Seelig timer. Ray Monks also had an all sheeted model (but with Benedek 8353 b2 wing section) with Rossi power. Other accessories included an old-type Derek Culpin pan, Krekschmer style 6$\frac{3}{16}$ in. x 4 in. g/f prop, and Ray's home-made timer utilising musical-box movements. Although he has used glass fibre rod fuselages, his Trials model was like the Pierre Trebod 1972 winner in having a balsa box fuselage. Roger Melville made up the Power trio. His first line model used a Rossi, Miessnest 7 in. x 4 in. (approx.) g/f prop, Seelig timer and Ronytube fuselage. Wings had the Koster *Cream* section and were *not* all sheeted! When this model went missing temporarily, he used a G15 powered reserve with normal fuselage construction for his last two maxs.

Subject to formal confirmation by the S.M.A.E., the first three people in each category will form the British Teams for the 1972 world championships.

* * *

September is always a popular choice with Rally organisers, and this year is no exception. There has been a lot of meetings and most will have to wait till next month before they can be reported.

The fourth *Northern Area Rally* was held at R.A.F. Lindholme on 3rd September, and was fortunate in having very pleasant flying weather. A calm 'flat' morning was followed by a brighter, if breezier afternoon, calming down before the evening fly-off. All told there were 32 separate events scheduled (16 F/F, 10 R/C and a mere 6 C/L) with a simple fee of 25p permitting entry to any or all! A comprehensive report on even the F/F segment would 'fill a book' so a few highlights will have to suffice.

Although most of the popular classes had to be decided by fly-offs, the combined F.A.I. event proved to be an exception. For some reason this was not dominated by the power entrants, and proved to be a glider benefit. Dave Barnes placed first, ahead of John Sayer and Bill Parker. All had four maxs and one otherwise.

The other combined event was 'Mini' flown using 'correction factors' to amend scores in the hopes of equalising the relative performances of Cd'H, A/1 and ½A power. The concept seems detested by both the non-mathematicians and those who consider it penalises their favourite class! There was a three way fly-off after five two's, with two Coupe's versus one A/1. I managed another win with my delayed-prop-release model even without the 'Fudge-factor'. Julian Hooper was second with a glass fibre rod A/1.

The 'minor' events were not well supported but scores were good. Henry Tubbs won tailless and John Godden won Vintage (with a *Scram*) – both with trebles. In Jetex I scored two maxs with my ancient (1950) model – and didn't need to fly again as I had a two second lead over Bill Newton. His model was remarkable for simple construction and the absence of a D/T. Barry Kershaw had a good day in winning both outdoor *and* indoor chuck glider. He had four 1½ minute maxs in his 7:14 outdoor total, whilst inside the hangar scores were around 24 seconds or so. The other events seemed to have suffered through being only a week after Cardington. There were no entries in Microfilm even though Stan Wade was doing 'demonstration flights' – and I took Tissue with a purely nominal score.

The three Open events had fair sized fly-offs. Power saw Brian Martin and Ron Johnson over-run, so leaving top places to go to Russell Peers, Ewan Jones and Mike Hargreaves, in that order. Russell used his K & B 40 model for the flyoff and had a 1½ minute margin. Open glider proved successful, if expensive, for Terry Dilks. He found weak lift with his 1½ size *Caprice* lightweight, and landed near the edge of the airfield. When he went to look for it after the rubber flyoff it was nowhere to be found! Theft is suspected – but why? Runner up in glider was N. Jackson with a *Lively Lady*, whilst Jack Kay was third – well ahead of the remainder of the field.

The open rubber flyoff gave the organisers a problem when Alan Jack's timekeepers differed one to another by over two minutes. Eventually, and on the evidence of onlookers with binoculars, the higher time was adjudged to count. This put Alan in top spot, a minute in front of John Carter's 6 foot-monster. John Turner was third with an unfashionable free-wheel propeller model.

Prizes at this meeting were cash – augmented by an array of tools donated by Messrs Stanley Works Ltd., and other contributions from Keil and M.A.P. Few events these days seem to receive any such support from the Trade.

Results:

TEAM TRIALS (Total score in seconds from both meetings)
A/2 Glider: 1. J. Cooper (N'hampton) 2378; 2. J. O'Donnell (Whitfield) 2362; 3. J. McNeil (Crookham) 2357; 4. A. Cordes (Leeds) 2304; 5. G. Madelin (Crookham) 2302; 6. D. Thumpston (Croydon) 2280. **Wakefield:** 1. J. Mabey (Croydon) 2383; 2. I. Keynes (Croydon) 2366; 3. J. Spooner (Croydon) 2359; 4. R. Pollard (Tynemouth) 2341; 5. D. Hipperson (Croydon) 2257; 6. J. Punter (Hayes) 2225. **Power:** 1. P. Ireland (Southampton) 2514; 2. R. Monks (Birmingham) 2492; 3. R. Melville (St. Albans) 2460; 4. A. McCombie (Blackheath) 2426; 5. M. Green (C/M) 2422; 6. B. Martin (Tynemouth) 2375.

NORTHERN AREA RALLY, R.A.F. Lindholme, September 3
Open Power (26 entries): 1. B. R. Peers (Falcons) M+ 5:02; 2. E. B. Jones (Sunderland) M+ 3:30; 3. M. Hargreaves (Leeds) M+ 3:24. **Open Rubber** (25 entries): 1. A. G. Jack (Tynemouth) M+ 7:25; 2. J. Carter (Falcons) M+ 6:26; 3. J. Turner (Darlington) M+ 6:14; 4. F. Elton (Leeds) M+ 5:33. **Open Glider** (40 entries): 1. T. Dilks (Falcons) M+3:46; 2. N. Jackson (Grantham) M+3:19; 3. J. Kay (Leeds) M+ 2:50; 4. D. J. Williams (Whitefield) M+ 2:16. **Tailless** (6 entries) 1. H. Tubbs (Leeds) 9.00; 2. J. Pool (Halifax) 6.00; 3. F. Elton (Leeds) 5.33; 4. G. Simpson (Grantham) 5:21. **Vintage** (11 entries): 1. J. Godden (Leeds) 9.00; 2. G. Jennings (Leeds) 7:19; 3. F. Elton (Leeds) 6:05; 4. J. O. Donnell (Whitefield) 5:51. **Chuck Glider** (9 entries): 1. B. Kershaw (Wigan) 7:14; 2. C. Allen (Falcons) 6:09; 3. E B. Jones (Sunderland) 5:45; 4. D. Yates (Wigan) 5:28. **Combined F.A.I.** (22 entries): 1. D. Barnes (Liverpool) 14:28; 2. J. Sayer (Darlington) 13:45; 3. W. Parker (Norwich) 13:31; 4. B. Baines (R.A.F.M.A.A.) 13:16. **Mini Comp** (13 entries): 1. J. O'Donnell (Whitefield) 2:24; 2. J. Hopper (Stansted) 2:21; 3. F. Elton (Leeds) 0:53. 4. B. Kenny (Sheffield) 9:06. **Jetex:** 1. J. O'Donnell (Whitefield) 6:00; 2. W. Newton (Leigh) 5:58.

Tony Cordes just failed to reach a place on the disputed A/2 team. Had Cooper's line-break decision gone the other way, he would have taken his place.

The Ruymbeke all-plastic ornithopter is an outstanding flyer capable of covering over 150 ft. – if it can be done with rubber power, why not with a motor and radio control?

Simulated Bird Flight

— with radio control

Two fascinating challenges with valuable prizes for pioneers

FOR CENTURIES man has endeavoured to emulate the bird, with limited success. Several nations have special study centres to search for information which might eventually lead to man's use of the remarkable mechanism which enables a bird to fly so efficiently; but enormous gaps remain in our knowledge. Fortunately baby birds remain ignorant of man's dilemma and perpetuate the mystery with the coming of each Spring.

Tests at the University of Oklahoma have clearly indicated the values of study into bird flight aerodynamics, and other, less revealing centres of learning sustain expensive research departments. One authority in the U.K. has expressed his conviction that use of oscillating wings is more efficient, safer and would have better control than the rotary wing systems as in helicopters. Yet to most laymen, the suggestion that man should fly precisely like the birds becomes the trigger for bemused laughter. Thank goodness the pioneers such as Ader, the Wrights or Igor Sikorsky were never deterred by amused spectators.

Moreover, in model form, the bird flight 'Ornithopter' has for a long time been a practical subject. In recent years, the mechanism which has seen such long use on built up models was developed in several plastic toy models, and by virtue of the high strength, these toys can absorb high torque loads and produce thrust for steep climbing flights.

In America, noted aircraft designer Mr. Spencer (best known for the Republic Sea Bee) has demonstrated glow plug powered ornithopters and the renowned Alexander Lippisch (Me 163, Convair Delta Dart) made many record breaking rubber and petrol engined ornithopters in pre-war Germany.

The arrival of the radio controlled helicopter model – hitherto considered 'impossible', gives credance to the suggestion that similarly radio controlled ornithopters will be flying long before 1984, in fact, even within the year.

One anonymous donor has already established an offer to S.M.A.E. members for a **'Natural Flight Race'.** Now this offer is open to everyone, and the regulations are printed here for the widest possible exposure. The challenge is for multiple entries to demonstrate comparative efficiency by flying around a triangular course.

Simultaneously, John Mew, another interested benefactor, offers a series of awards for best flights by a model which could ultimately be scaled up for man powered flight. While the approaches are different in purpose, there is a common area of interest which could lead to one model design competing in both events.

Who'll lead the challenge? AEROMODELLER will accept all applications for entry, will forward enquiries and play its part in arranging any contest. We will also keep readers informed on support and progress.

NATURAL FLIGHT RACE 1973

Objective

To determine the fastest (or farthest flying) 'natural' flier whilst flying round the prescribed course with up to three other craft.

Models

The models must be 'natural' fliers propelled only by oscillation of the wing, or parts of the wing, whereby more than half the propulsion comes from the outer half of the wingspan (i.e. the halves of the wing remote from the fuselage region) and whereby regions continuing directly inwards from the main propelling regions may have compensating effects, contra-oscillation, and propulsive properties; but whereby oscillating regions and lifting regions (other than a tail) must not be provided at any position separated from the wing; and whereby contra-oscillation must not exist, except as above, and except in the form of any necessary tail oscillation. Thus 'natural' fliers, so defined, may somewhat resemble birds (and even four-winged insects which have their wings hooked during flight); but *not* insects with contra-oscillating wings such as dragonflies etc.

Engines

Total displacement of internal combustion engines must not exceed 6.5 cc. Power to weight ratio must not exceed 1.45 cc. engine displacement per pound of total unfuelled craft weight. Extensibile motors of any power may be used.

Wings and Weight

No limits on wing area, span or minimum weight, for the first two years. The weight, without fuel, but including all equipment, must not exceed 6.5 lb.

Control

The model must be equipped with radio control to enable the flight path to be determined by the contestant.

Entries

Each contestant shall enter only one model, but he may own a second model which is entered by another contestant. Prize money will be conveyed to the winning contestant and not to the owner.

Each entry must be accompanied by scaled drawings of plan, and elevations, together with a statement of the craft's weight, and engine capacity. All craft must be available for inspection by the organisers, and view by other entrants and known outsiders, at least two hours before the start of the contest, in a viewing enclosure. The winners must make the above drawings and information available to any journals on request.

Course

As for Radio Controlled Pylon Racing. 10 laps.

Flying Procedure

When the model(s) have their engines running, or at the end of the four minute starting times, and are

ready for flight, self-take-off craft will be released from the starting line simultaneously, on a signal given at the moment timing starts. Hand-launch craft will be released on a second signal given 15 seconds after timing starts. Hand-launched craft must not be released by running, and must not have a launch speed noticeably (i.e. more than 50%) greater than the average flying speed. Self-take-off craft must take off before travelling 50m., and will qualify for distance measurements from the observed point of take-off. If any pylon turn is accidentally cut, it must be re-circled before the craft is deemed to have progressed past that pylon.

Judges and Markers

As for Pylon Racing; also – where applicable – officials may record the distance flown, by inserting stakes where the craft take-off and first touch the ground. Tape measure readings can then be made for the winners of the heats and the final.

Preliminary Heats

The preliminary shall consist of not fewer than five heats unless there are fewer than five entrants, in which case there shall be as many heats as there are entrants. Each craft may enter in only one heat.

Winner

The winner of the preliminary is the one craft which either completes 10 laps in the shortest time for the preliminary, or flies the farther distance in excess of 5 metres if no craft completes the course in the preliminary.

Final

The final shall include in one race, only those craft which have flown in the preliminary. Not more that four craft shall enter, and they shall be firstly the models which completed 10 laps in the shortest time, and secondly, if necessary to make up the four, the models which flew the farthest distance.

Winner

The winner of the final is the craft which either completes 10 laps in the shortest time, or flies the farthest distance in excess of 50 metres if no craft completes the course.

Prizes

The winner of the final shall receive a prize of £100. This shall continue for at least two years. Also, the following shall each be accorded a single prize of £20.

(1) The first ever craft in a final to fly 50 metres
(2) The first ever craft in a final to fly 150 metres
(3) The first ever craft in a final to fly round the first pylon
(4) The first ever craft in a final to fly one complete lap.

* * *

THE JOHN MEW CHALLENGE

This contest has a direct objective in being a *scale* model event leading to man powered flight.

Mr. Mew, the donor of this model award, would like to see the inventiveness and ingenuity of model makers harnessed to develop flapping wing designs through a test model.

It is impossible with our present limited knowledge to design one of these craft scentifically, and so it has been left to the province of the individual experimenters, often with entertaining results.

There are several features which could tell in favour of oscillating wings:

1. The Flying speed which might be reduced to below 15 mph with a corresponding reduction in drag to almost half that at 20 mph.
2. Wing experiments appear to indicate that the 'break-away vortices' which form on the upper surface of a wing are much reduced when it is oscillated. This could permit the use of a low aspect wing with a corresponding reduction in weight.
3. The earlier versions of oscillating wing have always been hinged in the centre whch necessitates a complex mechanical design and a wasteful lateral vector. *This* model competition, however, visualises a *continuous* wing working vertically up and down, using the weight of the crew (or their equivalent) as a reciprocal. Thus many of the forces can be taken in tension with a further reduction in weight.
4. Because of the reduced flying speed, and intermittent oscillations of the wing, it will probably be essential to vary both the angle of incidence and the aerofoil section.
5. At low altitudes, the rebound of air from the ground onto the wing called 'upwash' may be greater with this type of design both because of the downward motion of the wing, and the low aspect ratio. This will provide ground effect.

Design

For a model, variable controls always raise problems, but in this instance the initial downward motion could be arranged to tilt the wing up at the trailing edge automatically. A lot of research has been done in the field of sailing where aerofoil sections are varied to suit the wind speed and force (lift) required. Based to a certain extent on this knowledge a rigid leading edge with high lift characteristics might be tried with a central section which is slightly flexible, becoming more so as the trailing edge is reached. Experiments could be tried with slots to prevent separation with the relatively low aspect ratios envisaged. In this respect, models would probably not be much of a guide to full scale performance. The flexible part of the wing could be set for maximum lift at near stalling speeds, and if judged correctly should flatten automatically as the speed increases after each movement. During oscillation the tilt of the angle of incidence plus the flexion of the trailing edge should cause it to lift high enough to give a considerable forward thrust component. It will be important that when oscillating, the wing will lift relatively slowly and come down rapidly. In the full scale ornithopter, a rowing motion can achieve a slow pull up against an elastic resistance, with a rapid return from the top. With a model it will not be easy to prevent a sort of St. Vitus dance when attempting to emulate this, and care must be taken to position the centre of gravity of the fuselage directly below the centre of lift of the wing. In full scale, the points of application must move so as to enable the bulk of the crew to be more or less static. A reasonable sized tail will obviously be necessary as a stabiliser.

Power

Any type of power may be used; but preferably it should be equivalent to one or two man-power (1 hp. each for short periods or ½ hp. for long periods) in scale with the model.

The John Mew Awards

The model judged most likely to succeed as a full scale project in structure, mechanism and performance.

1st A Goblet and £100
2nd £20 and a plaque
3rd £10 and a plaque

The best low powered flying model: A plaque and £20
The most ingenious model: A plaque and £10

CLUB NEWS

Line-up of Junior Kit contestants at the Northern Gala show (left to right), R. Hyde, A. Godden, D. Shearsly, A. Carter and A. J. le Vay. Wide choice of models available for this contest, now that the only stipulations are kit models with a maximum span of 50 in.

THE CRANFIELD MEETING did not appear to be quite its old self this year. For one thing, the weather, wet and windy, was not conducive to the display and demonstration of the 'side show' machine, nor to the feel of a holiday atmosphere. For another, the entry charges were offputting for the spectator and model flyer excursionist, though alleviated somewhat for the contest flyer by making competition entry inclusive of the admission charge. The charges, incidentally, were mostly levied for the use of the airfield and not to swell the Area coffers. Indeed, it is unlikely that any profit will result. Let us hope for brighter things next year.

One advantage of flying Power Radio is that wind is not the bugbear that it is in free flighting. Thus, though the free flighters have had a thin time this year, it has been very much business as usual for the Radio flyer. Perhaps, though, just a bit too busy on the **Buckaneer's** Brickhill field, according to *Scimitar* the club mag. The noise level, overflowing into the nearby village, has not been so much intense as continual. Happily, no complaints have been forthcoming, but the club, sensibly, is concerned over creating a possible noise nuisance, and is taking steps to keep the decibel output at an acceptable level. Writing in the newsletter, Derek Giles tells of the problem of equating married bliss with a full and active model life. He feels that the latter is suffering under the demands of his new house, even though the model gear was shipped in right away to its very own room. I, too, can remember when my own models had a lot of space about them, but came the tiny patter. . . . Let him be warned. Comes inevitable the time when man and his machine must be parted. In Pete Smoothy's case it was a bit of heavy handedness on the elevator stick that parted him from his tried and trusted *Super 60*. But that's the price we model flyers pay. Part of the charm of model flying is overcoming the myriad of hazards that beset our frail craft, and you have to take the occasional crash like a man or join the boys on the model boating lake. Nothing like a model boat is Pete's current project: an auto-gyro. The inspiration came from seeing Dieter Schluter's helicopter fly at the Esher do. Model chosen is Eric Smurthwaites' Chippewa 4. Why? The only one available! A tough design to build and operate but hopes are high for the test hops.

St. Albans M.A.C's *The Thermal* regrets the lack of contests down South this year, due to the near to untenable state of model flying's last citadel, Chobham Common. Seems that the old wilderness, now so sadly ravaged in the interests of what is laughingly called progress, is only usable in the best of conditions; so while a few events have been scheduled for the old venue it is a matter of fingers very firmly crossed for good weather. Suggested here that the final event should be a grand Chobham Wake, models draped in black and all that.

'Trouble on t'Moor' is the substance of the **Watford Wayfarers'** brief newsletter. Croxley Moor has hit the headlines of the local paper: the subject being that old chestnut, model aircraft noise. A suggestion from a local community organisation is to restrict the flying to certain off peak times. Trouble is that model flyers seek their relaxation when others are seeking theirs, though perhaps more actively.

The **B.A.C.M.A.C's** *Airlog,* cites at least one benefit of club members; model materials at favourable terms. Selling like the proverbial hot cakes, with the exception of the small section strip balsa. This seems to underline the modern trend towards more solid structures. Take for example, the *Buntline* 30 which designer, Dave Womersley, describes. This multi radio model has a solid foam wing, obechi veneered, and the fuselage of all sheet and block balsa construction. No sticks or spars here. But if we build our models heavier they are just that much more vulnerable in any contact with terra firma other than a feather soft landing. This brought home to members Reg Wooller and Martin Raymer in the development of their unflatteringly named *Brickette* radio glider project. Before shaping it into a flyable proposition they had quite a number of mishaps, involving extensive re-design and rebuilding. But it is far more satisfying to get your own thing to fly than to tamely build someone else's design, however successful it may be.

Featured in the **Southern California Antique Model Plane Society's** *Hot Leads* is a plan of a typical sports model design of the immediate pre-war period, Louis Garami's rubber powered *Mid Wing Sportster.* With a span of only 20 in. or so it is much smaller than a similar rubber powered model of today might be. By coincidence, I have been tackling a 1938 design; one of Bob Copland's duration models. The size is about that of a Coupe d'Hiver, and it will be interesting to see how it compares in performance with one of these low powered models. Coming back to the S.C.A.M.P.S., they set up quite a few contests, mostly of the duration type, though of a relaxed and easy going kind. However, they are not wholly satisfied with the airborne time as the only criteria of excellence. Well, one way of allowing types and abilities to compete against each other is by a handicapping system, plus a point system for vintage fidelity. There is enough vintage data now available to fairly assess the performance potential of any particular model.

Living as we do in a world of intense inter-communication, it is not surprising that the *South Island Newsletter* from way across the Pacific ocean should feature an A/2 outline every bit as sparsely elegant as the Toronto model. And to underline the oneness of our model world even more, the design is that of a German model. Aspect ratio is as high as 12 : 1. Seems there is no end to the ingenuity of the modern free flight designer. The latest idea for adjusting the power/glide turn trim on the Power model is to allow the fin to be moved vertically up and down through the fuselage. Seen on a model at Zell See. As towards Christmas we descend into deeper and deeper gloom, regretting the summer we almost had, the New Zealanders are looking forward to longer days and a full flying programme. Just think of camping on the airfield in November or holding the Nationals at Christmas!

We have heard of June in January, but down **Christchurch** way (still in N.Z.) its definitely a case of January in June when, at the Club Champs F/F event, the weather was described in terms of *lovely thick holding air.* This reference to 'thick air' intrigued me. What exactly are the conditions that make it 'thick'? And are those high times recorded at fly offs in part due to the soupier air you get towards dusk?

Most of you have seen on television the judges holding up the score cards at Ice skating and diving events, well the idea was tried out at a Radio Novice event, run by the **Hamilton M.A.C.,** (N.Z.), according to *Flight Lines.* The system worked quite well. The spectators were kept well in the picture, and it cut down on the paper work. More on Power Models. The outstanding model at the Auckland F/F rally was Paul Lagan's F.A.I., design. The model, which won the Power event, is capable of consistent still air flights of 5 : 30. Talk about rocketing to fame.

Looking back over the past year, G. Eastell, the R/C Secretary of the **East Anglian Area,** draws some grim conclusions in the latest issue of the Area newsletter. From his report it would seem that the whole future of Radio, and indeed any other form of model flying is

fraught with all manner of constraints and restrictions. Those old fallow airfields upon which the Area relied so much for its events, both free-flight and Radio, are fast going the way of all good things. And what with his noise and damage potential, the Radio model flyer is hardly the most welcome of guests on any open space. But what to do about it? There's the rub. Mr. Eastell set out the problems, but provides no answers. Possibly there just aren't any. Airfield difficulties notwithstanding the Area free flight clubs, Norwich, Anglia and Havering have been getting together for all the major Area events. And not without success. Roy Collins adds to his season's Power wins with a clear fly off margin in the Astral Trophy, whilst Norwich, which can boast a first class model club as well as a first class football team, are holding third place in the Plugge Cup. The newsletter includes a nice plan drawing, including the mechanics, of Roy Collin's very potent *Astral* winner. An engineering job by an Engineer.

A club very much self supporting in the contest sphere is the **South Bristol M.A.C.** Club events have the sort of entry that we associate with Area meetings. One type of event which gets good support is Vintage, which went very much into the doldrums generally after the untra lightweight 'winner' designs had been culled from the old model mags, and it is surprising to see it so popular in the West country. During the season the club has had quite a few successes in the wider competition field, both in free-flight and control line. Richard Evans made, perhaps the most notable contribution to club prestige with a fine win in the International Combat event at Spaandam. The newsletter has an account of the event, written by R. Horwood. Quite apart from the fine flying from the 53 entries, the event was well organised and the competitors well taken care of everyone getting a prize of some sort.

A change of meeting house for the **Belfast M.F.C.,** according to *Nitro*. The old place Laurel Lodge, has been condemned – all that engine vibration! – and the club has moved into a tennis club. But it is flying, rather than volleying, as usual, with Maurice Doyle turning on the virtuosity by heading the list at the 1st Irish Free Flight Trials, winning, with C. Dickey, the Goodyear 500 event in 32 mins. 25 secs., and, for an encore, taking the Stunt honours. On the question of aeromodelling as a sport, I see I have an ally in John Seacombe. He sees this hobby as primarily one of design and construction technique, with the athleticism a sort of by-product of proving the model on the flying field. He thinks we should look away from the world of sport for our financial and prestige hopes and towards the commercial sponsor. After all, he says, Rothmans already sponsor a full size aerobatic display team, and could possibly do the same for a well turned out C/L team. And Radio, too, no doubt. John, who is at present 'exiled' in the United Kingdom writes amusingly of an experience he had in trying to obtain permission for holding a C/L display on a common that lay in the path of Bristol Airport approach. Seems the official view is that the model plane is either a kite or balloon, or both, and John was lectured on the consequences of endangering £2 million airliners and their passengers. Never mind, the airport people take much the same attitude towards birds. It's not the poor old birds who get hit by the airliners, it's the birds who hit the airliners. Mostly slope soaring these days means Radio, with the odd magnet model now and again, but in September the Belfast boys were climbing the slope at Bishopscourt for an A/2 event. Wind, which increases with height, had a velocity unsettling, to say the least, to the flimsy A/2 structures. Happily the wind decreased throughout the day and some good flights were recorded, particularly by Ian Wyllie, the winner with five 2 min. maxes, and second man, guess who?, Maurice Doyle with four maxes and a 105.

Would very much welcome some of your reports. Just a single anecdote or an aspect of club life is sufficient.

Clubman

Contest Calendar

November 26	**ST. ALBANS M.A.C. WINTER GALA.** Open R/G/P, Rds from 10.30 a.m. plus Cd'H & A/1. Power for Simeons Trophy. Venue: Chobham Common.
December 3	**FALCONS GALA.** Open R/G/P, Chuck Glider. Venue: R.A.F. Chetwynd. S.M.A.E. members only.
December 31st	**LONDON AREA F/F GALA.** Open R/G/P, Chuck, C'dH, A/1, ½A at R.A.F. Bassingbourn, Nr. Royston, Herts.

ENGINE TEST

Continued from page 702

Because the exhaust port is open for a full 360 degrees of shaft rotation and the discharge of spent gases is, therefore, continuous instead of in a series of short, sharp bursts, the exhaust note of the Wankel is more subdued than that of a two-stroke. The Wankel is also far more responsive to a silencer. A small expansion chamber, with a relatively small outlet area, is all that is necessary to achieve a quite remarkable reduction in noise, with only a slight loss of power. The O.S. Wankel uses a silencer of approximately the same size and outlet area (only 19·6 sq.mm.) as the O.S. 15 and 20 engines. Fitted with this, the Wankel loses only about 200 r.p.m. on a 10 x 6 prop, yet is much quieter than any other engine of anywhere near its size and power output.

Power output, in fact, was outstandingly good with a gross b.h.p. in excess of 0·70 b.h.p. on 5 per cent nitro fuel. Our dynamometer tests were carried out with the silencer fitted and under these conditions, revealed a maximum torque of 52 oz./in. at around 9,000 r.p.m. and a peak b.h.p. of 0·67 at 16,000 r.p.m. This is well above current levels for throttle equipped 5 cc. reciprocating engines and is comparable to what one might more reasonably expect of one of the better ·40 cu.in. (6·5 cc.) R/C engines. In terms of static prop speeds, again with silencer, the Wankel reached 11,300 r.p.m. on a 10 x 6 Top Flite maple prop, 11,700 r.p.m. on a 10 x 5 Punctilio, 12,600 on a 9 x 6 Top Flite maple and 14,200 on a 9 x 5 Top Flite. Even when fitted with props of somewhat larger size than one would normally expect to use, the performance was above average, e.g., 10,900 on an 11 x 5 Top Flite and 10,300 on an 11 x 6 Power-Prop maple.

Throttle response was extremely good and was an immense improvement on the performance, in this respect, of the prototype and pre-production units. We had no difficulty in obtaining safe idling at around 2,500 r.p.m. when the engine was propped for 12,000 r.p.m. static, plus excellent recovery and steady intermediate speeds. The airbleed setting was not at all critical.

Finally, there is the Wankel's smoothness. A planetary rotation Wankel motor, unlike Wankel's original *Drehkolbenmaschine*, is not, inherently, a perfectly-balanced unit since the mass of the rotor moves eccentrically as it rotates, but this can be counterbalanced by means of counterweights mounted on the mainshaft outside the rotor housing. The O.S. Wankel has this feature and is remarkably smooth running: its vibration level is just about the lowest of any engine tested to date, irrespective of size.

The only points on which the O.S. Graupner Wankel motor does not compare so favourably with an equivalent reciprocating motor are its weight and its price. Bare weight is about 3 oz. greater than for the average R/C ·40 engine, but rather less if one takes silencers into account, since the Wankel uses a smaller and lighter silencer. The price of the engine (in the U.K.) is two to three times as high, but by no means unreasonable when one considers the very much higher standards of engineering that go into it.

In all, this engine is a fascinating piece of work and the O.S. and Graupner companies are to be congratulated on a splendid achievement.

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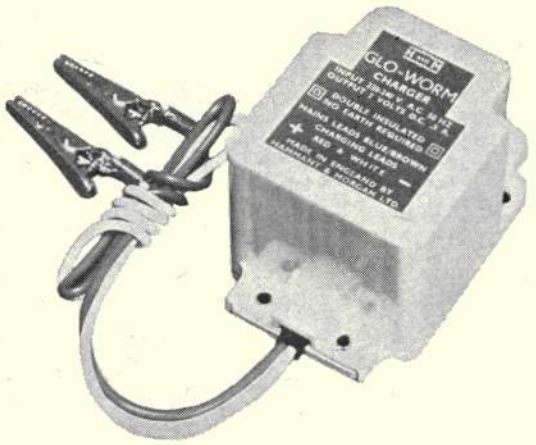

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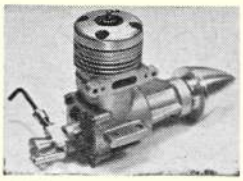

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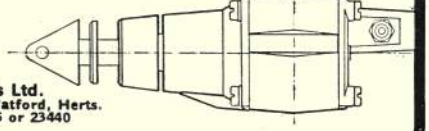

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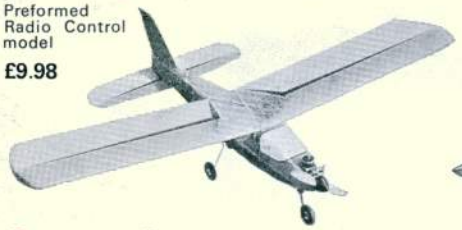

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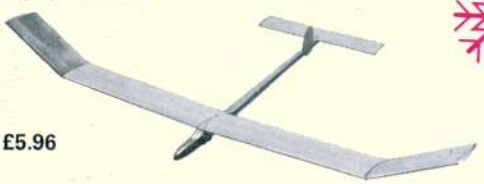

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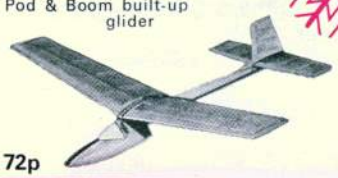

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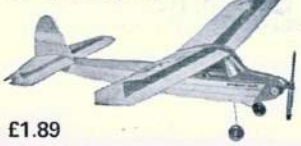

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