Aero Modeller

May 1972
15p
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INCORPORATING
MODEL AIRCRAFT

MAP HOBBY MAGAZINE

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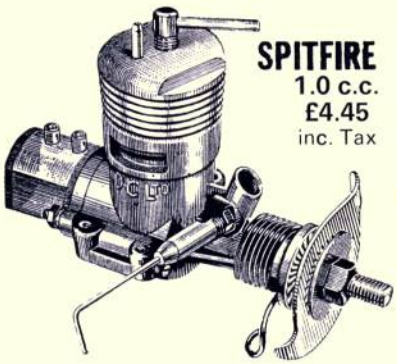

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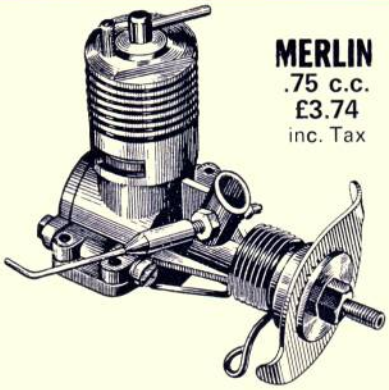

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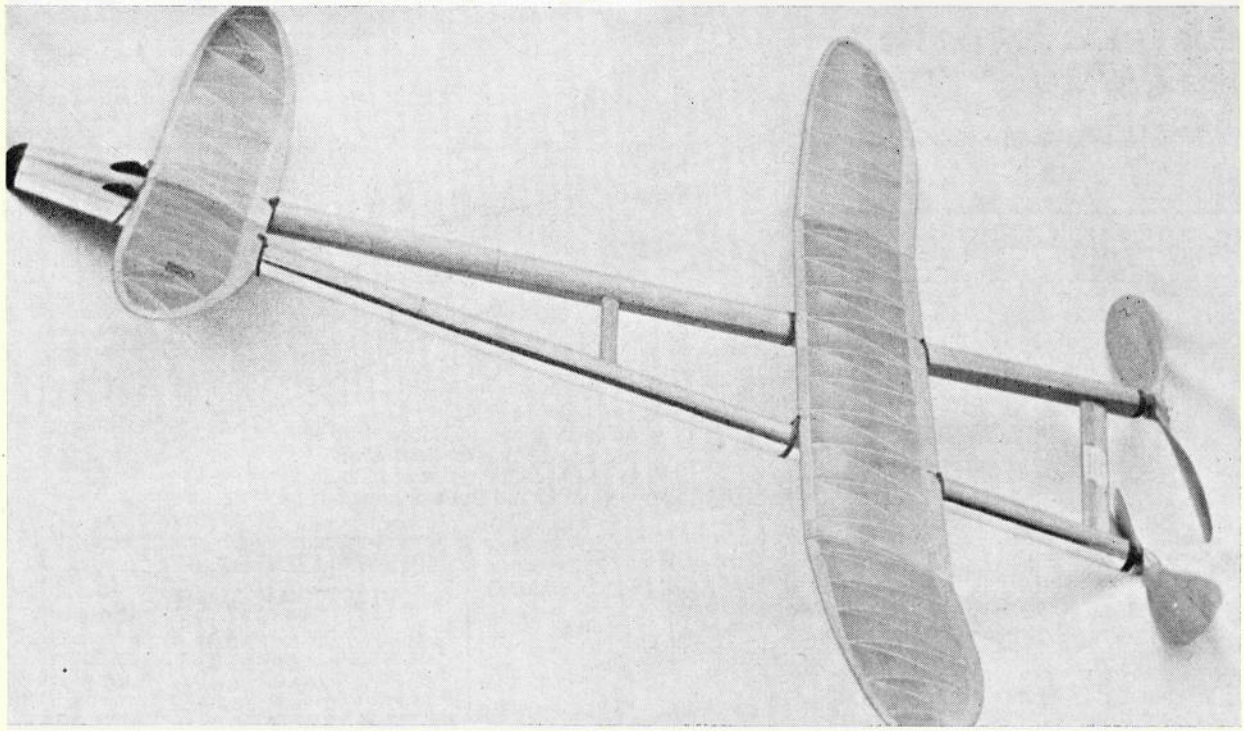

Our Mr. M. says of his A-frame pusher . . . 'Here's an advert line. If only grandfather had had SOLARBO Balsa, how much better his models would have flown''.' And then proceeded to demonstrate that his all-balsa A-frame built of the world's best balsa (his very words!) could turn in max's as readily as the best of modern designs. (Mondays to Fridays he goes back to selling Solarbo Balsa.)

Of course, we agree with Mr. M . . . but we think he has cheated a little. Warren girder ribs on an A-frame wing? Hollow tube motor sticks? Carved balsa propellers? And even Pirelli rubber and bobbins.

However, the point of the exercise is proved. The A-frame was a breakthrough in duration design, and can be further improved by modern 'know-how'. An even greater revolution in design thinking started in the early 1930s when balsa first came into use for airframe construction. Forty years ago . . . but balsa is still the 'standard' material where performance counts. Balsa was 'right' from the start . . . provided you qualify that statement. For the best results you need the best balsa – the 'know-how' in selecting, grading and machining balsa that is exclusive to Solarbo. No extra charge either. It comes 'built in' every piece of Solarbo sheet, strip and block!

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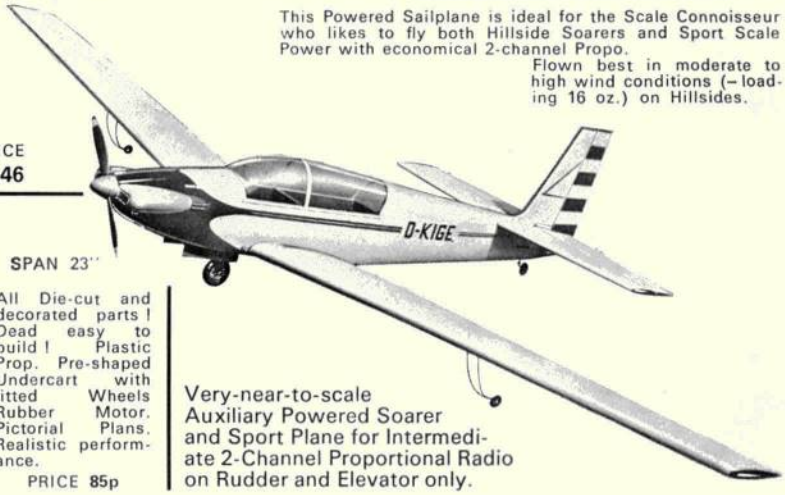

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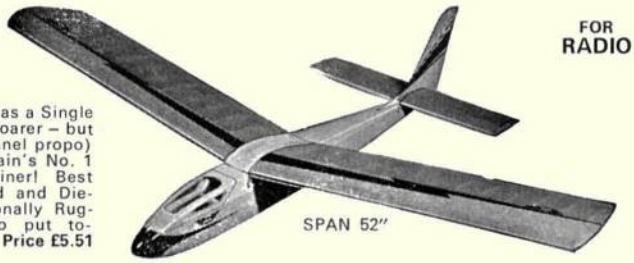

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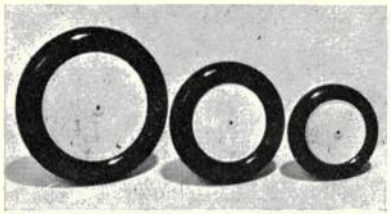

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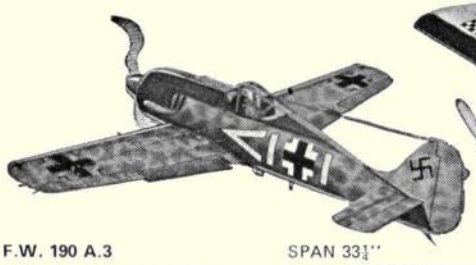

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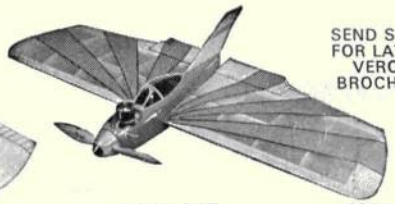

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May 1972 Volume XXXVII No. 436

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COMMENT

Our experiment in running a combined model, plus full-size, air show at Sywell over the Easter Holiday proved to be a resounding success. Although exclusively for Radio Controlled models, this exposure of the Modelling Hobby to at least 13,000 of the general public must surely benefit all aeromodelling. By bringing Ing. Dieter Schlüter over from Germany to display his remarkable Bell Huey Cobra Helicopter (in spite of wind gusts of 40 knots) we have shown the possibilities of sophisticated model development. At the same time, the nine hours of model display flying embraced all forms of sport and contest style models from amphibians, scale multi-engined types, to pylon racers and small field knockabouts. Jack Morton's synchronised aerobatics with model and full-size Tiger Moths will also be a talking point for months to come.

The EXPO itself, with 23 stand holders continually pressed by an inquisitive crowd, introduced radio equipment, accessories, kits and associated items to thousands who had hitherto regarded our preoccupation as 'kid's stuff'.

Now that such combined operations are clearly possible, the way is open to a new approach to public relations and promotion for aeromodelling.

on the cover

Andrew Smart, mascot of the Glevum combat team, poses in his club uniform of yellow helmet and waistcoat (complete with that club's emblem, a large black dot!), together with an earlier version of 'T-Bird' – this month's plans service introduction.

next month

TWO free plans appear in the June issue, together with a continuatio non the discussion of **variable camber wings**, an unusual control line handle for **third-line control**, an article on **how-to-build-better**, plus all the regular features. On sale May 19th.

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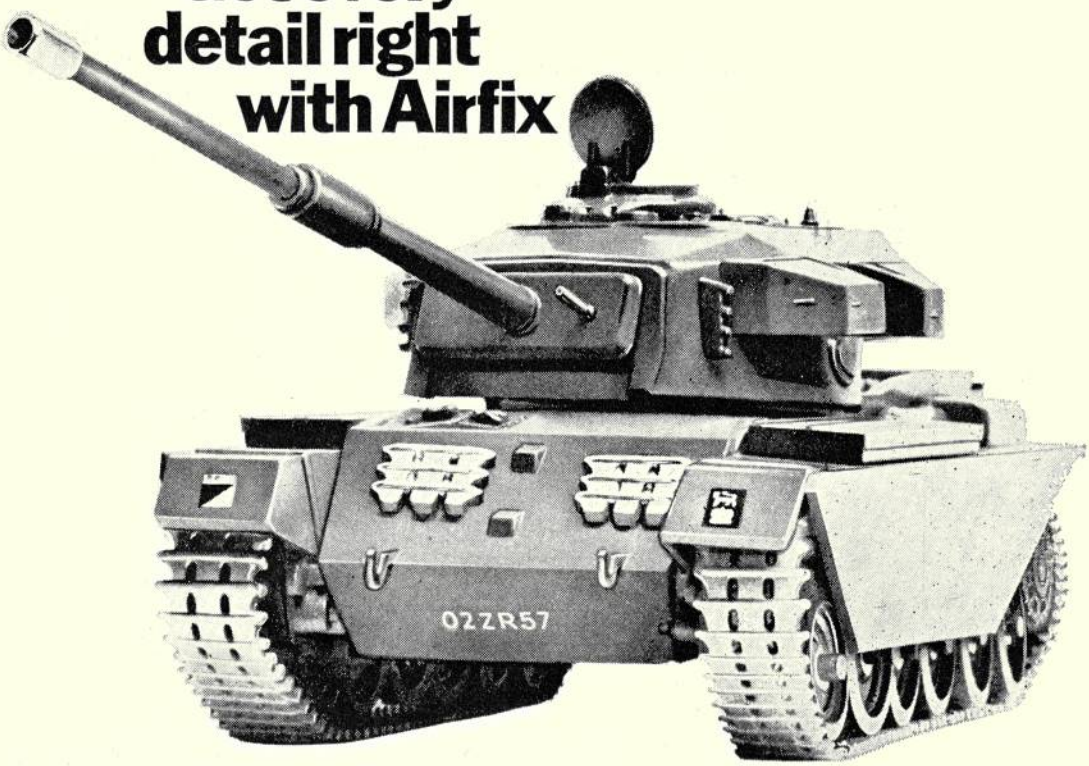

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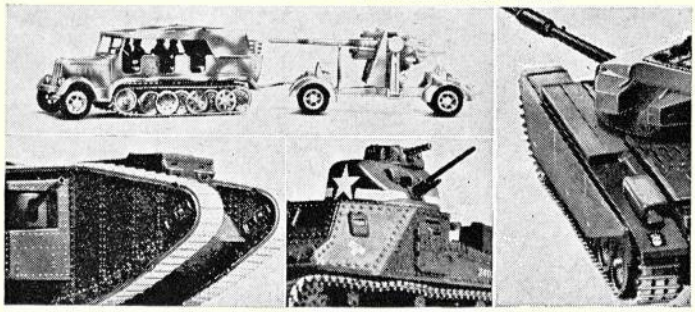
Bottom left : World War I tank Bottom centre : Lee/Grant tank Top left : 88mm Gun Right : Centurion



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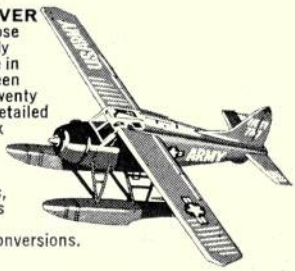

AIRFIX

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News, articles, conversions for modelling enthusiasts every month in AIRFIX MAGAZINE. 15p from your model shop or newsagent.

The Tamiya kit for the Dax Honda 70 runabout motorcycle is just one of many review items in May issue of *Scale Models*. An extensive feature deals with the Airfix kit for the D.H. Beaver, and for auto fans there is a fascinating article dealing with two Morgan 3-wheelers, one from the latest metal assembly kit. The Komar fast patrol boat with missile armament; scratch building a Pfalz-D111 and making a vacuum-formed Phoenix scout of World War II are other noteworthy features of the month, coupled with regulars like Book Reviews, Scale Topics and New to You?

Scale Models ON SALE PRICE 15p

"617 SQUADRON? NOW WHO WERE THEY?"

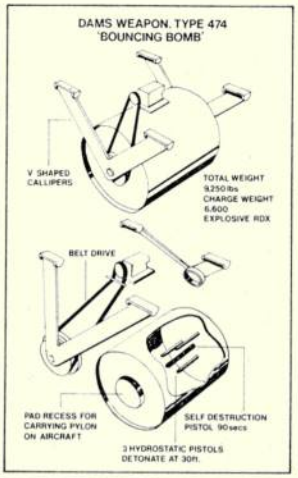
It's a question that strikes coldly on the ear of the middle-aged. A generation has grown up which may not even have seen the film 'The Dam Busters', much less remember the real-life chapter of a famous RAF squadron. For a generation to whom Agincourt, Trafalgar, and Waterloo are more familiar names than Möehne, Eder, and Sorpe, we briefly retell the splendid story.

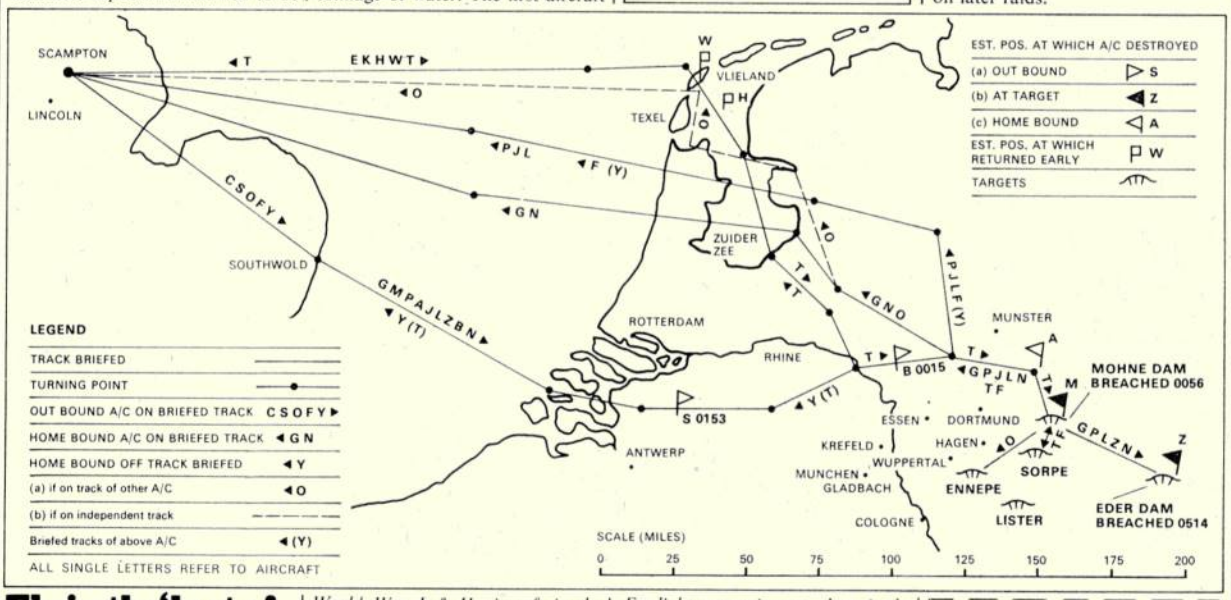
To compress into a few sentences years of work and frustration, Barnes Wallis invented the bouncing bomb. The task he set himself was to devise a bomb that would skip over protective anti-torpedo nets, make contact with the up-river side of the dam structure, and then slide down the face of the dam to explode exactly thirty feet below the surface. In the end (as we now know), he succeeded perfectly. But he relied on others to deliver the bomb—or rather the many bombs to be aimed at a whole series of dams in the Ruhr Valley.

Early in 1943, Guy Gibson was chosen to form and lead the Lancaster squadron that was to be identified as 617. Not yet twenty-five, he was already a Wing Commander with exceptional experience over Germany, and a DSO and DFC. He had to learn—and train his men in—utterly new bombing techniques. The squadron's Lancaster bombers had to fly at a speed of 240 miles an hour and an *exact 60 feet above the surface of the water*, releasing the bomb 450 yards from the dam. No altimeter was exact enough to ensure accuracy of height, so two spotlights were fitted beneath the Lancasters at such an angle that their beams would converge at exactly 60 feet. So the aircraft on this most precise of all raids would actually be carrying lights!

The month of May was chosen for the raid, because the dams would then be holding back the maximum tonnage of water. The first aircraft took off at 21.10 hours on the 16th. Nineteen Lancasters in all took part in the raid—a total of 133 men. Some, like Gibson himself and his crew, were involved in two attacks (on the Möehne Dam and then the Eder) in the one night. One crew approached the Möehne Dam no fewer than six times before getting into position accurately to release their bomb . . . and returned safely home, though without the aircraft. They were shot down crossing the Dutch coast, and picked up from their inflatable dinghy. Two aircraft were shot down with a total of three survivors who became prisoners of war. Some never even reached their targets. Of the 133 who set out, only 80 survived.

But the operation was a success. Over 300,000,000 tons of water swept down the Ruhr Valley, accomplishing (in the words of the official German report) "a dark picture of destruction" within a few hours. Guy Gibson was decorated with the Victoria Cross by King George VI, but he and a number of other survivors of the dambusting raid of 16th May 1943 were killed on later raids.





it's the simple ideas that win!

Right from the start model makers of all ages have risen to the challenge of the Bic Model making competition. The simple but imaginative racing cycle shown below, entered by David Smith of Clifton, Bristol, won first prize in the first quarter of the competition.

Instead of throwing away those used Bic Crystals, model makers have fused them, glued them, bent them and submitted a fascinating assortment of models of all shapes and sizes. Why don't you join in the fun?

Because Bic Crystals write first time every time, there are far more sold in the U.K. than any other ballpen. In fact, each year a Bic Crystal is sold for every man, woman and child in the country plus a few million more.

This is why you will probably find more than you expect in your own home. In offices and factories you should find them by the hundred.

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. . . is start collecting medium or fine used Bic Crystal ballpens now, complete a model and enter the competition.

There are cash prizes for the best models produced every three months both senior and junior. Finally, the supreme modeller at the end of the year will be awarded a further cash prize of £250 and the handsome Bic Championship Trophy.

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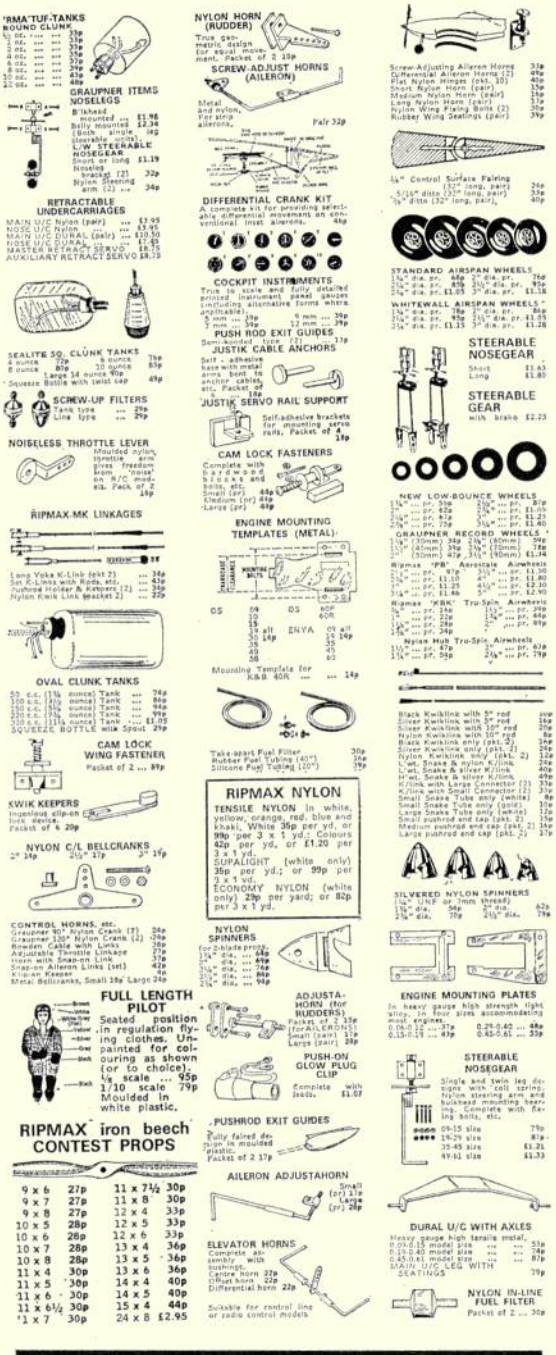

AT YOUR MODEL SHOP

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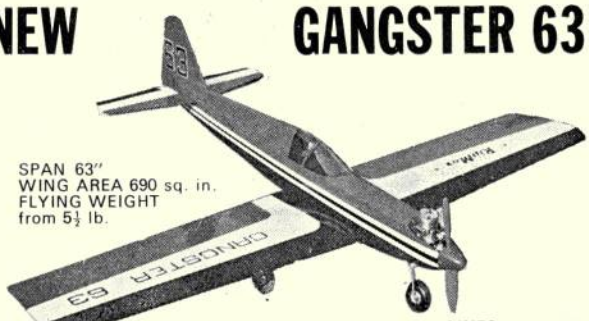

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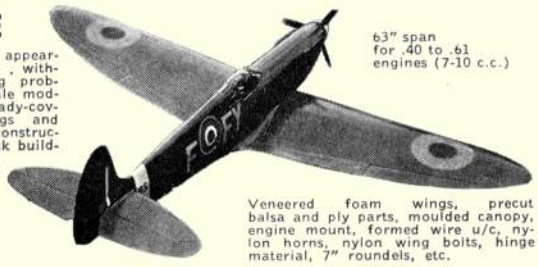

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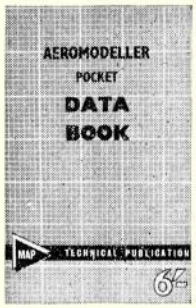
160 pages, 8½ x 5½ in., profusely illustrated throughout. Full colour hard cover. **75p**

3 AEROMODELLER POCKET DATA BOOK



Simply packed with clear sketches and useful tables to help modellers in every branch of aero modelling.

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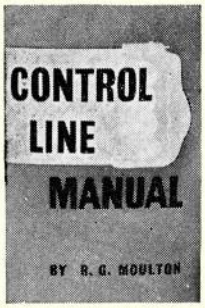
7 CONTROL LINE MANUAL



R. G. Moulton
Main chapter headings: Why Control Line?; Basic U-Control; Basic Monoline; Basic Flight Control; Learning to Fly; Aerobatics; Speed; Team Racing; Combat; Carrier; Cargo and Endurance; Scale Models; Jet. The Engine in Control Line; Towards the Indestructible; Looking after the Lines; Variations on the Theme. Plus appendix.

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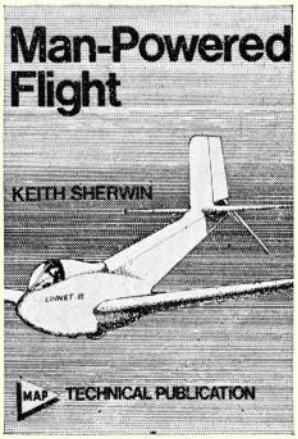
155 MAN-POWERED FLIGHT



In this, the first text book primarily aimed at the student of man-powered flight, Dr. K. Sherwin of the University of Liverpool analyses the problems of design structure and operation, adding his own theories for production of a practical pedal scooter. Over 128 specially selected illustrations collected by Aeromodeller staff convey a pictorial history of progress and combined with more than 90 text diagrams, form a scientific reference work of great value to all students of aviation.

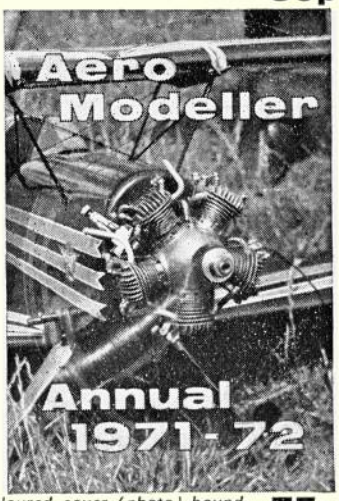
176 pages, International A5 size with stout strawboard covers, bound in Balacron and gold oil title blocking on spine. **£1.75**

59 SINGLE CHANNEL R/C

General definitions, simple receivers and transmitters and then on to cover actuators, escapements and servos. Suitable aircraft types and their power plants plus consideration of possible manoeuvres. Control systems for single channel–mainly rudder, but also engine control. Then boat and vehicle systems. Installation of equipment, operation, testing, fault-finding and trouble shooting are covered. Finally, valuable tables deal with available equipment, receivers, transmitters, servos, actuators, escapements.

7¼ x 4¾ in., 80 pages with 50 diagrams, plus 12 art pages of photo-pictures. Numerous tables. Drawn-on card photo cover in two colours. **30p**

160 AEROMODELLER ANNUAL 1971/2



Four dozen of the top model aircraft designers culled from a dozen countries give a balanced appraisal of modern aeromodelling. Survey of free-flight contest tactics; How to do aerobatics with control line models; Flying radio controlled thermal soaring gliders; Making sheet balsa models; The effect of altitude on model flying; Use of twisted wings; Towing a glider with a Power Model; Variable camber power models; Making fuselages in plastic; Engine Fuels . . . plus countless hints and tips. This pot pourri of all that's best in 1971 will be extremely popular with a broad range of interests in Aeromodelling.

128 pages, size 8¼ x 5½ in. Coloured cover (photo) bound boards. **75p**

58 MULTI CHANNEL RADIO CONTROL

This book has been introduced to help the beginner over his problems. Here the beginner will find explained in simple terms the working of multi-channel equipment.

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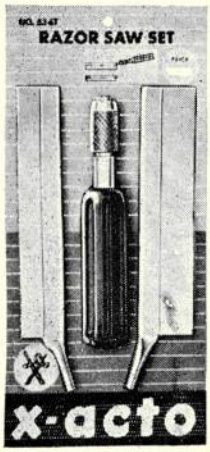

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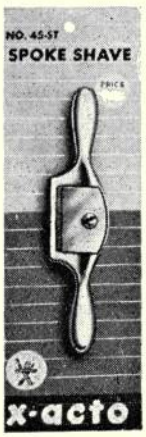

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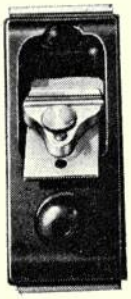

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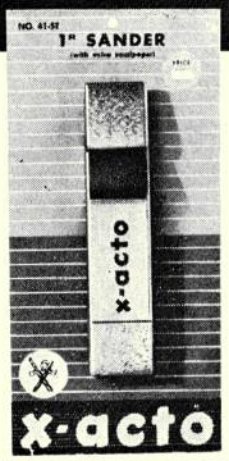

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Heard at the HANGAR DOORS

Superb control line scale model of a Phantom F4 by John Valasek is to one-twelfth scale and jet-powered – a form of propulsion which is arousing considerable interest in this country once again.

AEROMODELLER ALL SCALE DAY at Old Warden on 18th June will have two extra prize awards, thanks to the kindness of donors. The *H. J. Carter Memorial Trophy* is a newly established award for Control Line Scale donated by members of the Tamworth Flying Club in memory of Jack Carter who had for so many years not only been their mainstay for model supplies through his shop, but also been to the forefront in competitions with his control line biplanes. The other award comes through the generosity of Peter Miller of the Sudbury M.F.C. and takes the form of an autographed copy of Roger Freeman's book *The Mighty Eighth*, which will go to the best flying model of an American aircraft. Peter has given this award as a personal token of appreciation for the pleasure he has had at the Old Warden All Scale Days.

DATE CHANGE. The Aeronautical Sporting Association of Finland inform us that the 1972 World Control Line Championships, due to be held in Helsinki, will now be brought forward. The new dates are from 12th to 17th July. Our team manager for this event, Gordon Isles, has been busy organising a charter flight to this meeting at a substantially reduced price, and anyone seriously interested in travelling in this fashion should contact him immediately so that seats may be reserved. Gordon's address is Monteros, Willowmead Park, Prestbury, Cheshire, and please enclose s.a.e.

CHANGE OF VENUE this time, for the London Area Centralised Free-Flight meetings. Though held at Chobham Common for the past 20 years, meetings planned for 11th June, 9th July, 6th August and 10th September will now be transferred to Bassingbourn Airfield, approximately three miles north of Royston, Hertfordshire, just off the A14. Due to the currently highly-sensitive situation at military establishments, the military police will refuse entry unless a current S.M.A.E. membership card is produced. Display of such a card will enable helpers, etc., travelling in the same vehicle to gain access as well. It is important that models are kept away from the domestic site and that special efforts are taken to avoid litter problems.

ANOTHER well-known personality has joined the model trade. Steve Blake has recently opened his model shop named *Maple Models* (at 16 Maple Road, Luton) on a part-time basis, being open from 6-8 p.m. during the week (except Thursdays), and from 10 a.m. to 6 p.m. Saturdays. Apart from the retail side, Steve is also offering a model building service, and of course the advice of an experienced modeller. Best of luck Steve in this enterprising, specialised, service.

BLITZBOOB. The source of the following photographs illustrating Aircraft Described No. 212 on the *Arado 234 B Blitz* (March issue), p. 148 bottom, p. 152 two left-hand column and p. 153 two, was omitted. All were loaned by Air Britain's *German Aviation Research Group*. Readers holding original prints of pre-war and wartime German aircraft who would be willing to loan them for copying are asked to contact Mr. R. Sanders, Air Britain Information Services Co-ordinator, 69 Sherbrooke Road, Fulham, London SW6 7QL. After the copy negative has been added to the GARG Photographic Library the original print will be returned to the donor.

WORLD SCALE CHAMPIONSHIPS. Invitations have been issued by the French Modelling Federation and indicate a limit of eight official supporters and press from each nation in addition to the team of eight persons making up the Control Line and Radio Control teams, with two managers. Accommodation is only 300 metres from the flying site at Montaudran on the outskirts of Toulouse. Arrival day is 2nd August, departure 7th August.

CHAIRMAN of the *Fred Boxall Memorial Fund*, Ian Lucas, would like to thank the many contributors who have together donated a total of exactly £130. To avoid unnecessary administration expenses, acknowledgement of individual contributions has not been made, but nonetheless, the monies received are much appreciated – the Fund will close on 15th April.

The Annual General Meeting of the *Brighton and District Model Aircraft Club* decided that the best type of perpetual memorial would be in the form of a trophy for one of its centralised meetings, and bearing in mind that all the Open Rubber events already have trophies, it was resolved that the S.M.A.E. should be offered the *Fred Boxall Memorial Trophy* for the British Nationals Wakefield event. This offer will be presented to the Society at the next council meeting. The trophy will probably take the form of a replica of one of Fred's models encased in a block of transparent glass-fibre, mounted on a silver base, or should this prove impracticable, then a silver salver will be substituted. It is hoped to have the *Fred Boxall Memorial Trophy* on view at this year's Nationals.

a 'three-in-one' combat design to suit beginners or experts alike

The 'contest' version of 'T-Bird', recognisable by its elevator hinged to the extended trailing edge and thin, flat sectioned, airfoil. The Glevum's club emblem, consisting of a large, black dot is an easily-recognisable symbol! High standard of construction evident on all of Frank's models.

SO, YOU HAVE a little experience of control line flying, enough to enable you to keep the wretched model off the ground until it runs out of fuel without any premature 'landings'. Or perhaps you are already fully confident at handle waving and can complete a fancy-looking aerobatic schedule. Either way, you want to try combat flying – so *T-Bird* will fit the bill, whatever your prowess. This is achieved by the fact that three versions of the *T-Bird* are drawn here: a combat trainer, with a thick 1⅜″ full-stunt wing section and elevator hinged on the trailing edge, an advanced combat trainer with a similar specification but with an extended tail boom, and finally a competition model with a fashionable flat wing section, extended tail booms and lighter construction.

Perhaps the model does look ordinary, square and plank-like, but it has in fact been designed in an attempt to simplify the construction as much as possible for the complete beginner. The unconventional wing construction is particularly easy to make, and will result in a warp-free structure. Although not designed to outperform the top models, the trainer version will produce a very smooth flight pattern – even on days when the wind strength approaches Force 9–10! *T-Bird* may be flown around the full circle under these conditions, retaining good line tension, and this certainly gives the opposition something to think about!

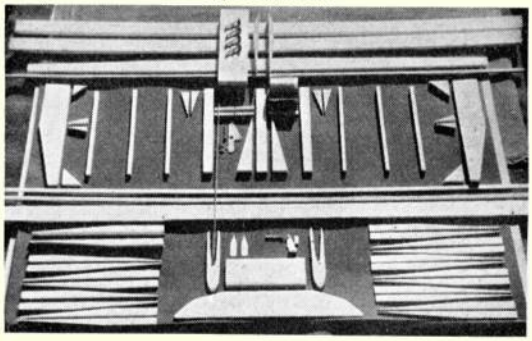
Constructed properly, this model is very tough – patched up versions of earlier models have had to be given away – but if you are *that* bad at flying, then cut the ribs from balsa which has had lightweight tissue doped on. This really holds the wood grain together and prevents it from splitting.

A thick section, swept back leading edge and straight tapered lead-outs are all employed to provide good airspeed and stability in flight – on no account rake-back these lead outs. For best performance keep the total weight down to 16oz. – this should be bettered by 1–2oz. for the contest version. First consideration should be given to which of the three types will suit your needs best, then study the plan carefully to establish the relevant building variations – this text refers mainly to the basic trainer. Now take a piece of soft 2″ x ¼″ balsa, and glue two pieces of ¼″ square spruce to each edge with a P.V.A. adhesive – hold with small elastic bands at 3″ centres while drying. Next cut out the tips (including the weight box in the outboard one), plus the eight gussets. When the balsa/spruce lamination is dry, cut along the centre line to form the leading edge centre piece and the trailing edge. Shape the chamfered portion of the T.E., then dope this chamfer to prevent denting during construction. Mark the centre lines with a ball-point pen then cut to length and pin over the plan. Glue the tips in place together with the three ¼″ sheet pieces at the root chord and the soft ¼″ square rib centre pieces. Mark the position of the leadouts on the relevant pieces for piercing later. Now add the soft ¼″ sheet gussets to the four corner positions. When quite dry, remove from the board, taper the leading edge, and then laminate two ⅜″ x 1″ very soft balsa strips either side of the leading edge core, leaving the ¼″ sq. spruce projecting for the rib supports.

As soon as the glue has set, lay back on the plan, using ⅜″ packing blocks under the trailing edge as shown. Now for the ribs. Just make a single sided 1/16″ ply template as shown, and the half ribs are quickly and accurately produced – no more weak points at the trailing edge or splitting of ribs as they are inserted, as happens with conventional structures.

Cut out eight half ribs from ¼″ soft sheet – if cut from the sheet edge you can guarantee a vertical rib. Also cut out twelve half ribs from ⅛″ sheet, pin together sandwich method, and sand smooth. Using P.V.A., glue all the top ribs in position, pinning in position temporarily. When dry, turn structure over and add the remaining ribs. Next, glue the ½″ centre fuselage pieces – cut to shape with the rib template – to the ¼″ sheet centre section strip, notching

To produce the models quickly, it is recommended that all parts are first cut out to form a sort of 'do-it-yourself' kit. Two models can be built almost as quickly as one . . . try it and see!



them to receive the bellcrank supports and engine bearers.

The $\frac{1}{8}''$ balsa fuselage doublers are then cut to size, the inner one being notched to accept the $\frac{1}{4}''$ square bellcrank doublers. Note that these pieces are $\frac{1}{8}''$ smaller than the main section to accept the $\frac{1}{8}''$ sheeting to be added later. Solder up the 7 strand heavyweight Laystrate to the 22 swg leadouts, then connect to the bellcrank, securing with cup washers. Mount the bellcrank between the spruce pieces with lengths of neoprene fuel tubing top and bottom to act as bushes. Shape the engine bearers, then epoxy in position, noting that the two trainer versions have $\frac{1}{8}''$ right offset. Fretsaw the ply fuselage doubler to the outline shown, and epoxy this in position too. The tank is then made up as shown, carefully soldered and checked for leaks before glueing in position with balsa cement. Sheet over the tank and bellcrank mount to form boxing. Now drill the engine mounting holes and add the blind nuts. A piece of very hard $\frac{1}{2}''$ sheet balsa is used for the fuselage fairing, and this must be a good fit over the wing. Cramp and allow glue to set overnight. When dry, use a rasp and sandpaper to produce a streamlined shape. Fill-in around the nose with soft balsa and shape to take the engine's prop. driver.

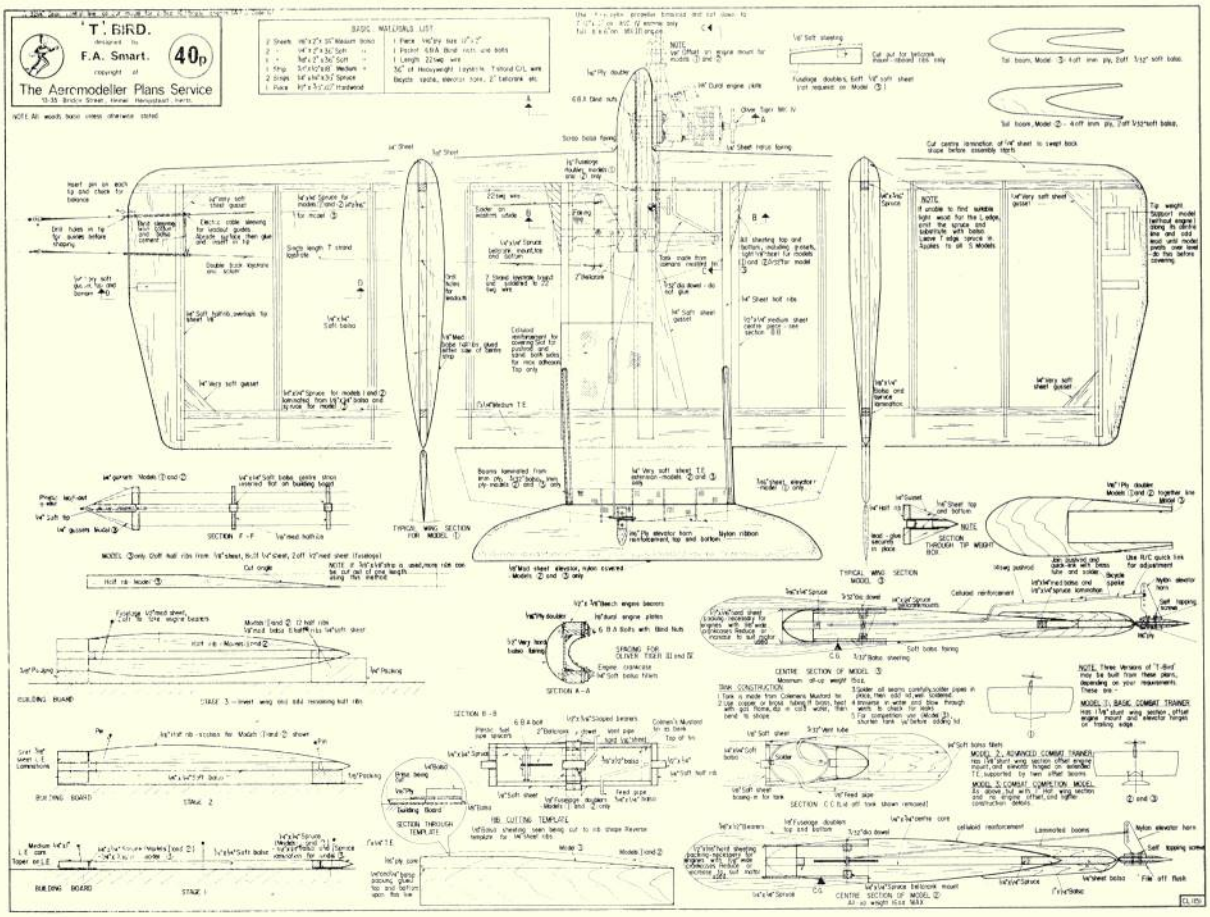
The leading edge may now be shaped, using a piece of $\frac{1}{4}''$ ply size $8'' \times 1\frac{1}{2}''$ with course garnet paper glued on one side, smooth garnet on the other, as a sanding block. Draw a biro line along the centre of the leading edge to aid symmetrical shaping. When satisfied with the airfoil, dope the LE to prevent damage. Drill right through the engine bearers and bellcrank mounts to accept a 3/32″ dowel, but do not glue this in place, you may wish to replace the pod assembly one day!

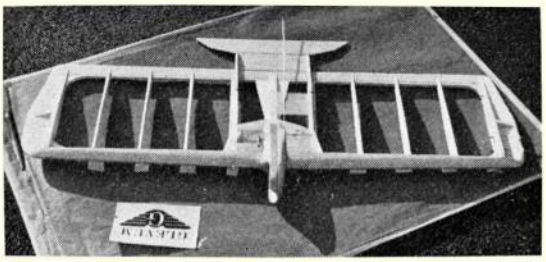
Add the line guides by drilling through the inboard tip and inserting the plastic sleeving so that they protrude through the rib a little. Bind these ends together with thread and balsa cement. Attach the push rod, then grip with a clothes peg to the trailing edge while the bellcrank is at neutral. Solder up the leadout loops with fishing swivels, to exactly the same length before adding the tip weight as shown and sheeting in the weight box. Finally, add the celluloid reinforcing around the push rod exit. Oil the bellcrank pivot, stand, then apply a coat of dope over the entire structure. Sand smooth and apply a second coat to all areas likely to be touched by the nylon covering.

Cover the engine pod first with two layers of nylon, applied with plenty of dope, sanding between coats. Cover this first as should the wing ever need repairing, it is much easier to remove the old covering, leaving the pod undisturbed. It is possible to cover the model in one piece if desired, by folding the nylon in half and fitting the fold over the trailing edge (but remember to cut the pushrod hole first).

Dope along the T.E. on the underside first, pulling the nylon out to the tips and pinning at corners to prevent

FULL-SIZE COPIES OF THIS 1/6th SCALE REPRODUCTION ARE AVAILABLE AS PLAN No. CL1151, PRICE 40p PLUS 5p POSTAGE, FROM AEROMODELLER PLANS SERVICE, 13/35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTS.





Unconventional structure is sturdy, simple and results in a perfectly 'true' wing every time. Careful selection of wood necessary for maximum performance.

movement. *Allow to dry*, then pull the nylon towards the pod and dope to the fuselage, again *allowing to dry*. Next, dope the nylon onto the sheeted areas each side of the pod, splitting the nylon over the pod, and *allow to dry*. Now pull the nylon tight over to the forward tips and dope in position, holding with pins until dry. Next start pulling spanwise towards the tips and complete the tips by wrapping over the edge and pinning. Run dope along the leading edge, one side first, then by standing the model on its T.E., start working along this edge, pinning and pulling the nylon as you go. Repeat for the other side, then trim with a blade along the front edge. Turn over and repeat exactly the same procedure along a ½″ overlap to the underside.

While drying thoroughly, start making up the tail booms and elevator – depending upon which version you are making. Nylon cover the elevator, add the tape hinges, and elevator horn ply pieces and cut out the very soft ¼″ sheet tail extension, sanded to shape to fit the trailing edge, and dope ready for fitting later.

Apply a thick coat of dope *all over* the model – holding the engine pod while brushing, then with the dope thinned 50% apply a further four coats, sanding lightly between each. When dry, insert the ¼″ sheet infill (models 2 and 3) and cover with heavyweight tissue, overlapping the trailing edge. Fit the elevator by doping ribbon hinges in position. Set aside to dry.

Sand the model all over with very fine sandpaper, dust off and apply any transfers, including your S.M.A.E. number of course. When these have dried out, apply a thin coat of clear polyurethene varnish as fuel proofer. After 6-10 hours this may be lightly sanded and a second thin coat applied. All that now remains is to link up the controls. Bolt the elevator horn in place, then pin elevator in the neutral position. With the leadouts level (bellcrank at neutral) bend the pushrod to length, insert in the elevator horn and retain with a tightly fitting piece of flex or fuel tubing. When mounting the engine, use ⅛″ dural plates to provide clearance for the crankcase and to ensure a rigid mounting. Remember the spring washers as well as plain washers when bolting the motor in place. Balance the model as indicated on the plan.

If you are new to combat, or even control-line flying in general, pick a reasonably calm day, and get a more experienced pilot to test fly it. First flights should be level, with loops coming next as you gain confidence – read the *Control Line Manual* (price 90p from the Aero Modeller Plans Service) for the basics in flying. Don't expect miracles – proficiency will take time! When safe to fly on your own, try combat flying by picking on someone of your own standard, and getting advice from more experienced fliers. Take it easy at first, and practice avoiding line tangles – a very costly affair in wrecked lines and models. At the same time, train a pit crew to efficiently prepare your engine and who will obey your instruction without question – and make sure that you know all the contest rules thoroughly. Next stage is to go and put your practice to the test by entering a contest – there are many held up and down the country (see *Contest Calendar*), and you will be certain to enjoy some different opposition!

READERS' LETTERS

Dear Sir,

The British Standard definition of an ornithopter – *British Standard Glossary of Aeronautical Terms, B.S. 185, Section 5, 5124 – reads:* 'A heavier than air aircraft supported chiefly in flight by the reaction of the air on wings to which a flapping motion is imparted'. An exactly similar definition except that the word 'planes' is substituted for 'wings' appears in the *Abard Aeronautical Dictionary*.

Now it is clear that according to this definition 'Wingfoot', published in the February *Aeromodeller*, cannot be classed as an ornithopter because the flapping wings provide, according to its designer, 'little lift' and 'responsibility for lift' is carried by 'a large pylon-mounted wing' (fixed).

The A.M.A. are, of course, entirely free to use any definition of an ornithopter that they please, but it would, I think, be a pity if the S.M.A.E. were to depart from the British Standards definition, particularly as outdoors a device like 'Wingfoot' might make thermal flights of more or less unlimited duration. 'Wingfoot' is an interesting device but it is not an ornithopter. It is an aeroplane driven by an oscillating vane and ornithoper records should be restricted to models 'chiefly supported by flapping wings'.

Hamble, Southampton *John H. Knopf*

Dear Sir,

In the Club News column in the April *Aeromodeller* reference was made in the paragraph on the Three Kings Club's comments on noise. Your comment that the council are the final arbiters is not correct. Legislation does exist to control noise. The Public Health Act 1936 and the Noise Abatement Act 1960 are the major source of control in the hands of a local authority, or more correctly in the hands of the Public Health Inspector of the authority.

As I have stated elsewhere, the mere fact that model noise is audible from some one's back garden is not in itself an offence.

What is excessive noise? Well, the law is not very helpful in the matter. In a High Court ruling it was stated that the same standards could not apply when comparing Belgravia (high-class residential) with Bermondsey (working class industrial). From this, we see that someone who decided to live beside an open space where models are flown hasn't much cause to complain. One should also consider if, say, a trunk road is located between a flying field and the back garden which introduces the 'dominant noise factor'. If model flying is the 'D.N.F.', perhaps a separation of 400 yards is needed between the back garden and a normally silenced large model (10 c.c. radio control), whereas if a main road passes close by, perhaps this distance shrinks to 200 yards – or less.

The manner in which a Public Health Inspector acts has been of concern to some fliers as (in practice) they have relatively little power to act and they should try to be conciliatory, although this generally looks like threats.

On receipt of a complaint, the Inspector is not obliged to examine the complaint before notifying the *individual flier* concerned (*not* the nonflying club secretary or similar person) in a proper manner (which states time, date, location, etc., of the complaint). Should he receive a further complaint relating to the *same flier*, he should gather evidence by attending the location from where the complaint originates (i.e. the back garden), then assert for himself that it is the *same flier* and serve a second notice. Should a further complaint be received regarding the *same flier*, he should again attend the location and collect evidence for the prosecution.

From this you will see that (as far as the authority is concerned) it is a difficult task to even gather evidence and perhaps when they apparently fail to act they recognise they haven't much of a case in law. Alternatively, a private person could prosecute probably for 'intolerable nuisance'. I wonder what chances they would have, particularly if such action was effectively defended.

I am not saying that a club secretary should ignore any letter from the authorities claiming noise nuisance, a club should carry out a *private inquiry*

to determine the true facts and should be very wary of admitting liability to a council or making a statement to the press. As you can see, the council (in the first instance) may not be in possession of the true facts either!

The same basic rules apply to both council and private flying fields. Except that notices would only need be served on the Owner, Tenant or Hirer of a private field.

A council (member, official or employee) cannot arbitrarily ban model flying from taking place on a council controlled open space *unless* they have a specific by-law for model flying, except where they can show that an individual flier is a nuisance or danger to other *lawful* users on that open space.

A council on demand are obliged to provide copies of the by-laws (for a small charge). Extracts at a park gate are not comprehensive enough.

Should a council see fit to legally ban flying on a site they are obliged to supply a *suitable alternative*. They should also permit *fair and equal* use of open spaces with *all other* activities.

Remember, no by-law – no stop . . . and you are entitled to object to the Home Secretary against proposed by-laws. If you consider existing by-laws too restrictive or no longer applicable to present-day circumstances, etc., you may bring these to his attention with alternative proposals.

You are not obliged to accept a council's interpretation of the by-laws if you do not consider they follow the proper meaning of the written by-laws, and never read words into by-laws they do not contain.

Enfield, Middx. *George J. Bushell*

Dear Sir,

I am interested in a letter recommending an intermediate size stunter for novice or even serious competitions. There must be plenty of room for people to improve the design of these models. Further, with the increase of size and engine capacity of the full-size international model, the cost of competing increases. A rigid limitation of engine size allows for closer and fairer competition. Three classes cater for everyone's taste and pocket.

Cardiff *J. Carne*

Dear Sir,

I would like to take the opportunity to thank those who have replied to my original letter re stunt entries.

It is apparent from Mr. Burton's letter (Jan '72) that he and Mr. Galloway have set about reaching a 'reasonable standard of flying' in a very determined manner. However, judging from the tone of the letter they have had considerable problems in the past year, and have drawn conclusions with which I cannot agree.

First I have to admit to being puzzled that they found 'experts models' were 'not at all suitable' for learning square eights and hourglasses. There is a good selection of designs available from which to choose a successful first model. To suggest that it is necessary to go back to Palmer lightweights is quite misleading. I have nothing against such models but I suggest that equally suitable models can be found among today's more popular designs.

Secondly, how long does it take to learn the schedule and reach a reasonable standard of flying? After 12 months of flying Mr. Burton and Mr. Galloway should be more than ready for competitions. Let me quote my own experience: After completing my first stunter in January 1962 I flew it at the Nationals four months later, and as this was during my first year at University practice was a little restricted! I would recommend anyone to have a go at competition flying after, say, three months' experience with a stunter. Why not turn up first at one of the more informal events rather than the Nationals (where even the most hardened of fliers, including me, show signs of contest nerves). Thanks to Wolves M.A.C. there is an event three weeks before the Nationals on May 7th (see Contest Calendar).

I can sympathise with J. L. Parks' feelings if he and his associates are flying 2.5 c.c. models and looking at the competition scene where .35 engines are now a minimum requirement. I can see a case for restricting engine size to 2.5 c.c. in junior stunt events in view of the cost and time involved in building a .35 stunter.

However, I still feel that any restriction in a 'Class 2' stunt event should be solely on the ability of the entrants (i.e., their competition record). To restrict engine size to 2.5 c.c. would produce models which could not later be used successfully in open events.

I agree with Mr. Parks' suggestion of a simplified schedule. This would to some extent reduce the difference between 2.5 c.c. and .35 cu. in. powered models. Why not then use the already accepted junior stunt schedule? In this way junior and Class 2 events could be combined giving a larger entry and hence a more interesting competition. Separate sets of results could still be produced to give senior and junior placings. I would suggest an extended form of the present handicap system such that 10 per cent is added to the entrant's score for each year under 20, e.g. a 19-year-old would receive 10 per cent bonus, a 15-year-old, 50 per cent bonus, etc. This gives the same age weighting as the present system but is easier to calculate (Junior stunt organisers please note!).

If enough interest is shown by intending entrants one or two such events could be run this year, provided some kind rally organisers can offer a venue.

3 Totnes Close, Bedford *J. R. Mannall*

The Editor is not bound to be in agreement with any views expressed in these pages

Dear Sir,

So Mr. Stapleton (March 1972 issue) has seen fit to introduce the ugly spectre of fatigue in relation to glass-fibre propellers and glass-fibre in general: let me hasten to reassure your readers! To date, well in excess of 100 papers have been published on the fatigue of G.R.P. as well as chapters in several books, and while it cannot be said that safe life design information is as complete as for metals, there is a considerable understanding of the subject. There is certainly a better understanding of fatigue of G.R.P. than fatigue of nylon which we have been happily using for propellers for many years. I do not propose to summarise the entire literature on this subject but would like to make a few general points.

1. G.R.P. does suffer from fatigue, but not to an extent to exclude it from cyclic loading application (e.g. helicopter blades are successfully manufactured from G.R.P.).

2. Unlike metals, G.R.P. does not suffer from fatigue failure without warning. Quite early in its life, a component will show signs of damage in the form of resin cracking and debonding of the glas-fibres. If a propeller is left unpainted and is polished this will be noticed before complete failure.

3. A similar form of damage can be seen when a component is subjected to a constant stress, damage occurring long before failure.

Returning to the question of safety of glass reinforced plastic model aircraft propellers, from a direct stress and fatigue point of view there is very little to worry about. By far the greatest stresses in a propeller are those in the root from centrifugal force, although there are some small bending stresses from thrust. I have tested a Bartels 7 in. x 7½ in. to destruction in tension and found that it broke at a load of 585 lbf. (a nylon one is stretching like toffee before 400 lbf. is reached). This particular propeller had been drilled out to fit an Oliver, a standard propeller should withstand over 1,000 lb. The number of stress cycles that a model propeller undergoes in its life are quite small, a complete zero-tension cycle being performed only once every time the engine is started and then stopped, although some all-tension stress cycling will be experienced when an incorrectly adjusted control line engine leans out and comes 'on song' every lap as it goes into wind. I doubt whether any propeller, even if its owner used it for many seasons, would be subjected to more than 10,000 cycles. From data sheets for materials similar to those used in Bartels props, this life would be safe provided the stress was kept below 60 per cent of U.T.S. A few calculations reveal that my drilled-out propeller would be safe at 35,000 r.p.m. for this life. As it is we are hard pushed to reach 18,000 r.p.m. at which speed the propeller should last 10 million cycles plus, which I think everyone must agree is a safe life!

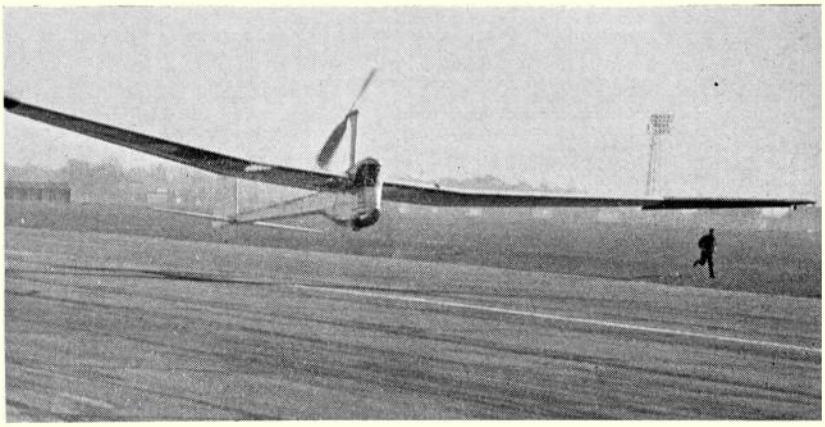
My calculations have assumed that the Bartels props are made from aligned continuous glass-fibres in epoxy resin. With certain other resin/glass combinations at 10,000 cycles it is possible that the failure stress may be as low as 20 per cent of the U.T.S. If the propeller that I have used as a sample had been made from such a poor material, given the same static strength and life of 10,000 cycles, it would only be safe below 20,000 r.p.m. But while we don't talk of banning wooden props because the occasional person carves one out of an orange box, by the same token let us not talk of banning composite props because the occasional person might make one from a car repair kit!

As for the comments about razor sharp surgical instruments, surely for maximum efficiency it's the trailing edge, not the leading edge of the propeller, that is required to be razor sharp.

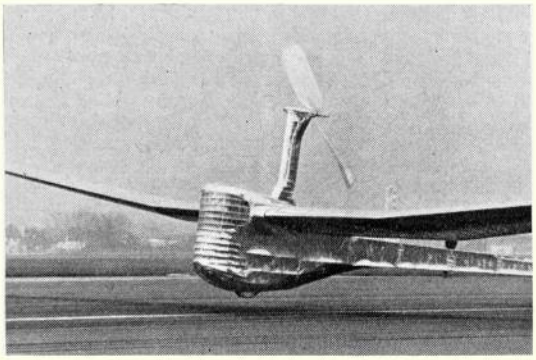
I hope this letter helps to put paid to the knocking of what must be one of the biggest advances in competition model aircraft in recent years.

Beeston, Notts. *K. Whybrew*

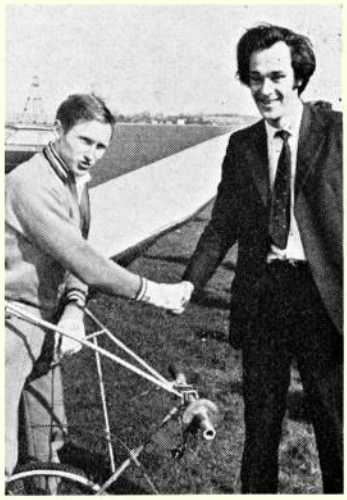
Man Power
achievements

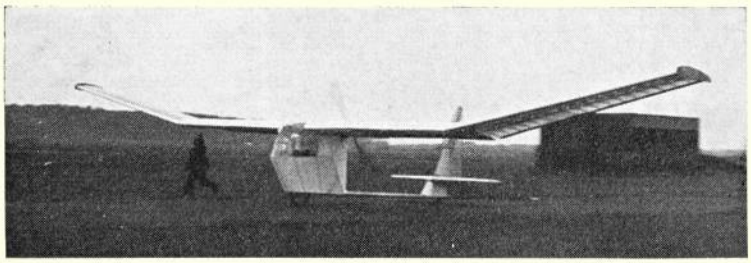


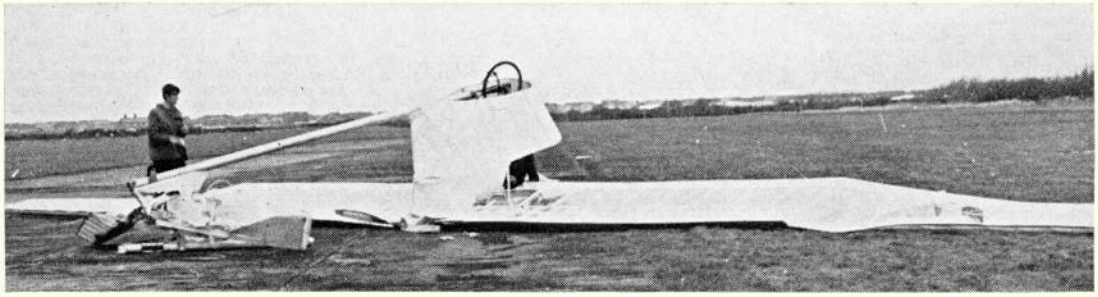
QUITE A FEW myths were totally exploded over the week-end of March 18/19th when a couple of spectacular 'firsts' were achieved in the world of man-powered aircraft. In chronological order, the emergence and successful flight of *Liverpuffin Mk. II* takes precedence, although the event passed by virtually unnoticed. Prof. Keith Sherwin of Liverpool University had suffered a tremendous setback when his newly-built *Liverpuffin Mk. I* was blown over on December 17th. The tail was smashed, wing panels crushed and that beautiful propeller which had served the *Puffins I* and *II* so well, was ruined. Undaunted, Keith redesigned the tail unit, remade the parts, and within three months, was ready to fly. On Saturday, March 18th, he piloted the new machine for a 60 ft. hop at just 9 in. altitude. Not much one might well say – until its comparatively small span of 64 ft., total weight of 300 lb. and simple 'rudder-only' control are taken into account. Longer and higher flights are confidently expected from this

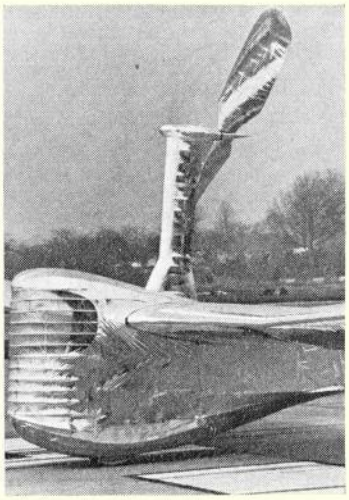


Above, Jupiter rises for the 24th flight. Take - off speed is about 14 m.p.h., prop speed appears to be in the region of 300 r.p.m. Left: The 22nd flight. Lift-off is smooth after 300 yds. run in zero wind. Covering is metallised Melinex. Right: John Potter and designer Chris Roper congratulate each other after longest flight of the day.

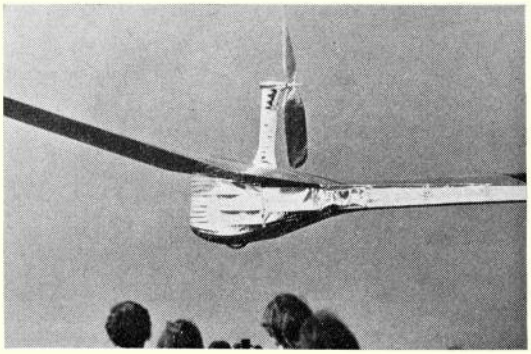








Trailed by the press, Flt. Lt. Potter proceeds majestically over the Benson runway. This was his greatest height, about 20 ft. Left: John Potter is ready for his 22nd flight. Chains drive the main wheel and are directed over idlers up the pylon to the shovel-type prop. Right, Airborne! A sight which, to modellers present, seems like that of a greatly - overgrown Wakefield.

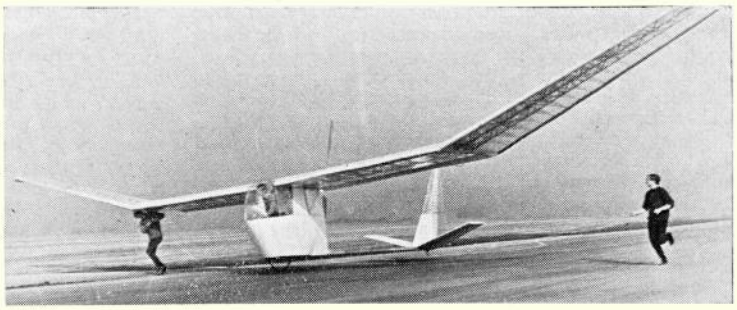


'scooter' among the sophisticated man-power projects.

The next day was equally calm, and at R.A.F. Benson a crowd of early-rising pressmen were treated to the first fully-planned publicity demonstration of any man-powered aircraft. The success of this operation is reflected in the fact that it obtained greater exposure than that of any other aircraft prototype except the Concorde. Every national paper, TV channel and newsreel provided photo coverage; but, as is usual, some of the descriptions were imaginative. It was *not* an attempt on the Kremer prize. The flight did *not* reach 30 ft., nor did it end in a dive to the ground. John Potter's 25th flight with *Jupiter* which is an R.A.F. apprentice/instructor team's completion of Chris Roper's 'Woodford' project started first in 1961, was a magnificent 500-plus yards of slow-speed flight which ended when the lateral controls failed to correct a drift to the left. It was the fourth flight of March 19th, those immediately preceding had been in zero wind and were shorter and lower. As the breeze picked up, so *Jupiter* rose to the occasion. Its slow-revving rubber-driven model-type of prop could almost be *seen* to thrust the aircraft higher as John Potter increased his effort during the flight. Much of the success of *Jupiter* is due to this prop and the excellent wing surface. The 79 ft. span has hardly a ripple, and the Laminar section is faithfully preserved, tip to tip. Like the Liverpuffin, *Jupiter* is also very simple in its drive, and is completely without frills, and even without a hole in the front for the gasping pilot! Given attention to dihedral or rudder, it could well exceed the 44 seconds' duration which captured so much publicity at Benson.

Control of the *Jupiter* is somewhat similar to that of the original *Puffin*. The handlebar has a twist grip at the right-hand which sets the all-moving tail. In fact, a small strip of Dayglo orange tape to indicate neutral setting forms the only instrumentation on the machine! The bar 'banks' for aileron, and is moved in steering fashion for rudder. We would not be surprised to see changes in the control ratios when *Jupiter* re-appears after repairs to its wheel and front fairing.

Meanwhile, the much bigger MP aircraft at Weybridge and the Herts. group two-seater Toucan are expected to take the air in coming months.



Left upper: Liverpuffin Mk. I taxy testing last December 16th with Keith Sherwin pedalling, alas on next day, she blew over during ground handling; moral, always have someone in the cockpit, and plenty of handlers. Right: Three months later, Liverpuffin Mk. II with new tail surfaces and prop about to make its first hop.

Chief protagonist of flapped power models is Denmark's Thomas Koster, seen here with his model which placed second at the Säve World Championships in 1971 – thus making him the most successful user of this technique as well. Note the gap between the trailing edge and the pylon when the wings are in the flat-section position for the climb. Straight dihedralled wings naturally simplify the mechanics considerably.

What's all the flap about?

John O'Donnell explains the 'whys and wherefores of variable camber wings for power duration models in the first part of his feature on this latest design development

FLAPS ARE the latest addition to the long list of 'with-it' devices that form an adjunct to modern power-duration models. Since the last free-flight World Championships in Sweden many modellers must have wondered just what flaps had to offer, and whether they are worth all the trouble.

'Gadgets' of any form are a delight to some people – and a nightmare to many others. Complexity for its own sake is hardly a virtue, but many modellers have come to regard an assortment of mechanical devices as the only way to obtain the desired performance. This has become particularly true for F.A.I. power models where pressurised fuel systems, auto-rudders, variable incidence tailplanes, etc., are now accepted as being the 'norm'. Reliability has always been a major stumbling block, aggravated by the fact that many aeromodellers are far from being model engineers. Developments over the years have tended to produce two simultaneous effects: to simplify the mechanics of specific gadgets, *and* to render their use almost essential.

Many devices are really aids to trimming in that the contradictory requirements of the climb and glide phases of flight can be solved separately. Auto-rudders and variable-incidence tailplanes are obvious and now commonplace examples.

A far more radical idea, of a completely different nature, leapt into prominence with Thomas Koster's performance at the 1971 Championships. As the whole of the free-flight world must know by now, his power models were 'flapped'. The rear portions of the wings were hinged, and changed the wing camber appreciably between climb and glide. Results, in terms of realised as well as potential performance, were spectacular and Koster's eventual second place must have made many people think very hard about using wing flaps themselves.

To appreciate fully the virtues and implications of using wing flaps it is necessary to start with 'basics'

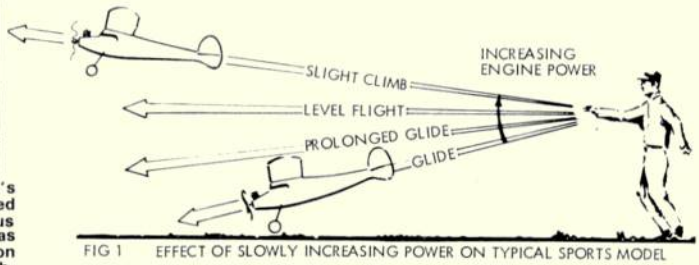


FIG 1 EFFECT OF SLOWLY INCREASING POWER ON TYPICAL SPORTS MODEL

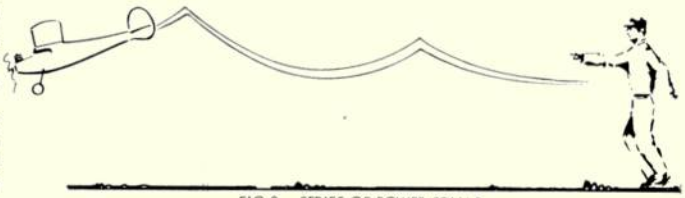


FIG 2 SERIES OF POWER STALLS

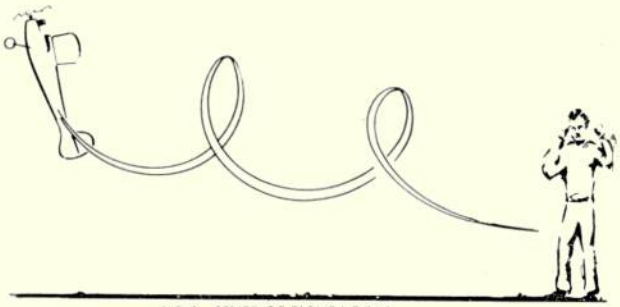


FIG 3 SERIES OF TIGHT LOOPS

and to consider the behaviour of a power model in flight and, in particular, during the climb. The subject could well fill a book – as indeed it has done (Frank Zaic's *Circular Airflow*) – but a very brief and over-simplified outline will have to suffice for this article.

Starting with a typical *sports* power model trimmed for a slow stable glide, consider the effect of applying very low power, and increasing it slowly. The model will at first have a prolonged glide, then fly level, and then climb slowly. These are basically the results of the propeller thrust increasing the flying speed and hence the wing lift. (Figure 1.)

With more power such a model will try to climb more steeply. As the angle increases the flying speed drops, and the model stalls. The resultant dive restores the flying speed and the process is repeated – giving a most inelegant series of power stalls, as in Figure 2. A further increase in power will cause the model to loop rather than stall. Some designs will, in fact, perform a series of tight loops, slowly gaining a little height, as illustrated in Figure 3.

This type of behaviour clearly prevents any hopes of obtaining the sort of performance desired from a power duration model, i.e. a long slow glide off a short fast climb. The reasons why a 'sports' model acts as just described are *not* tied up with its looks or shape (cabin, wheels, straight dihedral, etc.) but with the way it is *rigged* aerodynamically. The initial aim of a slow, stable glide implies a forward C.G. position, usually 30-50 per cent of the wing chord, and several degrees of 'longitudinal dihedral' or difference in incidence between wing and tail. Such a set-up produces the flight pattern described. The situation can be improved by sacrificing glide stability by simultaneously reducing the longitudinal dihedral, and moving the C.G. back to retain a glide. The former is the more significant under power – and makes the loops *bigger* – see Figure 4. This may not seem much of an improvement – but in fact it is the clue to controlling the model's power pattern.

A large loop takes quite some time to complete, and hence there is the opportunity to transform it into a different manoeuvre. By causing the model simultaneously to turn and roll whilst it is trying to loop, the flight path can be turned into an upward spiral climb, as in Figure 5. The roll can be produced by dihedral or wing warp (acting as aileron) or some combination of the two. Effects such as the angle at which the airflow impinges on the spiralling model, and the results of propellor 'wash' over the model itself, are also involved but cannot be considered here.

This trimming technique works well, and a good fast safe climb can be obtained. However, it does demand the correct balance between turn, roll and the looping tendency. Some designs need a 'knife-edge' trim whilst others are relatively insensitive. A poor launch can ruin the climb by getting the balancing forces out of synchronisation, and wasting much time and height before the model settles down.

Naturally even less incidence-difference can be tried – and results in what was known as the 'zero-zero' trim. Basically wing and tail were set at equal incidence, and a very rearward C.G. position (around the wing T.E.) adopted to suit the glide requirements. This arrangement gives a very large looping radius which needs little turn or roll to control. The resultant climb is fine, but the transition to glide is tricky. A bad stall often results in the tailplane 'taking over' and the model diving-in on glide. An identical situation exists in chuck gliders.

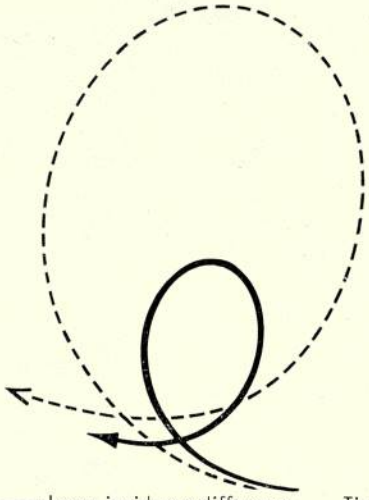


FIG 4 —— Large incidence difference Tight loop.
– – – Reduced incidence difference. Large loop.

Auto-rudders help the transition – but the real solution lies in the use of V.I.T. By altering the tail angle just after the engine cuts, a stable glide can be obtained after an all-but straight-up climb. This is the current practice, especially in F.A.I. and is certainly a very good solution to the *trimming* problem.

However, what has been done has implications. It should be realised by now that the secret of a good climb is to *prevent* the wing from generating high lift at high speed. A fast model climbs principally on engine thrust with the wing being *forced* to fly near its angle of zero lift. This is a fact which needs to be borne in mind when selecting (or sketching) the wing section itself.

Airfoils are usually thought about from the requirements of glide performance – which gives a thin, deeply undercambered shape. Such are not often used as power models even though V.I.T. would render them 'trimable'. It is often taken for granted (without further thought) that undercamber slows down the climb. Even though the reasons may not be appreciated, flat bottomed sections are popular enough on many power designs.

Diagrams on the flow round wing sections under glide conditions are common enough and usually look something like Figure 6. Much less usual is a drawing of the flow when the same section is giving little or no lift. As will be seen from Figure 7, the picture is very different. The airflow breaks away from the undersurface of the wing and this creates a lot of drag – and hence slows the climb.

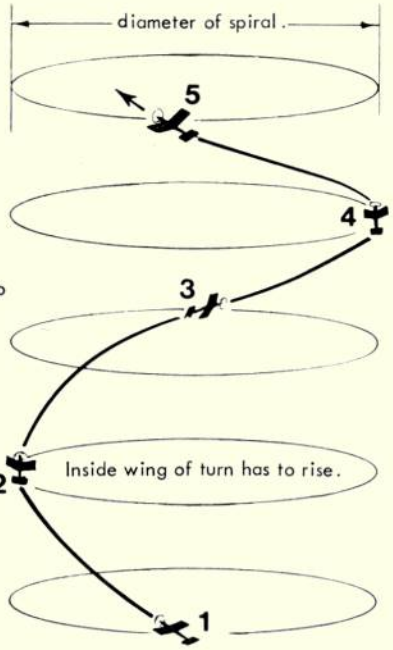
Clearly what is needed under power is something like a biconvex or symmetrical section that gives comparatively little drag at its zero lift angle. Unfortunately such sections do not glide well as they need high angles of attack to generate much lift, and this causes excess drag. If anyone needs convincing just watch a control line model on its glide! To reconcile the climb and glide requirements of the wing *airfoil* means either some sort of compromise choice – or some physical change in the section itself. Such a change is the function of flaps as applied to free-flight power duration models. By effectively 'bending' the airfoil, flaps enable the wing section to be a fair approximation of a thin, low-camber streamline shape under power, *and* a high-camber, high-lift section for the glide. This should provide the opportunities for a considerable gain in model performance, as the drawbacks of the usual compromise airfoil are avoided.

FIG 5.

Spiral climb

Flight path is a helix

Model must roll as it climbs and turns, so as to remain in same position relative to surface of "cylinder" upon which path can be drawn.



Model must be in same attitude at pt.5 as at pt.1

If one considers the model in its glide configuration, then the use of flaps can provide a considerable measure of *effective* 'streamlining' under power, and should increase the altitude obtainable by quite a noticeable amount. In this context flaps are valuable, when all other methods of improving the climb have been exhausted. This applies particularly to F.A.I. power models, where engine capacity is limited and highly tuned engines are commonplace. If power cannot be increased, then flaps provide what is just as useful, i.e. a drag reduction. 'Open' is a different matter, as the power installed can usually be increased – or the model size reduced! Conversely, if a model has already been designed for climb by employing a flat bottom section with upswept leading edge or even a biconvex airfoil, then flaps offer the chance to improve the glide without the need to curtail the rate of climb.

There are two basic approaches possible in designing a flapped wing. The first is to start with a normal 'glider' section and to flatten it out under power. The other is to take a biconvex 'speed' airfoil and to kink it out for glide. Both have their virtues and vices, and neither is by any means the ultimate! Those who consider flaps are complex should look at the N.A.C.A. Annual Report for 1920, where *Parker's Variable Camber Rib* is described. The

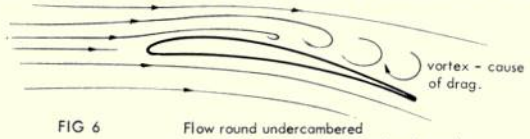


FIG 6 Flow round undercambered airfoil at several degrees angle of attack.

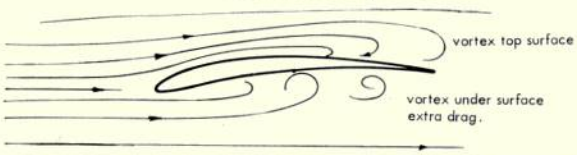


FIG 7 Flow round undercambered airflow at near angle of zero lift i.e. several degrees negative angle of attack. Diagramatic only.

Jim Taylor of the U.S.A. took a flapped model to Säve, but used his conventional designs in the contest. No doubt, the difficulty experienced by Koster in trimming his 'flapper' helped him make this decision!

whole section bends, with no discontinuities! Whilst hardly applicable directly to modelling, it does point the way to go. (Those wishing to follow this line of thought are referred to the N.F.F.S. *Free-Flight Digest* for June-July 1971, where Parker's ideas are reviewed.)

Historically, the use of flaps on power models is far from new. *Frank Zaic Year Books* contain the drawings of a couple of flapped designs. These are by Hank Cole (1957-58 Year Book, p. 69) and 'Andy' Anderton (1959-61, p. 77) – but they do not appear to have been persevered with by their designers, or to have been the source of inspiration to others at the time.

More recently, Bill Gieskieng of Denver, Colorado, U.S.A., seems to have sparked off interest in the idea of flaps. He has put considerable development work into a whole series of flapped designs. His wife, Annie, flew a most sophisticated 'flapper' to within striking distance of a place in the U.S. 1971 World Championship Team.

Thomas Koster got involved with the idea, and was certainly in close touch with Bill Gieskieng. By hitting the headlines with second place at Säve, Koster certainly put flaps into the limelight – and gave everyone plenty of food for thought!

Bill Gieskieng has supplied *Aero Modeller* with much information regarding his development work, and this will form the bulk of next month's 'continuation' of this article.

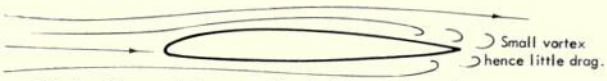


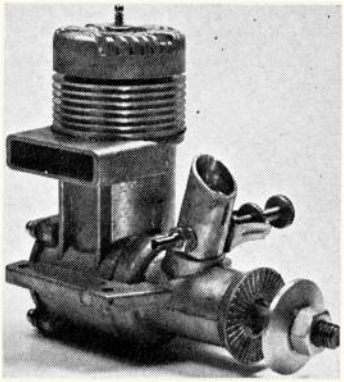
FIG 8 Flow round biconvex section at slight negative angle.

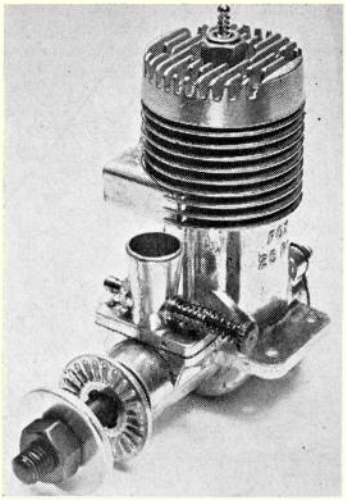
Narrow vortex at TE hence low drag Diagramatic only.

LATEST ENGINE NEWS

by Peter Chinn

TWO ENGINES of interest to control-line flyers that are currently being imported by *Irvine Engines* from the American Fox Manufacturing Company are the Fox 25 and Fox 40. Both of these are entirely new engines in that they are not developments of previous Fox models. Both use new castings and the 40, in particular, has some features which have not previously been seen on Fox motors.



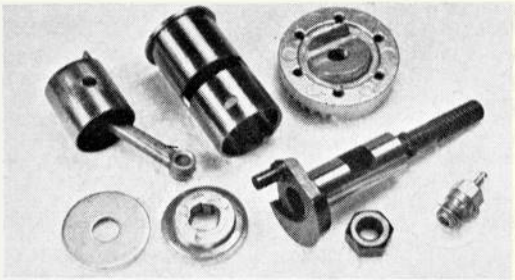


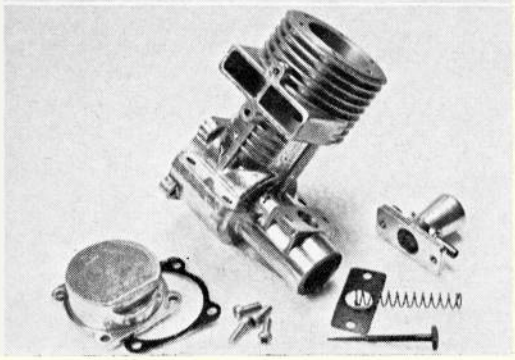
Above, the Fox 40 Stunt. The design of this engine differs considerably from previous medium-size Fox motors. At right is seen the new Fox 25, an 'odd' size (4 c.c.) offering the advantages of modest weight and low price.

Fox 25

This is the more recent of the two units, the first production models having been released from the Fox factory in January this year. Irvine Engines have now received their first consignment and the U.K. price has been set at a very reasonable £6·95.

The '25' stands for a nominal capacity of .25 cu. in. or 4 c.c. This displacement is uncommon in that it falls into the no-man's-land between the popular .19-.21 cu. in./3.2-3.5 c.c. group and the now somewhat diminished .29-.30 cu. in./4.9-5.0 c.c. class. However, the '25' could turn out to be quite a useful size and, in fact, the O.S. company are also making a .25 cu. in. version of their new Max-20 model. The idea is to keep the outer dimensions and weight of the engine as near as possible to those of a '19' and to use the engine's extra swept volume to overcome the power loss caused by the silencer – the necessity of using silencers now having become more or less universally recognised.

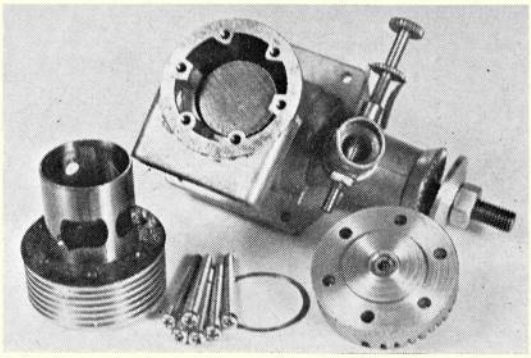




At left, parts of the Fox 25. Note the unusual flange-type carburettor mounting and the tapped lugs on the exhaust duct for silencer attachment. Below shows the cylinder assembly removed from the Fox 40 to reveal the unusual porting, deflectorless piston and flat cylinder head.

In the case of the Fox 25, the engine's overall size is certainly quite close to that of the average '19' and its weight is extremely modest at only 157 grammes or 5.54 oz.

In most respects, the Fox 25 is of orthodox design and construction. It is built around a pressure diecast crankcase / cylinder / front-housing unit with bronze-bushed main bearing and drop-in cylinder liner. The



hardened crankshaft has a 7/16 in. dia. journal and a 5/32 in. dia. crankpin. The lapped cast-iron piston is typically Fox with a thin baffle on an otherwise flat crown, and a slim (⅛ in. dia.) solid gudgeon-pin. A plain diecast conrod is used. The cylinder-head is of the familiar Fox wedge pattern and has a recessed 10 thou. aluminium gasket. Six screws tie the head to the main casting. The plug is a Fox 1½-volt long-reach type.

The only really unorthodox feature of the Fox 25 is the method of mounting the carburettor. This is similar to the style first seen on the Fox 60/74/78 series engines in which a saddle is formed on the crankcase nose as part of the main casting. This has a machined face and the carburettor body is equipped with a flange by which it is attached to the saddle with two screws.

One thing that we are seeing for the first time on a Fox motor (and something that is still rare on an American engine) is provision for fitting a silencer. Two tapped lugs, located above and below the exhaust duct, are incorporated in the main casting and to these it will be possible to fit one of the new Fox silencers.

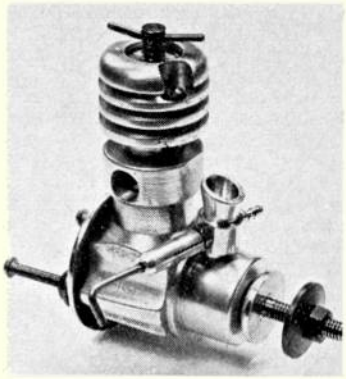
A throttle-equipped radio-control version of the Fox 25 is also being manufactured.

Fox 40 Stunt

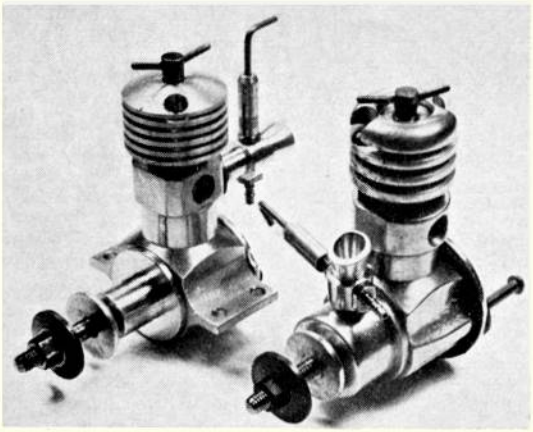
The Fox 40 Stunt was first seen last summer and marked a complete break with traditional Fox medium-size engine design. It has, for example, very un-Foxlike scavenging in the shape of two large inclined transfer ports fed by what amounts to three transfer channels in the crankcase casting covering almost half its circumference and used in conjunction with a flat crown deflectorless piston and a flat cylinder-head.

The crankcase casting, unlike earlier Fox 40's, does not include the cylinder casing. Instead, a separate machined finned jacket surrounds the upper part of the cylinder and the entire assembly of head, liner and jacket is tied to the crankcase with six long screws. Incidentally, the transfer ports open and close at 60 deg. each side of BDC. The exhaust ports open and close 64 deg. each side of BDC.

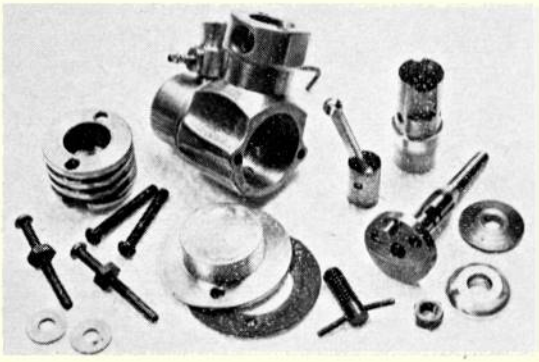
The crankshaft has a very large diameter journal (9/16 in.) and a gigantic gas passage. This latter, 0.410 in. bore, obviously does not help the stunt version of the 40 very much but, presumably, is there in anticipation of the future development of this basic design for other applications. The valve port, much smaller, remains open for approximately 180 deg. of crank angle, closing at 45 deg. ATDC.



The new Embee 75-RV. Unlike the standard Embee 75, it has radial mounting and rotary-valve induction.



Embee 75-RV with (left) the standard Embee 75 model. Both motors are reminiscent of early post-war design and probably well suited to the free-flight scale modeller's requirements.



Parts of the Embee 75-RV. The engine's small cylinder bore and long stroke are clearly evident. Front bearing is epoxied to the crankcase.

Quite a bit bigger in overall dimensions than the earlier Fox 40 models, the new 40 Stunt weighs 9.56 oz. It has a bore and stroke of 0.800 in. × 0.790 in. giving a swept volume of 0.3971 cu. in. or 6.507 c.c. The engine is supplied with two interchangeable venturi inserts which, after allowing for the restriction caused by the spraybar, give effective choke areas of approximately 13 sq. mm. and 16 sq. mm. The smaller of these should promote really strong fuel suction for smooth, safe operation through tight stunt manoeuvres. The larger one should allow slightly higher power with only a slight reduction in fuel draw.

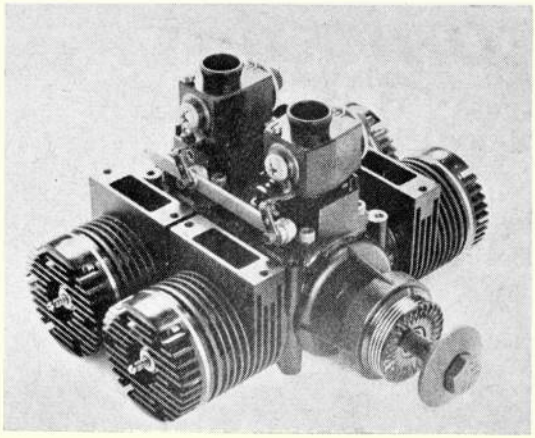
The engine examined for this report was not tested but we have run full tests on its companion 40 R/C model. This has an intake area considerably larger (24.6 mm.) than the 40 Stunt. According to the manufacturer's advertising literature, the 40 Stunt turns a typical 10 × 6 prop at around 11,000 rpm while the R/C version turns the same prop 500 rpm faster. It so happens that our 40 R/C did, in fact, record exactly 11,500 rpm on a 10 × 6 Top-Flite maple prop using a fuel corresponding to the recommended Fox 'Missile Mist' blend (and without a silencer) so it is reasonable to assume that the 40 Stunt would be capable of around 11,000 rpm under the same conditions.

Northfield-Ross Four-Cylinder

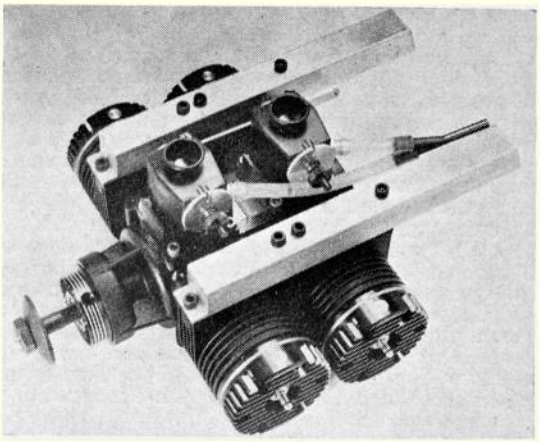
It would be hard to find a model aircraft engine in sharper contrast to the Embee (described below) than the Ross Four. This complex and very expensive motor, designed by Louis Ross, is now in production at the Northfield Precision Instrument Corporation plant at Island Park, Long Island, New York and the example illustrated here is the eighth one built.

This engine has a total piston displacement of just under 20 c.c. (i.e. it is actually inside the general insurance limits) but is remarkably compact at only just over 4 in. long and less than 5 in. wide across the cylinder-heads. The crankshaft is supported in four ball-bearings and the connecting-rods have split big-ends. Induction is via twin Perry carburettors and reed type intake valves.

Further details of this remarkable engine are contained in the current issue of our companion journal **Radio Control Models & Electronics.**



The 20 c.c. Ross horizontally - opposed four-cylinder engine. This is the largest and most expensive model aircraft motor at present in production. Note the linked Perry carburettors feeding the reed valve induction. These motors are finding great favour with drone manufacturers.



Another view of the Ross Four, this time fitted with twin exhaust manifolds. A wide variety of multi-cylinder engines are now produced by Northfield-Ross in capacities up to 100 c.c.

Embee 75-RV

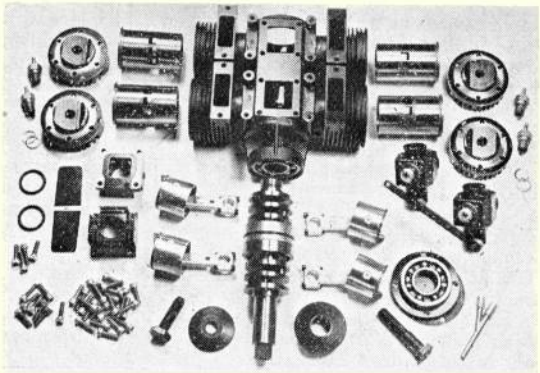
This new British small diesel is a development of the standard Embee 75 which was dealt with in the AM Engine Test series nearly four years ago. Embee engines are made by P.A. Moore, 72 Fairfax Road, Leicester and include, in addition to the 75 and 75-RV, a small, geared twin for marine applications and a ball-bearing 2.5 c.c. unit. All are diesels.

The main difference between the standard 75 and the new 75-RV is that the former's sideport induction system is replaced by a crankshaft type rotary-valve. A new front bearing unit is pressed into the crankcase (and apparently sealed with an epoxy resin) and this carries a shortened version of the standard carb assembly. A small valve port and gas passage have been added to the 0.25 in. dia. crankshaft. Cylinder porting still features two drilled exhaust ports each side. Transfer porting now consists of ports and passages front and rear instead of at the front only.

The beam mounting lugs of the standard 75 have been removed on the 75-RV and the engine is now intended for radial mounting, though we are not too keen on the provision made for this, which consists of two long roundhead screws protruding from the rear of the engine with nuts to hold the backplate in place. However, it would be a simple matter to substitute studs.

The 75-RV continues the tradition of the standard 75 in having a very long stroke (S/B ratio 1.54 : 1) and, as we said of the original engine, the 'vintage' enthusiast may find it well worth investigating as a near-authentic power-plant for an early post-war type free-flight power model. Otherwise, it should appeal mainly as a really economical beginner's engine, particularly for 'fly-for-fun' type power models.

The 75-RV is about 0.4 oz. heavier than the standard model, the example submitted for examination weighing 88 grammes or 3.1 oz. The engine has a nominal bore and stroke of 0.312 in. by 0.480 in. giving a swept volume of 0.0367 cu. in. or 0.6014 c.c.



Parts of the Ross Four. Construction throughout is to extremely high standards on these virtually hand-built motors. The big ends are split, as per full-size practise, and bolt together.

topical twists

by 'Pylonius'

Illustrated by 'Sherry'

'Reckon that's another World record gone for a burton.'

Cover Story

FROM NEWSPAPER REPORTS we learn that there is a model on display in a Cairo model aircraft exhibition which purports to be of a type that the ancient Egyptians flew as a relaxation from the incessant pyramid building.

This discovery would appear to be a bit of a blow to our national pride as we, in our stiff upper lipped way, have always claimed the model plane to be our own pet invention, along with the British Empire, the steam engine and football boots.

However, we need have no cause for dismay, for historical research has revealed that during the reign of Tut II a venerable ancient Briton, Og of Blog, pushed out his paper craft from Barking Creek to find that land upon which the thermal never sets. He eventually arrived at a fabulous place covered with tall grasses and one eyed people walking sideways. These people were clever, but Og, in a flash of intuition, could see why their model planes never flew: they used stone tablets as a covering, having not yet discovered paper.

When Og showed them what could be done with a bit of tissue they were amazed and shouted Ra, Ra, Ra. But where to get the paper? Why from all that long grass, said Og. So they pulled up all the long grass to make paper, which is why the place is now mostly desert, and why it is called E.G.Y.P.T. (Even Grass Yields Paper Tissue). And by way of honouring Og they called their young king after his place of birth: Tutankhamun, which, of course, is Egyptian for Tooting Common.

Record Review

It is all very tiresome the way some countries are so eager to lay claim to all the model records in sight, from CO_2 powered Ornithopter to Inverted Multi Radio. Back in the pioneering days of the hobby when the second hand of grandfather's watch could cope with all the timing problems, and when the natives of the countries now claiming all the records would have fallen before their ikons at the sight of a model plane, record breaking may have had some significance, but since the time the American gassie came on the scene and the stop watch was exchanged for an alarm clock, the whole business fell a bit flat.

Just after the war, however, we were jolted back into an awareness of records as an International issue by the sudden claim on the part of one country for every possible record for every possible class of model, some of which had not been recognised in the West since they scrapped the Mann Monoplane. But what shook us more than anything were some of the photographs backing up the claims. These depicted gentlemen in working class Edwardian dress clutching models of an equally ancient vintage. Somewhere out there, we conjectured, in the cold, cold wastes, must be a Yeti sized thermal.

It is true that the Radio model has revived the record mania to some extent, which is why we are subjected to a new batch of inscrutable claims, but the endurance factor is no longer one of flying science or mechanical ingenuity but that of sheer human tenacity. The fact that someone has kept a float plane up for ten hours is, I imagine, of more interest to those engaged on rheumatic research than to the model world.

Crash Course

A recent reference to the content of the model mag of yesteryear brings home, with a sense of shock, just how serious the old time modeller took the theoretical side of the hobby. In those days the question was '*Why?*' and not '*How Much?*'. If his model crashed it was for reasons other than radio failure, and there were plenty of literary theorists to tell him why he was picking up the pieces. Not that they all agreed upon the way to achieve one piece salvation. Some would aver that the answer was to build bigger, more uplifting tailplanes, whilst others saw perfection in deep pendulous fuselages with undercart wheels like clock weights.

Notwithstanding all the well meant theory, models still continued to crash, and didn't begin to fly reasonably well until some deviants began to do the exact opposite to that which the experts prescribed, producing models which, according to the theorists, could never do one minute let alone the five they did.

Most of the old theorists had the prudence never to build models along the lines of their own theorising. But now and again they were tempted, and one well known theorist, whose name cropped up recently, fell in a big way, and so did his model, which flew like a brick.

Saw Point

That idea of doing all your balsa slicing on a mechanised saw frightens the life out of me. It's not so much the dislike of being called Leftie, it's all the clearing up. After years of practice I have managed to confine the 'contaminated' area to something like a three foot radius. This I find maintains something of a domestic status quo, but the consequences of a machine spewing balsa shavings in all directions would be nothing short of disastrous. And, then, all it would mean is that I'd muck up more bits of balsa wood, quicker.

A highly successful glass-fibre fuselaged model by Jaroslav Safler and Jaroslav Kodytek

THIS F.A.I. class team racer was developed from a design which fellow Czech modeller Quido Klemm was using around 1966. Several models were built to this design, but with structural alterations, by the members of the Ahra club, and all of them immediately produced good performances. Safler and Kodytek then went on to place well in the Czech Nationals and other international events, ultimately winning an International Easter meeting and placing second at the 1971 European Championships held at Pecs, Hungary.

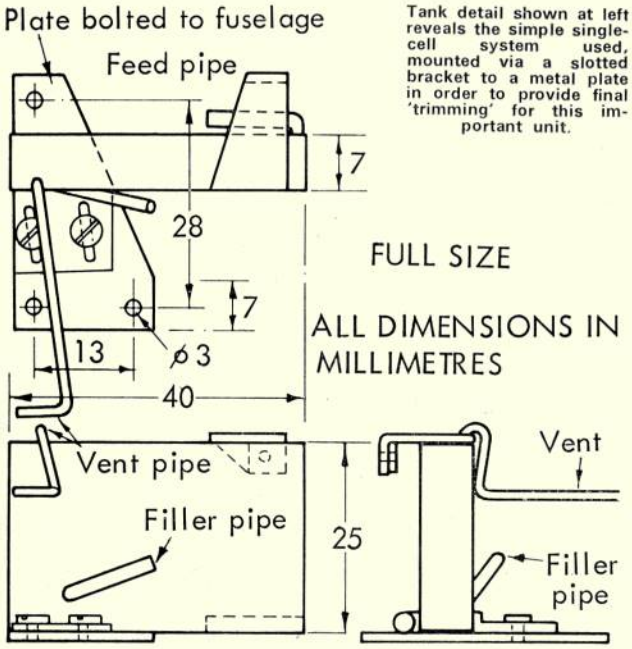
Use of a glass-fibre fuselage may seem over-complicated, but the nett result is a virtually unbreakable component, and this combined with glass-fibre cloth covered wings makes for an extremely hard wearing model – most important when top, consistent performance is required. Pit stop times are reduced by means of a pressurised refueling system, while an adjustable tank position means that the best possible economy from the MVVS 2.5TRS may be achieved. The original model tips the scales at 23½ oz.

The model drawn overleaf is to scale, with all measurements provided and important details drawn full-size, enabling a replica to be built without the necessity of full-size plans. However, it is obviously a machine that is in the 'expert only' category in respect of its fuselage construction, and thus only brief building details follow.

The monocoque fuselage is made in two halves, left and right, using two layers of medium thick glass-fibre cloth moulded in the traditional female mould fashion. Air inlet and exhaust ducts are carved into the mould so that they are cast integrally with the fuselage sides, while $\frac{1}{16}$ in. steel plates are added for the undercarriage mount to the left-hand side during the glass-fibre lay-up process. If needed, add resin filler to the shells and sand smooth before they are later joined.

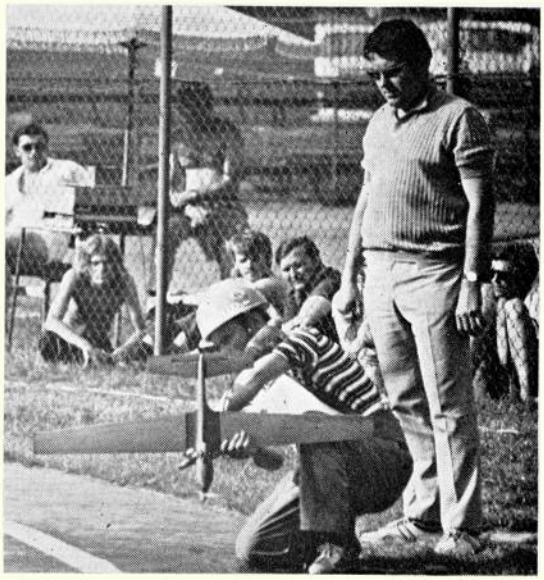
Cut the wing planform from ½ in. balsa, add the ½ in. x ⅜ in. spruce leading and trailing edge reinforcement, then carve to the wing section shown

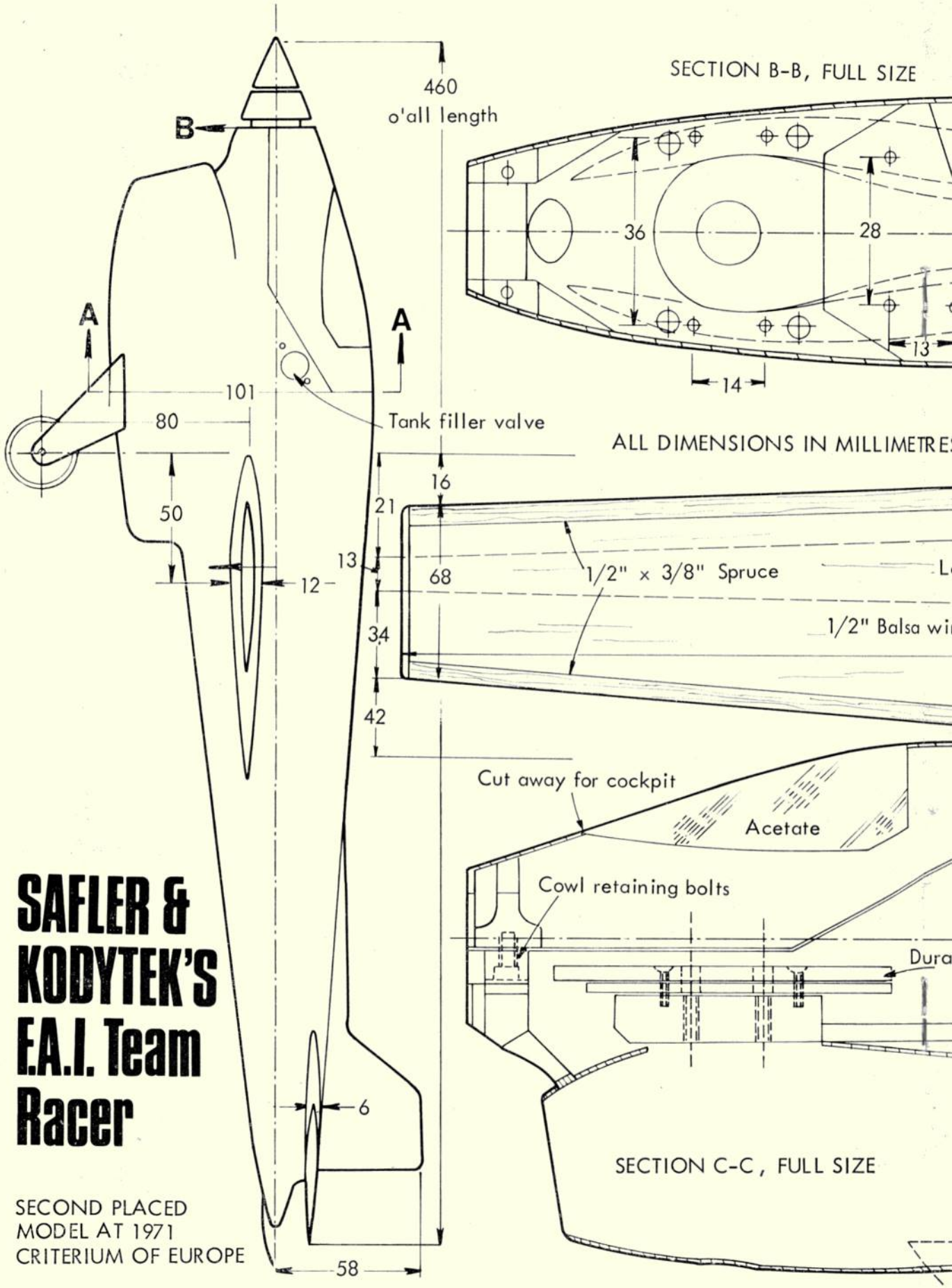
Continued on page 274



Tank detail shown at left reveals the simple single-cell system used, mounted via a slotted bracket to a metal plate in order to provide final 'trimming' for this important unit.

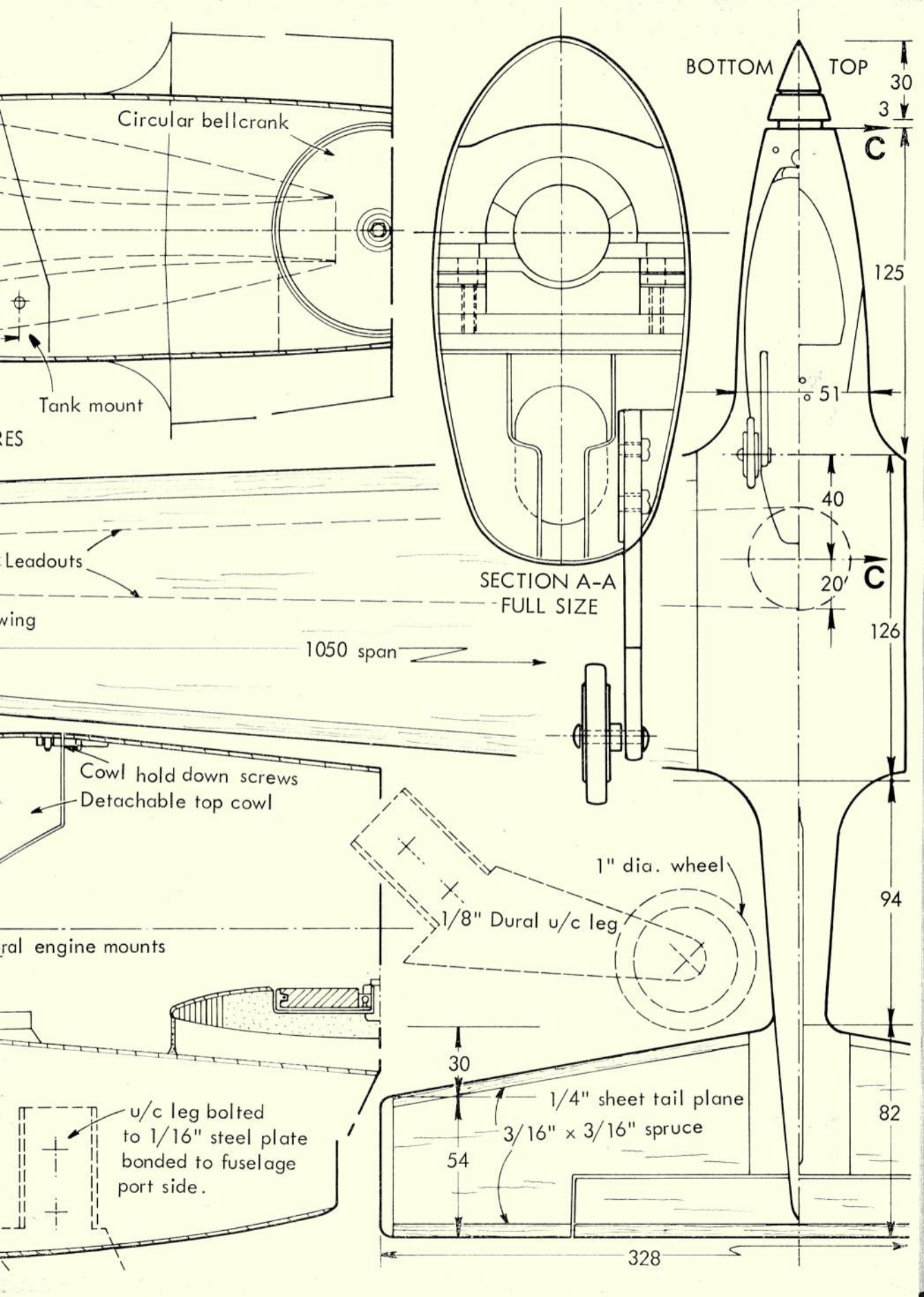
Team manager Milan Drazek watches as Jaroslav Kodytek cuts his engine prior to the final at the 1971 Criterium of Europe.

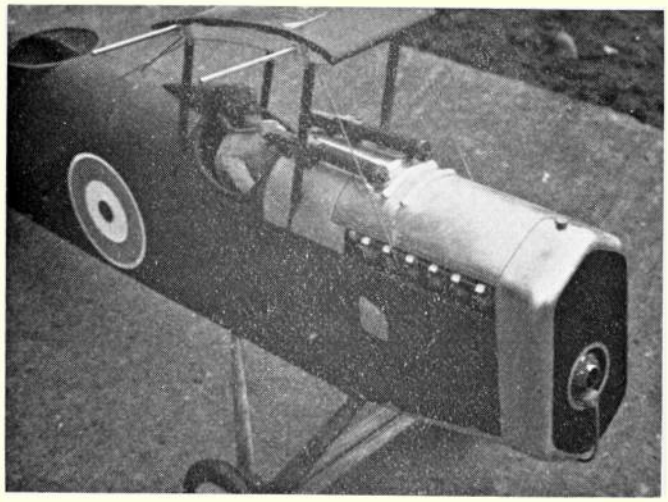




SAFLER & KODYTEK'S F.A.I. Team Racer

SECOND PLACED MODEL AT 1971 CRITERIUM OF EUROPE


Circular bellcrank
Tank mount
RES
Leadouts
wing
1050 span
SECTION A-A
FULL SIZE
BOTTOM
TOP
30
3
C
125
51
40
20'
C
126
94
82
328
Cowl hold down screws
Detachable top cowl
ral engine mounts
u/c leg bolted
to 1/16" steel plate
bonded to fuselage
port side.
1" dia. wheel
1/8" Dural u/c leg
30
54
1/4" sheet tail plane
3/16" × 3/16" spruce



FLYING SCALE COLUMN

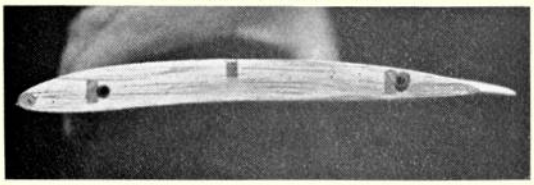
by Eric Coates

Exposed cylinder heads of a dummy Rolls-Royce Eagle VIII poke out from the nose of Terry Manley's present project, a D.H.4. The aluminium radiator is beautifully reproduced, and is almost a hallmark of Terry's modelling. Note also the heavy gauge wire wing dowels fitted to the centre section.

THE MONTH OF FEBRUARY was pretty ghastly – the weather that is! Almost continuous wind and rain made scale flying impossible while the electricity cuts have not helped the building side either. As I look back to my youth, I seem to remember successions of winter Sundays when the air was crisp and still with the ground frozen hard, if not with a covering of snow. The low lying fields around Goole and East Riding, which were then my flying grounds, were semi-flooded in the winter months and the frozen surface made excellent take-off areas. There may be a certain amount of rose tinted nostalgia about these recollections, but I am sure that the winters today are windier with much less frost. I won't say milder because a windy day, with the temperature at about 38°F can feel a darn sight colder than a calm day with the temperature around 25°F! You may say that my change of environment to the South is the reason but no, I still fly frequently in Yorkshire, both in winter and summer and find the change is just the same there.

Now for details of the new season's models, but I hasten to add that I have not been visiting the Paris salons! I mentioned last month that both Terry Manley and John Turvey were building D.H.4's and I have recently seen both models under construction. Terry, who is by far the furthest advanced, is building one of the late type with the Rolls-Royce Eagle VIII engine. A very nice job too he has made of the engine detail – the cylinder banks protrude on this model and all the head detail is exposed. Terry has certainly had plenty of time for this work as due to an industrial dispute, he has been a 'gentleman of leisure' for several weeks. (Every cloud has a silver lining . . . Ed.) Structurally the model follows Terry's traditional lines, somewhat different to mine, with flying surfaces thickened to allow for cantilever working with little, if any, assistance from the rigging. The major structural innovation is the wing T.E. structure. By thickening the section this has allowed Terry to introduce a sandwich form of structure, similar to the tailplane structure I have described previously, as shown in Fig. 1.

End view of Terry Manley's D.H.4 wing reveals the considerable thickening of the R.A.F. 15 section to allow the use of substantial spars and inset 1/16 in. sheet trailing edge with capping strip.



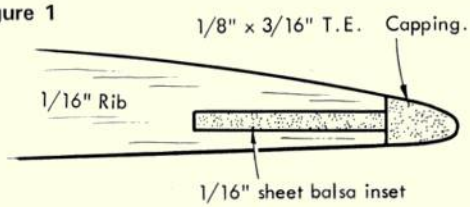
This form of structure is of course not new and has been used by the radio fraternity with their larger models for several years. There is no doubt that a small sectioned trailing edge looks more realistic when viewed in the plan, although looked at 'edgeways-on' the thickened wing section somewhat offsets the effect. I personally like to keep to a scale thickness for my wings which precludes such a form of T.E., and stick to a piece of $\frac{1}{2}$ in. x $\frac{1}{8}$ in. When painted drab khaki and with rib tapes run to the absolute trailing edge, the large section is almost invisible; from the top anyway.

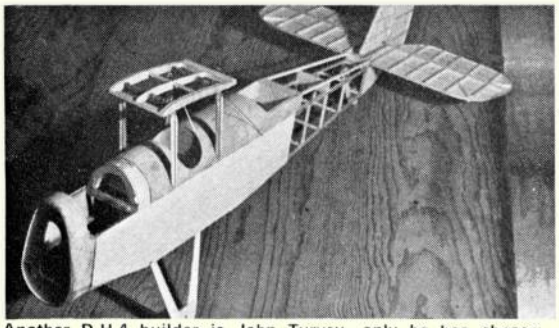
The other structural innovation on the wings is the introduction of yet another subsidiary spar (I have earlier discussed the use of an $\frac{1}{8}$ x $\frac{1}{8}$ in. spar let into the top surface of the ribs at the point of maximum camber). This is only a short spar stretching two rib bays or so either side of the aileron root rib. This is a notoriously weak area owing to the discontinuity of the T.E. at this point. Terry considers that weakness in this area is one of the causes of the onset of the dreaded eliptical dihedral. Like the full length subsidiary spar, this short spar is inset of course, so that it is invisible when covered.

John Turvey is modelling the earlier D.H.4 with the Siddeley Puma engine. In some respects this machine with the engine totally enclosed, and egg shaped radiator, is more attractive than the later Eagle VIII versions. Performance-wise there was no comparison however, the Eagle VIII version being some 30 mph faster – they were in fact the 'Mosquitos' of W.W.1, with a top speed of 136·5 mph, faster than contemporary scouts in service on either side.

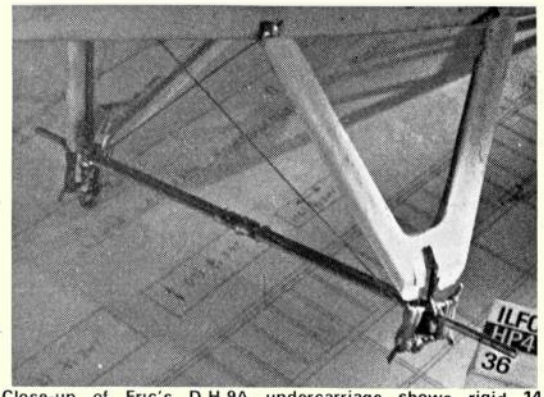
The structure of my D.H. 9A is now almost complete and I have taken great pains to keep the weight down on this model. There are a great many ribs and riblets in these wings so I used 1/32 in. sheet for these – the first time for many years. I still have mixed feelings about ribs

Figure 1





Another D.H.4 builder is John Turvey, only he has chosen the Siddley Puma-powered variant. The above view of the partially-completed fuselage reveals the egg-shaped radiator – rather less austere than the Rolls-powered version, and easier to model, due to the totally cowled-in engine. Fuselage construction is typical, being mainly a sheeted 'box' with a built-up rear end.

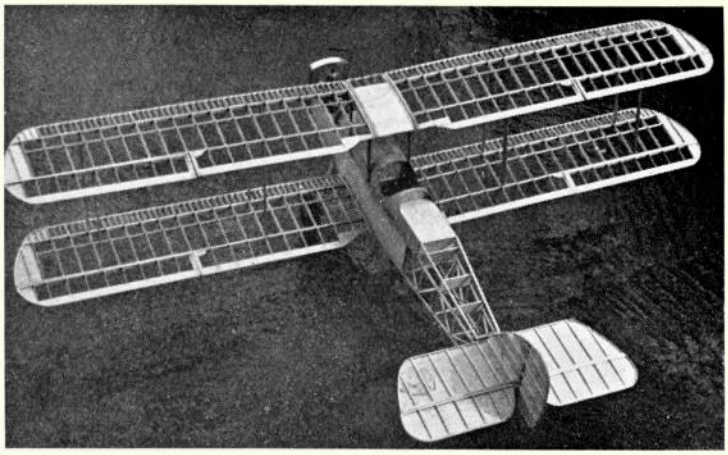


Close-up of Eric's D.H.9A undercarriage shows rigid 14 s.w.g. legs and ply fairings, Bungee hangers fore and aft of the axle permit over ¾ in. vertical travel.

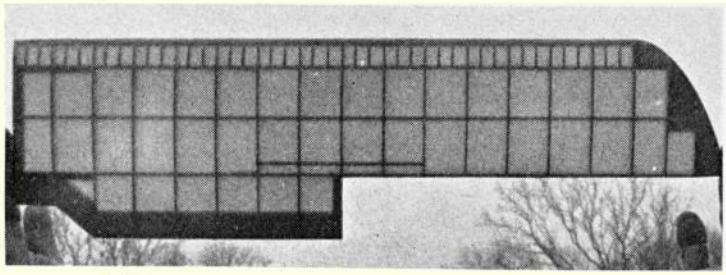
as thin as this. They are certainly easier to block out but are very delicate in the structural stage requiring careful handling to prevent breakages, while the odd one always 'concertinas' slightly during construction no matter how careful you are. P.V.A. adhesive is a must for such thin ribs. Also to cut down on weight, I have greatly reduced the wire scantlings, on nearly all parts, to that which I normally use for a model of this size (50 in. span). This seems to have paid off, for the model almost structurally complete and including the Mills 1.3, weighs only 21 ozs. My target weight is 32 ozs. so I should accomplish this without too much difficulty. Being relatively short coupled and long nosed, the C.G. should not be difficult to site correctly without resorting to a load of ballast.

Apart from the obvious advantage in performance I particularly want the 9.A to be light because for the first time in many years I have fitted an undercarriage without any rearward swing: it is very difficult to make a 9.A undercarriage look realistic unless the rear legs are anchored. As there is much more vertical travel incorporated in the original 9.A undercarriage than in most of its contemporaries I decided to risk a scale structure, so 14 swg wire was used for the legs (this in itself a considerable weight saving on the 10 swg wire necessary for one of my customary backward-swinging torsion-bar jobs). These are anchored to brass tubes epoxied to the fuselage structure, while the whole structure is made rigid by the fairings, fretted in one piece from 3 mm. ply. These are then suitably grooved to completely enclose the wire legs and secured with epoxy. The spreaders are 16 swg wire and the 12 swg axle is secured to the centre of the spreaders by fusewire binding and soldering. Springing on the 9A was a little more sophisticated than the usual binding of the axle to the u/c structure with bungee cord. Hangers were provided, attached to the axle and u/c structure, to allow pretensioned loops of bungee to be fitted in fore and aft of the axle, so I fabricated similar hangers from 18 swg wire and used rubber bands as bungee. The axle is constrained to a vertical path of travel by the slots in the fairings – over ¾ in. of axle travel is possible. The finished u/c looks a sound engineering job but whether the rear legs can stand the punishment, only time will tell.

There are several other features I am trying out on the 9A for the first time which I will go into detail about in future editions of *Scale Column* but to conclude with this month I will recount a story regarding the fin. Before making the drawings I spent the best part of a year collecting gen on the 9A. Surprisingly for an aeroplane that was in service with the R.A.F. in considerable numbers from 1918 until 1932 it is poorly documented. The 9A is essentially a D.H.9 (which following the D.H.4 was an abysmal failure due chiefly to an inadequate power plant) fitted with the then new Liberty engine of 400 h.p. The span was increased to 46 ft. to handle the new unit, all the modification work being carried out by Westlands. It was from this company and the War Museum where the only decent photographs, showing adequate detail of wartime machines, were obtained. I had gathered three



The author's D.H.9A is rapidly nearing completion, as shown by this photograph taken in early March of this year. Note the 'sandwich' tailplane construction used, as described by Eric in his earlier Flying Scale Models series. For a person who professes to dislike cutting out wing ribs, we have something of a masochist in our midst . . . Light weight has been achieved by paring the dimension of all components wherever at all possible.



Hold it up to the light, not a stain and shining WHITE ? ? ? Wing of Manley's D.H.4, covered but unpainted, reveals the full-length centre spar and short spar at the aileron cut-out – invisible when the finish is applied, of course. Note also the trailing edge inset structure.

sets of drawings over the years, but, when compared with the photos two sets were obviously widely inaccurate. The third set, although to a very small scale (about 1/124) seemed to be fairly accurate apart from one or two details. I therefore photographically enlarged this drawing to 1/72nd and worked from this, correcting details from photographs as I thought fit. The working drawings were completed and the fuselage structure built. John Turvey then called round one evening to see how it was all going. looking at the drawing he immediately queried the fin shape – I said I thought it was accurate producing the original drawing from which I had worked. Yes, it looked O.K. to that but when compared with the photographs the shape was obviously a mile out. Rather strangely the other two drawings which were inaccurate in nearly every detail had reasonably accurate fin shapes.

Luckily I hadn't started the fin structure so I found a direct side view photograph and enlarged this up, using the grid method, to exactly 1/11th scale. When compared to my original fin it was nearly ½in. out in places; which would have been 6in. on the prototype! It just shows that if the original aircraft is not available for examination then scale drawings should be treated with considerable caution and checked with as many photographs as possible. When you have finished your working drawings and before you start work on it, show it to a knowledgeable friend together with a set of photographs and invite him to pick holes in it. It is surprising what a fresh set of eyes new to the project can pick out!

The final twist of irony to this tale was that when comparing John's working drawings of his D.H.4 fin with the photographs this was inaccurate also; although I may add nothing like as bad as my 9A fin. Checking back to the original set of drawings, regarded hitherto as of unimpeachable accuracy, the fin shape here was also inaccurate when compared to photographs. Mind you looking at as many photos of the D.H.4, 9 and 9A fins as John and I have this last month we came to the conclusion that they weren't all built to a set of accurate drawings either!

One final plea for this month. Where has all the lightweight silk gone? It seems to be unobtainable from model shops throughout the country. Can it be that there has been such an upsurge in building scale models that the country's stocks have been laid as low as they have of coal. Perhaps we shall see an entry of 110 in the 'Super' at the Nationals this year!

CZECH TEAM RACER

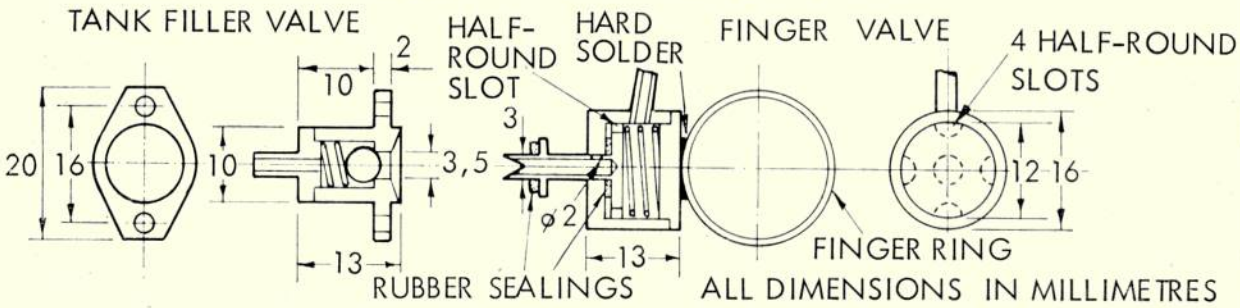
Continued from page 269

using a rasping file and several grades of glass-paper. In the centre, cut a hole for the circular bellcrank, then groove the left-hand panel for the leadouts. Varnish these grooves to prevent them from causing binding on the lines, then epoxy 2 in. long brass tubes at the tips for their exit. Epoxy a piece of lead, size 1 in. x 1 in. x 1/16 in. to the starboard tip. Fill in the leadout grooves, then finally sand the wing smooth before covering with a single layer of glass-fibre cloth and epoxy resin. When dry, apply a further coat of resin, then sand down with wet and dry paper, used wet.

Tailplane construction is identical, the ¼ in. sheet balsa being stiffened by 3/16 in. x 3/16 in. spruce leading and trailing edges. Elevators are hinged via Teflon strips, and the whole once more covered with glass-fibre cloth. Repeat for the fin also.

Now to assemble the model. Cut a slot for the tailplane in each fuselage half, then insert the wing into the starboard fuselage piece and epoxy in place. 22 swg gauge leadouts are connected to the bellcrank, then this unit together with the pushrod is securely installed. Next, slide the left-hand fuselage in position, epoxying the two shells together. Add the tailplane, then reinforce all joints with a strip of thin glass-fibre cloth.

The engine is mounted on dural blocks epoxied and bolted in position – take care to align these properly. Solder up the fuel tank from thin tin plate and bolt to these engine mounts – note how the slotted mounting holes provide adjustment for the ultimate efficiency. Mould a canopy from acetate using the cowling as a former, then cut away the glass-fibre and install in the appropriate position. Epoxy the cowl attachment pieces in place, and the model is complete, with no further painting necessary, provided that pigmented resin was used during the fuselage moulding. The epoxy is 100 per cent fuel proof so decay due to fuel seepage is a thing of the past with a model like this!



GOLDEN WINGS AEROMODELLER MODEL CLUB

Are you between 10 and 16 years of age? Then don't delay, join today

JUNIOR KIT CONTEST NEWS

As detailed in our March 'Wings' column, the first of the bumper 1972 S.M.A.E. Junior Kit Contests will take place over Whitsun at each of the S.M.A.E. British Nationals venues.

The contest scheduled for the Free-Flight Nationals at R.A.F. Strubby (Near Mablethorpe, Lincs) will be held on Monday May 29th and the one at the R/C & C/L Nationals (venue R.A.F. Hullavington, Wilts) will also be held on the same day.

So, get building and practising. The only other item of importance, for those of you writing to RAY FAVRE for advice etc., should note that his address is now:

26 West Drayton Park Avenue,
West Drayton, Middx.
Telephone: West Drayton 4410

Dear John,

Having got S. Coles' excellent plan of the free-flight Spitfire Mk. Vb, would it be overpowering the design if I put a D.C. Merlin .75cc engine in it? Also, I'm trying to find scale drawings of the Piper Cub and the little known tricycle undercarriage trainer, called the General Aircraft Owlet, as big as possible. Any information you can give me about obtaining them would be greatly appreciated.

Morecombe, Lancs. *J.R. Smith*

In answer to your query re the Spitfire's powerplant, your model will not be overpowered if you use this engine. As regards the Scale Drawings, the current range of Aeromodeller Scale Drawings does not cover either of these aircraft. However, three view drawings of the Owlet appeared in Volume 2 of 'Aircraft of the Fighting Powers'. As for the Piper Cub, all we can do here is to suggest you write to the Piper Aircraft Corporation at Lock Haven, Pennsylvania, 17745 U.S.A.

Dear John,

I am doing a project on 'Aviation' at school and wonder if you could send me any information, photos of aircraft etc., to help. Also scale drawings if you have them.

Dagnall, Herts. *R. Rimold*

We are very sorry, but we have no information here suitable for projects such as you request. You may find some information in our magazine, and a complete list of all our three-view drawings is carried in our Plans Handbook No. 1 (price 15p). Alternative sources of information would be specific aircraft firms making the aircraft you wish to include in your project and the Science Museum in Exhibition Road, London. Your local library will also have reference books on the history of aviation from which project material may be gathered. More detailed information on specific aircraft may be obtained from Profile Publications. A list of their booklets, containing colour views, and illustrations of various aircraft markings, together with a historical description may be obtained by sending a 3p S.A.E. to them – Dept. AE91, Coburg House, Sheet Street, Windsor, Berks. Yet more information could be obtained from the various aviation museums in the country, such as the Shuttleworth Trust at Old Warden, Beds, where various vintage and veteran planes are on show to the public. Photographs of these could be included in your project.

Dear John,

In the March issue of *Aeromodeller* you featured *Little Hinney* an A/1 glider design. This interested me greatly so I sent away for the plan. When I received it, I failed to understand a few points and I would be grateful if you could enlighten me on them. Firstly, I I do not understand what it means by 'Wing Warps', Wash-in on R.H. inner panel' ($\frac{1}{16}$ in.) and also 'Washout on both tips ($\frac{1}{8}$ in.)'. Secondly I could not understand how the tail wing was attached to the fuselage so that it sprung up when the D/T timer was activated. Last of all I failed to understand how the rudder (autorudder) was fitted to the tailfin so that it would spring to the right when the D/T timer was activated.

Could you please inform me (if possible) if there is a kit or plan produced in U.K. for a model rocket as I would be interested in making one.

Morpeth, N'land. *D. Jennings*

Oh dear, David, you seem to have overlooked the statement that 'Little Hinney' was not designed for beginners – if you had built a couple of similar models previously you would have had no trouble understanding these points. However, they are not really difficult to understand. Warps are frequently built into free-flight models, for various reasons. Wash-in refers to an increase in incidence of the wing panel i.e. the trailing edge has been lowered $\frac{1}{16}$ in. to increase the lift of that panel, thus inducing a slight left hand turn during the glide. This is not to say that the whole T.E. is lowered $\frac{1}{16}$ in. – this is progressive from the centre section to the tip dihedral point. To build this in, ideally the building board should be lower at this point –naturally this is not piece of $\frac{1}{16}$ in. packing under the leading edge at the tip dihedral point – the other three corners of the panel being pinned flat on the board. Now build the panel in the usual way, except that the leading edges of the ribs will progressively rise off the board until the end is reached, and this will be $\frac{1}{16}$ in. clear. Raising the leading edge gives the same effect as lowering the trailing edge – try it and see what I mean, it is not nearly so confusing as it sounds! Actually, with so little wash-in, the wing could be built flat, then covered and jigged for the $\frac{1}{16}$ in. wash-in while the dope dries. After completely doping, leave pinned down for at least 24 hours to permit the dope to thoroughly set, whereupon, you will find that the $\frac{1}{16}$ in. wash-in will remain.

Wing tips use washout for a different reason. Washout refers to a decrease in incidence, i.e. the trailing edges are raised $\frac{1}{8}$ in. at the tips so that the tip produces less lift than the centre panel. This means that the centre panel will stall before tips, with no danger involved. If the tips stall first, the model would probably spiral into the ground. Washout is built-in exactly as the wash-in, except that the tip end of the trailing edge is raised $\frac{1}{8}$ in. off the board during assembly.

The tailplane is attached to the fuselage by means of rubber bands passed around the fuselage, over the wing platform and on to the tailplane hook – thus providing springing for the D/T action. This is the most common method of attaching tailplanes on free-flight models.

The rudder is hinged to the fin, and tensioned by an elastic band to provide offset when the towline is released and the D/T timer actuated.

There are no plans or kits available in this country for model rockets, as solid-fuel rockets are banned in this country under the 1949 Explosives Act. However, now that freon gas-operated rockets have been developed, such kits may soon make their way on to the U.K. market.

Dear John Bridge,

I am between 10 & 16 years of age and would like to become a member of the 'Golden Wings Club'. With this application I enclose postal order (International Money Order) for 25p to cover cost of the enamel club badge, two coloured transfers and membership card.

NAME IN FULL.....

ADDRESS .....

.....

YEAR OF BIRTH.....**SCHOOL**.....

NAME OF ANY OTHER CLUB OR CLUBS TO WHICH I BELONG (if any).....

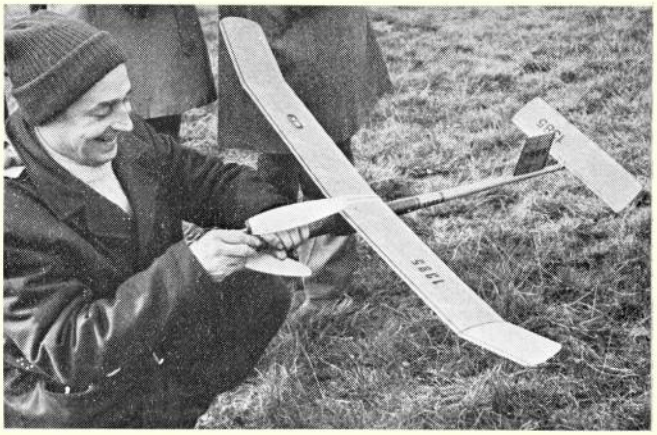
SEND TO: **GOLDEN WINGS CLUB, AEROMODELLER, 13-35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTS.**

5/72 15p in the £1 Rebate on plan purchase coupon for Golden Wing Members G.W. No. .....

28th Coupe d'Hiver International

Many changes in the annual event sponsored by Modéle Réduit d'Avion at Le Plessis-Belleville, February 27th

Roger Garrigou of A.M.A.I.F. Club, winner of the fly-off and his model which has in the past placed 2nd in the C.d'H. International, 1st in the Cadet class flown by his son, and will be next months full-size plan in Aeromodeller. This model is four years old, airfoil is 'Yoosasank' which had us beaten for a while . . . it's U.S.A.5!



Franco Malnati of Union Sportive Aeromodellistica Lombardy Club and his second place model which has a balsa tube fuselage as seen in the close-up views opposite. Franco packs his models and a full range of propeller blades in one of the smallest model boxes we have ever seen.

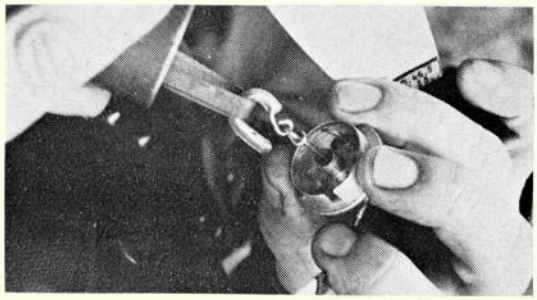
THE TRADITIONAL end-of-February Coupe d'Hiver International saw numerous changes this year. Because the contest is regarded by the French Federation as a 'private' affair (but still sufficiently important in the contest calendar to warrant full administrative support), it does not closely follow the F.A.I. definitions of Coupe d'Hiver. The original requirement for 'ROG' (rise off ground) launching is retained, so are the flights restricted to three in number, and each contestant is allowed two separate entries; yet this year, for the first time, a change in specification was adopted within a couple of months of its F.A.I. adoption.

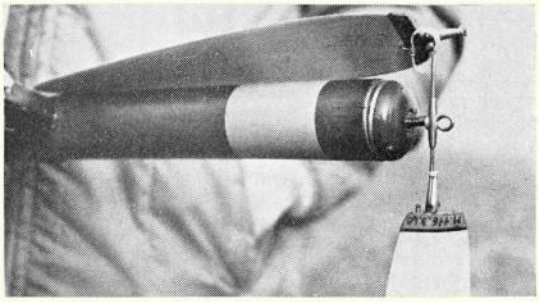
This was the increase of total weight from 80 to 100 grammes. When this proposal was first heard of, few British or American modellers could see the point. The French argued that we had reached the age of the two-minute C.d'H. model and the extra weight would produce the retardation of performance as well as permitting use of heavier or stronger materials. About the only real effect was the production of stronger feelings for the class. One well-

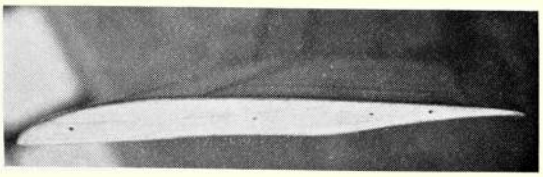
Ian Sutton of South Bristol was obviously influenced by last year's winner to judge by his reversed tips.

De Griveau produced a biplane with flip-out lower panels which double under for the climb.

Right: details of Franco Malnati's prop assembly, much after the Swiss Siebenmann style for Wakefields, each blade marked for pitch. Below: the two views is Christian Menget's fifth place model airfoil, S.T.A.E.3.A., used on a huge wing.







known American modeller set forth on a crusade to stem the change. Most Europeans tended to accept the decision with a shrug plus a 'wait and see' look, threw in a penny or two, maybe a clockwork timer, or a strip of Meccano as ballast and carried on flying.

Coupe d'Hiver is now a 1:10 power/weight ratio class like it or not, and the French event, private or not, was run to the new specification. This was the first change.

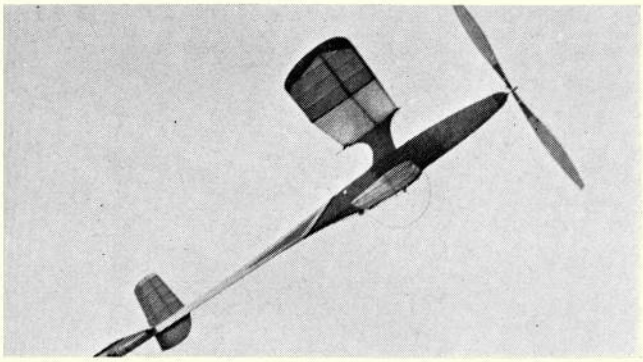
The second change was that of the venue. Chavenay, to the S.W. of Paris has been used for years. Come rain or shine, this small field and its surrounding ploughed earth have seen some grand contests, so the news that the event was to be held at Le Plessis-Belleville to the N.E. of the city was greeted with some apprehension. As it happened, the new venue has advantages of greater size, flatter surroundings and access by rail or motorway; but these attributes were dulled by the third change, which was that of the weather conditions.

February 27th, 1972, was hardly wintry. It was positively Springtime, with fog hanging around during the morning in almost still air. Thermal activity was plainly evident though not excessively so, and generally it could be said that the new 100 gramme formula was blessed with the finest possible chance of showing its worth.

As it happened, it made no difference at all to the experts. Those who are less skilled but by no means less enthusiastic were making more flights of under a minute than they'd cheerfully admit. When the contest ends in a fly-off with Garrigou beating the Italian challenger Malnati with a three minute flight against 1:40, then it is clear that in future the quality of the rubber motor will be the most decisive factor in C.d'H. modelling.

The British group was larger than usual. Ron Coleman took his party from Cheltenham by Dormobile, the St. Albans party 'Mini'd' and seven others made their trip by air. As always it was a hectic weekend and the 'Aeromodeller' group had their fill of incidents en route. They also had their share of incidents on the field and our showing as visiting firemen was overshadowed by the Italians. This was a club group from Gallerate in Lombardy,

Right: Alain Landeau helps his wife Mireille with her entry, Alain was 3rd. Below: De Griveau's biplane climbs with lower wing doubled to symetrical section. Below right: seven-year-old Phillip Roche, one of several youngsters in the contest.



Coupe d'Hiver International

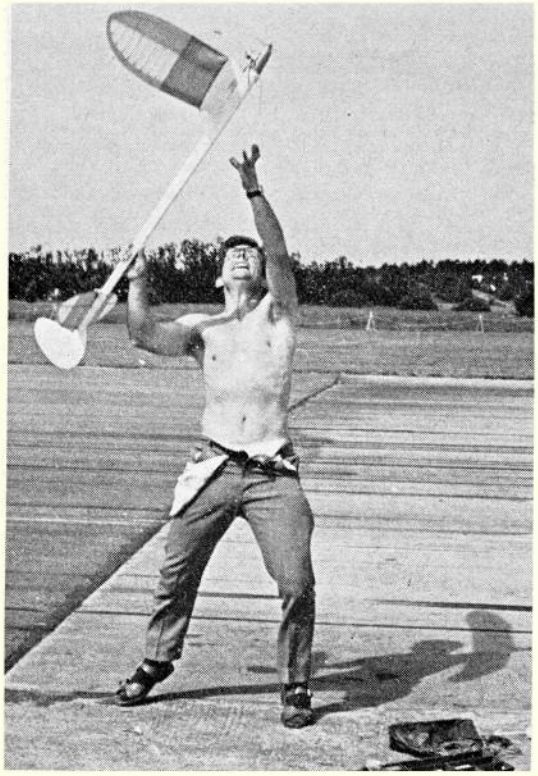
Left: from Montreal, Canada, Dr. Savage made an impression with some very rapid rates of climb, quite the best of the British party. Spring-like background conveys something of the atmosphere.

Left: Mike Fantham readies his Pawnee II, one of the most refined models in the Aeromodeller group, and which placed 23rd. Below, left: Italian entry by Enrico Balzarini which came 8th and seems to have received the benefit of a strong push! Central below: the kneel down and shove approach used by Roger Garrigou and at right: the complete low-down by Francois Rapin of Bourges, who also likes his fins to be low down as well!

and as the results indicate, they matched the quality of the construction with really fine flying. When four modellers take on all the top Frenchmen and quite a group of Britishers, then finish with all eight of their models in the top 23 places, they demand a respect which must place Italy high on the Coupe d'Hiver pedestal. Not all of their advantage can be placed upon the fact that they come from the home of Pirelli. Their models were as intricate as the modern Wakefield, with particular accent on the propeller and noseblock bearings. We shall be hearing much more about them in future.

28th COUPE D'HIVER RESULTS

1 Garrigou (France) 360+180; 2 Malnati (Italy) 360+100; 3 Landeau (France) 358; 4 Dufossez (France) 347; 5 Garrigou (France) 336; 5 Menget (France) 336; 7 Boutillier (France) 335; 8 Balzarini (Italy) 333; 9 Colombo (Italy) 327; 10 Zeri (Italy) 322; 11 Meritte (France) 319; 12 Colombo (Italy) 305; 13 Lepage (France) 304; 13 Landeau (France) 304; 13 Malnati (Italy) 304; **16 O'Donnell (U.K.) 303;** 16 Zeri (Italy) 303; 16 Garrigou (France) 303; 19 Rapin (France) 301; 20 Meritte (France) 300; 21 Rennessan (France) 299; **22 O'Donnell (U.K.) 297; 23 Fantham (U.K.) 290;** 23 Balzarini (Italy) 290; 25 Trouve (France) 287; 26 Zeiss (France) 281; 30 Dr. Savage (Canada) 275; 34 Dr. Savage (Canada) 269; **38 Tipper (U.K.) 267; 43 Fantham (U.K.) 261; 45 Tubbs (U.K.) 259;** 49 Hicks (Proxy Garrigou) (U.S.A.) 252; 51 Medley (Proxy Tubbs) (U.S.A.) 250; **52 Elton (U.K.) 249; 53 Morris (U.K.) 248; 54 Tipper (U.K.) 246; 56 Elton (U.K.) 242.**



John O'Donnell's

FREE-FLIGHT COMMENT

being concerned mainly with the mysteries of variable incidence tailplanes

CONSTANT CHANGE would appear to be one of the characteristics of the age in which we live. This applies particularly to anything with a technological flavour – and certainly includes aeromodelling. The factors involved are far too widespread and involved to be discussed here – but the whole situation is usually described as 'progress'.

The process does not always proceed in the expected and implied direction, however. An objective appraisal of the 'before' and 'after' states of many products or activities can be a real eye-opener. One example that certainly falls within the scope of my monthly column is the subject of power duration models.

There have been plenty of developments with this type of model. Engines have become ever more powerful over the years – with the emphasis laid very heavily on horsepower per unit of engine *capacity*. Innovations such as pressurised fuel systems, auto-rudders and variable-incidence tails are so commonplace that they are now regarded as the norm. The *potential* performance obtainable from currently available hardware and techniques is unquestionably higher than it has ever been before.

Paradoxically, the performance actually obtained is very often a great disappointment, as, whilst the best models are very good indeed, the *average* standard of power model flying has declined over the last few years. The deterioration has shown in both performance and consistency. One illustration will suffice to make the point. In the early 60's, when the Cox 15-powered *Dixielander* was the standard approach for power contests, I attended a certain Chobham Rally and did a 3½-minute power fly-off. This placed me tenth out of the 15 to 20 in the fly-off!!! Anything resembling such a situation nowadays would be unthinkable. A digression into the history of how the present position developed, and the chance to speculate on the part played by the temporary imposition of silencers, might well be interesting. It would, however, seem of questionable value in trying to improve the situation.

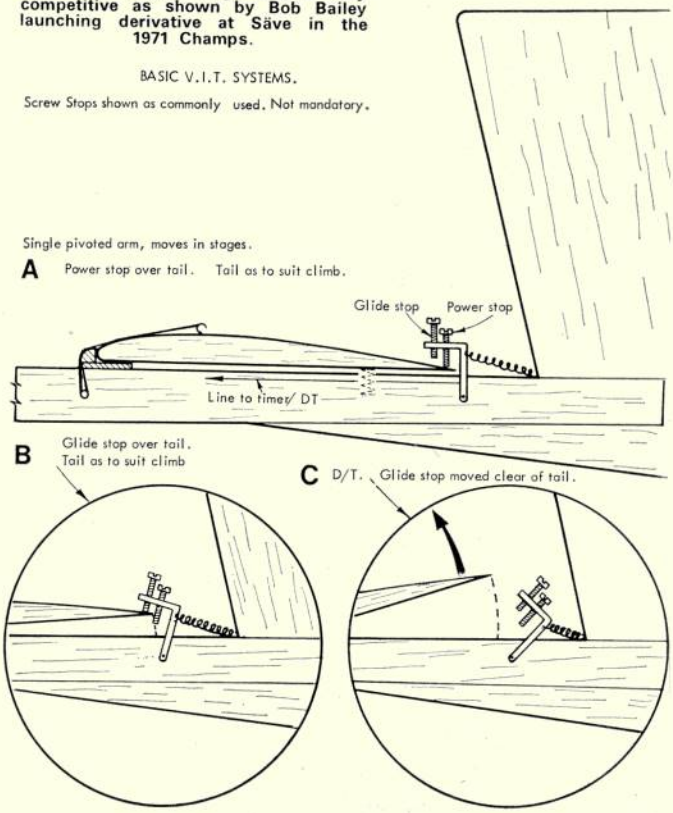
The very ideas that should improve performance are the ones that can bring disaster to the inexperienced, or to the careless. As the 'casualty rate' witnessed at many contests is surprisingly high, some specific advice would seem appropriate.

One very noticeable omission in the way of readily available information concerns the use of variable incidence tails. There has been plenty of material published concerning the mechanics of the alternative systems favoured by different people – and very little about the actual trimming of the model when so equipped. This 'knowledge gap' is dangerous, to say the least, and can prevent the modeller from ever reaping some of the benefits obtainable from the V.I.T. system – certainly there are no benefits whatsoever if the model does not survive the test-flying stage.

Conversely, V.I.T. has a lot to offer. Firstly it enables the climb and glide phases of the flght to be *adjusted* separately. Then it sidesteps the problems of glide stablity that would result from using a zero-zero trim to suit the climb. Finally, and frequently overlooked, it permits trimming to be much *safer* by providing the ability to D/T the model just after the engine stops. Such a D/T will often save a model from crashing through inability (or insufficient height) to recover from some unwanted attitude.

For completeness the commonest V.I.T. systems are shown in the accompanying sketches – but should not be treated as 'ends' in themselves. Although obviously important they are really only the means by which the desired performance may be attained. The real subject for discussion at this stage is the *trimming of V.I.T. Power Models*.

Left: George French's 'Night Train' was amongst the first to demonstrate the virtues of V.I.T. George used the system of a single arm moving back in stages. Basic design is still very competitive as shown by Bob Bailey launching derivative at Säve in the 1971 Champs.



Always try to launch the model into its climb attitude. Here Ray Monks shows grim determination as he is about to release his Cox 15-powered open model.

Basic Concepts

1. Adjustments for climb and glide are largely independent of each other.
2. Almost all systems contain inherently the means of D/Ting as, or soon after, the engine cuts – simply by letting the tail go to the D/T position rather than to the glide position.
3. Using tail incidence to discourage looping there is no need for a tight spiral climb. With but a half to one full turn under power, little rudder offset is needed, and little wing warp to complement. The faster the model, the *less* warp is needed. Some models need no warp.
4. The tail should be held securely in the power position for safety and consistency. It should not be let 'float' against a stop, but should be held tightly against the fuselage (or suitable packing affixed thereto). Tail angle can be adjusted by packing under the L.E. or T.E. Similarly the rudder should have positive stops and not be positioned merely by its actuating line.
5. Rather than readjust the glide each time the tail L.E. packing is altered, it is convenient to trim the model *first* for power (D/Ting off the top of the climb) and only afterwards for glide. Should the glide stability need improving then this can be achieved by moving the CG forward and increasing the tail negative setting for glide.
6. Some models behave differently, even dangerously, on low power compared with high. Testing therefore should be done on *full* power. Safety is provided by an initial use of short engine runs, followed by D/Ting just after the engine cuts. This technique gives a quick recovery from most off-pattern and unwanted attitudes.
7. Launch should be such as to put the model into its climbing attitude and speed as nearly as possible.

Pre-flight adjustments

8. Decide direction of turn in climb and glide. Right/right is standard for pylon models.
9. Rig model in accordance with either:
   a) Designer's specification if model is proprietary design.
   b) Previous experience or earlier version of same design.

   or

   c) Following recipe for typical pylon, polyhedral, rear fin layout.
      No downthrust
      No sidethrust
      No tail tilt
      Wing incidence 2°
      Tail incidence 1½° power
      Tail incidence 0 to ½° glide
      Rudder deflection Straight, power
      Rudder deflection Right, glide
      C.G. 85 – 90%

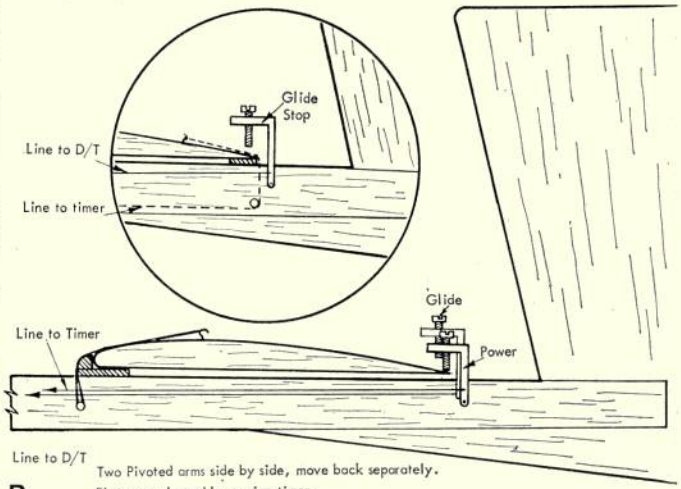
   Wing Warps: Port (left) tip: noticable washout (less incidence) Inner panels flat
   Starboard (right) tip: trace of washin (more incidence)
   Tail warps: none
10. Arrange sequence of timer operations to be:
    Rudder movement: ½ to 0 seconds before engine cuts
    Tail movement: 1 to 2 seconds after engine cuts.
11. Check operations of mechanics Ensure that:
    a) Tail and rudder are held securely in their power positions.
    b) The moment the engine *stops* is established correctly relative to the operations of cutout/flood off/ etc., *and* the rudder and tail movement. A delay in the engine stopping can be used advantageously in obtaining the desired sequence by coupling together the cutout and rudder operation.
    c) Moving arms or wires on the timer cannot jam or re-engage. On a Seelig timer or similar with 'stacked' discs, the arms after release can sometimes catch under the *next* smaller disc.

Test Flying

12. The usual test glide stage is little use (see item 5) beyond establishing some idea of rudder position of glide.
13. Set timer to cut engine at 2 to 3 seconds.
14. Set tail to go straight to D/T position (not glide) after engine cuts. This eliminates any need to use D/T fuse or timer.
15. With engine running at full speed, launch model in vertical atitude with smooth follow-through. (Wind should be blowing onto under surface of wing.)
16. *WATCH* what model does. Ideally the model should climb nearly vertically, with no tendency to go 'over the top', and with just a trace of right turn. The model should swing right as the engine cuts under the influence of just applied rudder and start to swing into the 'glide' – and then promptly D/T.
17. Adjust tail and/or rudder as appropriate. A tendency for the climb to be less than vertical is acceptable at this stage. If the model goes over onto its back and D/Ts from the inverted altitude, increase tail incidence considerably.
18. When/if the power pattern is correct on 2 to 3 seconds run, increase run progressively by 1 to 2 second increments until the full 10 seconds run is reached. Adjust tail and rudder as and when appropriate.
19. When/if the power pattern is correct on 10 seconds run, commence to trim glide. First test glide and alter *glide* position stops on tail to suit. Then set short D/T, say 20

A

Tail held down directly by line to engine timer. Tail rests against fuselage. Single pivoted arm, with glide stop, moves clear for D/T.



B

Two Pivoted arms side by side, move back separately.
First arm released by engine timer.
Second arm released by D/T

seconds, and fly on about 5 seconds power run. (20 seconds is safe even on fuse D/T as model cannot D/T under power due to V.I.T. system.) Observe glide and adjust tail and/or rudder glide stops as appropriate.
Increase run to 9/10 seconds and after tail stop until stall is evident, using say 30 seconds D/T to prevent model stalling down. Then backtrack slightly till glide is smooth after transition.

20. Cement or otherwise lock all packing and screw adjustments. Then check-fly for consistency.

Trouble Shooting (Non-mechanical)

21. Over-rolling.
Cause: Excess wing warp
Cure: a) remove some warp
b) Accept and use rudder to balance, climb in spiral.

22. Inside wing does not rise in turn.
Cause: Insufficient warp.
Cure: a) Increase warp
b) Add aileron or flap
c) Use straighter climb.

23. Climb starts steep, turns and flattens, then becomes steep again.
Cause: Too much 'longitudinal dihedral' i.e. incidence difference between wing and tail.
Cure: Add positive incidence to tail under power.

24. Stall on transition.
Causes: Various.
Cure: a) Move rudder *sooner* (relative to engine cut) so as to turn model from the straight vertical climb.
b) Move tail later. This is needed when model 'loops' at top of climb.
c) Move rudder *more* i.e. through greater angle. If glide cannot be tightened, then need left rudder under power combined with right sidethrust.

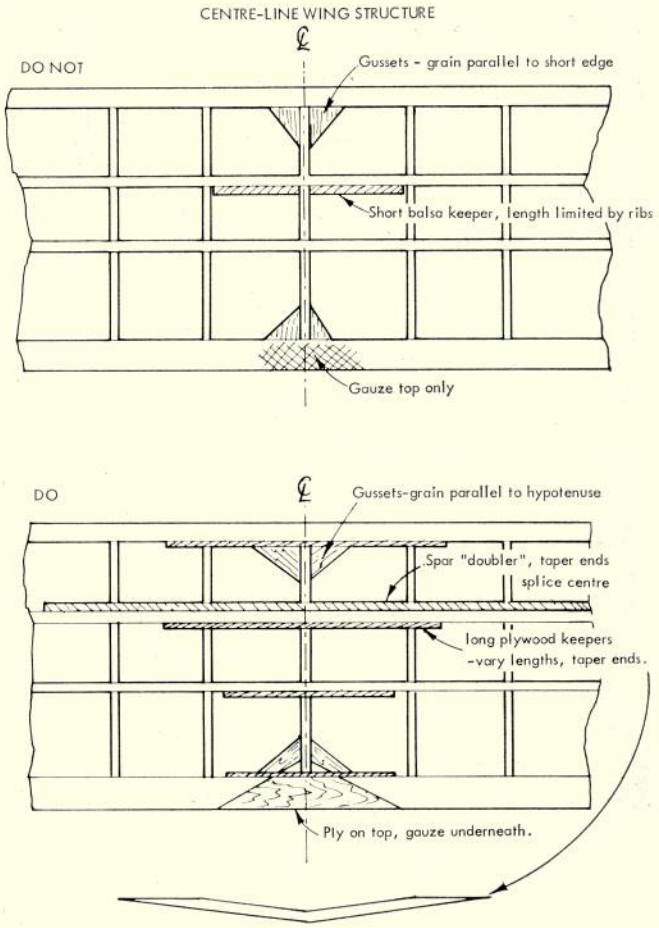
25. Lurch /spiral dive on transition.
Causes: various.
Cure: Opposite to items 24.

26. Wings break in centre when D/Ting just after engine cuts.
Cause: Wing/joint too weak.
Cure: a) Stronger wing structure
b) Plywood dihedral keepers, spar doublers etc.

Centre-Line Wing joints

The final item (26) under trouble-shooting was not included to be funny. Shock loading of wings through D/Ting a fast-moving model does impose severe stresses on the structure and failures can and do occur. The vast majority are due, not to the wing itself being too weak, but to the *joint* being inadequate. With polyhedral being universal wings are joined just at the worst possible place.

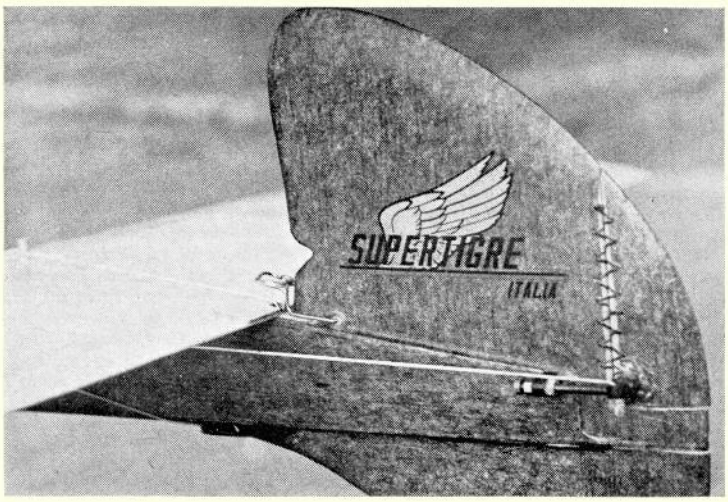
Without getting too involved in what is a very big subject I would recommend that the joint should be so constructed that it is at least as strong as the basic wing. If it isn't then one is carrying useless weight about in the wing structure itself. To get the joint strong implies continuing some structural members across the centre line. As the LE, TE and usually the spars are cut and rejoined, this implies the use of 'dihedral keepers' (It is possible to splice the spar but very few people do it). Such keepers are far better cut from ply rather than balsa, and on anything over $\frac{1}{8}$ sq. spars I would recommend $\frac{1}{16}$ in. ply, not 1 mm. or $\frac{1}{32}$ in. ply. The keepers should be long, with tapered ends. They can be cut by a modelling knife fitted with a strong blade – but a fretsaw would seem ideal.



Another valuable aid is a spar 'doubler' running out about half-way along the inner panels. This should be tapered off over a considerable length, and is more than worth the trouble of fitting. Finally need I mention that a good strong adhesive should be used at the actual joints? It is not necessary to glue everything with epoxy but pre-coating should definitely be used for balsa- cement applications.

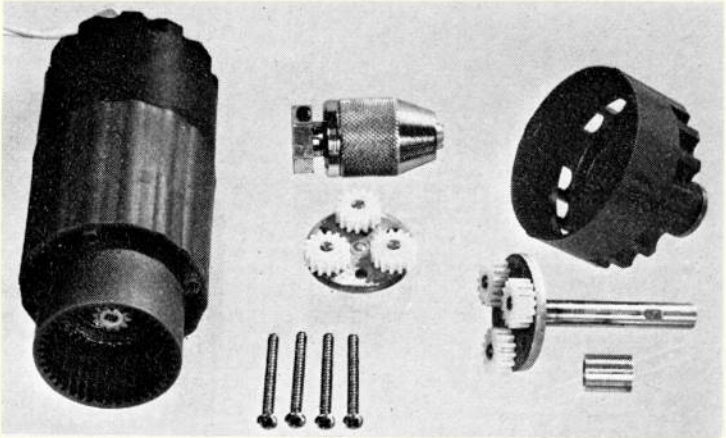
Correction

Contrary to that reported in my March *Comments*, flying at the Trials will *not* be split up with A/2 on the Saturdays and the other classes on the Sundays. This interpretation was the result of the way events were laid out in the published Calendar – but I am assured that there was never any intention of deviating from the usual Rubber/Glider/Power sequence of rounds, and that the Trials will be run with all classes spread equitably over both days of the two weekends.



Typical installation of a V.I.T where the tailplane is retained by a line direct to the engine shut-off timer – as illustrated in diagram A at left. Note the notched fin leading edge to permit the stop to pivot clear of the tailplane's trailing edge for the dethermaliser action.

GADGET REVIEW



Parts of the Versa Tool adapted in order to make a cheap engine starter. The epicyclic gear cluster is removed and the new tubular distance piece must be made. Note also the flat filed on the output drive shaft. See text for details.

ENGINEERS FREQUENTLY use this method for making a cheap knife, but how many modellers realise that an ultra-sharp knife can be made from a piece of broken hacksaw blade? T. Whiteside of Marlborough, Wiltshire, sent details of this cheap, easily made tool, illustrated in **Figure 1.** Firstly, the teeth are ground away on a grindstone, and the blade snapped off to the required length. A very basic tool could just have a 'handle' consisting of adhesive tape wrapped around one end, while a more de-luxe version could have a length of ¾" dowel split down the middle and epoxied either side of the blade. The 'knife' is now simply sharpened on the grindstone to provide a keen edge which will hold its sharpness for a considerable time. Blade shapes can easily be varied by careful use of the grindstone.

A useful repair dodge is provided by Trevor Faulkner in **Figure 2,** and is for use on repairs needing pressure from the inside, such as on a fuselage, where the joint is inaccessible. Pinning through from the outside would not do, as pins would just simply push away the ply reinforcing piece. Instead, the idea is to coat the ply reinforcement with glue, place it in position behind the break, then push plastic foam behind the plate – this provides sufficient pressure to the plate to hold it in close contact while the glue dries.

Another regular contributor, Martin Dilly, reveals a neat method of butt-jointing two sheets of balsa, illustrated in **Figure 3.** After trimming the edges dead straight and square, offer the edges up together and run a strip of clear self-adhesive tape along the whole length of the joint. Make sure that no daylight is visible between the sheets, then fold them back against each other, using the tape as a hinge. Run the glue along the trough so formed and fold the sheets together again. Weight the wood down with the taped joint against the board, removing all surplus glue. A long steel straightedge comes in useful here as a means of distributing the weight along the full length of the joint during drying. Some advice now on economising on balsa cement from Brian Hunt of Wolverhampton. Firstly, to get the most from your tube, take a large split pin (**Figure 4a**), open it up and slide onto the bottom of the tube – this way the tube may be tightly rolled up as it is used, squeezing out the last drops. Secondly, to prevent you from losing the tube altogether amongst the balsa shavings, he uses a small hook as a stopper, from which the tube may be suspended when not in use (**Figure 4b**).

More advice from Martin Dilly in **5a.** If there are awkward screws to be fitted in inaccessible places, try folding a piece of Twinstick double-sided adhesive tape around the tip of a screwdriver, then push the screw slot onto this. The screw will normally be held in line with the screwdriver until it can be started in the hole. A similar nett result is achieved by Dave Harris of Berkhamsted, Herts, whose method is to magnetise the tip of the screwdriver by rubbing up and down a magnet. (**Figure 5b**). This works well with the smaller sizes of screws.

Figure 6 shows an idea submitted by R. J. Smith of Hornchurch, Essex, and is a device to ease the starting of small glow motors when installed in hovercraft or ducted fan type models where access is restricted. He simply takes the screw top from a fuel can and bolts it onto the crankshaft of the engine immediately in front of the propellor. Wrap a shoelace around this top and pull sharply – and away you go.

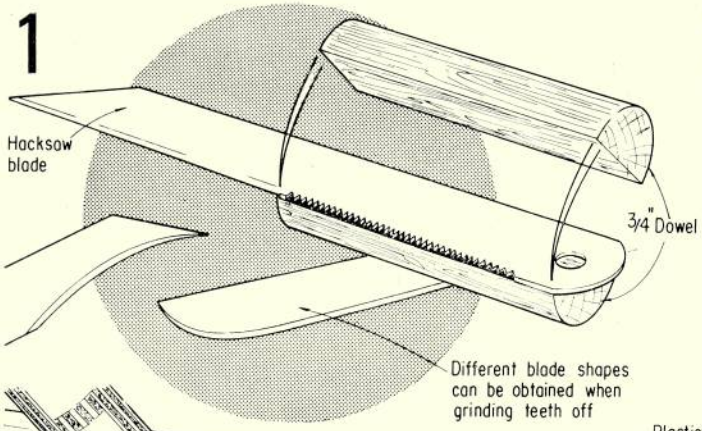
P. A. Scorey of Finchley has a very simple idea for 'drilling'ultra fine holes seen in **Figure 7.** Just cut the head of a modelling pin, then bind and solder 10 amp fuse wire to the 'blunt' end.This enables the pin to be held securely in the chuck of a wheel brace and can then be used for drilling holes in plywood when stitching on undercarriages, etc.

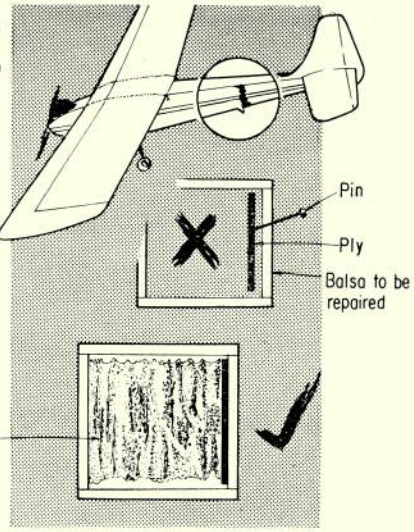
The photograph above shows a Versa 12-volt Power Tool which D. Parker of Southport, Lancashire, has converted to an electric starter for engines up to 2.5 cc. This tool is available at a much lower cost than commercial engine starters and is easily adapted. As supplied, the Versa Tool drill drives through a double epicyclic reduction gear, giving an output rpm of about 650. This is too low, but fortunately the design permits one epicyclic train to be removed, increasing the output rpm to 2600. The sequence of operations is as follows:

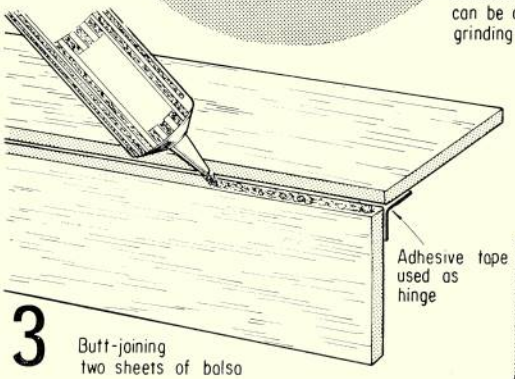
1. Make a tubular distance piece, 5/16 in bore diameter and 9/16 in long. Steel is probably the best material.
2. Remove the chuck by unscrewing the hexagon socket screw.
3. Remove the front cover by unscrewing the four self tapping screws.
4. Remove the inner epicyclic gear train; this just lifts out.
5. Slip the distance piece over the chuck shaft attached to the remaining epicyclic train, replace in the gear housing, and refit the front cover.
6. File a flat on the shaft for the socket screw to suit the new position of the chuck.

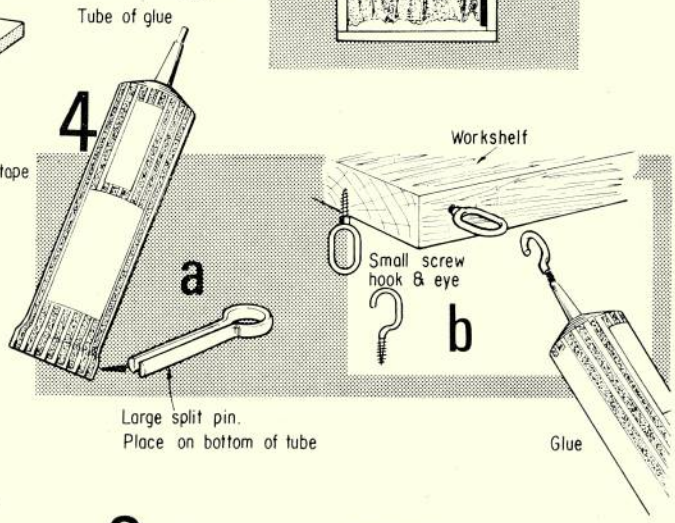
Notes: The distance piece must be of such a length that it allows about 1/32 in. end float of the chuck shaft when reassembled. The back face of the chuck must be smooth, and the chuck positioned correctly when tightening the set screw so that the end thrust when operating is taken by the face of the bronze bush, and not internally.

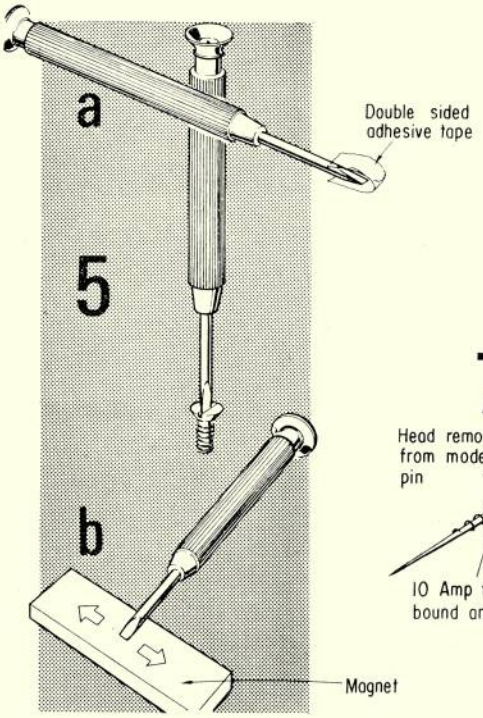
The body of the drill is of plastic, and the self tapping screws can easily make a new thread each time they are screwed in. Therefore, when refitting each screw, turn it slowly backwards until it jumps into the start of its existing thread. Then start screwing it in. The drive to the engine is by a 3 in. length of 1¼ in. dia (bore) car radiator hose. This fits tightly over a wooden block on a ¼ in. dia bolt held in the chuck, and gives a good friction drive when pushed on a 1½in. dia propeller spinner.


1
Hacksaw blade
3/4" Dowel
Different blade shapes can be obtained when grinding teeth off

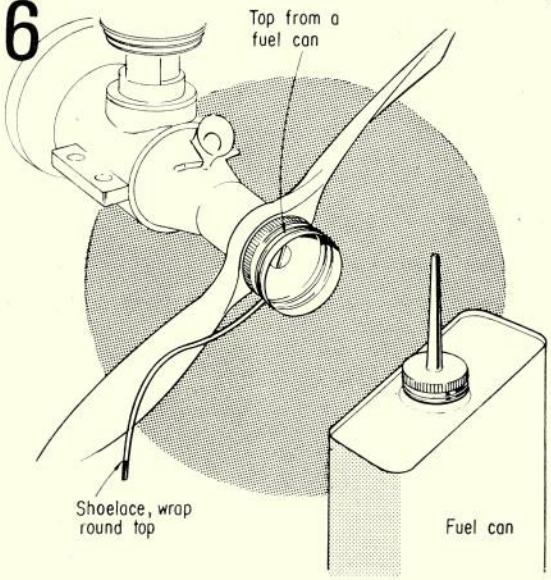

2
Pin
Ply
Balsa to be repaired
Plastic foam


Adhesive tape used as hinge
3
Butt-joining two sheets of balsa


Tube of glue
4
a
Workshelf
Small screw hook & eye
b
Large split pin. Place on bottom of tube
Glue


a
Double sided adhesive tape
5
b
Magnet


7
Head removed from modelling pin
10 Amp fuse wide bound and soldered


6
Top from a fuel can
Shoelace, wrap round top
Fuel can

MOULDING CARBON FIBRE PROPELLERS

concluding a feature on the applications of carbon fibre, JIM McCANN describes his most successful casting techniques

Our own efforts at moulding a propeller as it appeared on separating the mould. Some degree of flashing is inevitable, even desirable, but overfilling caused this to be a little excessive.

IN THESE COMPETITIVE days of greater engine power and higher rpm, it would seem an opportune moment to consider the propeller which is annually expected to accept higher and higher stresses. The choice of a suitable prop. material is now becoming quite critical, especially in those classes where racing motors are operated at peak revs. Nylon props. are still used for these high output motors, despite their reputation for blade-shedding, while the flexibility of nylon with its inability to hold a constant pitch renders it quite unsuitable where safety and efficiency are prime considerations.

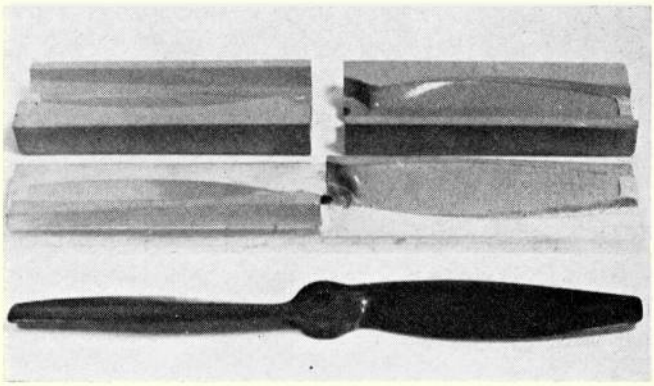
A big step forward in both these criteria was made when moulded glass fibre reinforced plastic propellers were made available, especially when the glass fibre was in continuous strands laid tip to tip. Unfortunately the range of sizes was limited and the supply erratic, which lead to a lot of home-moulded propellers making their appearance. Some were good, others bad – the main faults being either insufficient fibre or air bubbles. Two years of learning the hard way, with air bubbles, areas devoid of fibre and moulds which refused to open, have evolved a method of producing both very acceptable moulds and propellers. In 1971 another step forward was made when I was introduced to what may be fairly described as a wonder material – Carbon Fibre. The manufacturers and distributors, Morganite Modmor Ltd, were very co-operative in providing Data Sheets, etc., and the properties of carbon fibre have been well described in the April issue of *Aero Modeller*.

The first impression on handling a CFRP moulding is one of immense strength and rigidity. To ensure that these impressions were not a fallacy and to stress to the limit a CFRP prop., a series of tests was arranged with the Materials Strength Department of Newcastle-upon-Tyne Polytechnic. The props., picked at random from my stock, were of the Cox 7 in. × 3½ in. type, a composite of carbon fibre on the outer surfaces, where its properties are best utilised, with a core of glass fibre rovings. A prop., was clamped in a Tensile Testing machine, the clamps being specially machined to match the blade camber, and bolted by the centre hole, the anticipated fracture point lying between the centre hole and the mid point of the blade, where the clamp was positioned. The prop. finally broke across the centre of the hub, the load being 0.4 tons. Further tests for torsion and bending produced similar high figures. From these results it was calculated that these carbon fibre propellers will be safe up to 200,000 rpm. A wonder material indeed, and one which must provide the ultimate in safety and efficiency.

The making of a suitable mould for propeller production is usually the difficulty and deterrent to would-be moulders. The moulds produced by the following method will yield excellent copies of the original prop. over and over again, which are comparable to a good commerical product. The mould will reproduce every detail of the pattern exactly so if using a wooden pattern take great care to fill the grain and polish to a high gloss, and remember, if the pattern is specially carved, it is only necessary to make one blade, as by reversing the pattern two absolutely identical blades will be reproduced.

The following materials are recommended for the moulds: **Base.** The most satisfactory is aluminium alloy strip, ¼ in. thick and 1½ in. wide, length about 1 in. more than the prop. diameter. An alternative, although not so good is ½ in. ply faced on both sides with Formica. **Centre rod.** Silver steel is best, the diameter of which is the size of the hole in the prop. centre. **Mould material.** Many types of polyester pastes and fillers were tried and rejected usually on grounds of poor reproduction and/or poor mechanical strength. *Plastic Padding* is now used exclusively for it has proved ideal in all respects. The finest detail is reproduced exactly, the surface is hard and has

Jim's three part mould, as described, with the finished product. The Plastic Padding produces a very smooth, high gloss finished mould.



a high gloss and it is more than strong enough. Several of my moulds have produced over 25 propellers each and are as good as new. Plastic Padding comes in two grades, Hard and Elastic. Hard is the one to use. **Release agent.** Polyvinyl Acetate in alcoholic solution is specially prepared as a release agent, and is ideal for use throughout the whole process. In my early days the use of wax-type release agents produced a series of disasters – either poor coverage or break down of the film occurred, resulting in the mould seizing-up, and the whole lot had to be dumped. The PVA type is dyed blue, so there is a visual check on complete coverage while another advantage is that being water soluble, it can be washed off with warm water.

Making the Mould

Firstly the base. Drill a hole the size of the centre rod in the middle of the base plate, ensuring that it is vertical. Put the centre rod in its hole and place the pattern prop. in position. Using a wax based pencil draw the outline of the prop. on the base and remove the prop. Within the outline of the blade at the trailing edge and in a straight line along the leading edge, drill $\frac{1}{8}$ in. holes as shown through the base. At the hub ensure that these holes are outside the outline of the leading edge. From the back of the base counter sink 3/16 in. dia. about half way through. These are to form 'keys' to hold the lower surface of the mould (see Fig. 1).

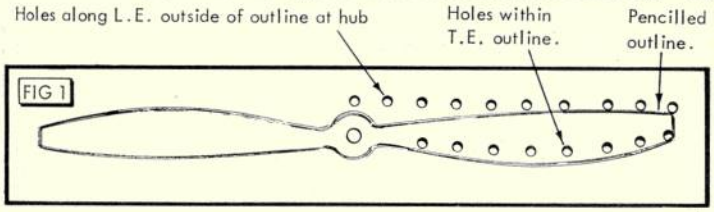
Now clean the upper surface of the base plate removing all traces of oxide with emery cloth, and degrease with detergent and carbon tetrachloride Do not touch the cleaned surface with the fingers. Coat the pattern prop. all over with PVA release agent and allow to dry. Prepare sufficient Plastic Padding to fill the space between the bottom of the blade and the mould and to provide excess material along the leading edge where the mould is extended. If in doubt, prepare more than necessary – the wastage must be accepted, for the mix must be made in one go. From the underside of the mould, force some of the mix through the holes of one blade only until it appears on the top surface, then spread a good helping on the top in excess of the blade area, especially at the leading edge. Spread a fairly thin layer on the back of one blade, being very careful not to trap air bubbles next to the blade. Place the centre pin in the hole, place prop. over it and press the 'spread' blade onto the mix in the mould. A piece of sheet aluminium or Formica, previously treated with PVA is now used as a boundary wall at the leading edge of the blade to build up the Plastic Padding as shown in Fig. 2. This wall is $\frac{1}{8}$ in. from the blade at its nearest and is parallel to the edge of the base. Ensure that sufficient of the mix is spread to beyond the tip and beyond the centre, as in Fig. 3, the shaded area being the extent of the mix. The wall should be maintained at an angle of 10 degrees from the vertical, towards the prop., for reasons explained later.

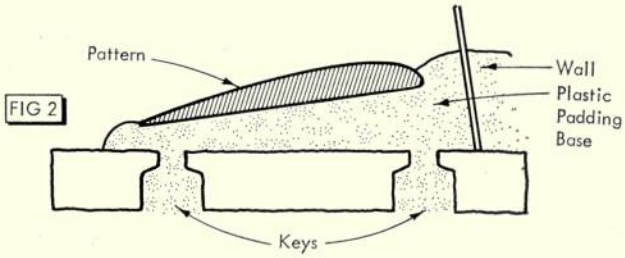
While the P.P. (Plastic Padding) is setting, the prop. must be firmly held onto the base with one hand while supporting the wall with the other. When the P.P. has set to the firm gel stage, carefully remove the wall, and now working very quickly with a modelling knife, cut away the P.P. along lines A-A and B-B. Still working quickly, cut the surplus P.P. away from the trailing edge of the blade, holding the knife at an angle of 10° from the vertical towards the blade, and then trim off the excess at the leading edge, as in Fig. 4.

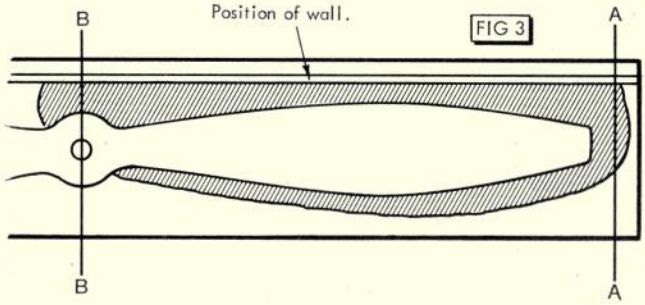
Next carefully remove the prop. by first removing the centre pin and then gently ease the prop. out by twisting, so as to ease up the trailing edge of the blade and withdraw backwards. The mould at the leading edge will now resemble Fig. 5 with part of the mould overhanging. Using 400 grade wet or dry (wet) rub down to line C-C which passes through the radius of the leading edge. This line C-C is at 10° to the horizontal. The reason for these 10° tapers is to provide an easy release when the mould is opened – release is almost impossible from a parallel.

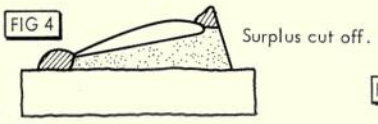
Now we have the lower surface of one blade formed. Wash the release agent off the pattern, re-coat and allow to dry. Repeat the procedure for the lower surface of the other blade, this time ensuring that the pattern tips are the same height from the base. This is important to ensure a true running prop. When both lower surfaces have been prepared, we can now tackle the matching tops which I have found easier to make in two parts, split across the centre line.

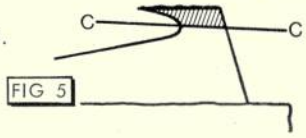
Wash off all the old PVA and recoat the pattern, centre rod and the lower mould all over and allow to dry. Place the pattern on the mould and insert the centre rod. Prepare and coat with PVA a wall for each side of the mould about 1 in. high and the length of the base. Mix a good helping of P.P. and with the side walls in place carefully pour in and spread the P.P. ensuring absence of trapped air and that the pattern is completely covered (one blade only). Make sure that the P.P. goes down to the base at the sides and is beyond the tip end of the lower mould and just past the centre rod. The thickness of the top should be $\frac{1}{4}$ in. to $\frac{3}{8}$ in. When at the firm gel stage, remove the walls, trim off at the centre and the tip along lines A-A, B-B as in Fig. 3, and clean up the corners of the mould adjacent to the walls. Allow to harden and cool. With the blade of a knife between the base and the top

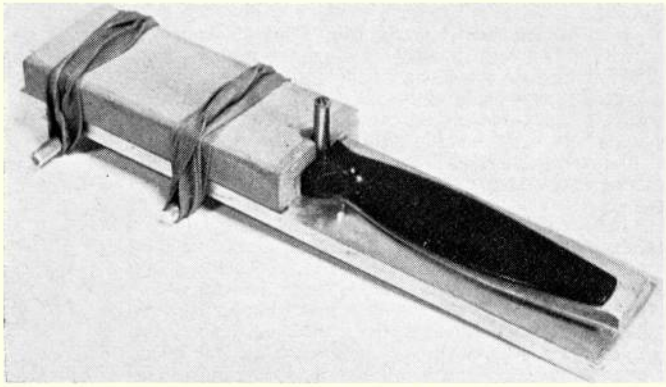












A finished prop. poses within the mould with one of the top sections removed. Note how the rubber bands are used to clamp mould parts together during curing.

mould, carefully separate and remove the top, then wash off all the old PVA and recoat all parts completely. Replace the pattern on its base, centre rod inserted, and place on the new top half and repeat the top casting procedure. In this case the first top forms the wall at the centre. When set the mould must now be marked to ensure that the tops go on the ends for which they were made. I do this with a shallow saw cut on one side, cutting into the base and the side of the top mould as may be seen in the photograph.

The mould is not quite complete at this stage. The final step is to cut down with a small file the part of the mould between the blade tip and the end of the mould. When cutting down this part do not go flush with the blade surface. Leave a slight ridge; this provides an outline of the blade when removing the moulding flash. The cut-away is to allow the strands of carbon fibre to pass through the mould in the laying-up stage.

Moulding the Propeller

The mould must be completely coated with release agent. Any missed areas will cause adhesion and will ruin it – if in doubt give two coats of PVA.

Materials required for this operation are: **Carbon Fibre** in 'tows' of 10,000 filaments, lightly bonded with an unhardened epoxy resin to facilitate handling. This resin does not interfere with the curing of a polyester resin. **Glass Fibre.** The most convenient form is glass rovings. These are filaments lightly bonded with a polyester soluble resin to form small bundles like a fine untwisted thread. The material I use is Deeglas Rovings, Type A 29 60 strand. **Polyester Resins.** These are usually readily available, and Bondaglass resin has given good results. The props which were tested were made using my usual resin, CRYSTIC PA Type 404. **Epoxy Resins.** Araldite MY753 with hardener HY 956 as supplied by Ciba-Geigy (UK) Ltd., is ideal. Viscosity is just about right for this application, and has a good pot life. It is however, about 3 or 4 times more expensive than polyesters. **Pigments.** Carbon fibre is black, as would be expected, and there is no point in adding pigments to a carbon fibre moulding, unless the percentage of CF is low, when black pigment can be used to give a uniform appearance. Mouldings using glass fibre only can be pigmented in any one of several colours.

Now for the actual moulding. Throughout the following description, the text refers basically to producing a typical 7 in. diameter free-flight type propeller, and the budding prop.-moulder will find that some variations are necessary according to the propeller he wishes to mould. For example, a typical speed prop. would need considerably less carbon fibre to cover the blade width than one destined for use on an R/C .60 powered model, as will the total amount of material used. It is essential that all the carbon and glass-fibre is cut to length before the resin is even mixed, as some resin is almost bound to adhere to the fingers – and then you will be in trouble! For each of the upper moulds, cut two lengths of carbon fibre ½ in. longer than the mould, two approximately ¼ in. shorter. The lower mould requires four lengths ½ in. more than the prop., one the length of the prop., and then 3-4 more progressively ½ in. shorter. Now cut several more lengths varying between 1 in. less than the prop. down to 1 in. long,altogether using about 4 metres of carbon fibre.Glass-fibre is now readied – one length 1 in. short of each tip with successive strands progressively ½ in. shorter.

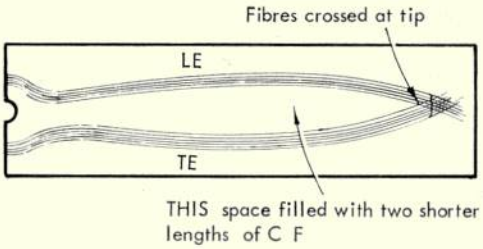
Next prepare the resin. It is preferable to mix the resin in a shallow container to retard exothermic heat build-up and prolong pot life. After mixing, allow to stand for 10-15 minutes to permit the air bubbles to clear, then apply a thin coat to the prop. area of the mould. Take one of the upper moulds and lay the longer lengths along the leading and trailing edges from the centre to beyond the tip, spreading the fibres out to 3/16 in.-¼ in. wide and crossing them at the tip to provide a measure of lateral binding. This will leave a space between the leading and trailing edges – fill this with the two shorter lengths (more for a wider blade of course), spreading the carbon fibres in order to cover and adding resin as you go in order to impregnate. Do not apply resin with a brush, as frightful tangles will result. Instead, I use a piece of ¼ in. × 1/16 in. spruce cut to a chisel edge and sanded smooth. This is ideal for spreading the fibres and squeezing out air bubbles. Now for the lower mould. Apply the four long lengths in the following order: LE/TE/LE/TE crossing the fibres at the tips once more. The space between is then filled with shorter lengths. A good layer of carbon is laid up (approximately 1/16 in. thick) being careful to get complete coverage around the centre pin, the 1 in. lengths are useful here. Glass-fibre can now be applied – starting with the longest piece.

Keep the glass-fibre away from the L.E. and T.E. The glass-fibre is laid on alternative sides of the centre rod. When all of this material is applied, continue laying-in carbon fibre with the lay up following the original thickness pattern. As the laying up proceeds, keep adding resin in just sufficient quantities to impregnate thoroughly, taking care to avoid air bubbles.

The mould should by now be filled, and if in doubt slightly over-fill to ensure absence of unfilled spaces and trapped air – in a hand-pressed moulding an acceptable proportion of resin to fibre is 60:40. It is preferable to have resin-rich areas rather than risk imperfect impregnation which would result in an enormous fall in both strength and rigidity.

Apply a final thin coat of resin to both upper and lower parts, and place the tops in position, leaving a ⅛ in. gap

The sketch below shows how the carbon fibre is initially laid in the top pieces of the mould. More tows may be required to fill the space between the leading and trailing edge, depending on blade width.



between the two tops. Squeeze gently to expel surplus resin, then still pressing, slide the tops centrally in position up against the centre rod – then press together as hard as possible. Surplus resin will continue to ooze out and can be wiped away. Bind the mould together with wide rubber bands stretched to their limit and place the mould in a warm place (on a radiator, etc) or give it a quick bake in the oven at 100°C until the resin has set – this can be checked by feeling the protruding fibres. When completely rigid, allow the mould to cool off completely, remove rubber binding and remove the centre rod – I use Mole-grips – a twist to release and then pull out. The mould is parted by inserting a knife blade between the base plate and the outer ends of the top moulds. The tops should pop off easily but if reluctant to come off, ensure that there is no surplus resin binding the tops to the base plates at the sides. Usually the tops come off leaving the moulding on the base. To free the prop., gently raise both of the tips away from the mould until released, then free the centre by sliding a pointed knife between the prop. and the base, being careful not to touch the Plastic Padding contours. Trim off the flash with a fine fretsaw, about 1/16 in. from the prop. outline, finishing off with wet or dry. Thinning and balancing is best done with wet or dry paper, used wet, starting with 240 grade, then 400, finishing with 600. Finally, a coat of clear polyurethane will give a high gloss and seal the surface against the possible, but unlikely adverse effects of oil and fuel. The mould can be cleaned by soaking in warm water. The release agent is water soluble and washes off easily.

In the interests of safety all props., regardless of their material, should be critically inspected before each flight for possible damage and cracks. I am informed that a local modeller had hospital treatment for a severe eye injury caused by a shed blade. As was anticipated, the prop. was of nylon – not on a racing 40 or even on a 15, but on a TD.0.010! Any motor can fling a prop. blade, if the prop. is in a damaged or fatigued state, so please give your props. more than a cursory glance, and if in doubt scrap it and fit a new one (of carbon fibre?).

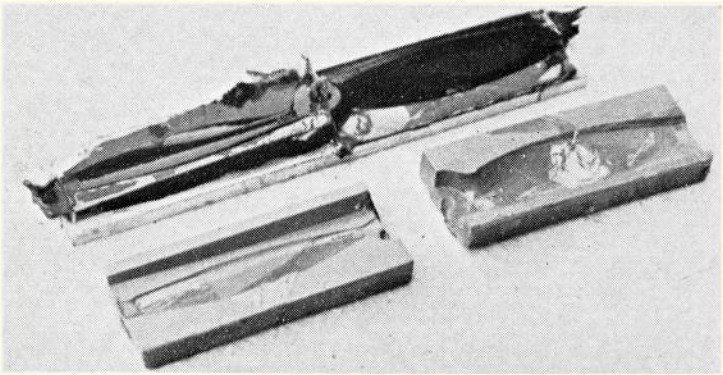
MATERIAL SOURCES

Carbon fibre may be obtained from Morganite Modmor Ltd. of Battersea Church Road, London SW11 3LZ. Glass-fibre is sold in many forms by such companies as Bondaglass, Strand Glass, etc., and can be obtained at many local sources. The same companies also supply polyester resins and suitable release agents. However, if any reader experiences difficulty in obtaining supplies, the author can supply the P.V.A. release agent, glass and carbon fibres in small quantities. Letters will be forwarded from these offices.

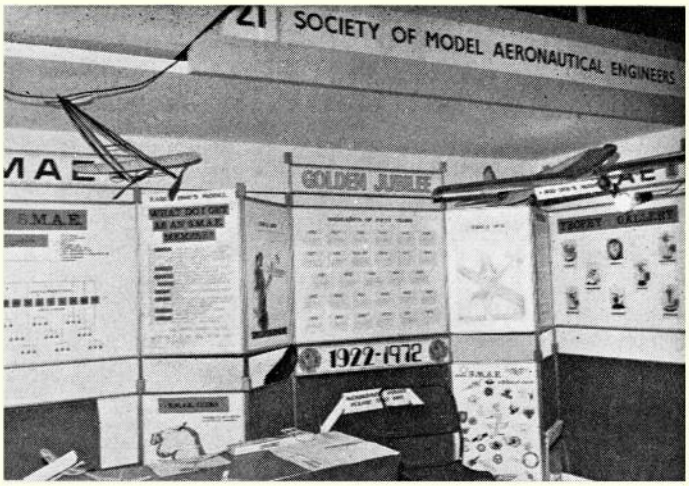
.... and now the Editor tries his hand with the hairy black stuff...

So often, when one reads an article such as the foregoing, the overall impression received is 'Well, that's fine for the experts, but way beyond my own capabilities'. I must admit to being a little sceptical about the average modeller producing a reasonable replica, so when Jim kindly offered the loan of his mould and materials to 'have a go', I gladly accepted, with perhaps rather more confidence than I felt, as my only previous experiences of glass-fibre had been restricted to a layer of cloth wrapped around the nose of R/C models for added strength, plus a little repair work to a motorcycle fairing.

Following his instructions to the letter, all the carbon fibre tows were cut to length and placed in order of usage next to their respective moulds, as were the glass-fibre strands. At this stage, it was discovered how fibrous the material was – if you thought that G.F. made you itch, just wait until you start snipping carbon fibre! Two coats of release agent were applied all over the mould rather than risk damaging Jim's superb piece of handiwork, particular attention being paid to the centre pin/lower mould joint. The carbon-fibre, although very 'hairy' proved easier to handle than expected, thanks to use of the spruce sticks, and when wetted with resin, were quite manageable. Indeed, the application of resin made handling so much easier that probably too much was added and this, combined with a rather generously-filled mould, did produce a very 'messy' object when the three parts were brought together with rubber bands. Fortunately a supply of polythene gloves kept the sticky resin off my hands, and a cloth made the mould tolerably clean. On drying, the bands were rapidly removed, only to reveal a mould well and truly bonded together – and it wasn't even my mould! Disaster . . . or so it seemed. However, when an excess bead of resin was removed from around the mould – easy, thinks to the effective release agent, separation was tried again. This time, after a few nerve-racking seconds, the top moulds did separate cleanly, and a black, shiny, prop outline was clearly evident! At least partial sucess. . . . Further prising removed the complete assembly and revealed that the whole job had certainly surpassed all expectations. Even the hub area was clearly filled, which had been a major source of doubt. The excess flashing was easily removed, and a rather thick leading and trailing edges revealed, caused by overfilling the mould. This was then corrected by thinning the blades with firstly a file, then wet and dry paper, the nett result being most rewarding – at least to my own, somewhat biased, eyes. The whole process was completed in the space of one evening and had proved the job to be remarkably straightforward – practice will doubtless enable the thickness of carbon-fibre to be more accurately estimated. Now just one problem remains, just what am I going to do with a 7 in. x 3½ in. prop?



First sighting of our own prop. on removing the top sections. Note the thin film of P.V.A. release agent evident in the top halves. Make sure that the centre pin/lower mould joint is well protected by the release agent to enable easy separation.



CLUB NEWS

The S.M.A.E.'s display stand, which may be seen at many rallies up and down the country where the public are admitted, is fully portable, and may be borrowed from the Society's P.R.O. to help publicise the hobby. This stand at the Model Engineer exhibition depicts the Society's fiftieth anniversary.

THERE IS QUITE a bumper bundle of reports and newsletters to cover this month, all deserving of some mention, so please forgive omissions and exceptions, although I hope these will be minimal.

First comes a report from the **Leeds & D.M.A.C.**; a club with a long and distinguished history, particularly in the free-flight contest field. And part of that history, and a very potent part of the present also, is veteran Henry Tubbs, whose contest successes are legion, and who is still picking up the hardware with the same old insouciance. At the club reunion dinner he collected no less than five trophies, including that of the club championship. Special guest at the dinner was S.M.A.E., Chairman, Ron Firth, but no less distinguished were some of the luminaries of yesteryear who were also invited along. These included Ron Calvert, Stan Eckersley, Trevor London, Dennis Lees, and the inimitable Silvio Lanfranchi. Next year it is hoped to extend the guest list even further, and the Secretary, J. Mosely, would like to hear from ex-members of the old Leeds, Bradford and Baildon clubs. His address is 37 Springmead Drive, Garforth, Leeds LS25 1JW. Another sort of 'reunion' comes in the winter building programme, where there is a get together of some popular models of the past, including a *Jaguar*, several *Korda Wakefields* and not a few versions of Laurie Barr's *Scram*.

Just a Rolling Stone's throw from Liverpool is the township of **Widnes**, where a Model Flying Club of that name has just been formed. Notice of this event comes from Mr. 'Leo' M. Lyons, who is the club treasurer. Strength at present is about twenty members, mostly concerned with the controlled arts of C/L and Radio. The club field is the S.S. Fisher Moore Playing Fields, and there is another possible one under negotiation. Whether the latter will allow for free-flight we are not told, but at least the free-flighters have the fields of a friendly farmer to use for four months of the year. New members welcome at the Sea Cadet H.Q., in Regent Road at 8.00 p.m. No day given, but you can phone the Secretary at 051-424 3901 for further details.

Negotiations can sometimes give rise to complicated solutions, and those between the **St. Albans M.A.C.**, and the local council over power model flying on Nomansland are no exception. Since the notices on the common may cause some confusion, and because you want to know what's what before you make the journey, Mr. A. C. Booth, the club P.R.O., has asked us to publish the following list of approved times: For Power Models other than Radio: Monday/Tuesdays, 10 a.m./7 p.m. Wednesdays/Thursdays, 10 a.m./9 p.m., Saturdays, 10 a.m./6 p.m. Sundays. No Flying. Radio Power Models: Mondays/Fridays, 10 a.m./7p.m. Saturdays, 10 a.m./6 p.m. Rubber Power, Gliders and Miniatures: Any Day, Any Time. Models should be effectively silenced, C/L models flown in the allotted area and radio jobs flown as far away as possible from inhabited areas.

John Taylor is the Chairman of the **Tamworth Model Flying Society** (Staffs.), which has been re-born under entirely new management. And he tells us that this time they really mean business. Interest centres mainly on C/L Stunt and Combat, in which arts the lads are highly competent. So much so, in fact, that they are looking forward to some trophy hunting during the season. Appropriate spot for Combat flying is the castle grounds at Tamworth, now the scene of many a chivalrous joust. Other flying locales are where the club is giving its many public displays.

Only flying field complaint to be heard in **Leicester M.A.C.**, is that the Wymeswold concrete is too hard, whereas the usual one we hear is that the flying field is just hard to get. Personally, I am much too crash prone to be a hard field flyer, and my cold feet are more often to be found in some boggy field where the going, like my model flying, is soft. It's a wonderful feeling of relief to pick up that off trim model and find no 'bones' broken. Also flying the hard way is when your radio model takes off when another is doing likewise in the opposite direction. Two very short flights recorded at Wymeswold. Sensibly the major free-flight events are to be held in the early and latter parts of the year to avoid the growing crops abounding Wymeswold. An important consideration, too, since it is noted in the newsletter that there has been a marked expansion in F/F contesting in the last year or so.

Is there a club or clubs within driving distance of Preston sufficiently combative minded to take on the **Preston & D.M.A.C.**, in a one day Combat event? If so, Secretary, Mr. K. J. Powis, of 197, Havelock St., Preston, Lancs., would be only too pleased to throw down the gage.

The **F.A.C.C.T.**, Club had its initial success (and what initials) in the sphere of C/L, but the latest report of club trends from Mr. G. H. W. Johnson, indicates a strong drift to radio. And drift is the operative word, as the main interest seems to be Thermal Soaring, with a spot of slope thrown in. Thermal launching is mainly by non-athletic bungee, which is very leg saving with large, heavy models, although for contest work I should imagine the puff and pull method gives you a higher release. Free-flight has also grown up in the club over the past few years, with Andy Crisp, contest virtuoso, as the leading light. But C/L is not entirely submerged: the Shaw/Johnson team are hoping at least to keep that little known C/L club, Feltham, out of the Goodyear finals.

Deep in the heart of Kent operates the **Sevenoaks & D.M.A.C.** Meetings are held at Westerham, and some flying, though perhaps not all, takes place at the West Malling airfield. This info culled from the club mag *Airmail* '72. In the mag members are asked if they wish to exhibit models in the Sevenoaks Art Exhibition. No doubt a model aircraft would be classified under handicrafts and hobbies, although, when you come to think of it, a model can be a work of art, particularly a 'well sculpted' own design craft.

Yet more challenges. This time from a note appearing in *The Message*, the newsletter of the **N.W. Area**. The juniors of Whitfield and Syke clubs offer to take on any other junior clubs in the Northern 'Hemisphere' in F/F competition of any type. No travel problems, for the challengers have their own transport. And for the really young in age, as well as heart, there is a mini postal event (for boys as well!) for modellers up to the age of 12. Organisation is from New York, and events include chuck gliders and r.o.g. Flying Scale.

Usually the only power cuts referred to in the model world are the ten second ones, but it's the other form of power cut which prompts the **Watford Wayfarers M.A.C.**, to introduce their newsletter from 'darkest Hertfordshire'. But has it really affected the charging of DEACs?

A club which has had a few ups and downs in its flying field fortunes over the past year is the **Maidstone M.F.C.**, according to the latest newsletter. We can only hope the ups and downs have now levelled into a flyable plateau. One of the present available flying fields is at Readcorn, where Peter Cook, Noel Lovett and other practitioners of the art can be seen in action.

Education wise aeromodelling seems to be moving up the social scale, for I note in the **Three Kings Aeromodeller's**

bulletin, an offer of an instructor post in aeromodelling made by a Further Education Centre, which, no doubt, will be of interest to club officials who are always trying to get members to do more 'homework'. But model flying is not only educationally improving it is also physically enhancing. We are reminded of this by the appearance in the newsletter of the prospectus of the Central Council of Physical Recreation. Model of the month is Dave Wood's *North American Harvard*. Also in the running was a *Hotshot* stunt model built from a plan in the 1949 *Model Aviation* magazine. A reminder here just how lucky we were weather wise in the south during the winter. News from the north tells of modellers firmly encamped behind four protective walls whilst their brethren down south were enjoying the outdoor delights (at least on the Croydon field).

No **Buckaneers** Bulletin this month, but Pete Smoothy has sent us along a nice report in his own best handwriting. The Buckaneers, too, have been taking advantage of the exceptionally mild weather. In February they went along to Finmere to join with aeromodellers from the Midland Flying Club for an impromptu 'Fun Fly' afternoon. Guests arrived in a well-equipped luxury coach, to make a change from the usual cramped up car journey, and found flying conditions to be just ideal. The club played host yet again in February when they were joined by members of the Northampton and Harpole clubs for a lecture by Radio expert Dave Boddington. Pete suggests Dave must be the country's most prolific aeromodel designer, and some proof of this was seen in the many colour slides he brought along to show to the 40 strong audience. He also brought along his beautiful Sopwith Tabloid, which was featured in our R.C.M.E. magazine. And to any oldie like myself, who has actually seen an Alan Cobham Air Circus (At Dagenham, of all places!) the second half of his lecture, on the Barnstormers Aerobatic Display Team, who travel the country giving displays on the lines of the old Cobham circuses, would have struck a nostalgic note.

A nice shot of a Bristol Fighter graces the cover of the *South Bristol News*, the bulletin of the **South Bristol M.A.C.** Listed are some good reasons for joining the Bristol club. There is, apart from the companionship, all that essential knowhow at your disposal. In addition you can buy much of your modelling needs through the club at reduced price, and there are pieces of exotic equipment for all to enjoy such as a radio monitor, and perhaps not so exotic, a 5 gallon water container. A point also stressed that the club newsletter is an amenity rather than a joke, although a bit of contributed humour would not come amiss, along with some harder sort of copy. Most model flyers have a few pet ideas and personal systems they would like to put over to the world at large and the club mag should be just the place. A potted history of the club appears in the newletter, and from this we learn that it was formed way back in 1947 when the club records were held by such old doughties as a Mills powered *Hi-Ball* and a *Sunnanvind* glider (covered in brown paper and still a worthwhile project today).

Yet another good issue of the **British Aircraft Corporation M.A.C's** *Airlog*. One article draws an interesting parallel between Igor Sikorsky's attempts to fly in 1912 and modern r.t.p. models. His planes, like the r.t.p. models, were underpowered, underweight and slow flying. The point made, as far as I can see, is that you must not fly a r.t.p. model at a too hectic speed if all realism is not to be lost, but slow flying makes for some very curious control responses. The problem, which could also relate to scale flying generally, is nicely set out by Mike Knott – and for the boffin boys he has supplied the mathematics. The mag includes some nice plan views of an assortment of r.t.p. craft. I particularly like the ducted fan *Skyray*, which should look quite spectacular if regulated to a fair scale speed.

We don't know what happened to all that open range where the cowboys chased the indians, but on the American model scene there is an awful lot of concentration on small field flying. Much of the content of the Southern Connectitcut A.M.A.s *Contact* is taken up with 'battery' model flying as opposed to the free range stuff. Plans featured are for Chuck (H.L) and A/1. Glider, and a Coupe D'Hiver with a name sounding like a boot, *Rubber Soul*. All much on the familar lines. But to prove that theory is not as dead as vaudeville, there is a mathematically meaty article on the relative merits of high and low aspect ratio on A/2 gliders.

What is a Rafterbanger? You may think it's bats in the belfry but it is, in fact, the name of an Indoor contest held by the **Willamette Modellers Club,** Inc. (Oregon, U.S.A.) in a school gymnasium. The rafters, which were gently nudged rather than banged, by the microfilmies, were some 42 feet above sea level, which is really a fair bit of headroom. Most of the *W.M.C. Patter* mag devoted to indoor antics, including a nice plan for a microlite covered *Penny Plane*.

Interntionaler Wurfgleiter Wettbewerb is all about the great Chuck Glider event. Entries came from as far awide as Christchurch and Wigan. Won by a U.S.A. team, our best entry from Wigan came 15th.

Free Flight (Down Under) features a number of H.L. or Chuck Gliders, and this might well reflect the growing interest in this para physical type of event, or it could be that plans of such are easy to reproduce. Generally, in this country, we are pretty immune to the craze; and although you occasionally get the big contest entry the chuck glider event is usually treated with some indifference.

From *Propshaft* (Rhodesia) comes a cautionary tale of what happened to the first lady club member's model. Wing and rest of model parted company in mid-air. She should have taken notice of Women's Lib ,where they are told to 'band together'.

I would like to have used a comment or two from the *Journal of the Society for the Promotion and Avoidance of Boomerangs*, but I must leave you with the joke implicit in the title.

Clubman

CONTEST CALENDAR

April 23rd	**S.M.A.E. 2nd AREA CENTRALISED MEET.** Open R/G, F.A.I. Power. Area Venues.
April 23rd	**LONDON AREA C/L CHAMPS.** 1st round. Goodyear, F.A.I., ½A T/R, Combat. Charville Lane, Hayes.
April 30th	**LUTON & DISTRICT SLOPE SOARING RALLY.** R/C Multi and single channel, R/C Ladies event. Also F/F Chuck Glider/Magnet if conditions and demand permits. Superhet only. Pre-entry (30p multi, 20p S/C and Ladies) to T. R. Clark, 'Windyridge', 126 Alexandra Avenue, Luton, Beds (Luton 22742). Venue Ivinghoe Beacon.
May 7th	**FACCT THERMAL SOARING RALLY.** Venue Enstone Airfield, on B4030 Bicester-Enstone road (1 mile from Enstone). Field entry – 25p, pre-entry – 20p. Details G. H. Johnson, 37 Oxford Road, Kirtlington, Oxon.
May 7th	**DEVON RALLY.** Open R/P/G. All in F.A.I., Chuck Glider. Woodbury Common, nr. Exmouth – 10 a.m. Unlimited re-entry.
May 7th	**WOLVES MAC C/L FLY IN.** C/L Aerobatics, Fly-for-fun (most entertaining flight wins). Short grass surface. Silencers and Insurance Proof essential. Lucas Aerospace Ltd., Hobson Works, Sportsfield, Fordhouses, Wolverhampton. Details: W. A. Hatfield, 563 Stafford Road, Wolverhampton WV10 6QE.
May 7th	**STAFFORD HURRICANES SCALE R/C AIR DAY.** Class II rules. 10.30 a.m. start. 25p pre-entry/details from D. Martin, The Laurels, 58 Mount Road, Stone, Staffs. Venue Hixon Airfield, 4 miles east of Stafford on A51.
May 14th	**St. ALBANS MAC THERMAL SOARING RALLY.** 3 rounds from 10.30 a.m. 150 m. line. No Regen. Venue Nomansland Common, Wheathampstead.
May 27/29th	**BRITISH NATIONALS:** R/C, C/L, F/F. Scale at R.A.F. Hullavington, Wilts. F/F & R/C Thermal Soaring at R.A.F. Strubby, Lincs.
June 4th	**ELLIOTT ANNUAL CONTROL LINE GALA.** Stunt, Combat, Goodyear at Elliott Bros., Airport Works, Rochester, Kent.
June 4th	**S. MIDLANDS AREA THERMAL SOARING.** Venue Bassingbourn – provisional. Details C. D. Dallimer, 10 Angle Way, Stevenage, Herts.
June 10th	**CROYDON D.M.A.C. EVENING F.A.I. COMP.** Rubber, Glider and Power from 18.00. No rounds. Venue Chobham Common.
June 11th	**WESTERN AREA C/L RALLY.** F.A.I., Goodyear, A-Rat (to Western Area rules), F.A.I. Combat. Entries close 12.00. Venue R.A.F. Fairford.
June 11th	**S.M.A.E. 3rd AREA CENTRALISED MEET.** Open G/P, F.A.I., Rubber. Area Venues.
June 11th	**S.M.A.E. R/C MEET.** Aerobatics (F.A.I.) at R.A.F. Cottesmore, Rutland.
June 17th	**CROYDON D.M.A.C. EVENING F.A.I. COMP.** Rubber, Glider and Power from 18.00. No rounds. Venue Chobham Common.
June 18th	**AEROMODELLER/SCALE MODELS/R.C.M. &E. ALL SCALE RALLY** at Old Warden, Biggleswade, Beds.
June 18th	**SOUTHAMPTON M.A.C.'s F/F GALA.** Open R/G/P, Chuck, Combined mini-comp. Venue Beaulieu Airfield, 10.30 a.m. start.

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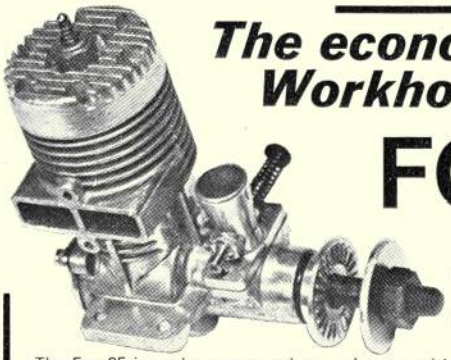

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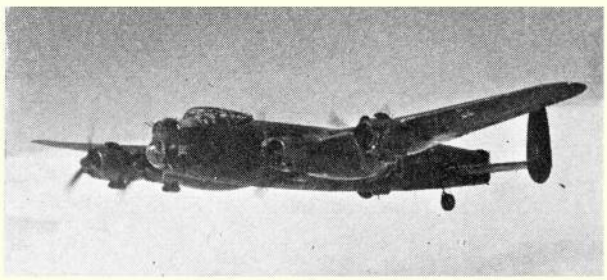

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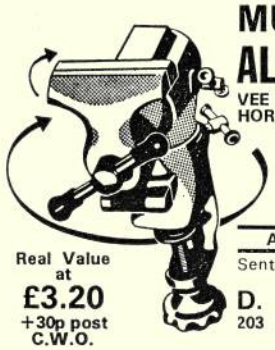

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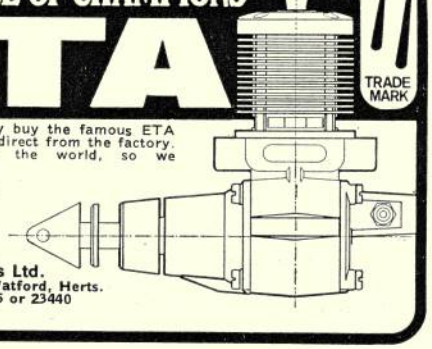

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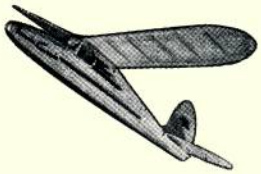

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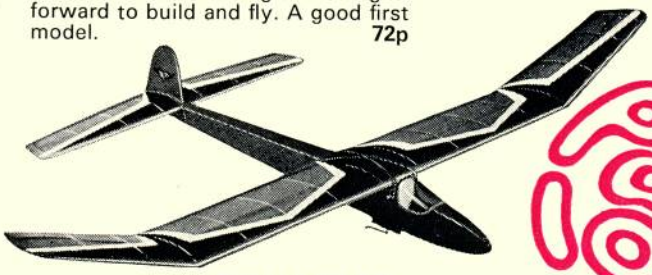

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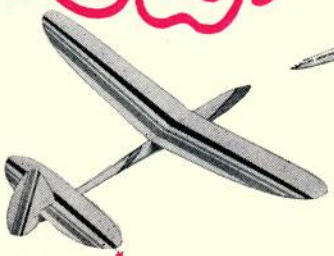

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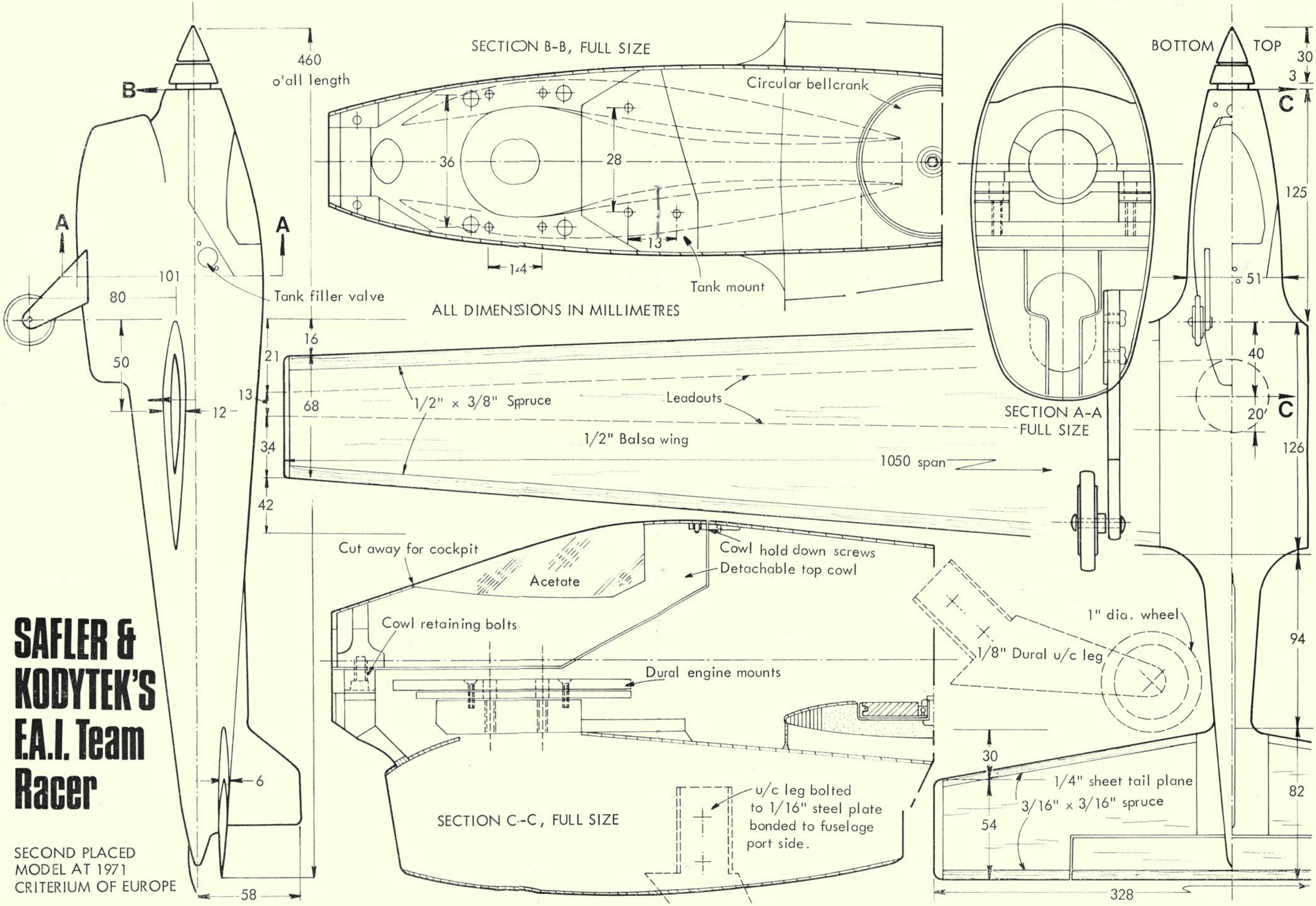

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