Aero Modeller

FEBRUARY 1969
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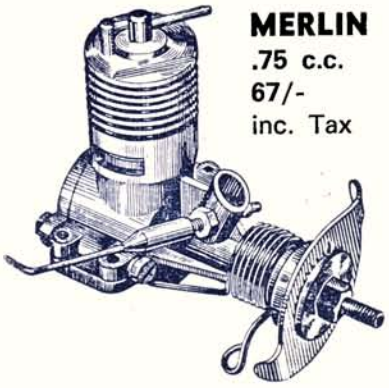
INCORPORATING
MODEL AIRCRAFT

AN MAP HOBBY MAGAZINE



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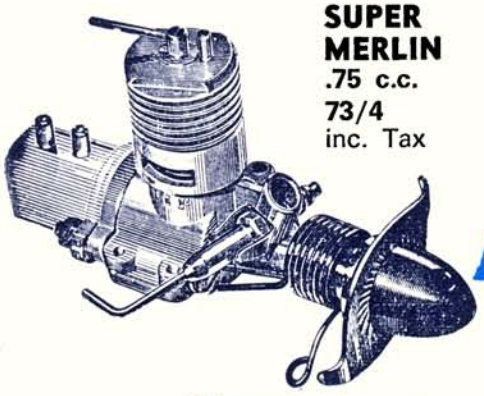

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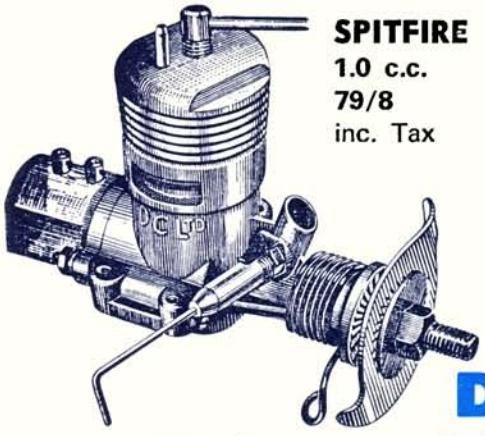

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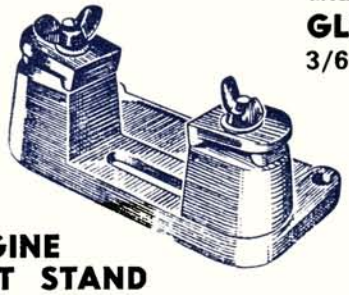

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and
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Aero Modeller

INCORPORATING
MODEL AIRCRAFT

February 1969 VOLUME XXXIV No. 397

CONTENTS

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Editorial Director **D. J. LAIDLAW-DICKSON**
EDITOR **R. G. MOULTON**
Advertisement Manager **ROLAND SUTTON**

COMMENT

Statisticians revelling in the glory of the Borman, Lovell, Anders fantastic Moon-flight have come to the conclusion that all Astronauts are either only sons, or first sons from quite ordinary family backgrounds. We'll throw in another simple common denominator and state that each of them has at one time made model aeroplanes. So too have all of the top designers in aviation and countless other executives in industry as well as airline captains, and the skilled pilots of the Air Forces of every nation, When he was President of the F.A.I. a few years ago, that greatest of test pilots, Vlad. Kokkinaki of the U.S.S.R. made public his view that aeromodelling was the finest means of teaching the spirit of aviation, and his country includes the subject as part of standard school training. Yet in Great Britain, the official attitude is to evade any form of recognition of aero-modelling as an educational subject. The Central Council of Physical Recreation has even gone so far as to tell us that since Aeromodelling 'demands no physical effort' then it cannot be accepted as a Sport. Happily all is not lost. There are many individual teachers who are conducting their own model-making courses and their efforts will be co-ordinated by the Air League's A.E.R.O. committee. Air education is now more vital than ever before.

next month

Elton Drew tells of his **Contest Tactics** with gliders, and Andrew Crisp introduces his **Accipiter A/2.** The racy little French Jurca home-built aircraft, **Tempete** and **Sirocco** are scale drawing subjects. Machining ops for the **Topsy diesel** and details of our **round-the-pole electric powered models.** Out on February 21st.

on the cover

Just part of Australian artist Ray Honniset's painting of Kittyhawks in action. Reproductions of this and many other paintings by Ray and associates are in world-wide distribution, agent in this country is Beaumont Aviation Literature, 11 Bath Street, London, E.C.1. We are grateful to Ray for permission to reproduce a section of this print to introduce the feature on pages 84-88 of this issue.

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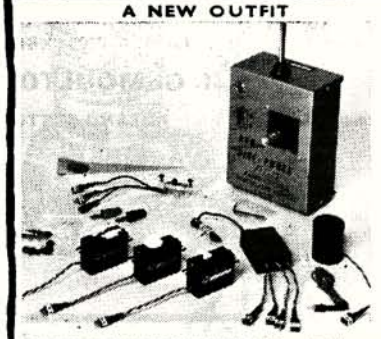
RADIO CONTROL SUPPLIES

A NEW OUTFIT



R.C.S. Mk.II DIGI-THREE S'het Orbit servos, Slimline Rx, new adjustable stick DEAC wiring harness £110. 0.0
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O.S. Minitron Superhet £31.19.4
O.S. Single Proportional £70.13.9
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MacGregor Minimac Relayless £14. 9.6
MacGregor Mk. II Superhet Relay £23. 0.0
Fleet 6 with Tripack £50. 0.0
Fleet Prop. Rand LR3, DEAC £53. 5.0
Futaba Single £16. 4.6
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S.A.E. brings brochure 'An Introduction to R/C Equipment'

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Aquamite Amplified £9.1.2
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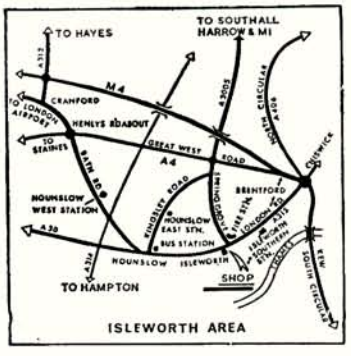

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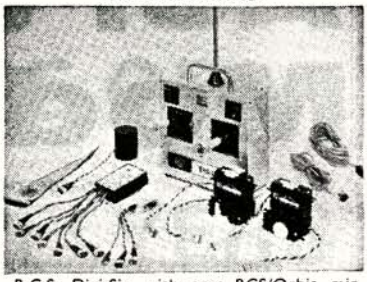

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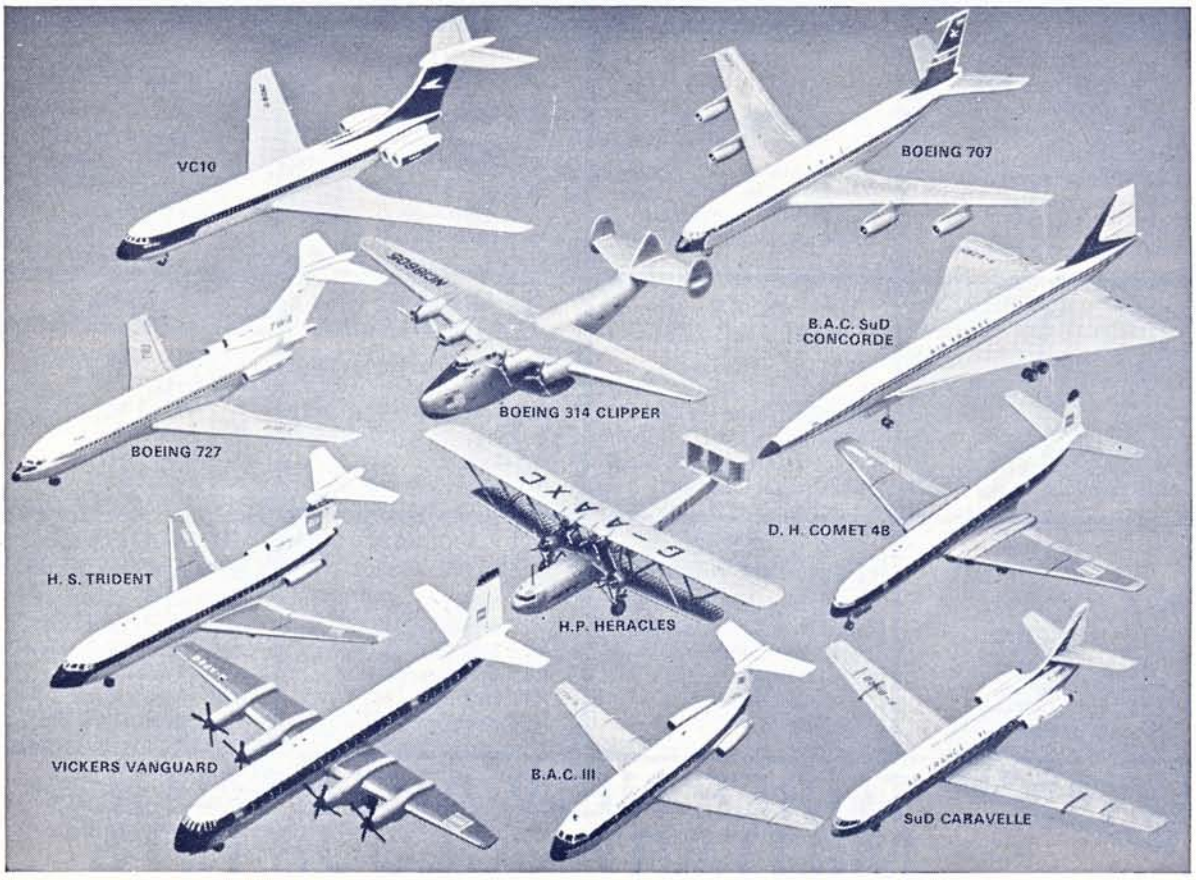

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HB.2 Dark Earth
HB.3 Ocean Grey
HB.4 Duck Egg Blue
HB.5 Sky Type S
HB.6 Sea Grey Medium

KIT 2
LUFTWAFFE

HG.1 Schwarzgrun 70 (Black Green)
HG.2 Dunkelgrun 71 (Dark Green)
HG.3 Hellgrau 76 (Light Grey)
HG.4 Dunkelgrau 74 (Dark Grey)
HG.5 Helblau 65 (Light Blue)
HG.6 R.L.M. Grau 02 (R.L.M. Grey)

KIT 3
U.S.A.F.

HU.1 Medium Green 42
HU.2 Olive Drab 41
HU.3 Neutral Grey 43
HU.4 Non Specular Sea Blue
HU.5 Intermediate Blue
HU.6 Light Grey

KIT 4
FLEET AIR ARM

HB.7 Extra Dark Sea Grey
HB.8 Dark Slate Grey
HB.5 Sky Type S
HB.9 Sea Blue Gloss
HB.10 Night Black
HB.11 Underside White

KIT 5
ROYAL AIR FORCE
(OVERSEAS)

HB.2 Dark Earth
HB.12 Mid Stone
HB.13 Azure Blue
HB.10 Night Black
HB.11 Underside White
HB.14 Airframe Silver

KIT 6
FRENCH AIR FORCE

HF.1 Kaki (Khaki)
HF.2 Vert (Green)
HF.3 Terre Foncee (Dark Earth)
HF.4 Gris Bleu Clair (Lt Blue Grey)
HF.5 Gris Bleu Fonce (Dk Blue Grey)
HF.6 Chocolat (Chocolate)

KIT 7
ITALIAN AIR FORCE

HI.1 Mottle Green
HI.2 Upper Green
HI.3 Overall Green
HI.4 Sand
HI.5 Grey
HI.6 Insignia White

KIT 8
JAPANESE AIR FORCE

HJ.1 Green N.1
HJ.2 Grey A/N2
HJ.3 Green A.3
HJ.4 Mauve N.9
HJ.5 Brown N.17
HJ.6 Silver A.6

KIT 9
U.S.A.F. (VIETNAM)

HU.7 Green 34079
HU.8 Green 34102
HU.9 Tan 30219
HU.10 Grey 36622
HU.11 Airframe White
HU.12 Night Black

KIT 10
MILITARY VEHICLES

HM.1 8th Army Desert Yellow
HM.2 Afrika Korps Desert Yellow
HM.3 U.S. Olive Drab
HM.4 German Panzer Grey
HB.1 Dark Green
HB.2 Dark Earth

KIT 11N
NAVAL VESSELS

HN.1 Light Grey
HN.2 Dark Grey
HN.3 Deck Green
HN.4 Deck Bleached Teak
HN.5 Hull Red
HN.6 Black

KIT 12
WORLD WAR 1 AIRCRAFT

HB.15 R.F.C. Green
HB.16 Clear Doped Linen
HG.7 German Pale Yellow
HG.8 German Green
HG.9 German Purple
HG.10 German Light Blue

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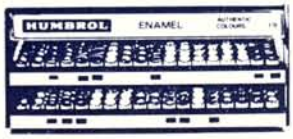
HM.12 Dark Blue
HM.13 Dark Green
HM.14 White
HM.15 Flesh
HM.16 Crimson

23 MILITARY EQUIPMENT
HM.17 Gun Metal
HM.18 Brass
HM.19 Dark Wood
HM.20 Silver Plate
HM.21 Leather
HM.11 Black



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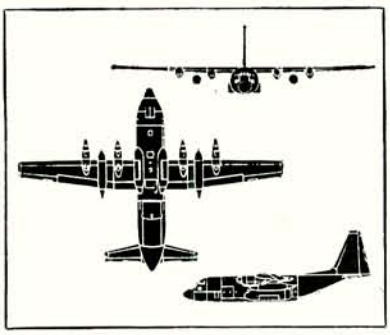

Royal Air Force

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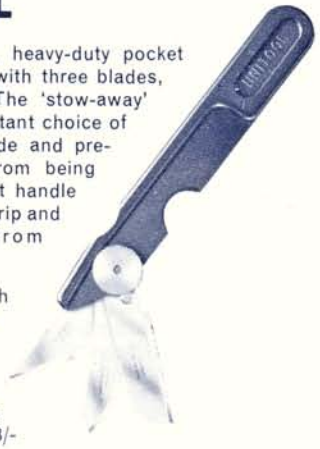

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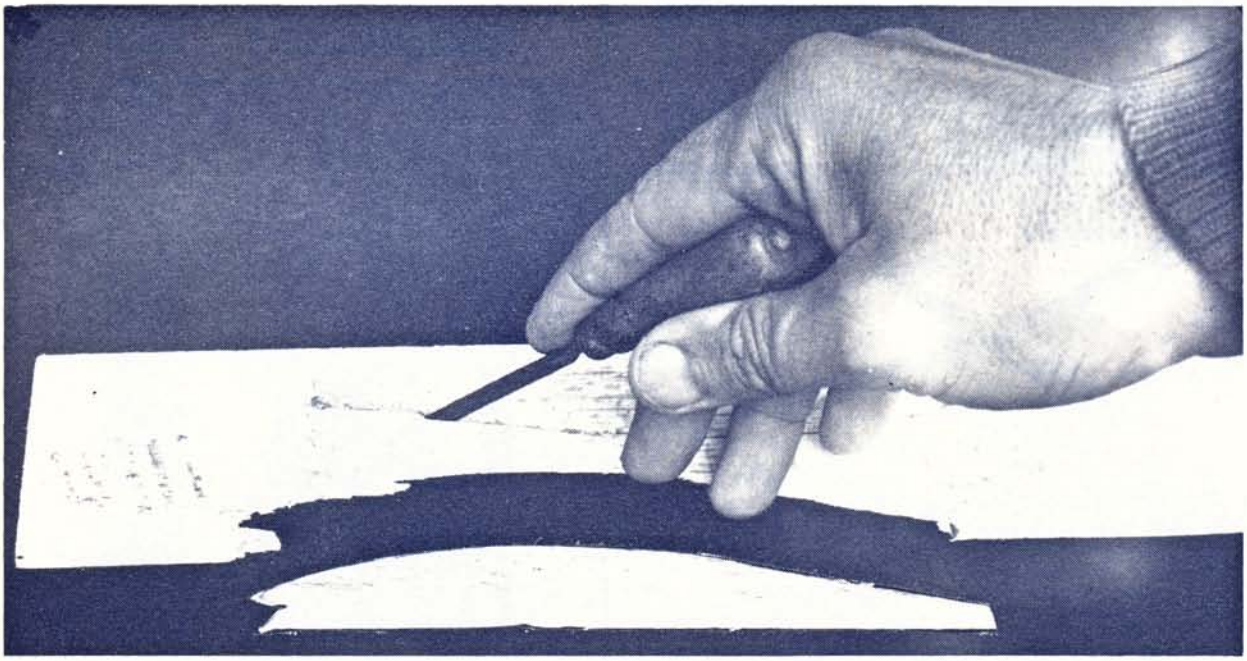

YOU WOULDN'T CUT OUT RIBS WITH A FILE

Aeromodelling construction is a skilled job—so you use the right tools, otherwise you cannot get results which even begin to be acceptable. Of course, one of the great advantages of Balsa is that it is so easy to work—a sharp knife is the answer to most cutting jobs in Balsa sheet. But don't forget about files entirely. A flat file of the right thickness is the ideal tool for slotting trailing edges. Also if a very junior would-be modeller (under ten !) wants to try cutting out Balsa for the first time, turn him loose with an 'Abrafile'. At least, he won't cut his fingers then !

The better the material, the better—and more accurately—you can work with it, of course. That's where Solarbo Balsa scores in being only the best Balsa, specially selected and graded for aeromodelling use. You will find that you **are** more skilful with any piece of Solarbo Balsa because it is **right** for the job (not just a random piece of balsa wood). That goes for junior working with his file, too—so see that he has plenty of offcuts to keep him from using your main stock. Or he can use up those pieces of 'ordinary' balsa you may have accumulated but are reluctant to use because the quality is not right.

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KINDLY MENTION 'AEROMODELLER' WHEN REPLYING TO ADVERTISEMENTS

Heard at the Hangar Doors

Only Hawker Typhoon outside the U,S,A, recently refurbished at R.A.F. Shawbury for the Royal Air Force Museum after being sent from Canada. Serial is MN 235 on this 'Tiffie'.

D. H. DRAGON – the one on our cover for May '66 G-ADDI is still operated by Chris and Claire Roberts from Luton and Sywell, may yet find even greater fame. Sponsors are sought to enable the D.H.84 to cross the Atlantic in the *Daily Mail* air race between the Empire State Building and G.P.O. Tower, London. Such a flight would commemorate the Mollison's famous flight in '*Seafarer*' of July, 1933 and '*Seafarer II*' which subsequently flew as '*Trail of the Cariboo*' back to Heston in '34. (Full story in 'Atlantic Wings' by Ken McDonough).

APOLOGIES to all those disappointed modellers who failed to get their 'Aeromodeller Annual' for Christmas. Unprecedented demand for our 21st edition completely exhausted all stocks within eight weeks of issue. We have rushed through an extra batch but pressure in the bookbinders is such that for most of December and the beginning of January we are unable to supply a single copy. Such demand has taken us by agreeable surprise. Could it be that the larger number of drawings, and selection of leading features has created a new formula? In any case, we're trying the same next year and can promise an equally surprising collection of designs as well as some remarkable articles.

CONGRATULATIONS to John Crampton for his first British attempt at establishing a speed record with a radio controlled model. John averaged 101.5 m.p.h. in a two-way run and this with a much reduced 'Shoestring', 32 in. span, and powered by an exposed Merco 49. Fixed tricycle undercarriage and lack of cowl make one wonder what John will do at next attempt? The Merco is now cowled. Many people have talked of attempting speed. How refreshing it is to have news of someone *actually doing something!* We must emphasise that this extremely well-planned and documented record claim has yet to be ratified at time of our going to press.

RECORDS ratified by the F.A.I. during 1968 indicate that during June a record attempt meeting must have been held in the U.S.S.R. as five successful claims were made in different categories of Free Flight from June 3rd to 16th. A. Novjny established a new free flight power *speed* record for 144 Km/h and in free flight rubber helicopter A. Nazarov made a flight of 33:26.7 *duration*. A. Voltchanovsky flew 352 metres high for *altitude*, P. Motekaitos achieved 78.3 Km/h in rubber helicopter *speed* and Voltchanovsky flew a power-driven helicopter at 99.9 Km/h to establish another remarkable *speed* record. Remainder of the F.A.I. record ratifications went to the U.S.A. and Czechoslovakia. Newly established Seaplane R/C *Speed* record is 134.8 Km/h by J. Rankin and *distance in a closed circuit*, 116.2 Km with an R/C Seaplane by D. L. Gregory. New Glider *altitude* record for R/C is 1,496 metres by R.F. Smith. Vlad. Stefan's long flight of 15 hours 2:25 which we have already reported in detail is now officially a World Record for *duration*. N. Malikov of the U.S.S.R. made 12 hours 53:10 on 13th September in a fine attempt which deserves recognition as an 'unsuccessful' claim. We look forward to hearing of further marathons in arctic light! Few people seem to appreciate the effort required and technical efficiency demanded of equipment to establish records of this nature. The club flyer who finds his batteries low after a half-dozen jaunts on the local field or whose attempts at helicopters have been significantly abreviated will readily grasp the enormity of these achievements.

IN ANTICIPATION of radio control scale becoming an official World Championship category, a fund has been launched to establish a **Keil Memorial Trophy.** Eddie Keil had a great interest in flying scale models and adoption of a trophy for the team award would be especially fitting. An explanatory appeal has been distributed to all clubs and retailers but should any reader feel that he would like to make a contribution, no matter how small, we would be most pleased to supply details.

FLY FOR FUN '69 is going to be one of the greatest events of the year. Being planned by a group representing most of the light aircraft, gliding and, of course, aeromodelling movements, it is scheduled to bring aviation to the public by demonstration of just how simple it is to build and fly one's own model or real aircraft. To take place at Sywell, Northants, September 20/21st, it will include a large static display area as well as continuous flying demos. Organised by the Air League, it offers a wonderful opportunity for aeromodellers to show the value of their hobby.

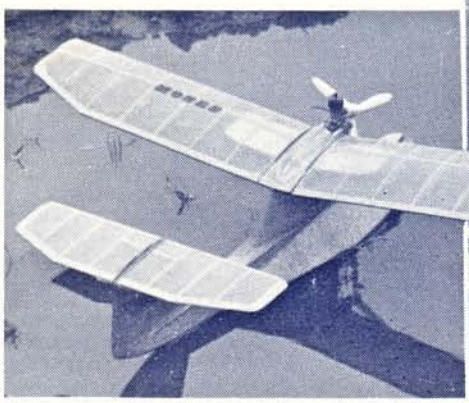
Winners of the scale model contest run by the Central Flying School, Royal Air Force, Little Rissington were W. A. Vandersteen with his 1/24th Maurice Farman Shorthorn at left and 15 year old Alan Brett with his 1/72nd scale Avro Tutor at right. Standard was high, and like recent correspondence, emphasises that there is a large following for the self-constructed non-flying scale model, generally known as the 'solid'.

John Crampton's much abbreviated 'Shoestring' touches down after 100 m.p.h. speed run at Dunsfold. Span of the gold MonoKoted 5½lb. model is only 32 in. Merco .49 will be cowled for further record flights.

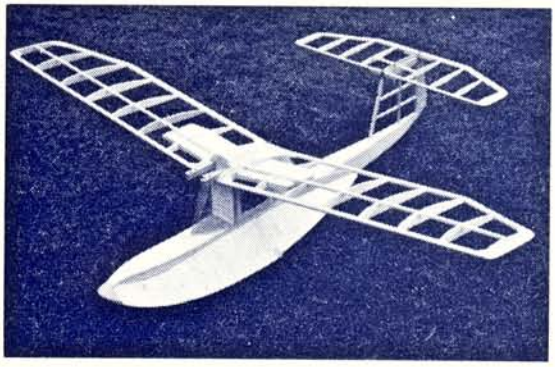
Resolve your flying field problems

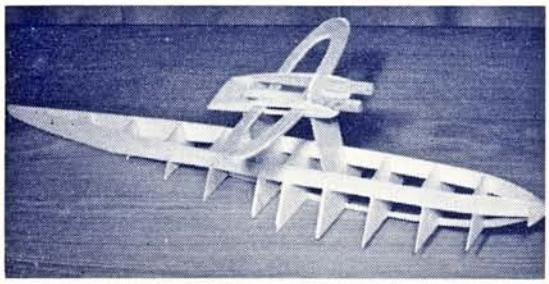
—TAKE TO WATER !!

IAN BARRETT'S NOVEL LITTLE TEE-TAIL DESIGN SKIMS ALONG ON H_2O -OR SLIDES SOFTLY ON TO GRASS



Ian Barrett picks a smooth and glassy lake for tests of prototype with D-C Quickstart Dart .5 cc. diesel. Design takes all the little engines.





MANY MODEL FLYERS dream of trying a flying boat; but because of the lack of suitable nearby stretches of water never bother to build one. Nevertheless, it is surprising how often the opportunity arises for flying boat operation. For instance, after heavy rain (not infrequent in this country) fields become waterlogged with large puddles. At holiday time, stretches of water can usually be found, inviting the use of a small, easily transportable model. 'Moses' was designed with this in mind, and its small size, with removable flying surfaces, allow it to be packed away conveniently with the holiday luggage.

Construction of the fuselage is straightforward. Cut out the two fuselage sides and all the formers, and build up the basic fuselage as shown on the plan. Add the keel pieces and the engine bearers. Very carefully mark the position of the centre section ribs R1 on the formers F5 and F8, and cement the ribs in place. Each rib should be at the same angle of incidence. Make the plywood tongue, and steam the centre until a 10 deg. dihedral angle (20 deg. total) is obtained. This is not as difficult as it may sound. When dry, slide the tongue through the ribs and under the bearers, firmly gluing into position using P.V.A. adhesive. Build up the fin over the plan, and when dry cement it in position in the fuselage, ensuring it is vertical. The remainder of the fuselage can now be sheeted in, with the grain running across the fuselage. Plank the engine nacelle with 1/16 in. x $\frac{1}{4}$ in. strips, and add the cabin sides, after first cementing the windows to the inside. Fill in the wing section between the ribs with 1/16 in. sheet top and bottom. Add the nose block, and

Left, structural views illustrate the simplicity and yet when finished, the broad hull takes on a fine near-scale appearance. Design is tough too, and superbly stable with deep pylon offering pendulum effect. Try one to take on your 1969 seaside holiday.

sand the fuselage.

The wings are built around the tongue boxes, the boxes being built on the tongue and held together with rubber bands until dry. They can then be removed, and ribs R2 and R3 cemented in position. The rest of the wing is then built in the normal fashion.

Construction of the tailplane also follows standard practice.

After sanding the leading and trailing edges to the correct section, the model is ready for covering.

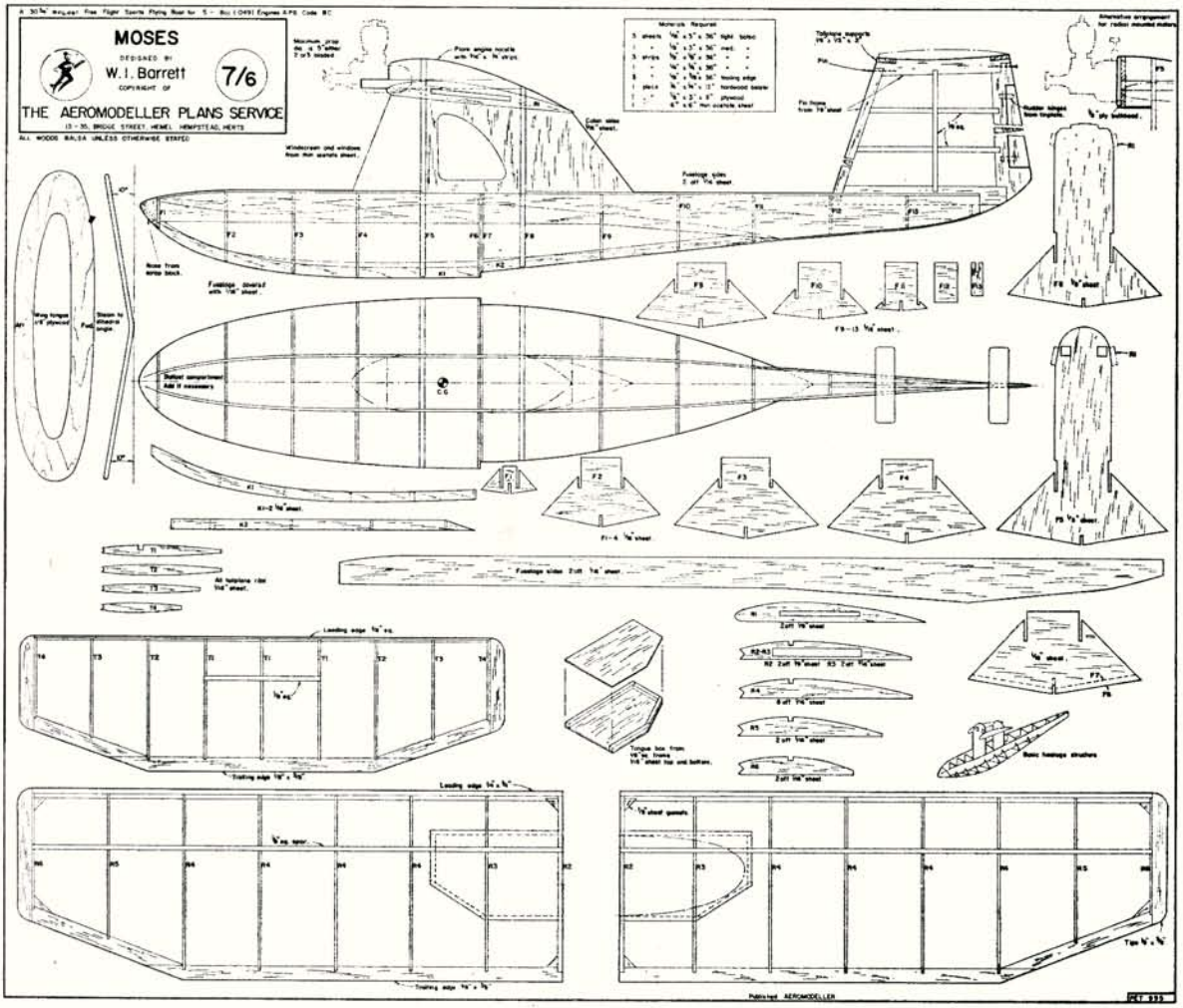
It is wise to cement ¼ in. wide nylon strips along the keel and outer edges of the fuselage before adding the tissue. Lightweight modelspan is used, two coats of clear dope being added. The fuselage is next varnished to make it waterproof. If polyurethane varnish is used the dope should be allowed to harden for three or four days first, otherwise incomplete protection is obtained.

When the model is completed, check for warps, and steam out any that have appeared. The model should balance level when supported under the wing mainspar. If not, ballast may be added to the front compartment between formers F1 and F2, by cutting a hatch into the top decking. Test glide the model over long grass, final trim being obtained by packing up either the leading or trailing edge of the tailplane as required. When satisfied with the glide, try a short engine run at low power, and if satisfactory, gradually build up the power. The original model did not need any side or down thrust on the engine.

The model lands easily on grass, but, of course, its home is on water. When you have found your stretch of water, start the engine and release into wind. If a crosswind strikes the model, causing it to tip, it will swing slightly and right itself. Take-off is very clean, and requires little power; the original has taken off with a Kalper .32 c.c. diesel running at part throttle. Any engine up to .5 c.c. diesel, or .049 glow, would be suitable (what better than a home-built 'Topsy' as in this issue), but with the larger sizes increase the power with caution – the most pleasing flights are done with a minimum of power, giving a long take off and a lazy climb, followed by a gentle glide back home to a soft landing.

What more do you want on your holidays!

FULL SIZE COPIES OF THIS 1/5th SCALE REPRODUCTION ARE AVAILABLE AS PLAN PET 995 PRICE 8s., INCL. POST, FROM AEROMODELLER PLANS SERVICE, 13/35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTS.



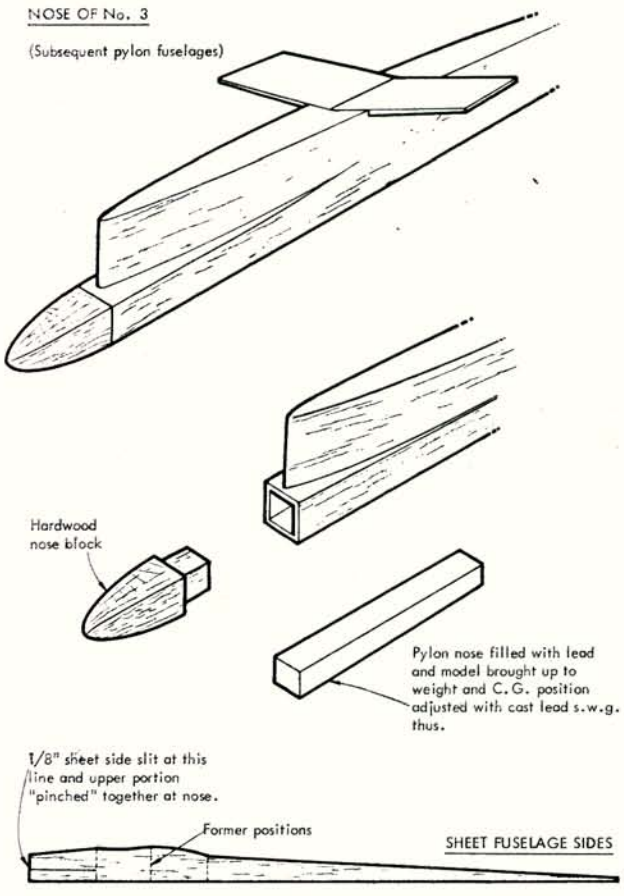
F.A.I. Glider development

by Elton Drew

PART TWO, The two latest designs and incidental details

THE NEXT MODEL incorporated many features from **No. 6** and is slightly more refined in detail. Every effort has been made to keep inertias as low as possible and a reasonable 'still air' time aimed for. To these ends the wing tips have been slightly tapered, whilst being kept very light and A.R. again raised with a return to the 5¾ in. chord.

Initial thoughts led to the consideration of a rear fin position 'just for a change'; but an Auto-Rudder system arrived to suit this position which seemed worth a try-out. This system has one horn only and one stop for both glide and tow positions, permits easy adjustments, and seems particularly suited to the aft fin position (see diagram).



Number 7 had a promising *debut* doing three 'threes and a fly-off of 5:06 D/T'd to win the S.M.A.E. Open Glider decentralised event on April 21st. The model behaved well in a variety of conditions throughout the day ranging from sunny and calm to very strong winds and it was particularly pleasing in its towline characteristics.

The all-red scheme of **No. 7** has given rise to its name 'Redaytoo' (*subtle eh?*). The next one, **Number 8** was produced rather hurriedly following the loss of No. 7 about a month prior to the First 1968 Team Trials. Happily No. 7 turned up and was in fact, used throughout.

Basically, this model is a repeat of No. 7 with minor detail changes aimed at speeding up production to some extent and also to improve operating efficiency.

The fuselage features a slightly simpler pod layout and a revised fin profile. The previous fin shape was not entirely satisfactory and some unkind comments arose from fellow club members and further prompted the change.

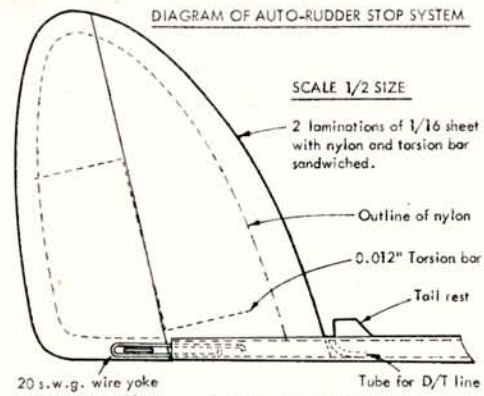
The wing planform is also changed slightly to bring the total area to 520 sq. in. projected – still well below the maximum permitted; but this should avoid any processing difficulties if indeed it is ever subjected to any exacting processing. Structurally, 3/32nd ribs have been introduced on the inboard panels. This should help to prevent trailing edge warping, and careful wood selection should avoid any great weight penalty. A stock of suitable quarter grain 3/32 in. sheet on hand was another reason for the change.

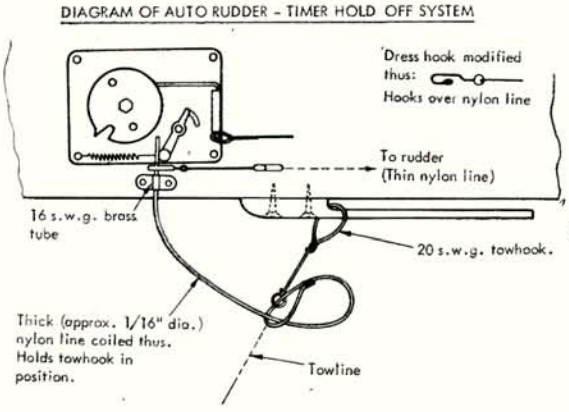
The spars are now all ¼ x 1/16 in. but the webbing has been doubled up over the central 9 bays. Past experience indicates that this spar arrangement should be satisfactory. Future experience might well prove me wrong.

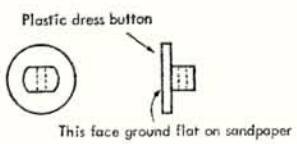
The remaining changes are restricted to detail improvements of the systems. Vernier type adjustment of the rudder is now incorporated. Whilst the system used on No. 7 proved very satisfactory, the ability to make smal adjustments with the ease and precision of screw adjusters was missed. It was found that invariably small adjustments are needed each time out, in particular to get the tow 'spot on' and it is here that screw adjustment scores. The timer release line guide, previously made up from brass tube and shim and screwed to the fuselage, is now replaced by a plastic dress button of suitable size. The button is filed flat, and to a suitable thickness and secured to the fuselage with Araldite. This gives a very smooth acting release system for little effort, correct positioning of the guide is, of course, important.

The Auto-rudder and D/T hooks also now have provision for adjustment to enable the correct line tension to be obtained more readily. These hooks are also much less fiddlesome to use, and should be a boon in the cold weather.

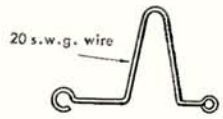
Testing indicates identical characteristics to No. 7. The towline performance of these models is particularly



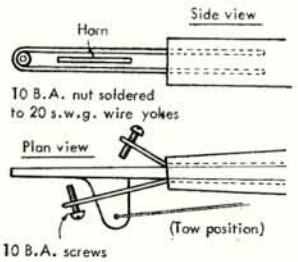




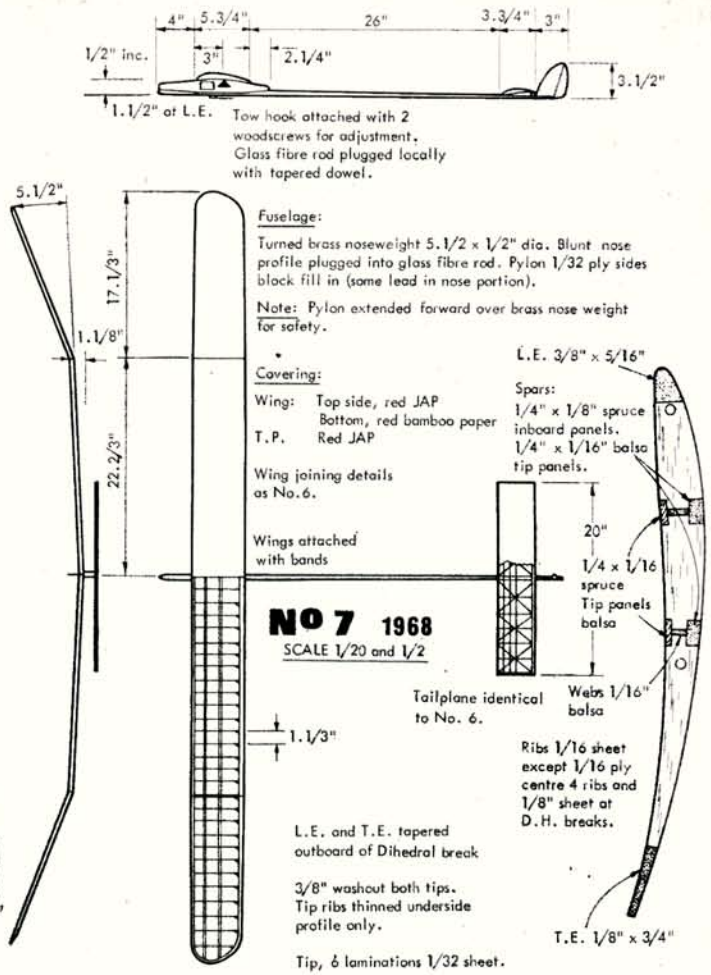
Simple timer release line guide from plastic button.



Dethermaliser end Auto Rudder hook adjuster.



Auto Rudder stops with vernier adjustment (see also next page).

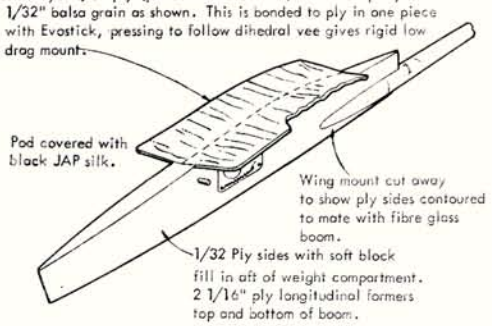


pleasing and the aft fin position might well be a beneficial feature in this respect.

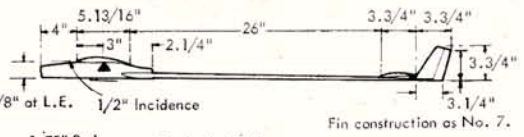
Flight preparation

ARRIVING AT A reasonable contest design is only half the battle – Flying technique is all important. To this end development is directed to obtaining a model with as high a 'still air' time as possible, allied to consistency and for want of a better term 'thermalbility', i.e. the characteristic of being susceptible to lift on the line and the ability to stay in lift once found. I do not agree with the school of thought that insists that anything goes up in a thermal and that there is no point in bothering with 'still air' times. Admittedly, this is true in many cases but there are numerous occasions when only weak thermals are available and it's then that the advantages of a, say, 2½ minute job are readily apparent over the out and out thermal catcher with a 2 min. or less 'still air' potential. On the other hand it is not worthwhile, particularly in this country, to go all out for high potential 'still air' performance, a compromise, erring towards a model of reasonably high 'still air' time, appears to me to be the best solution. The term 'still air' is employed for the want of a better one. The author doesn't believe such a thing exists but it is a useful term for comparative purposes to infer the time a model could be expected to put up in neutral conditions. If ever an unlimited supply of true still air could be found, I am sure several 'still air' glider times claimed would be revised and not upwards!

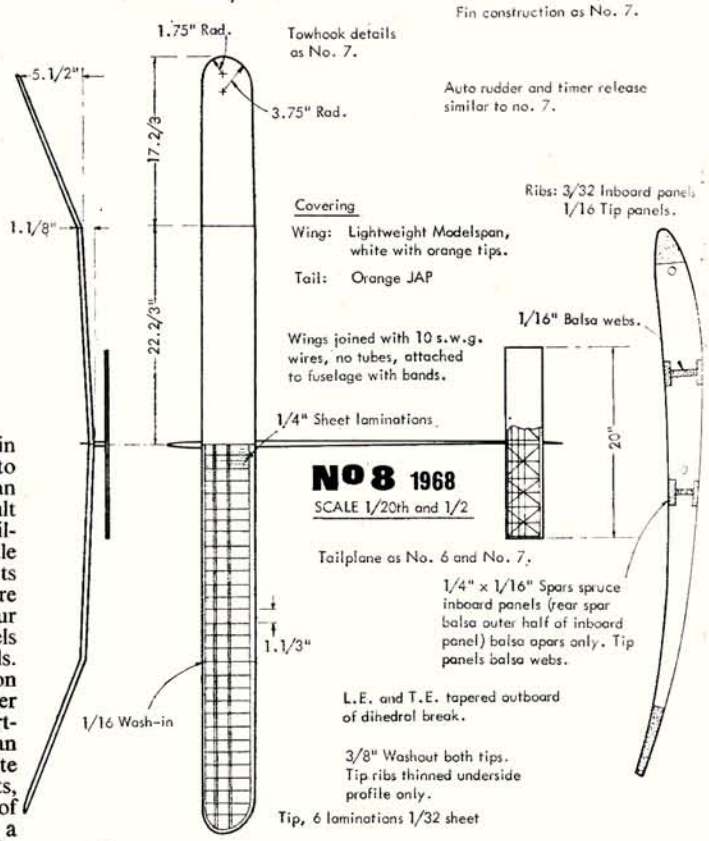
There is little point in building models other than A/2's (and possibly A/1's) for use in Open Contests.



SIMPLIFIED POD No. 8



Fin construction as No. 7.



Whilst larger models have a theoretical advantage in performance and obviously in visibility they have yet to prove consistently superior contest machines. They can be expensive, time consuming in construction, difficult to handle in winds and troublesome to transport. Similarly, lightweight or small machines appear to have little to offer. Flying A/2's in both Open and F.A.I. events obviously means less building effort, and allows more concentrated development. It also means that your contest flying is spread over a fewer number of models enabling one to become more familiar with those models.

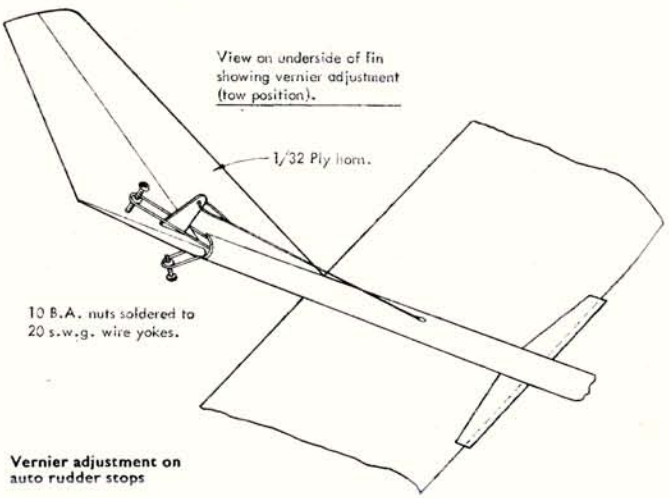
Another important aspect of contest flying is attention to systems and equipment. One learns, through bitter experience, at Trials and other windy events, the importance of the towline and winch. Broken towlines can readily wreck your chances and a towline of adequate strength, regularly inspected for fraying, loose knots, etc. is essential. Some people use hawser-like towlines of about 50 lb. breaking strain but the added drag is a disadvantage when searching for lift on the line. Similarly, stretchy nylon lines seem to kill all feel for thermals. However, other members of my club, Bristol and West, swear by them so it is probably a matter of what you are used to. The important thing is the integrity of the line, a broken line can result in a flyaway with most timer release systems and/or the loss of a flight. In such circumstances a folded wing might well be preferable if the choice has to be between a broken line or broken wings.

Whilst on the subject of towlines, why do so many glider flyers insist on using scraps of tissue, oily rags, handkerchiefs, etc. for pennants? Besides being illegal if under size, they don't help the performance in any way and certainly in most cases don't help the timekeeper!

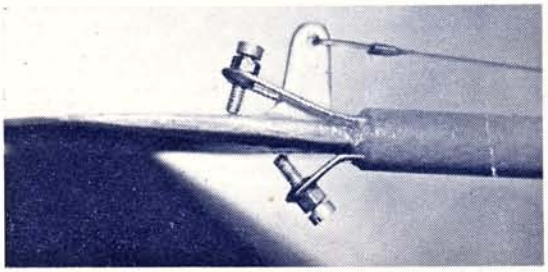
A foolproof auto-rudder system is very desirable – many a contest has been lost when the flyer has been unable to release the towhook with the model straining at the end of the line in a real boomer! Conversely, it doesn't help to have the hook slip off or be pushed off by the A/R system unexpectedly while towing.

One should aim for a model on which one can set up Auto-rudder and D/T systems easily and quickly, place in the hands of the launcher, and forget. Many systems are such that the launcher can inadvertently set them in action with usually disastrous results if not noticed. Many systems have been tried and that shown is the most satisfactory to date. Here the thick nylon release line is preferable to a pin as, being flexible, it will not jam. It can also be looped in such a way as to lightly restrain the towhook in position. (Beware here, not to coil it the wrong way or it will push the hook off if line tension is relaxed).

NEXT MONTH, *Flying Technique*

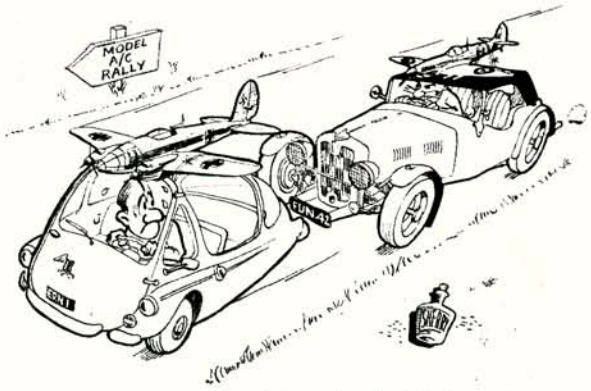


Vernier adjustment on auto rudder stops



TOPICAL TWISTS

by "Pylonius", illustrated by "Sherry"



Outer Space

Seems all the countries in Europe are clamouring to escape the honour of holding the F/F Championships on their native soils – and some even have airfields to back up their claims. But, to me, this airfield business is the worrying point, considering that the F/F Champs has now become a sort of cross-country Olympics. Thirty roughshod sorties per contest calls for a tough physique. It is little use any boffin emerging from workshop hide-out to triumphantly brandish his auto-incidence, variable prop Wakefield, if the retrieving terrain is hostile to his enfeebled legs. Could those cramped muscles and knotted sinews survive the thirtieth crossing of the peat bog, returning via the barbed-wire fence and that funny-looking grey wall? (Who do they think they're shooting at, anyway?)

What handicaps the free-flight modellers is the fact that these personal survival courses are entirely un-official and unrecognised. In order to preserve his way of life he must accept the general illusion that he flies his models strictly within the limits of the airfield. It would be absolutely disastrous to the whole future of F/F flying if the ugly truth were to be generally accepted; that the airfield site is just a launching point and homing centre. In fact, any model landing within the airfield limits is either badly out of trim or an antique.

Naturally, the F/F contest organisers sustain the illusion, too; working on the bland assumption that the perimeter fence marks the boundary of the known world. They feign surprise when told that the contestants are tearing up the local countryside, raise horrified hands to the posses of armed farmhands, and promise the authorities not to let it happen again. They then move on to airfields and pastures new, to repeat the whole blinkered procedure.

Now, when this sort of lunacy is indulged at a local rally we just get mildly embarrassed, but when we see it happen on an international scale it becomes positively frightening.

Thick-Skinned

Keeping the aeromodelling movement on a sensible, shoulders back, left foot forward, 'Realist' course was, at one time, the self-appointed duty of pukka minded aero-modelling colonels, of which there was never a shortage in the hobby. However, in recent years, in the tradition of old soldiers, they seem to have faded away, with the result that the functionalists have had the field to themselves. Models, as a whole, have become decidedly hairy. Long, untidy fuselages, scraggy-looking wings and under-cartless underpants are commonplace excrescences of the modern scene. Seldom do we see a respectable cabin, a gloss of silver dope or a decently cowled engine; a state of sloppinness that can only be attributed to a sad lack of that corrective discipline which the militant colonels were wont to apply.

Now, those who believe that a model plane is a model plane and not a flying toy can take comfort from the intervention of a retired Naval Commander. His 'dressed overall' admonitions are even sterner than the short back and sides reproofs of the colonels. He has taken to task, in no uncertain manner, those deviant Scale modellers who blantantly present to a discerning public such gross infamies as glaringly unoccupied cockpits, and uncalibrated instrument panels.

But, asks the wary Realist, is he going too far? From the point of view of minaturised reproduction the model plane is not on the same sure footing as the model loco (true to the last rivet head), or the model boat (bilge perfect). Truth and beauty in the most luscious Scale model is but tissue skin deep. Peel back the covering and the innards revealed are about as authentic as a match-stick muck-up of Westminster Abbey is to the actual thing. Where should be a 1000 rivet heads is a chunky bit of ¼ in. square. It's not so much a mock-up so much as a hide up. So, go easy, Commander – don't give the game away.

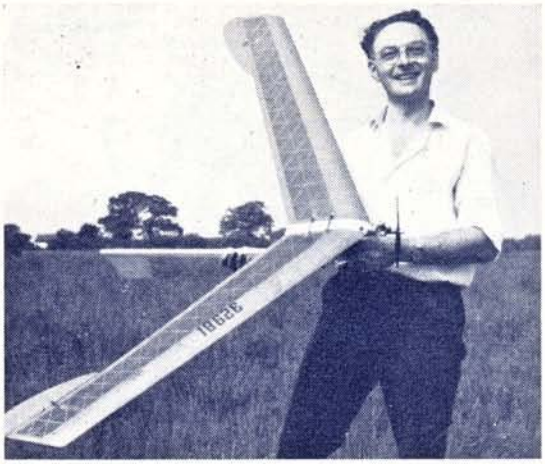
Hare—Last Performance

A club has been asked to give up its flying field because the model flying disturbs the hares. Now, the disturbing of hares would not be such a disastrous thing in itself, but, apparently, it prevents the local shooting club from getting their hare line sights into purposeful focus. And since the general attitude to model flying is usually of the shoot first and ask questions afterwards priority, the size twelve boot made way for the 12-bore shotgun.

When you take into account all the depressing reports that come in of dispossessed model flyers, and the high speed rate at which the big boot operates in these days of instant Radio, it's a wonder that people still dare to intervene a model betwixt cloud and pasture. Yet when I look at some of the gaga flying that goes on I am amazed at the incredible tolerance of public and local authorities. On sneaking over to the local common I all too often find the no-insurance, no-silencer – and almost no-control – boys in full possession. Needless to say, you never see the same faces and the same models twice; the turnover rate of Radio flyers is simply fantastic, almost as high as the turnover rate of the models.

High-speed flying is matched by high speed building. Many of the models appear to be built on the action painting principal. Not that any of them are painted, mark you; they are mostly exhibited in the raw balsa state, with the feverish strokes of the balsa knife adding a rugged, manful texture. Radio installations are almost 'Flintstone' in technique, with escapements etc., wedged in with assorted lumps of balsa, and the whole doused in a gooey layer of diesel fuel. Yet they . . well, I'm not sure if the car was in the way of the model or the model in the way of the car, but if the car is out of action the model isn't. Rugged! Why, over Chobham they even put the tanks under cover.

As far as I'm concerned it's not the local authorities that turf me off the flying spaces, but the rampant radio models.



Always nonconformist, Jim McCann's elegant red and white tailless power design has high thrust line Cox T.D. 049, two piece wing and diagonal rib bracing.

Free Flight Comment

by John O'Donnell

'Warps'

'Prevention is better than cure' is old advice – but it still sums up quite accurately last month's remarks regarding warps.

Nevertheless, cures are srill necessary in this imperfect world. No free-flighter needs to be reminded that this applies to warps. Quite a variety of recommended methods of straightening out twisted surfaces have appeared in print over the years.

In principle all these methods amount to (**1**) forcibly twisting the warped component back at least to the straight and level (and usually past this to the opposite warp) whilst relaxing the covering; (**2**) then allowing the covering to return more or less to normal whilst keeping the component restrained and (**3**) finally removing the restraint and observing the result.

The net result should be that the component will take up a new position part way between the earlier warped and the forcibly held states. With practice and a little luck this should produce an 'unwarped' component again.

As warps often show up during the doping of a new model, then removal is sometimes possible by pinning down the component (with opposite packing) on a board whilst subsequent coats of dope are drying. A logical extension of this technique is to redope an exisiting component that has warped and again pin it down to dry. On lightweight structures the additional tightening of the covering (through the extra dope) can cause as much trouble as it solves, and the extra weight may be undesirable in any case. A 'coat' of thinners adds no weight – but may do no good if it evaporates before softening the 'old' dope.

Most attempts however, rely on twisting the component by hand whilst slackening the (tissue) covering by either dry or wet heat. The best method I have found is to use the steam from boiling water in a kettle or saucepan. The offending component is held in the steam, twisted opposite to the warp for a moment, removed from the steam whilst still being held with the opposite twist, and allowed to 'cool' before release. This is repeated if necessary until a little (relative to the original warp) opposite twist is retained on release. This will usually disappear over the next few hours, so a subsequent inspection (and maybe retreatment) are routine.

Other people have recommended the use of an electric (or gas) fire instead of steam, but I personally have had little success with this method. This could possibly be connected with the *brand* of dope employed as some softening of the dope with heat presumably is required.

One important point seldom stressed is the *time* for dewarping. If a wing or tail warps after doping it should be straightened out without delay and certainly before the dope has really hardened. As a guide I would check a component an hour or two after doping, and, if warped, steam it straight immediately. This is *significantly* more successful than trying the same cure a week later.

Neither steam nor electric fires are normally available on the flying field which is the usual place for most unwanted warps to be discovered. Fortunately in this affluent society there is a readily available substitute in the form of exhaust gases from the modeller's car! Treatment is as already described for steaming, but try to use a hot engine and a touch of accelerator! Whilst fine for emergencies, this form of warp-removal is not really permanent. Neither need be the black spots inevitably deposited all over the component!

For the common case of a model that 'changes trim' during our occasional sunny and hot days, there is an even simpler 'cure'. This is to put the model back in its 'coffin', under a car, or otherwise out of the sun and into shade, so it cools down and leave it there for half an hour or so. I try to make a point of keeping my models (especially the power models) under cover as much as possible on such occasions and find that it certainly is well worthwhile. The one thing that I don't advise is to try to alter trim to keep up with the rate of warping!

But situations can arise when none of these methods is effective. The commonest instance is that of a model being lost, and lying out in the open for some time before being found. Alternations of rain and sun can play havoc with a model, especially if it is upside-down resting on its wingtips. I have seen models returned with wings twisted like propellers or with 45° washout.

Generally such models end on the scrapheap very quickly as their owners seem to think (or in some cases, find) that dewarping is hopeless. With the already described normal methods this is probably true. But one technique, born of desperation some years ago, is remarkably effective.

This is to place the afflicted component in the kitchen sink, or bath if space requires it, and then to tip a couple of kettlefuls of *boiling* water on top. After leaving to soak for 10 minutes or so, the component is removed and pinned down, still dripping wet, on to a substantial flat board with a little opposite packing, and left as long as possible. A *week* is recommended and a fortnight is better.

Of course, this method is drastic, but it works even on wings with 'locked-in' warps through being built with P.V.A. and having it soften through damp, and then rehardening in the twisted state. I have even removed *undercamber* from a multi-spar tail (on which the ribs cracked) with boiling water. Russell Peers, whose 20 plus flyaways in the 1968 reason must be unequalled, has used this method with considerable success in salvaging several rubber model wings and tails. He has almost insisted that I describe the 'boiling water method' for general consumption!

'69 Programme

Whilst the S.M.A.E.'s 1969 Provisional Contest Programme appeared in last month's *Aeromodeller*, it was too late for comment. Nonetheless, it has several features that should be highlighted.

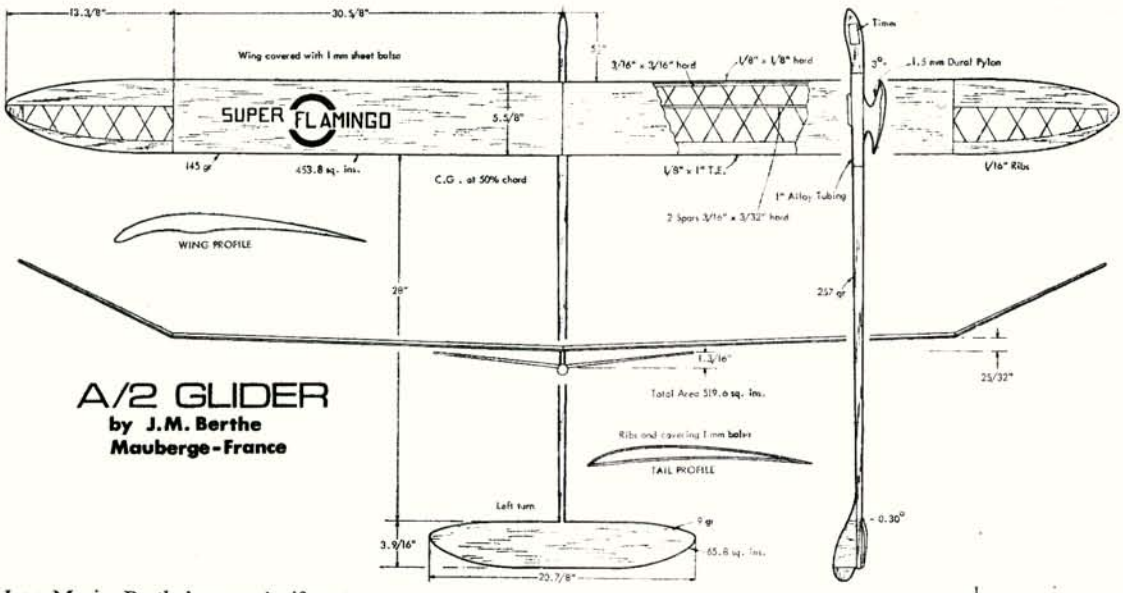
Basically the programme is the usual arrangement of six area-centralised f/f meetings and a number of centralised events. In this it agrees well with established practice and a Council decision to retain a stabilised programme.

However, the choice of certain *dates* has caused considerable consternation in my home N.W. Area. The scheduling of the R/C and C/L Trials (for the criterium) for Easter Sunday, and the newly-introduced F.A.I. centralised contest for the August Bank Holiday weekend are *both* direct clashes with the long-established Tern Hill and Woodford Rallies. Naturally, strong representation is being made by the North West to have the S.M.A.E. programme altered, but such 'collisions' should never have been overlooked. There is little doubt as to which events will satisfy most modellers and generate the most public and other interest!

The Nationals still have a rather strange arrangement of the f/f events. Now the three F.A.I. events are proposed to be held on the Sunday with the three open (plus ½A power) on the Monday. I can see no logic in grouping together on one day the events demanding the most flights, timekeeping and processing – especially when they *all* count for the season's Senior f/f Championship. This last factor is hardly calculated to increase the interest in their title. A windy Nationals will reduce the championship to a mere endurance trial. Exactly the same criticism applies to the Junior Championship as the three open events are on the same day.

Crawley Club's *Turbulator* newsletter in its final issue (closing down through lack of contributors), points out that no regard seems to have been paid to the advantages of late evening fly-offs, especially for open rubber.

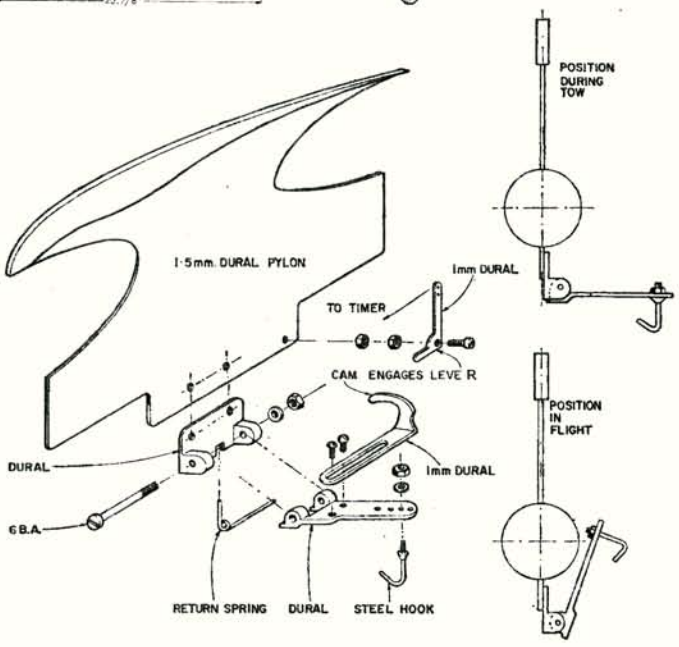
All in all, a much more satisfactory division of the events would be to have open Rubber, F.A.I. Glider and Power and ½A Power on



A/2 GLIDER

by J.M. Berthe
Mauberge-France

Jean-Marie Berthe's moral, if not actual victory in the glider event at the 1968 Alpine Cup, held at Wiener-Neustadt, Austria, brought attention once more to the unusual 'Flamingo' airfoil section. This has been employed with mixed degrees of success for many years, and appears to have originated in Austria, though most of the present day exponents are from France. It is only part of the novelty in Berthe's A/2 glider. The sketch shows other details of the metal wing pylon and its towhook fittings. Berthe uses the offset hook as used by his fellow countryman Bourgois to 'wheel and deal' on the towline while feeling for a thermal. The operator remains almost stationary while the glider describes a series of tight circles. Actual offset in Berthe's case is 1½ inches to the port side of the fuselage centreline. His hook folds upwards when the towline is released and this actuates the dethermaliser timer as a cam engages a lever which in turn switches the timer 'on'. Though a rudder is shown, there is no indication that it is neutralised for the tow.



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the Sunday, with the balance of events on the Monday. There should be no difficulty in instigating this change at this stage. After all, the programme is described as 'provisional'.

Mention of the Senior and Junior Championships would be incomplete without further comment on the new idea of restricting them to F.A.I. and Open categories *respectively*. Whilst the Juniors could perhaps gain by only having to consider simpler and cheaper models, the Senior's F.A.I. restrictions has undertones I personally do not like. It would seem another manifestation of the attitude that this country should go all-F.A.I. If this should ever happen it might well improve on International placings, but at the price of dissatisfying the relatively large number of flyers who continue to support our present open events. I consider that this price is too high!

Separation of the Area Championships from the Nationals having been urged for two years, has now been agreed. But what is the point of promptly recombining it with another contest – this time the Northern Area's annual F.A.I. Meeting? When events are combined one or other inevitably loses its identity, and hence interest. The only hope of proving the real worth of the Area Championships is to revert to a special meeting. If this isn't adequately supported then perhaps the contest can be dropped.

The really new idea in connection with the '69 season is in the Society's decision to institute a Contest licence priced at two guineas (half price for juniors) and which will permit entry in all S.M.A.E. contests. It will certainly save *regular* competitors a fair amount of money. The break-even part comes after eight contests – so can I suggest a review of previous season's activities?

Aero Modeller

'Pop' Warburton maintains the family tradition with another fine semi-scale stunt controliner and introduces new ideas in this 51 in. lightweight for the popular .35 size engines

ZLIN 226

By F. Warburton Sr., A.S.L.A.E.T.

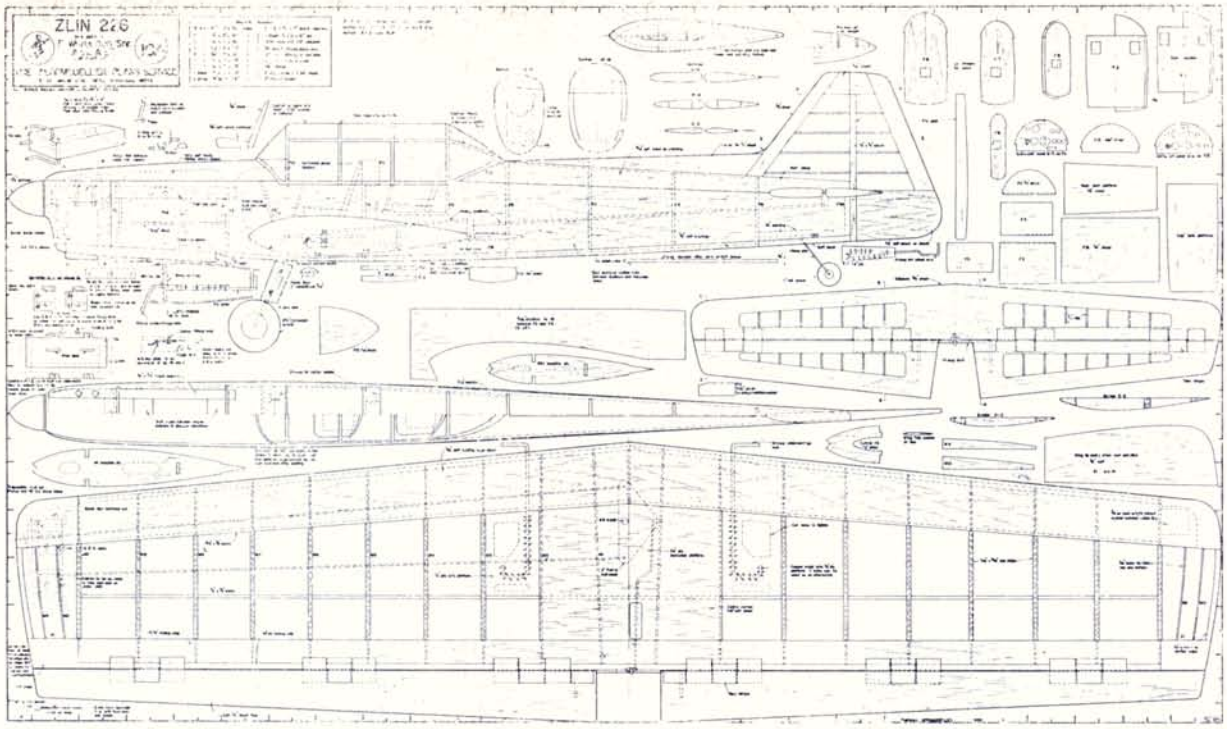
THE IDEA of building a ZLIN as a semi-scale stunt model must have occurred to innumerable modellers. I first looked into a year or two ago (thanks to the Editor, for the suggestion and appropriate information). It is an excellent subject which really flies *and* looks equal to the very best. The ZLIN family makes regular winning appearances in the World Aerobatic Championships for full size aircraft and this makes it an attractive model to build. It also gives one a chance to put some further theories of model stunt building into practice. One was to try and prove that this type of aircraft with a large two-seater 'glass-house' cockpit canopy can be made to execute the stunt schedule just as well if not better, than a sleek fighter or jet appearance layout. It does just that, and moreover it is very good in all weathers, from wet and windy to dry and still air.

One of the latest items included is the fully adjustable lead-out positions in the wing tip. The function of these is to enable one to find the ideal lead-out position. All models seem to vary in flying performance and line tension no matter how careful two same type models are built. Adjustable lead-outs allow a wider scope of finding similar flying characteristics. They also give a variation of line tension for very windy to calm conditions. However this adjustable lead-out trick does not eliminate the vital necessity of a correct bell-crank position. Top stunt men have said that the bell-crank position is not as critical as the lead-out location. Both are of equal importance and any builder is recommended to ensure that the bell-crank is positioned carefully to plan, when building this ZLIN.

Another factor in this effort to get the best from this model was to go back to the smaller wing span and low total weight to give better wing loading. The .35 size of motor is chosen because it is the most popular, the price generally lower and there is a good choice of silencers and fittings. This motor size in turn called for a wing span of 50 in. – 52 in. (50¾ in. chosen). Careful selection of wood and a few lightening tips have in this instance kept the weight down to 38 oz. This layout is also cheaper than the .45 size in initial cost of motor, materials used in building and fuel used when practising yet it will give just as good a stunt pattern!

At this stage, it must be emphasised that the 'building in' of exact trim is most important. This applies to any stunt model. First the thrust line, wing line (wing incidence) and tailplane (tail incidence) although at different levels in the fuselage must all be neutral (zero incidence), *i.e.* all horizontal with each other. The gluing of the wing to fuselage sides is perhaps the most difficult to line-up at zero. Perseverance here in setting-up correctly with the engine bearer line is one of the 'musts' for an accurate flying model. Next trim check is with the model held up and looking from the front the wing leading edge must have the tail leading edge line from tip to tip exactly parallel. If it isn't parallel on the finished model, one or two faults will reveal themselves in flight. 'Losing' the model by coming in and flying across the circle in the vertical eights, or, 'losing' it at least to the point of a very bad pattern on the top of the second square of the horizontal eights. You will also notice that the tape hinges on the flaps are approximately 3 in. from the wing tip edge. This is done so that it is possible to use the last 3 in. of flap as fixed trim tabs by cutting through the flap at this position and cementing the 3 in. pieces to the trailing edge of the wing. This can be set with either a few degrees up or down as required to let the model fly on a parallel line with the control wires. In other words, the model should fly with the wings level to the ground only if in straight and level flight at a height of four feet. As the model is allowed to climb to a line angle of 45 degrees, so must the wings be at the same line angle. If this fixed tab system is used, do both flaps, port and starboard, and not just one side only. This would give uneven flap control surfaces.

The ZLIN employs straightforward and easy construction methods and should offer no difficulties. The wing is commenced by cutting the ribs from soft 1/16 in. balsa by the sandwich method. For this purpose ⅛ in. or 1/16 in. ply templates of W.1 and W.10 are cut. Ten rib blanks are then sandwiched between the two templates, cut and sanded to shape. Remember that on the starboard panel W.10 will not be required. The mainspar slots are cut with a razor saw. For the rear spar a small guide hole can be drilled through, then the ½ in. by ⅛ in. hole marked out and cut into each individual rib on removal from templates. The lead-out wire clearance holes (port side) and the same type of holes (used to keep the weight down) on the starboard side are also cut after removal from template. Select a medium straight grained sheet of



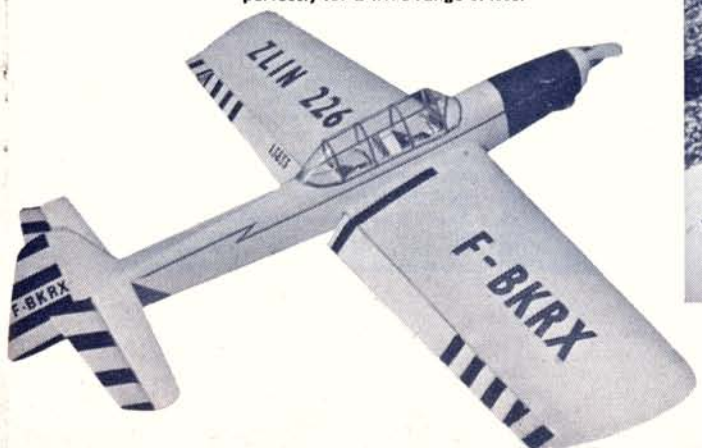
Full size copies of this 1/8th reproduction are available through A.P.S. as Plan CL955, price 10s. inc. post.

⅛ in. balsa and cut spars for the port wing. Mark rib positions on the spars, slide ribs in place and spot cement. Add leading edge and repeat the process for the starboard wing but throw away W.10 after sanding. Cement wing halves together with braces and sighting along trailing edge, check for alignment. Space trailing edge pieces and cement in place. Finally, add trailing edge cap (med. hard ¼ in. square). Glue and pack bell-crank platform and control assembly (complete with lead-outs and push-rods) in place. Attach shaped ¼ in. flaps with non-stretch muslin or strong linen hinges and connect the pushrod. Double all spar/wing joints. Bend undercarriage wire from 10 s.w.g. wire and sew with copper wire (and fix with 'J' bolts) to ⅛ in. ply platforms then cement and pack to spars. Glue leading edge sheet in place and cement 1/16 in. x 3/16 in. cap strips to all ribs. Carve tip outline for ⅛ in. soft balsa and cement to centre line of rib W.10 (W.9 on starboard side). Blocks at L/E and T/E of tips are from soft balsa and hollowed out, pack ¾ oz. lead on starboard side. Glue adjustable lead out unit to underside of post tip with linen patches. If not having adjustable lead-outs glue pieces of brass tube into position as drawn on the plans, once again with linen. Cement riblets in place. Solder push rod elevator connection to the flap horn.

Start the fuselage by drilling the bearers for motor position with 1-2 degrees offset to out-of-circle for line tension. Pre-cement them to F.1 and F.2. When set, the bearers can be drilled between F.1 and F.2. With approximately a 5/32 in. drill spaced at ⅛ in. This will help to keep the weight of the assembly down. If any lightening holes are cut out of F.1 and F.2 formers glue a piece of 1/16 in. balsa to the face of F.2 to keep fuel out of the fuselage and interior cockpit areas. Glue tank soundly in position, held in place by scrap balsa. Cut sides from ⅛ in. x 4 in. sheet, mark the inside faces, leaving an ⅛ in. space for F.2 and add 3/32 in. balsa doublers. then before the cement dries, glue to engine bearer assembly and hold with elastic bands till dry. Pack around bearers with scrap balsa to cut down vibration. Cement former F.4 and then join fuselage to wing and check for zero incidence. Bring the fuselage sides together with F.9A and hold with elastic bands. Carve tail-plane from ⅛ in. sheet and add 1/16 in. ribs. Connect push-rod to tailplane and slide up and down fuselage till neutral flap/elevator position is reached, then cement in place,

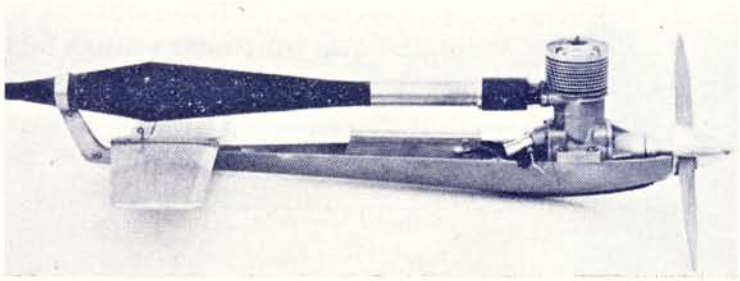
continued on page 75

Three views of Pop Warburton's semi-Zlin reveal its compact size, and the bright white, blue, red and black colour scheme taken from a French registered example. Large cabin reminds one of Walter Bagalini's impressive 'I-BAGA', seen at '66 World Champs, was in '67 Annual, and currently Italian Champion. The Zlin should become extremely popular, it fills the bill perfectly for a wide range of .35s.



LATEST ENGINE NEWS

by Peter Chinn



Engine, pipe and pan assembly of Piero Muzio's 10 c.c. class speed model. Holder of the Italian 10 c.c. record, model is powered by the highly promising new O.P.S. 60 motor made at Monza.

O.P.S. 60 Racing Engine

AN EXAMPLE of this highly interesting new Italian motor has just been loaned to us for examination and will be fully described and illustrated in this column next month. So far seen only in a few continental C/L speed and power-boat events, the O.P.S., nevertheless, finished the 1968 season by topping the overall results in the 10 cc. control-line speed class in Italy and set a new Italian 10 cc. record into the bargain.

The O.P.S. has been specially designed for use with a tuned length double-cone pipe which the manufacturer also supplies. Thus equipped, it has not only handsomely beaten the usual Rossi powered opposition, but seems to have outpaced the new 'ABC' Super-Tigre G.60R (see last month's L.E.N.) as well. It will be interesting to see whether the latter can regain the initiative this year when it appears in its promised pipe-equipped version.

The O.P.S. is now in small scale production and we understand that, so far as U.K. distribution is concerned, The Model Shop (Manchester), 13, Bootle Street, Manchester 2, will be able to offer limited supplies in the near future.

M.V.V.S. 2.5RL With Tuned Pipe

Another engine now being made in a tuned pipe version is the Czechoslovakian M.V.V.S. 2.5RL. Akira Fujimuro,well-known Japanese modelling writer and former speed flyer and engine man, has acquired one of these motors and sent us the two photos reproduced here. While essentially the same as the standard 2.5RL which was the first 'production' C/L speed engine to employ a rear exhaust layout, the tuned pipe version has, as one might expect, amended port timing to make better use of the pipe's characteristics. It also has a new cylinder-head and a circular section (instead of oblong) exhaust duct for easy connection to the pipe. The pipe is 11.2 in. long and has a black baked-enamel finish. It has an 11 mm. o.d. inlet, an 8 mm. o.d. outlet and a maximum diameter of 28 mm. Dimensions, in fact, are quite near to those of the Lindsey-E.D. No. 1 Power-Pipe.

O.S. Wankel Engines

Readers of *Radio Control Models & Electronics* will have already seen our comments on these new developments by the O.S. company that have been going on since the autumn of 1967 and which were made public for the first time following a series of demonstrations of O.S. rotary-piston engined proportional R/C models last October in Japan.

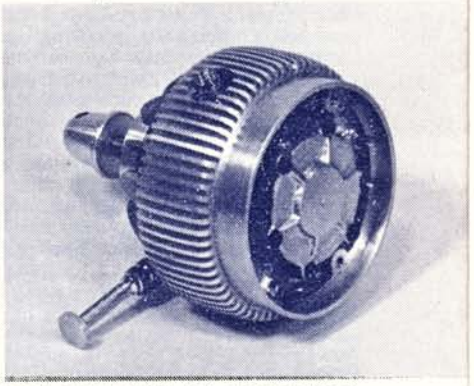
The O.S. rotary engines are based on an N.S.U.-Wankel type rotary-piston unit designed by Herr Schaegg for the well-known Johannes Graupner model firm in Germany. Fred Militky of Graupner, it may be recalled, demonstrated a prototype Schaegg engine in a Graupner Taxi R/C model during 1967. The O.S. company were then invited in July 1967 to take over the subsequent development of the design, with a view to eventual production. Many experimental models followed, with extensive testing both on the bench and in the air and the stage has now been reached where the first production run of 5 cc. engines is now imminent.

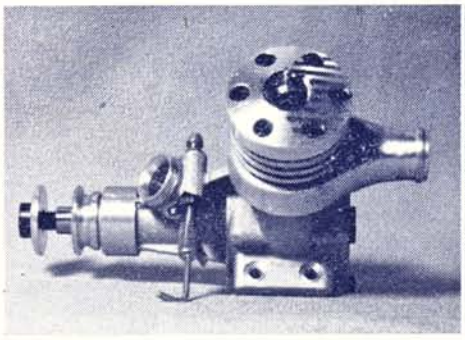
The engine is very compact, only 70.5 mm. diameter and 60.5 mm. long from prop driver face at the front to the 3-point radial mounting flange at the rear. It runs on an orthodox methanol and castor-oil fuel mixture, ignited by a standard O.S. glowplug. A barrel-throttle carburettor is fitted and there is provision for attaching a silencer.

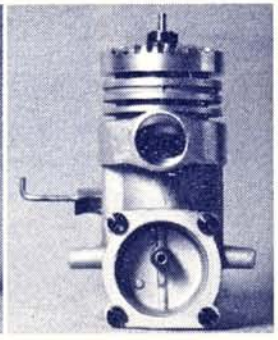
Internally, the engine is, of course, a good deal more complex than the usual reciprocating piston model two-stroke and obviously calls for much greater precision in manufacture. Even more complex is a 10 cc. rotary engine which O.S. have designed and built to investigate the potentialities of such a unit for R/C use under the present maximum displacement limit. This engine, much smaller in frontal area than the typical 10 cc. reciprocating engine, is, in fact, a twin rotor unit and, as such, is believed to be the world's first model engine of this type.

Full technical details of these highly interesting new power units will be published in this column as soon as available.

A more recent O.S. pre-production 5 c.c. rotary engine installed in one of the O.S. company's test models. The model is equipped with O.S. Digitron DP-4 proportional radio. A twin-rotor 10 c.c. version of this engine has also proved very successful. Below, the second O.S. prototype 5 c.c. rotary-engine seen from the back and end showing the cover enclosing the rear counterweight.







Tuned pipe version of the 2.5 c.c. Czechoslovakian M.V.V.S. 2.5RL motor. Engine is similar to standard 2.5RL but with modifications to suit pipe characteristics.

Cylinder, head and piston assembly of Super-Tigre G.21/35 follows familiar ST racing engine practice. Note large inclined transfer ports, timed to open simultaneously with exhaust ports, and wide squish band on head.

Offset intake on the G.21/35 and its interchangeable venturi inserts. Small venturi has six peripheral jets fed by outer channel. Large venturi draws fuel direct from single jet hole in needle-valve body.

Super-Tigre G.29/35

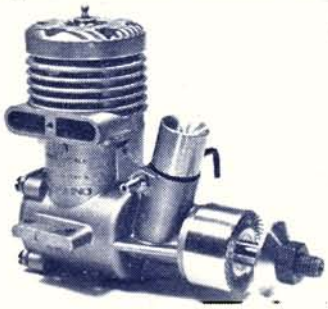
Currently on offer by World Engines, and, incidentally, quite reasonably priced at £8 4s. 6d., pre-November mini-budget (and any more taxes, surcharges, squeezes, deposits or other measures that might be imposed before this gets into print), is a ball-bearing .35 based on the front-induction Super-Tigre G.21 crankcase.

This engine should not be confused with the plain bearing S.T.35 model, sometimes known as the 'C' series, which is made in stunt, combat and R/C versions. Actually, the precise uses for which the G.21/35 is intended are not stated by the manufacturer. It has the simultaneous port timing and flat crown piston generally found only on Super-Tigre racing type units but, as supplied, is fitted with a small bore 'stunt' type venturi insert. Included with each engine, however, is an alternative venturi of the large bore racing type, plus a pressure fitting to enable the engine to be used with a crankcase pressurized fuel system to supply fuel to the large venturi. Presumably the aim is to equip the purchaser with an engine applicable to a variety of different models intended for .35 cu. in. motors, but with the emphasis on those applications calling for high performance.

As already mentioned, this engine uses the G.21 front induction type main casting. This is common also to the front rotary-valve versions of the G.21/29, G.21/40 and G.21/46 and features an intake offset to the right to promote tangential gas flow through the rotary-valve. The small venturi has only a 4 mm. bore and features six peripheral jet holes. The high speed venturi, on the other hand, has a bore of 10 mm. and an effective area almost six times that of the small venturi. The rotary-valve is open for over 200 degrees of crank angle, closing very late at some 58 deg. ABDC. The transfer and exhaust periods are each approximately 135 degrees.

Mixture is conveyed to the crankcase through a large bore (9 mm.) shaft passage and thence via a wide transfer passage through large parallelogram transfer ports into the cylinder. The piston has internal annular stiffening ribs both above and below the gudgeon-pin bosses and is coupled to a machined dural conrod with a tubular 5 mm. gudgeon-pin. The rod is bronze bushed at its lower end and the gudgeon-pin is located by circlips in the piston. The cylinder-head is machined and incorporates a 3.7 mm. wide squish band surrounding a hemispherical combustion chamber. Two 0.2 mm. soft copper head gaskets are fitted.

The Super-Tigre G.21/35 has a bore of 20 mm. and a stroke of 18 mm., giving a swept volume of 5.655 cc. or 0.3458 cu. in. It weights 8.73 oz. as supplied with the small venturi, or 8.57 oz. with the large venturi. The manufacturer claims an output of 0.95 b.h.p. at 19,500 r.p.m. – fuel unspecified but presumably with the large venturi.



Two views of the Super-Tigre G.21/35 engine with its peripheral jet venturi as supplied. Engine is basically similar to to G.21/29 shaft-valve racing unit with 1 mm. increase in both bore and stroke.

ZLIN226 *continued from page 73*

reinforce the joint and cement small block on top of tail. Now add formers F.5, F.6, F.7, F.8, F.9 (cut slots to elevator wire hole in each former to get them in position, and then re-cement piece in position). F.12, F.13 and F.14, cement under wing.

Cover fuselage bottom with soft $\frac{1}{8}$ in. sheet and top decking with soft 3/32 in. Carve top block, hollow out and cement in position.

The fin and rudder can be built, either by cutting the centre post (Fin Spar) and all other parts and cementing them together laid in the plan, when set, cement assembly to the fuselage – or, by building on the 'plane itself, starting with the upright centre post then lower rudder block, followed with the rest of the outside shaped pieces and finish with 1/16 in. balsa ribs. Fit the dorsal fin. Sand and blend complete assembly.

Build up cowl from $\frac{1}{2}$ in. sheet leaving plenty of air space around engine. Cement and wood-screw tie-bar in place. Seal off tank compartment with 3/32 in.

Sandpaper the entire model and fill with plastic wood wherever necessary, follow with a coat of sanding sealer over entire airframe. Cover the fuselage and flaps with lightweight tissue, followed by three coats of dope – not too thick, sanding between each. Cover wings, tail and rudder with heavy weight tissue applied damp and give three coats of clear dope containing a little talcum powder, sanding between each. Colour schemes are virtually unlimited.

Locate the ideal C.G. by placing lead weight in tail or nose as required.

Make sure your tank is clean; use 10 in. x 6 in. either Nylon or wooden two-blade prop and 1.5 v. in preference to 2.0 v. glowplugs for easier starting and less chance of 'light-out' on a slow, rich run.

GOLDEN WINGS CLUB PAGES

GOLDEN WINGS AEROMODELLER MODEL CLUB

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

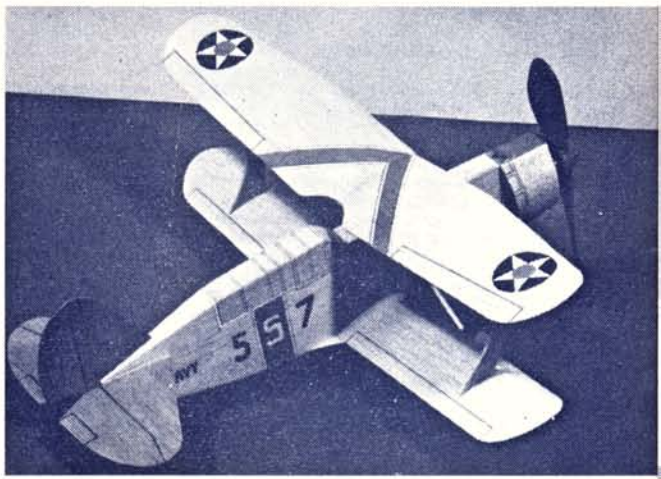
Plans this month for a simple all-sheet model of a famous biplane, designed by Ray Malmstrom

Curtiss SBC-3

THE REAL CURTISS SBC-3, in service with American carrier-based squadrons around 1936 was a compact colourful biplane and was described in September '68 issue by George Cox. This easy-to-build, all-sheet model follows in the gay, fast-flying aerial footsteps of its big brother. Spend a couple of evenings building this little job and brighten up the sky over your favourite flying field.

The colour scheme is shown on the plan. It is advisable to colour all parts before assembly. A word of warning. Avoid using enamels or coloured dopes. The new way of colouring sheet balsa, pioneered by the writer uses oil pastels (oil colours in stick form). Obtainable in boxes at any art shop. Apply the pastel to the balsa sheet and then spread evenly with a soft rag. That's all! Quick, colourful – and *no* added weight! Use Sellotape masking for sharp clear edges. Avoid applying oil pastels to parts that are to be cemented.

Construction is not difficult if you follow these notes, the plan and sketches. Care and accuracy will ensure your Curtiss SBC-3 looks – and flies as well. Use *medium* (NOT hard) grade balsa sheet. Cut two fuselage sides, add 1/16 in. sq. strips and nosepieces, drill 1/16 in. dia. hole, reinforce with 1/32 in. sheet for rear motor peg. Join sides with 1/16 in. sq. pieces. Cement in pieces Y for wing mounts and W for undercarriage assembly. Add top and bottom 1/32 in. sheet covering pieces, but not piece



Almost the last of the great biplanes of the United States Navy, the SBC-3 also 'joined' the Royal Air Force and was called the 'Cleveland'. It makes a most attractive subject, even for the simplified techniques used for this 13 in. wingspan all sheet balsa flyer.

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 2/6d. to cover cost of the enamel club badge, two coloured transfers and membership card.

NAME IN FULL .....

ADDRESS .....

.....

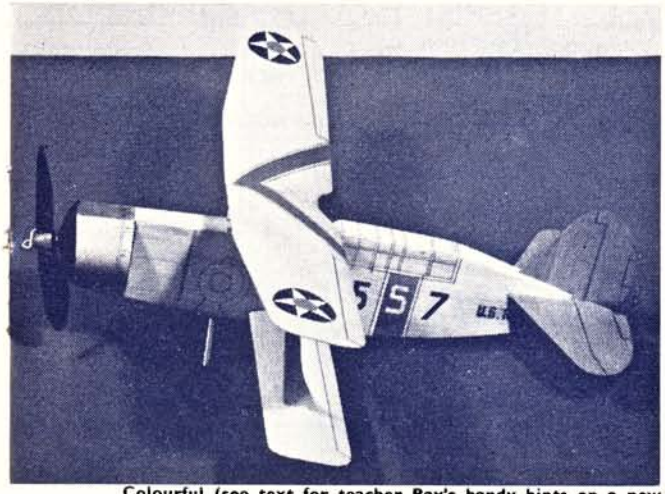
YEAR OF BIRTH ..... **SCHOOL** .....

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

How to Join . . .

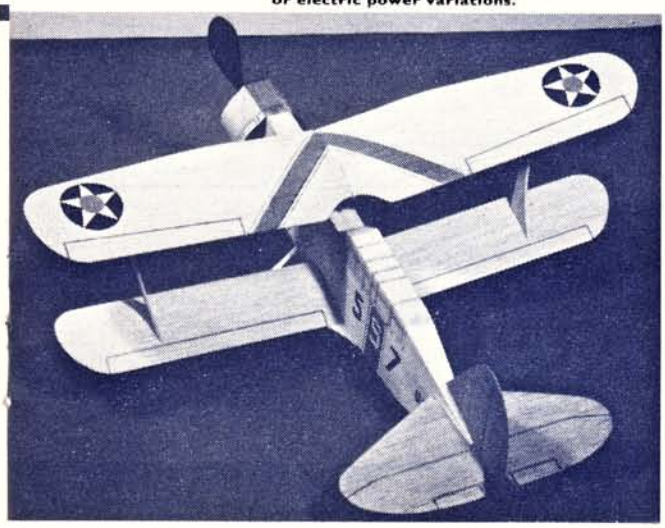
To join, fill in the handy membership coupon and send with a postal order/money order or cheque to the value of 2/6d. made payable to 'Aero Modeller'. Post to Golden Wings Club, Aero Modeller, 13-35 Bridge Street, Hemel Hempstead, Herts. Each member will receive his own badge – depicting 'Golden Wings', a membership card, and two transfers to decorate his model or model box, and will make him a member of the largest modelling club of all time. **John Bridge**



Colourful (see text for teacher Ray's handy hints on a new method of glamorising sheet balsa) and purposeful with its tapered top wing and rearward cabin for the crew, the prototype 'Helldiver' stands ready for a flip round the park.

A at this stage. (The long piece from nose to cabin, drawn separately at top of plan). Cut out tailplane, noting 1/16 in. sq. strips and cement in position, followed by fin. Check for correct alignment. Add 1/16 in. sheet tailwheel. Make noseblock from ¼ in. sheet. Note cut-out in the spigot which forms the rear part of the nose-block. This is a weight recess to help balance your Curtiss SBC-3. Drill the nose-block to take a 20 s.w.g. brass bush. Before inserting the bush, cement 1/32 in. plywood pieces at front and rear of nose-block. These ply pieces hold the bush firmly in position. Form a hook on one end of 2¼ in. length of 20 s.w.g. wire. Mount on to this shaft a KeilKraft plastic propeller (from your model shop) that has been cut as shown on plan to 4½ in. dia.; then two small cup washers, the nose-block, finally forming the rubber motor hook. Bend undercarriage wire to shape and cement to 1/16 piece V. Hold firm with two

Large tail surfaces and useful area in the two wings give the SBC-3 a light wing loading (unless you select heavy grade wood) and make 350 ft. flights an easy target, even for the rawest novice. We fancy that the structure and size will also attract the more expert modellers to make indoor round-the-pole Cox .010 or electric power variations.



layers of tissue doped on. Make the wheels from ¼ in. sheet and retain on axles with close fitting valve tubing or a blob of cement. Undercarriage is a push-fit between pieces **W**. Model may be flown with or without U/C. Add cowling pieces. Cut upper and lower wing panels (separate halves for each) from 1/32 in. sheet. Ribs are all 1/16 in. sheet. Mark the position of the ribs on the underside of all wing panels. Cement ribs in position holding the sheet to the ribs with modelling pins carefully inserted. Please note that all wing root ribs are angled for dihedral. Use the root-rib template **Z** as shown in the sketch. Check that panels are free from warps. Holding for a few moments in the steam from a kettle, removing and holding for another minute or so in the correct position will remove any warps that may have crept in during wing construction. Cement wing panels together and check for equal dihedral on both sides. Bend the front and rear top wing mounts from 22 s.w.g. wire. Form these accurately over the plan, otherwise when you come to mount the top wing on them you will be in difficulties. Cement piece **V** to the wing mounts and hold with layers of tissue as for the U/C. Cement the completed wing mount assemblies between pieces **Y** on top of fuselage (*see sketch*). Add front fuselage top piece **(A)**.

The top wing is held to the wing mounts with two layers of tissue paper doped on. The bottom wing is cemented into the cut-out on the bottom of the fuselage. Check at all stages for correct alignment of upper and lower wings. Add fillets to lower wing roots. Use thin notepaper for wing mounts struts and U/C legs. Cut two interplane struts from 1/16 in. sheet, sand edges round and cement between wings as shown. Check for accurate fit before finally cementing struts.

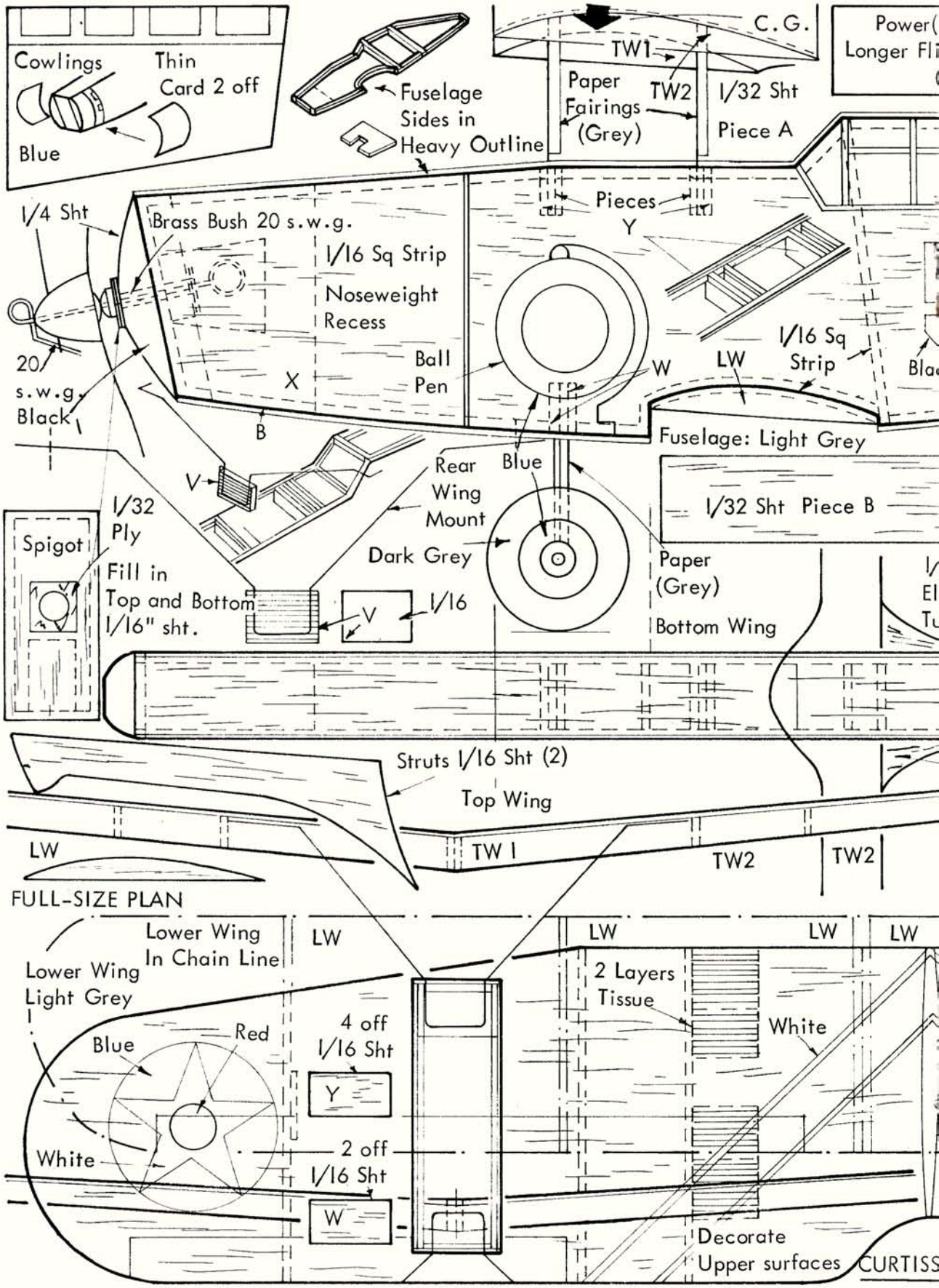
Make up a 9 in. loop of 3/16 in. flat strip, lubricate (Humbrol rubber lubricant, 1s. tube from your model stockist) and install in model. This is a test motor and with it in position you can balance your model correctly. Suspend the model from a length of thread and a pin pushed into the top wing centre rib at the position shown on the plan (*balance point*). The model MUST hang level. You will most likely need a small piece of lead or folded empty cement tube cemented into the noseweight recess on the rear of the nose-block. Correct balance is all-important for good flying, so *please don't skip it!*

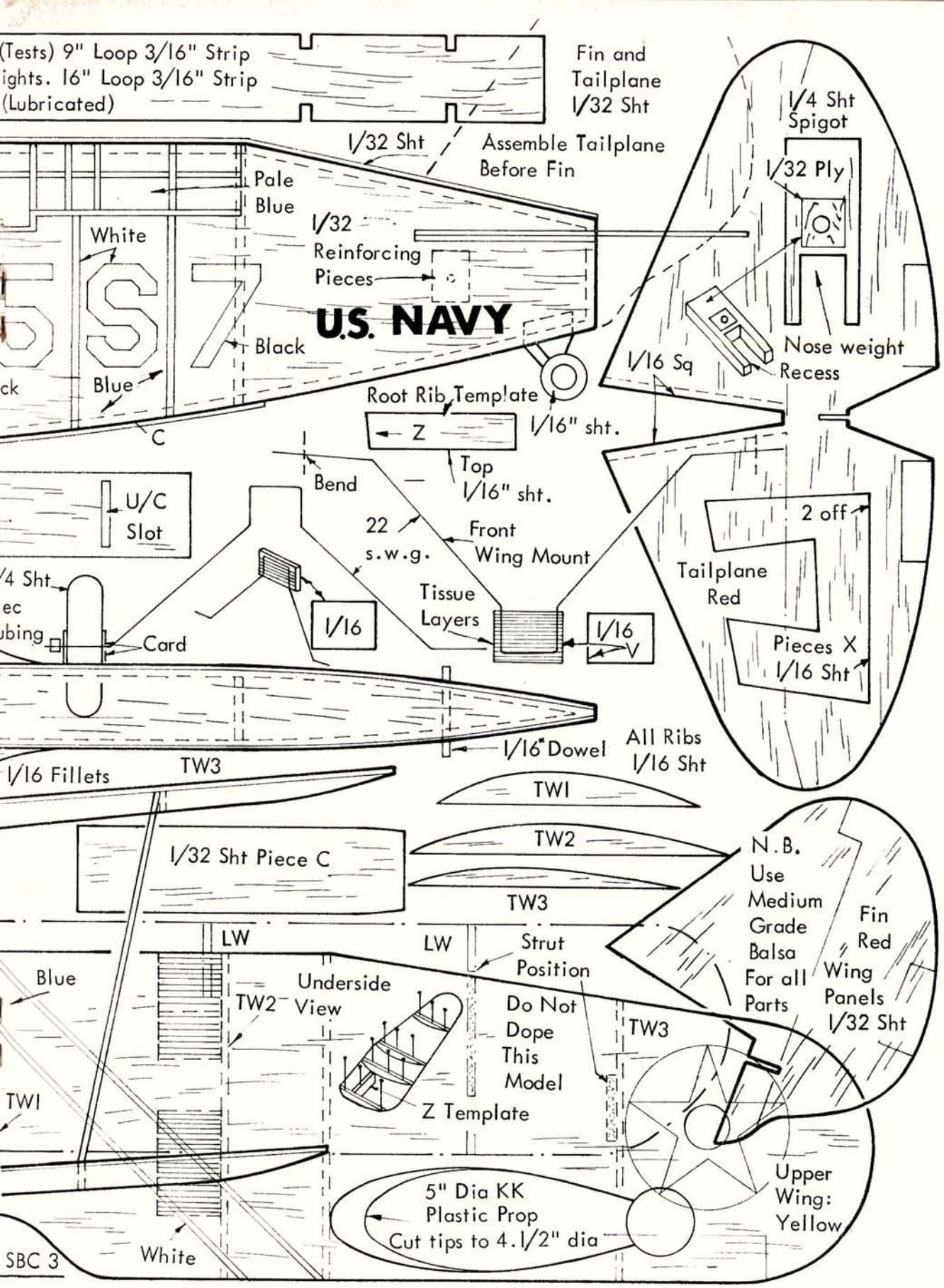
Flying

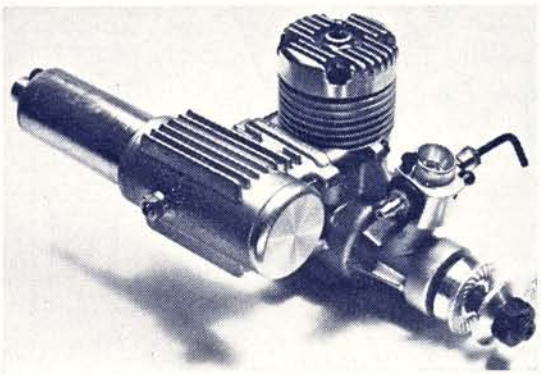
Test glide on a calm day over long grass. Get a good straight shallow glide (from a shoulder-high launch your Curtiss SBC-3 should land about 20 ft. in front of you). When glide is O.K. cement a small length of 1/16 in. sq. strip down the *left* hand side of the front of the fuselage (model viewed from rear). You can now try a power test-hop. The 9 in. test motor is good for 200 hand turns approx. This will give you a short flight to see if all is well. Your Curtiss should fly steadily away from your hand touching down a hundred yards or so ahead. Have with you the flight motor. This is a loop, 16 in. long, of well-lubricated 3/16 in. flat strip rubber. Install this if your test-hops are O.K. Remember to correct any turning tendency by *gently* warping the rear of the fin in the opposite direction to the turn. Climb is controlled by warping the rear of the tailplane, *up* for more climb, *down* for less. Wind the flight motor with a geared winder, stretching the rubber out as you put on turns. Increase the number of winder-turns with each successful flight. Maximum turns on the 16 in. loop is around 200-220 with a winder geared 3½:1.

All the best to you with this colourful, fast-flying little Curtiss SBC-3!

Full size plans

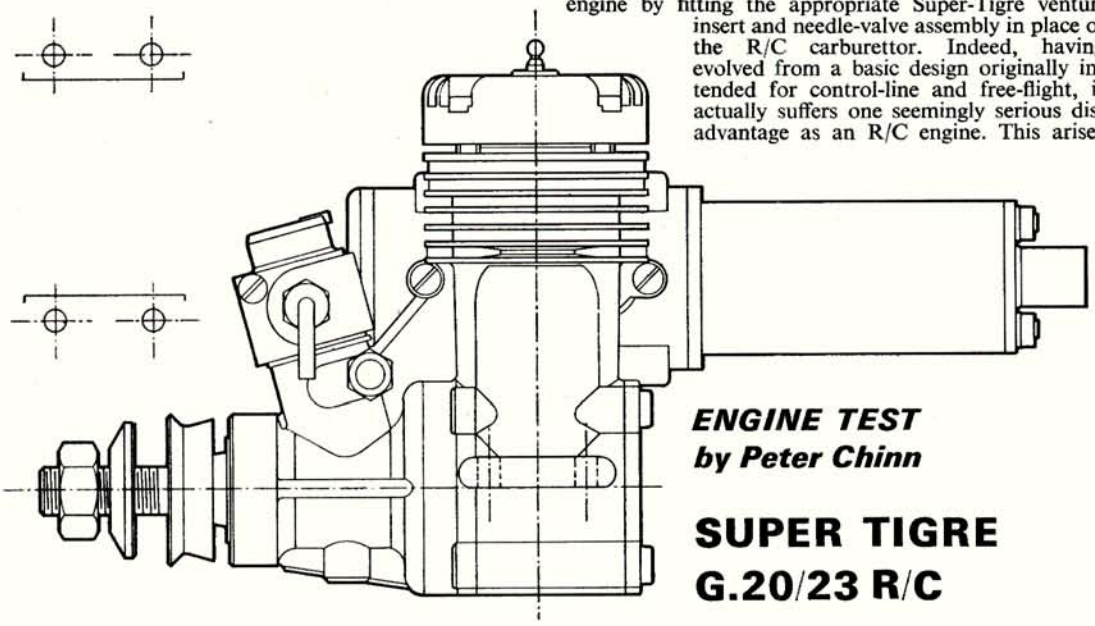

Cowlings
Thin Card 2 off
Blue
Fuselage Sides in Heavy Outline
C.G.
TW1
TW2
Paper Fairings (Grey)
1/32 Sht Piece A
Power(
Longer Fli
1/4 Sht
Brass Bush 20 s.w.g.
1/16 Sq Strip
Noseweight Recess
Pieces Y
20 s.w.g. Black
X
Ball Pen
W
LW
1/16 Sq Strip
B
Fuselage: Light Grey
V
Rear Wing Mount
Blue
1/32 Sht Piece B
Spigot
1/32 Ply
Fill in Top and Bottom 1/16" sht.
Dark Grey
1/16
Paper (Grey)
Bottom Wing
Struts 1/16 Sht (2)
Top Wing
LW
TW 1
TW2
TW2
FULL-SIZE PLAN
Lower Wing In Chain Line
LW
LW
LW
LW
Lower Wing Light Grey
2 Layers Tissue
Blue
Red
4 off 1/16 Sht
Y
White
White
2 off 1/16 Sht
W
Decorate Upper surfaces
CURTISS


(Tests) 9" Loop 3/16" Strip
ights. 16" Loop 3/16" Strip
(Lubricated)
Fin and
Tailplane
1/32 Sht
1/32 Sht
Assemble Tailplane
Before Fin
1/4 Sht
Spigot
1/32 Ply
Pale
Blue
White
1/32
Reinforcing
Pieces
U.S. NAVY
Black
Blue
C
Nose weight
Recess
1/16 Sq
Root Rib Template
Z
1/16" sht.
Top
1/16" sht.
Bend
U/C
Slot
22
s.w.g.
Front
Wing Mount
2 off
Tailplane
Red
Tissue
Layers
1/16
1/16
V
Card
Pieces X
1/16 Sht
1/16 Dowel
All Ribs
1/16 Sht
1/16 Fillets
TW3
TW1
TW2
1/32 Sht Piece C
N.B.
Use
Medium
Grade
Balsa
For all
Parts
Fin
Red
Wing
Panels
1/32 Sht
TW3
LW
LW
Strut
Position
Blue
Underside
View
TW2
Do Not
Dope
This
Model
TW3
TW1
Z Template
Upper
Wing:
Yellow
5" Dia KK
Plastic Prop
Cut tips to 4.1/2" dia
White
SBC 3



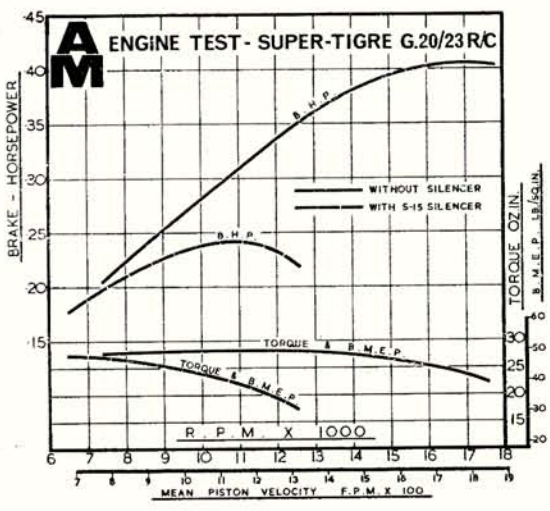
IN NAME, the G.20 series Super-Tigre goes back nearly two decades. The first G.20 – nominally Garofali's twentieth design, hence 'G.20' – was a 2.5 c.c., shaft induction, ball-bearing, glowplug engine of 15 x 14 mm. bore and stroke. Perhaps because this formula was continued in subsequent Super-Tigre 2.5 c.c. glow engines, the G.20 designation was retained even when development through the nineteen-fifties was succeeded by a complete redesign, including an entirely new main casting, in 1960. The current G.20 series, dating from 1965, is based on a further development of the highly successful 1960 model. At the present time it includes glowplug and diesel 2.5 c.c. (G.20/15) units, in both standard and R/C versions, plus the 3.6 c.c. (G.20/23) glow motors, also in standard and throttle-equipped versions, the latter being the subject of our report this month.

The G.20/23 R/C has been a popular engine in its class for several years, particularly for intermediate class R/C. It also converts easily into an excellent C/L or F/F engine by fitting the appropriate Super-Tigre venturi insert and needle-valve assembly in place of the R/C carburettor. Indeed, having evolved from a basic design originally intended for control-line and free-flight, it actually suffers one seemingly serious disadvantage as an R/C engine. This arises



ENGINE TEST
by Peter Chinn

SUPER TIGRE G.20/23 R/C



from the fact that the piston skirt partially uncovers the exhaust port for a period of approximately 80 degrees of crank angle at the top of the stroke, thereby admitting air to the crankcase – and in far greater quantity than is admitted via the carburettor when the throttle is closed. This, naturally, has the effect of raising the idling speed fairly considerably. It also means that, when a silencer is used, exhaust gas, instead of pure air, enters the crankcase and this, unquestionably, is largely responsible for the rather staggering difference between the 'silenced' and 'unsilenced' performance as indicated by our power and torque curves.

Opening the crankcase to atmospheric pressure by shortening the piston skirt to clear the bottom edge of the exhaust port (commonly known as 'sub-piston supplementary air induction') has, of course, been widely used in the past to promote free breathing. It is less popular nowadays for the reasons stated above. A few engines which, in their standard versions use sub-piston induction, have, when offered in R/C versions, been fitted with longer pistons to eliminate this. Others have had sub-piston induction eliminated in order to make them more suitable for use with silencers.

Why, one may ask, does the manufacturer not make a

similar modification in the case of the ST G.20/23 R/C? The difficulty here is that there is insufficient clearance between the piston and the crankshaft counterweight at the bottom of the stroke to allow the piston skirt to be lengthened. The ideal solution would be to use a longer connecting-rod (thereby obviating the need for the fore and aft cutaways in the piston skirt) in conjunction with a longer cylinder liner and raised ports to restore exhaust and transfer timing. The snag is that the ports would not then line up with the ducts in the casting, although it is reasonable to suppose that the latter might be slightly modified to improve matters. Another partial solution would be to raise only the bottom edge of the exhaust port, but this would certainly obstruct scavenging.

The root cause of the problem is, of course, the fact that the 23 is assembled around a body casting primarily intended for a 2.5 c.c. engine of 14 mm. stroke and, while its use with the 16 mm. stroke of the 23 is perfectly acceptable for non-throttle, non-silencer equipped applications, it has obvious shortcomings when the R/C throttle and silencer are added.

Having said all this, let us now hasten to put the matter into perspective by pointing out that a 40 per cent drop in power when the silencer is fitted, as shown by our b.h.p. curves, is indicative not so much of a poor output with the silencer, as of a quite outstandingly high performance without it. Although the Super-Tigre is just over .22 cu. in. capacity compared with just under .20 cu. in. for the popular '19' class engines, it is of comparable overall dimensions and weight and can, therefore, be grouped with them. By 19 R/C standards, a silenced output of 0.24 b.h.p. at 11,000 r.p.m. on 5 per cent nitro fuel is reasonable. By the same standards, an 'unsilenced' output of over 0.40 b.h.p. at 17,000 r.p.m. is exceptionally good and well in excess of anything we have achieved to date in tests of 19 R/C class motors.

Test Performance

Our test unit was a brand new G.20/23 R/C that had not previously been run. After priming through the exhaust, it started quickly from cold on a 9 x 4 Top-Flite prop, both with and without the silencer fitted. Hot restarts were first flick if the motor was stopped with the fuel line still full (e.g. if stopped with the throttle or by maladjustment of the needle-valve) but were less positive if the engine ran out of fuel, especially when the silencer was used.

After one hour of running time, the Super-Tigre was checked on a variety of props. With the silencer, r.p.m. figures obtained included 6,600 on an 11 x 6 Power-Prop, 8,100 on a 10 x 6 Tornado nylon, 8,800 on a 9 x 6 Top-Flite wood, 9,600 on a 10 x 3½ Top-Flite wood, 10,800 on a 9 x 4 Top-Flite and 11,100 r.p.m. on an 8 x 6 Power-Prop. With the silencer removed, these figures were increased by 100 r.p.m. to 6,700 on the 11 x 6 and by no no less than 1,700 r.p.m. to 12,800 on the 8 x 6.

After a good deal of experiment we managed to get the G.20/23 R/C to idle at around 2500 on a 9 x 4 when fitted with the silencer, provided that periods of idling were not longer than about 30 seconds duration and the airbleed was fully opened. If the airbleed was not fully opened, the engine puffed out a good deal of smoke when the throttle was opened again and promptly cut. With the standard coupled exhaust blanking plate in place of the silencer, the minimum safe idling speed obtained on test was 4,000 r.p.m. on a 9 x 4 prop.

Response to needle-valve adjustment was positive but delayed; i.e. the effect of turning the needle slightly either way from the optimum setting was to slow the engine perceptibly but only after a delay of a second or two and it was then possible to move the needle back to the best setting without risk of cutting. Obviously, an excessively lean setting caused the engine to cut. Strangely enough, it was difficult to induce four-stroking with an excessively rich setting: the G.20/23 R/C simply cut out abruptly instead. Happily, a single flick of the prop would bring it to life again.

In general, running qualities were good. Both with and without the silencer, the engine ran steadily and without excessive vibration.

Like all Super-Tigres, the G.20/23 R/C is well made and is an engine which the user should find to be hard-wearing and trouble-free.

Power/Weight Ratio (as tested):
0.49 b.h.p./lb. (with silencer); 1.02 b.h.p./lb. (less silencer).
Specific Output (as tested):
66 b.h.p./litre (with silencer); 111 b.h.p./litre(less silencer).

SPECIFICATION

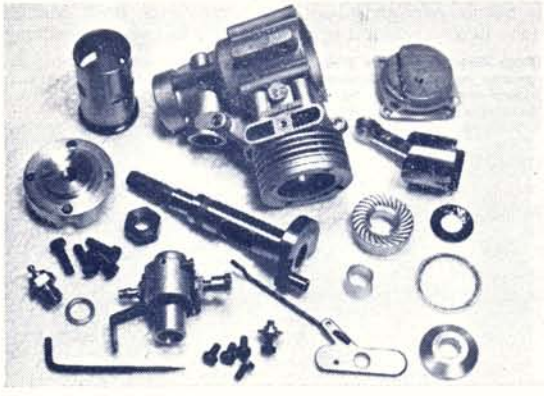
Type: Single-cylinder, aircooled two-stroke cycle glow-plug ignition with throttle control. Crankshaft type rotary-valve induction. Single ball journal and bronze bushed main bearing.
Bore: 17 mm. (0.6693 in.) **Stroke:** 16 mm. (0.6299 in.)
Swept Volume: 3.632 cc. (0.2216 cu. in.)
Stroke/Bore Ration: 0.941 : 1.
Weight: 6.38 oz. (7.93 oz. with S-15 silencer).

General Structural Data

Pressure diecast aluminium alloy *crankcase/cylinder/main-bearing housing* with detachable *rear cover* secured with four screws. Hardened, counterbalanced *crankshaft* with 10 mm. dia. main journal, 7.5 mm. bore gas passage and 5 mm. dia. hollow crankpin. Shaft runs in one 10 x 23mm. *ball journal bearing* at rear and one 10 mm. i.d. *sintered bronze bushing* at front end. Lapped cast-iron *piston* with baffle and hardened 4 mm. dia. tubular *gudgeon-pin* retained by wire circlips in piston bosses. Machined duralumin *connecting-rod* with plain eyes and lubrication slit at lower end. Drop-in steel *cylinder liner* located in cylinder casing by flange at top and locked by cylinder head. Machined aluminium alloy *cylinder-head* with 0.3 mm. soft aluminium gasket and secured to main casting with four screws. Machined aluminium alloy *carburettor body* seating on rubber gasket and fixed with cotter pin and nut. Ground steel *throttle barrel* with stationary co-axial brass spraybar assembly. Separate idling and airbleed adjustment screws. Coupled centrally pivoted steel *exhaust restrictor*. Machined aluminium alloy *prop driver* fitted to shaft with alloy split taper collet. Beam mounting lugs.

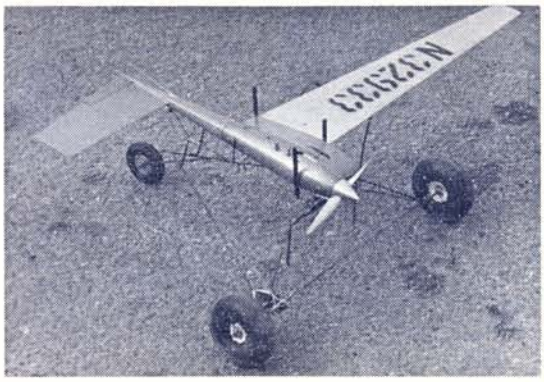
TEST CONDITIONS

Running time prior to test: 2 hours.
Fuel used: 5 per cent pure nitromethane, 25 per cent Duckhams Racing Caster Oil, 70 per cent ICI Methanol.
Glowplug used: Super-Tigre standard long reach, platinum filament.
Air Temperature: 52 deg. F.
Barometer: 30.20 in.Hg.
Silencer: Super-Tigre Type S-15.



Control-line News

by John Franklin



CLEMENTE CAPPI writes from Italy with news of the O.P.S. 60's performance in control line speed models. At each successive meeting in '68, Italian O.P.S. speeds were getting higher as the modellers became accustomed to operating this twin Schnurle, plus boost port, tuned length exhaust pipe engine. At their last contest held on October 6th at Ravenna the top three .60 models were O.P.S. equipped. Piero Muzio took top place at 161.6 m.p.h. with Salvatore Rossi in second place at 160.3 m.p.h. (not connected with Rossi brothers). Carlo Saudella was third with 152.9 m.p.h. Amato Prati flew the fastest Super Tigre powered model at 151.6 m.p.h. and placed fourth. All of these speeds were recorded on straight methanol/oil fuel with two line models, the line diameter being 0.5 mm. and the length 19.9 metres. After the contest some record attempts were made with nitro fuel and 0.4 mm. diameter lines. The speeds were, Piero Muzio 167.8 m.p.h. and Salvatore Rossi 164.7 m.p.h. Mr. Picco the O.P.S. manufacturer is working hard on production and the future of the engine seems assured. *Aeromodeller* has just received one of the production OPS engines with a special static running pipe and this has been passed to Peter Chinn for testing and evaluation – so watch 'Latest Engine News' for results. All we can say is that it looks 'mighty'. Still on the O.P.S. we have heard that Willi Holle (Netherlands) has extensively modified one and his speeds are reported to be in the 180 m.p.h. region. The plans for 'Velocita III' reproduced at right from the Italian magazine *Auto-Modelli* illustrate a typical O.P.S. installation in a two-line speed model. Note the plywood centre wing lamination and the upthrust on the pipe. Carlo Saudella the designer flies this model consistently at 150-154 m.p.h. on two 0.5 m. Italian lines and straight fuel.

* * *

South African all-round control-liner Basil Menges who flew in Finland with Neil Holtz has some good news for modellers in that part of the world. Rand M.A.C. in the Transvaal have a new control line site. The circle is concrete and has a 10 foot radius centre with an outer ring from 58 foot radius to 72 foot radius. This makes it suitable for F.A.I. T/R, Speed and Rat Race. Combat is being flown on an adjacent piece of ground which is going to be grassed over. The cost of the concrete circle was £775 and they are now busy making electric lap counters and warning lights for team racing – this being in preparation for the 1969 S.A. Nationals which are to be held there (5,500 ft. above sea level). 'Tarmac Torque' the newsletter of Rand M.A.C. has a concise report on the World Control Line Championships in it and the results so far in their Open C/L Championships, P. Parsley won ½A Proto Speed with 61.2 m.p.h., fastest time Rat Race of 4:01 went to Johan de Kock with a K&B Torpedo. .35 model J. Bilyard won the final with 7:43 using a K&B 40.

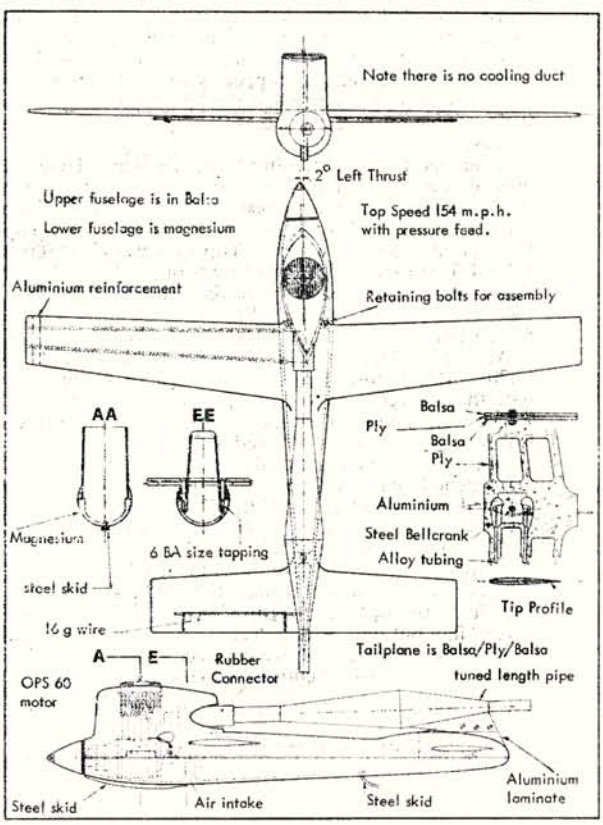
* * *

The World Championship report in October *Aeromodeller* and the 'Technicalities' in November issue brought forth two interesting letters, one from Rolf Miebach expresses criticism (he was not at the meeting), and the other from W. I. Barrett, surprise, both on the same point. First the letter from Germany:

Let me take the opportunity of writing to you to express some criticism on John Franklin's World Champs Details article in 'Aeromodeller' November issue:

If someone happens to build Arnie Nelson's 'Roadrunner' after his description it will most certainly be a failure!

Top: Arnold Nelson's 'Roadrunner', subject of interesting discourse on page opposite, and below, three O.P.S. 10 Italian speed models which have eclipsed opposition in 1968, by Muzio, Saudella (drawing of model at right) and S. Rossi.



He left out the basic idea of this ingenious model: The metal wing is warped downward towards the end of the wing, giving positive incidence at the wing root and negative incidence at the tip. If this is done in the right way (a lot of testing and re-warping is necessary) the model will fly horizontally regardless of its speed.

This is absolutely necessary because a model which flies 'wing-tip up, fuselage down' will be disastrously affected by sidewind. Apart from this, how could the model land without breaking its tail if it did not fly horizontally even at low speed? ROLF MIEBACH

and the letter from Mr. Barrett:

I have been reading John Franklin's article on technicalities at the World Championships (November 'Aeromodeller') and was intrigued with the theory behind Arnie Nelson's speed model, 'Roadrunner'. I was surprised by the thought that an upright cowling would produce a strong yawing action. Assuming the model was flying normal to the lines, i.e. not pointing out of the circle, then the angle subtended at the centre of pressure of the cowling (say about three inches foward of the centre of gravity) by a tangent of the flight circle (52 ft. radius) is only about $\frac{1}{4}°$.

However, if we accept that this yaw does occur, and we look for the answer in the 'Roadrunner' layout, we find that there is a strong nose-up pitch movement with the motor running ('when the engine cuts, the model dives to the ground'). This implies that the cowling is moving at a slight positive angle of incidence relative to the slipstream. The clue seems to lie in the fact that when the motor stops, the lift is immediately lost from the cowling. Is it derived, therefore, from the helical motion of the air leaving the propeller? This would produce a cross flow over the cowling, and thus lift the nose, requiring down elevator to balance it.

If this is the answer, then it also applies to the model with an upright cowling, giving the outward lift component. It would appear, then, that to overcome this problem, the cowling should be at a small angle to the centre-line of the model, so that it presents a more streamlined form to the spiralling air flow from the propeller.

The theory outlined above could be proved by either mounting the cowling outboard instead of inboard, flying the model with inboard cowling in the opposite direction, or running the motor backwards with an opposite hand propeller! The effect would be to produce a nose-up pitch when the motor stopped. Anyone care to try? The problem is a tricky one, but could be overcome providing the conditions are fully understood.

W. I. BARRETT

After receiving both of these letters we were still convinced that our original report and technicalities were correct. Even so, we thought we had better check with the designer Arnie Nelson in California. His reply supports the magazine report and clears the matter up. If two people write in about something there are sure to be 200 who share the opinion but have not bothered to write. We also asked Arnie to explain how he makes his alloy sheet wings:

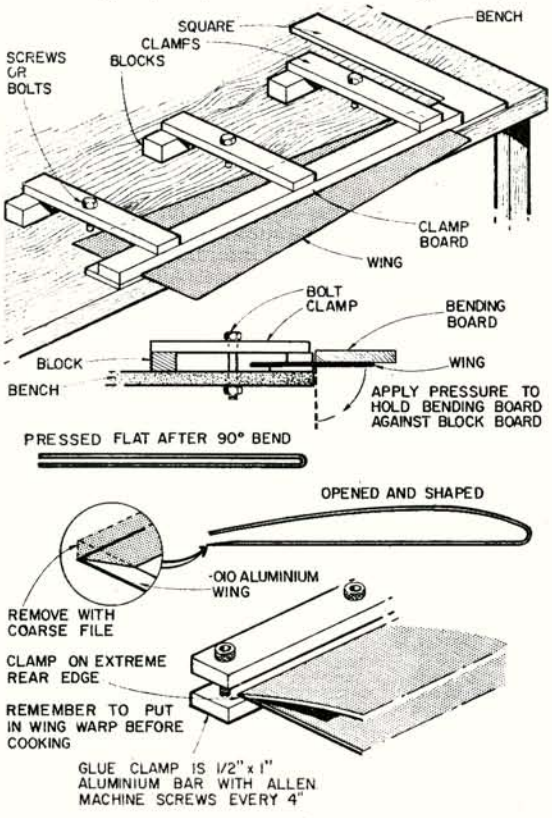
Interesting letter from Rolf Miebach. As you remember I said, the 'Roadrunners' are my version of Chuck Schutte's design, which he had at the 1966 World Champs. I went over Chuck's design with him in some detail. He had built quite a string of them, each a little different from the last. His first models did, as Rolf suggested, have positive incidence at the root and negative at the tip. Somewhere around two, or three degrees at the root and one at the tip. On each model this became progressively reduced.

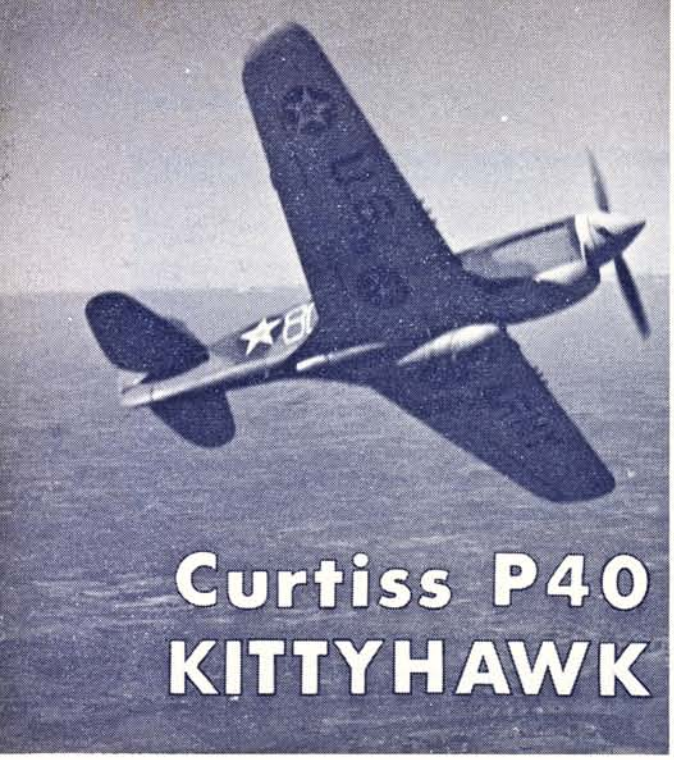
I reasoned that there is almost enough centrifugal force to hold up the model at speeds of 145-150 m.p.h. Of course, the least amount of incidence possible is ideal. Therefore, my model has almost no negative at the tip and has the root set at almost 0 incidence. The wing has a lifting section at the root and is symetrical at the tip. This has seemed to work well. I now think that with the correct off-set of the wing above the CG, at 160 m.p.h. or so, one would need no lift. To stop the tailplane from breaking off I usually set the tip up a $\frac{1}{4}$ *in. or so from horizontal.*

We all make wings a little differently over here. Bill Wisniewski has made a small sheet metal break, which will accept up to 18 in. This, of course, does a very good job. Chuck does the same thing with a wooden-hinged arrangement. I use a somewhat more crude method. As the sketch shows I use a carpenter's square and a 1 in. board to clamp the wing in place on my bench. I then use another board to apply pressure to make the first 90 degree bend. Next I lay it on a flat surface on the floor (cement), and bend the wing the rest of the way over. This gives the sharp leading edge. Next using a wooden wedge : open up the wing progressively more from the tip to the root. We all then bend the top of the wing to give a little curve from about mid-section to the root. If you cut the wing correctly and bend it on the centre line the trailing edge should line up. I next file the inside edge of the trailing edge to a taper. I use a fairly course file, which leaves lots of little grooves in the joint for glue.

Next I glue and clamp it at the very trailing edge. My method of filing and clamping allows the wing to retain its correct cross section and not go flat at the trailing edge as some do. I use PlioBond by Goodyear for glue. Clean the joint with acetone and apply a thin layer of glue to both sides of the joint. Allow glue to become tacky, then clamp and cook in the oven at 300 degrees until the PlioBond turns a light chocolate brown. When 'done' allow to cool, unclamp and file trailing edge true. For the wing tip filling I use aluminium filled epoxy, filed to shape.

ARNOLD NELSON





Curtiss P40 KITTYHAWK

Quickly distinguished by rearward vertical tail position, the Mk. IV (P-40N) or Australian A-29 seen above has all-white tail to avoid confusion with Jap Tony. Left is Army Air Corps P-40F.

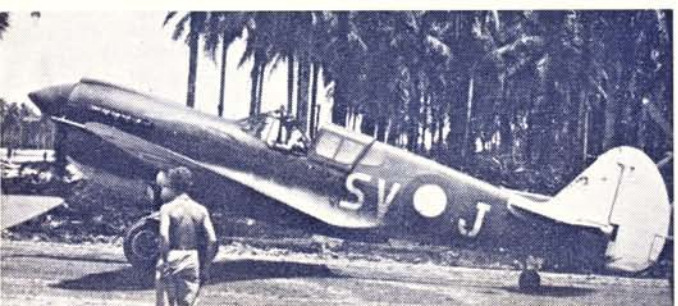
AIRCRAFT DESCRIBED NO. 179

By G. R. DUVAL

THROUGHOUT the Second World War, the Curtiss P-40 could be found in almost every theatre of action, and while the basic design stemmed from the Curtiss Hawk 81A, successive modifications gave the machine a confusing variety of names and alphabetical appendices. The official U.S.A.A.F. nomenclature went from P-40B through to P-40N, the Curtiss designations from Hawk 81A to 87A, and the names from Tomahawk to Kittyhawk, the latter being known as Warhawk to the Americans! For all this, the P-40, never an outstanding fighter by general standards, had two main attributes: it was available at times when fighter aircraft were urgently, sometimes desperately needed, and the type had an almost legendary reputation for absorbing battle damage.

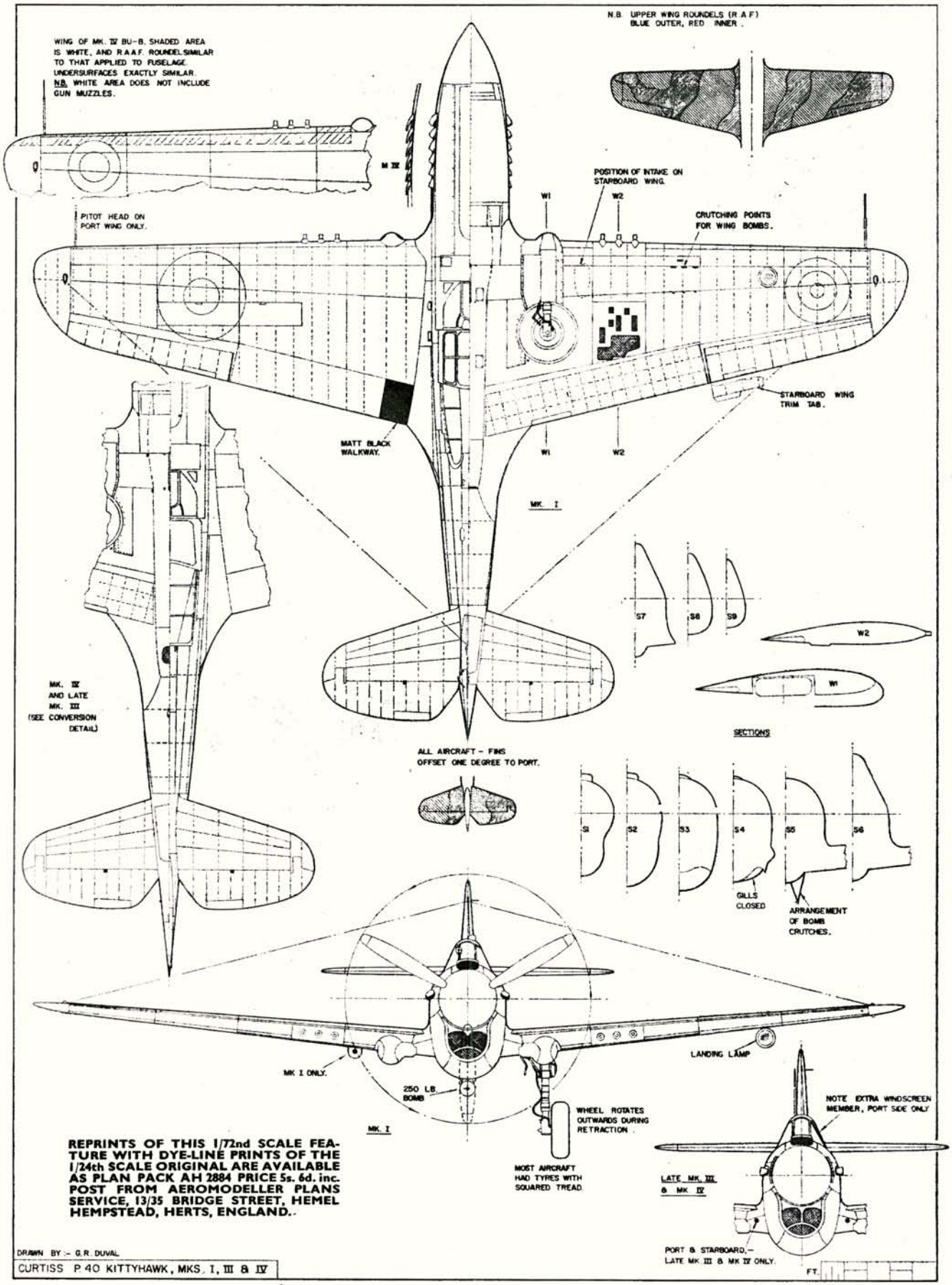
At the beginning of 1940, an improved version of the Allison V-1710 liquid-cooled engine became available, and Curtiss decided to re-design the P-40B/C (Tomahawk I/II) utilising this new 1,150 h.p. power unit. This resulted in a shortening of the overall length by six inches, a raised thrust line, and a consequent reduction in undercarriage leg length. The fuselage cross-section was reduced and the radiator enlarged and moved forward. Armour plate was fitted, and the fuselage guns deleted, the armament now consisting of four 0.5 in. Browning guns in the wings. In May 1940, a British order for 560 of these machines was received, naming them Kittyhawks Mk. I, the U.S. Army placing their quantity order for the more formal P-40D. The first flight took place on May 22nd, 1940. After delivery of 20 Kittyhawk Mk. I's a further modification resulted in the armament being increased to six wing guns, the Mk. I's becoming Mk. IA (P-40E-1).

Below, a late Mk. III of R.A.A.F. taxis to S.E.A.C. airstrip. At right, a typical Mk. IV decoration in R.A.A.F. Service, troops called it 'Neverhawk', from Barry Pattison collection.



The British Kittyhawks were sent to North Africa, commencing action on New Year's Day, 1942 over the Western Desert and forming the equipment of Nos. 94, 112, 250, 260 and 450 R.A.F. Squadrons, No. 3 R.A.A.F. and Nos. 2, 5, 7 and 11 S.A.A.F. Further machines were sent to Canada, and a large number to the R.A.A.F. and R.N.Z.A.F. in the Pacific theatre. On operations, several faults became apparent, the main one being that the Allison engine had a poor performance at altitude, as in the Tomahawk, and in an effort to rectify this, Curtiss experimentally fitted a British-built Rolls-Royce Merlin 28 engine to a P-40D airframe, which proved to be a successful marriage. Production, using a Packard-built V-1650-1 Merlin, was to a total of 1,311 machines in the P-40F series, externally recognisable by the absence of the upper air scoop on the engine cowling. 250 of these machines were purchased with Lease-Lend funds for the R.A.F. as the Kittyhawk Mk. II, but were re-allocated before delivery, going instead to the Soviet Union, and to the Free French Air Force in North Africa. A large number were retained by the U.S. Army.

Another failing of the Kittyhawk (and all early P-40s) was a marked lack of directional stability, manifest in yawing during high-speed dives and in a tendency to 'ground loop' on take-off and landing. Regarding landings, a special technique had to be followed of touching down on the main wheels and then allowing the tail to drop, any attempt at a 'three-pointer' usually resulting in what the pilots described as an 'interesting arrival'! A modification in the form of a dorsal fin cured this tendency to some extent, being fitted to same late production Kittyhawk Mk. I/IA's and standardised on the P-40K, the latter having a more powerful Allison engine of



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DRAWN BY :- G.R. DUVAL

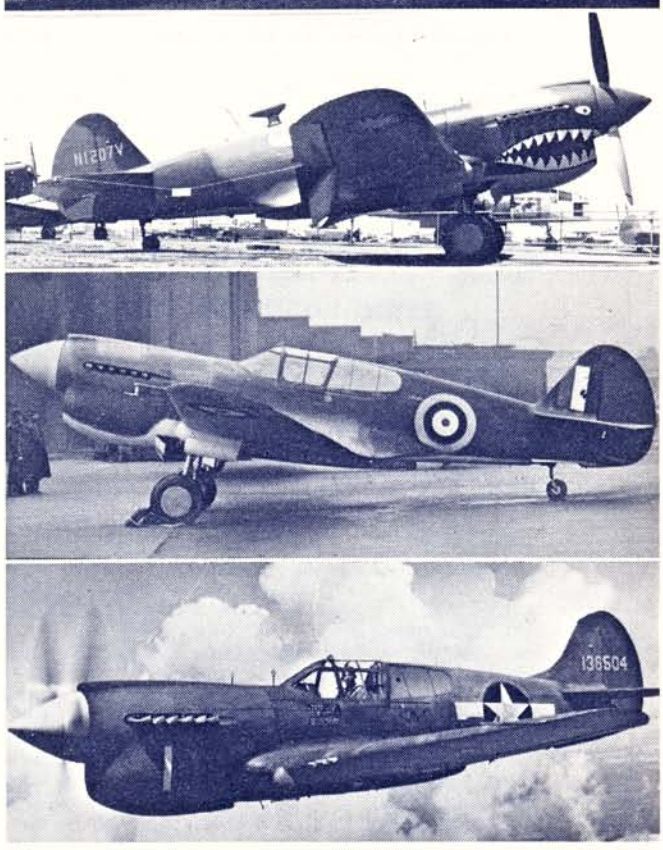
CURTISS P.40 KITTYHAWK, MKS. I, III & IV

Top right and left, Curtiss P-40 N151U. Owned and flown by Gil Macy, Monterey, California. Built in 1944 and powered with 1475 h.p. Allison engine, it is one of several P-40's still flying. This one sports a different cockpit enclosure plus buddy seat and a 4-bladed propeller. N1207V has similar AVG (China) markings and belongs to A. R. Woodson of San Mateo, California. It is a P-40E and has a D.F. loop housing above the fuselage.

1,325 h.p. This model was known as the Kittyhawk Mk. III in the R.A.F., which slightly confused the recognition experts when another Mk. III made its appearance, without the dorsal fin and having a 2 ft. 2 in. extension to the rear of the fuselage which moved the fin noticeably aft of the tailplane. This was the P-40M, the structural modification also being applied to late-series P-40K's and to the Merlin-powered P-40F.

By 1944, the performance of existing P-40 variants, both American and Commonwealth operated, had fallen far behind that of fighter aircraft in general, and Curtiss embarked upon a major effort to improve the basic design to a degree where the P-40 would be of full operational value to the end of the war, which was now in sight. A new lightweight structure was devised, together with a general survey of components to see if further weight could be removed. The result was the P-40N, the fastest variant of all in its early form, with a maximum speed of 378 m.p.h. at 10,500 ft. Powered by the 1,470 h.p. Allison V-1710-99 or -81, the P-40N was known as the Warhawk to the U.S. Army. but the 586 examples delivered to Great Britain under Lend-Lease were designated Kittyhawk Mk. IV, and while Nos. 250 and 450 Squadrons of the R.A.F. were equipped with this Mark in Italy, the majority went to the Far East and the Pacific for the R.A.A.F. and R.N.Z.A.F. As the Kittyhawk Mk. IV progressed through its career, several modifications were inevitably ordered, including changes in engine Marks, increase in external stores capability, fitting of non-metallic self-sealing fuel tanks, new radio and oxygen equipment, and more obscure alterations. But the only plainly visible change was the introduction, from the P-40N-5 onwards, of a frameless cockpit hood, the fuselage aft of the cockpit and under the rear perspex being cut down to a forward-sloping rectangular cross section for better rearward visibility.

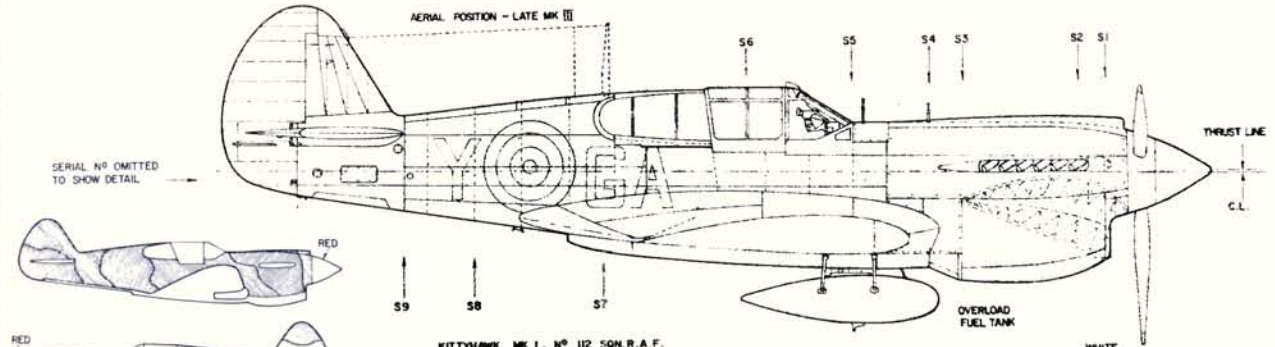
The service history of the Kittyhawk and its U.S. Army counterpart is an impressive one, and cannot be adequately covered in anything less than a full-length book. Never the fine-edged weapon that the Spitfire, Messerschmitt 109 and Mustang were, the Kittyhawk was a tough, hardy, machine, a redoubtable fighter-bomber, and fighter too, in capable hands. Over 3,000 Kittyhawks were delivered to the Commonwealth Air Forces, including 1,500 Mk. I/IA's, 616 Mk. III's, and 586 Mk. IV's. Of these totals, the R.A.A.F. received approximately 1,050 machines, and the R.N.Z.A.F. over 500. From June, 1942, R.A.F. Kittyhawks in the Western Desert, together with Squadrons of the S.A.A.F. and R.A.A.F., were converted to carry bombs beneath the wings and fuselage to a total weight of 1,000 lbs., and so armed, not forgetting the six 0.5 in. machine guns, wrought much havoc among Rommel's forces. When used for escorts to the light bomber Squadrons they scored many successes in air-to-air combat, even against the superior



Above pair are a P-40D on acceptance trials for the R.A.F. as the Mk. I in 1940 (Serial is AK 578), and a late series P-40E showing the modified dorsal fin for improved directional stability. Note simple ring and bead gun sight.

Me 109 and Fw 190, and some returned to base with battle damage which would have brought down aircraft of less sturdy construction. The pilots of No. 112 Squadron, R.A.F. were quick to follow the example of the American Volunteer Group in China, painting the fearsome 'Shark' motif on the eminently suitable noses of their mounts. The P-40 and Kittyhawk were noted

One of many excellent preservations, this P-40N is in the Wright Patterson U.S.A.A.F. Museum and carries the popular shark's mouth decoration, though the position of the eye varies – see above alternates.

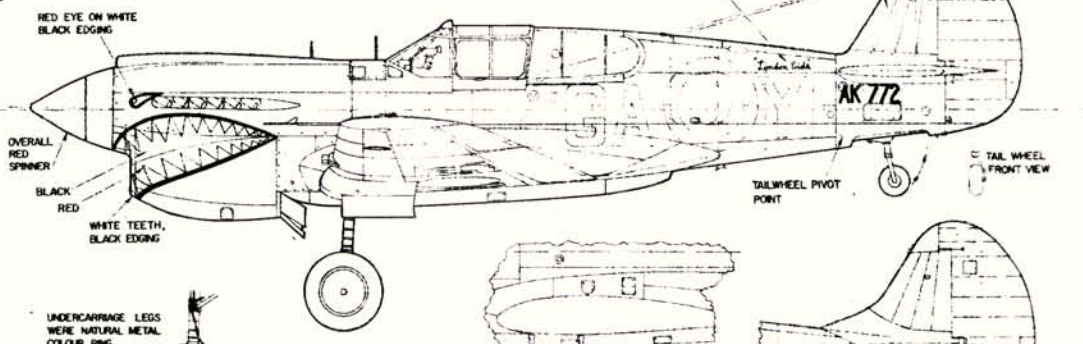


KITTYHAWK MK I, Nº 112 SQN. R.A.F.
DESERT AIR FORCE,
GAMBUT, LIBYA, MAY 1942
(SGT. PILOT H.G. BURNEY)

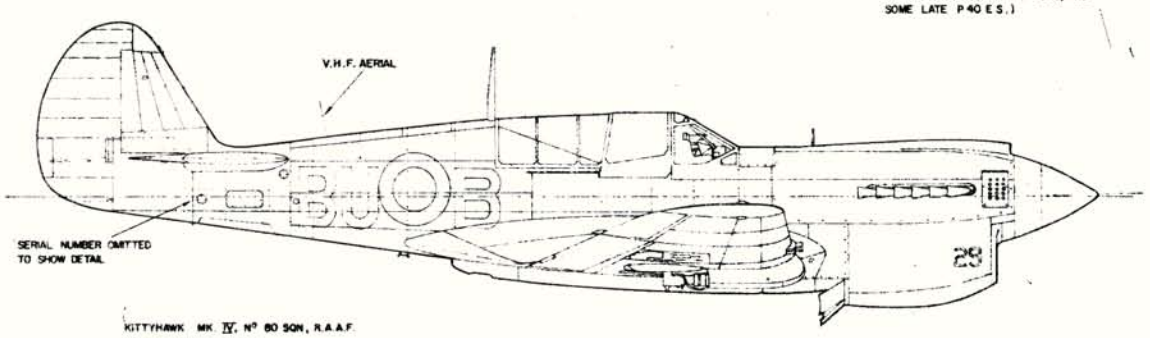
COLOUR SCHEME GA-Y

MIDDLE STONE
DARK EARTH
AZURE BLUE

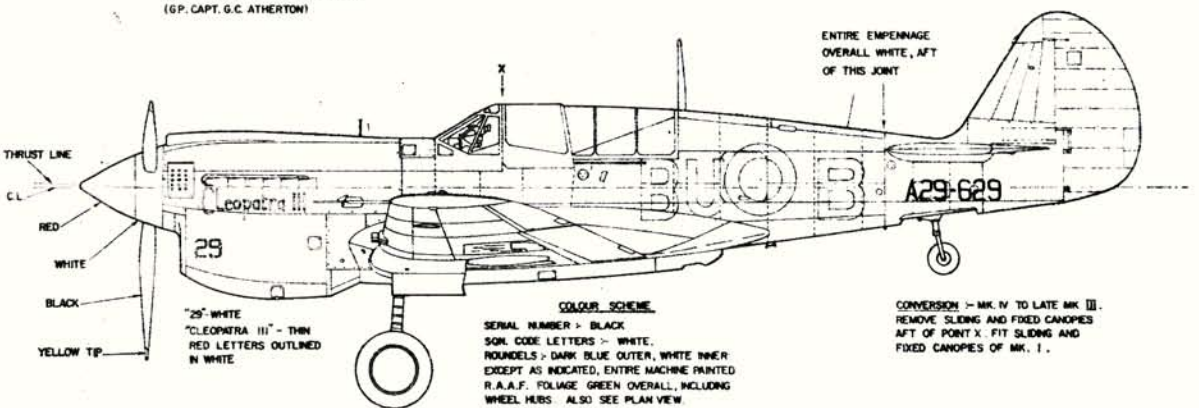
SERIAL NUMBER :- BLACK
SQN. CODE LETTERS :- WHITE
ROUNDELS :-
NORMAL RED, WHITE, AND BLUE.
FUSELAGE ROUNDELS HAD
YELLOW OUTER RING
ALSO SEE PLAN VIEW



CONVERSION :- MK. I/IA TO EARLY MK. III
ALSO FIT EXHAUST PIPES SHOWN BELOW ON MK. IV. (U.S.A.A.F. P 40 K, AND SOME LATE P 40 E S.)



KITTYHAWK MK IV, Nº 80 SQN, R.A.A.F.
(1st TACTICAL AIR FORCE.
MOROTAI, S.W. PACIFIC, LATE 1944.
(G.P. CAPT. G.C. ATHERTON)



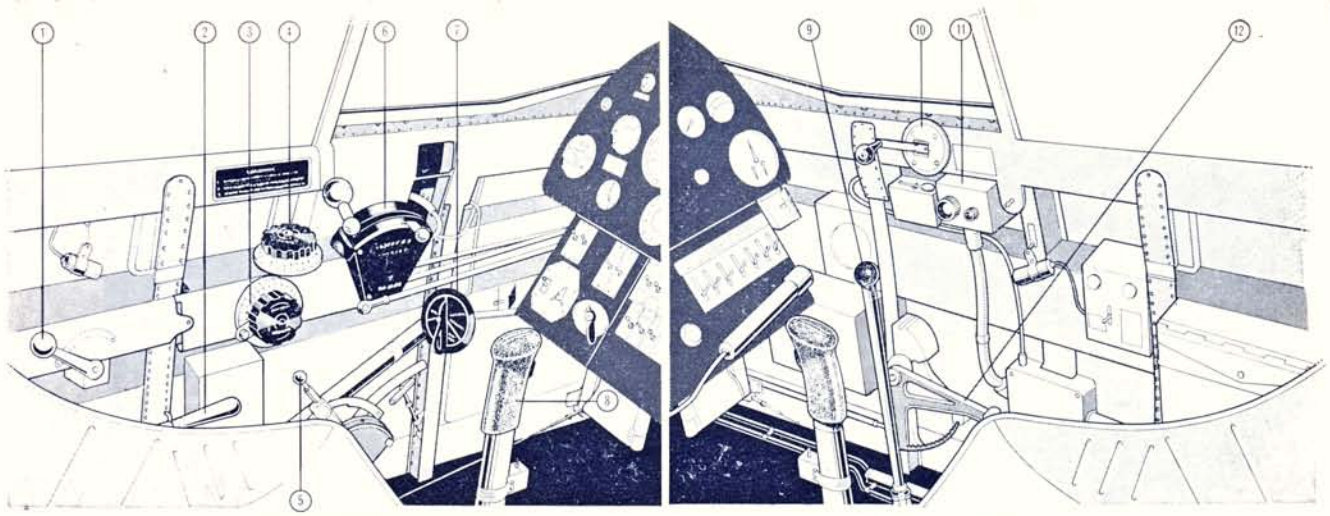
"29" WHITE
"CLEOPATRA III" – THIN RED LETTERS OUTLINED IN WHITE

COLOUR SCHEME

SERIAL NUMBER :- BLACK
SQN. CODE LETTERS :- WHITE.
ROUNDELS :- DARK BLUE OUTER, WHITE INNER
EXCEPT AS INDICATED, ENTIRE MACHINE PAINTED R.A.A.F. FOLIAGE GREEN OVERALL, INCLUDING WHEEL HUBS. ALSO SEE PLAN VIEW.
NOTE :- TO OBTAIN FOLIAGE GREEN
(R.A.A.F. CODE Nº K3/177)
MIX TWO PARTS HUMBROL MATT 30
TO ONE PART HUMBROL MATT 31

CONVERSION :- MK. IV TO LATE MK. III.
REMOVE SLIDING AND FIXED CANOPIES AFT OF POINT X. FIT SLIDING AND FIXED CANOPIES OF MK. I.

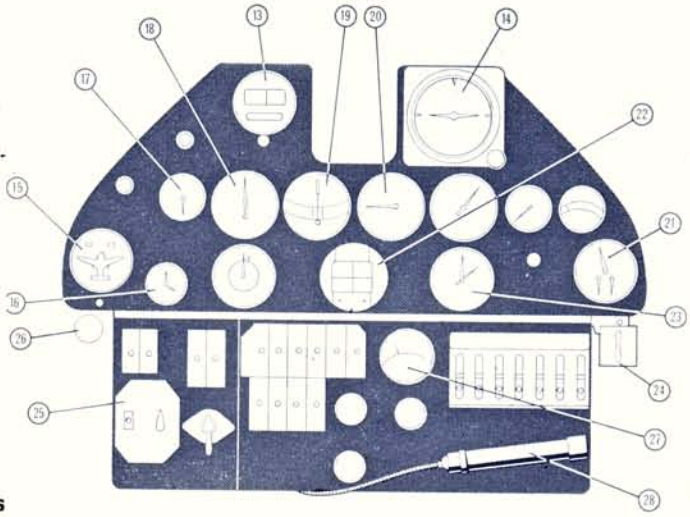
FT



CURTISS P-40 KITTYHAWK
Key to cockpit sketch diagrams

1. FLAP CONTROL
2. UNDERCARRIAGE LEVER
3. ELEVATOR TRIM
4. RUDDER TRIM
5. BOMB/BELLY TANK RELEASE
6. THROTTLE/MIXTURE/PITCH CONTROLS
7. FUEL COCK
8. CONTROL COLUMN WITH GUN TRIGGER AND FLAP ACTUATOR SWITCH
9. HYDRAULIC HAND-PUMP EMERGENCY PUMP AT BASE
10. CANOPY WINDING HANDLE
11. RADIO CONTROLS WITH MORSE KEY
12. RADIATOR FLAP CONTROL
13. DIRECTION INDICATOR
14. ARTIFICIAL HORIZON
15. FLAP/WHEELS INDICATOR
16. CLOCK
17. FUEL GAUGE
18. AIRSPEED
19. TURN/BANK
20. RATE OF CLIMB/DESCENT
21. COMBINED ENGINE PRESSURE/TEMPERATURE GAUGE
22. COMPASS
23. R.P.M. GAUGE
24. CARBURETTOR HEAT CONTROL
25. PROPELLOR SELECTOR SWITCHES
26. PARKING BRAKE
27. AMMETER
28. FLUORESCENT LAMP

N.B. **NOTE THAT LOWER PANEL IS ANGLED TOWARDS PILOT**



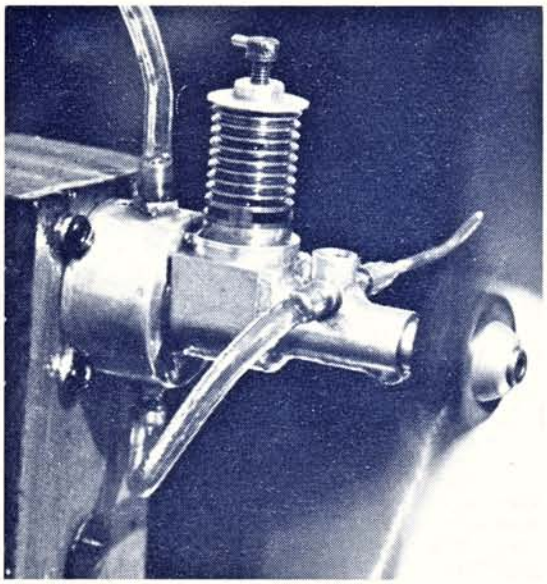
for somewhat garish embellishment of their noses, and apart from sharks' heads there were tigers' heads with gaping jaws on a U.S. Army unit in the Aleutian Islands, and an enormous grinning skull on a Warhawk Squadron in Burma!

In the Pacific, the Kittyhawks of No. 15 Squadron, R.N.Z.A.F. fought alongside their American allies from the island base of Guadalcanal in 1943. The first R.A.A.F. Squadrons in action were Nos. 75 and 76 who were sent North to defend Port Moresby in early 1942, where there were many air battles with Japanese fighters and bombers, the results of which scotched the rumour that the Kittyhawk was no match for the Japanese Zero. A decisive victory for the 'Aussies and Kiwis' was scored at Milne Bay in August, 1942, when the incessant attacks by the Kittyhawks smashed an offensive by the Japanese Army, who were about to decimate a small American and Australian force, and then intended to take Port Moresby. After the end of 1942, air-to-air combat became rare, and the Kittyhawks became fighter-bombers and ground strafers to great effect.

Several examples of the Kittyhawk remain to this day throughout the world, carefully preserved, and several are in flying condition in the United States. The work of preservation by devoted enthusiasts cannot be better illustrated than that carried out by the Museum of Transport and Technology in Auckland, New Zealand, who rebuilt a Kittyhawk in two years from components rescued from all over that country, service sources, schools, garages and junk-yards.

Such was the Kittyhawk – never the best, but surely one of the greatest.

Below: two more photographs from Les Hunt's collection for his famous 'Vintage and Veteran' book. Top is 1076, a P-40F in the Canadian National Aeronautical Collection at Rockcliffe and below, a P-40E restored by volunteer enthusiasts from multiple sources for the Aviation Division of the Museum of Transport and Technology, Auckland, New Zealand. Markings are typical of R.N.Z.A.F. Our thanks are due to such enthusiasts and particularly Barry Pattison of I.P.M.S. (Australia) for aid in producing this feature.



She won't break any records for horsepower or compete with mass-produced commercial products

BUT YOU CAN MAKE IT YOURSELF!

TOPSY

.375 c.c.

Specially designed by G. Hugh for construction on a centre lathe

AFTER AN ABSENCE of nearly 20 years from the world of aeromodelling, my son and I took a trip to see the National Championships. There was much of interest to one so long away from the sport. I have always had a mechanical turn of mind and engines, miniature ones in particular, have always held a fascination for me. So although the flying greatly interested me, the engines held a greater attraction. However, I had no opportunity to examine them except from a distance. They seemed to be much improved to the ones that I had known, much more powerful but also bigger and heavier. There seemed to be no very tiny diesels performing and this disappointed me, as I have always cherished the dream of flying a diminutive model, powered by an equally diminutive diesel. After an enjoyable day at the Championships my interest in modelling was renewed, and I began to read any aeromodelling books that I could lay my hands on, with particular reference to the sections on engines. Diesels under 0.5cc. were conspicuous by their absence, and even those mentioned struck me as being fairly heavy and of somewhat large overall dimension.

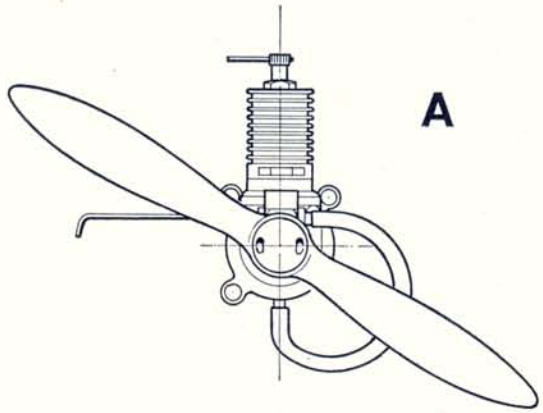
I began to toy with the idea of trying to design and make one myself. I studied the photos and illustrations featured in the *Aeromodeller*, together with the texts dealing with the technical details and after a while I was convinced that I could make a motor that would work. Of one thing I was determined. It should be as *small* and *light* and *compact* as possible, allied to a design that would lend itself *easily to being manufactured entirely on a centre lathe* out of *materials easily obtained* and *without resorting to costly castings.*

Without any drawings except a hand-drawn sketch minus any dimensions, a start was made. The design was to be of about 1/3 cc. (although later, not entirely by design it went up to 3/8 cc.) and if possible it should not exceed approx. 1 oz. all-up, including prop, fuel lines and radial tank and spinner, ready to fly. In fact, it finished up at under 1¼ ozs. Also I wanted to get a good power-to-weight ratio. And I wanted it to look attractive and functional, with integral radial tank.

A start was made on the crankcase, allowing for bore of .312 in. and stroke of .300 in. These were to be a maximum, I had no other dimensions or set ideas in mind so that I could change and modify at will. From then on, the motor, like **'Topsy'** just *'growed'*. My first attempts did not meet with the success for which I had hoped, but at least it ran well although revs were not all that high. This had a cylinder with two exhaust and two transfer ports diagonally opposed. Next I tried three exhausts and one transfer. This was no better! My third was entirely to my satisfaction having three exhaust ports and three angled transfer ports. Variations in crankshaft porting were also tried without having any marked improvement as far as I could tell without testing equipment.

I finally settled for a crankshaft with a port ⅛ in. wide elongated to .187 in. the trailing edge of which is in line with the centre of the big-end. The motor seems to run better in the upright position but requires a little famili-

Heading is a prototype with large capacity tank, running sweetly as it drives a hefty 6 in. propeller. At right is a selection of cylinder experiments with variation of transfer passage design up to final selection at extreme right.



arity in order to get it to start easily. However, it runs smoothly and consistently when the technique has been mastered.

It is best to mount the prop so that as the motor starts to meet compression the prop stays on its own at about 'ten to four'. (**A**). Then prime the intake with two or three drops of fuel and poising the forefinger at about two or three inches away, strike the prop smartly. This provides the required amount of inertia to give the motor about three or four rapid turns. Once it has been started it only requires to be choked with the finger and a smart flick will get it going again. No doubt a spring of the 'Quick-start' type would be the answer, but, once having mastered the method of starting I could see no useful purpose. It would increase the weight and this would have been against my earlier aims of keeping the weight as low as possible.

Considering that I have neither handled or examined a C/I motor since the very early side port diesels of 1948, I was suitably pleased when some months later I read an article on the design and manufacture of modern C/I motors and discovered to my surprise that my thinking had run along similar lines, even down to the choice of materials, as that of the professionals.

Some of my methods of manufacture are, however, decidedly unprofessional if looked at from the viewpoint of the academically trained engineers, and won't be found in any of the text books, but are not unusual to a practical man to whom a lathe has become almost an extension of himself. You may think, as did a friend of mine who *is* a designer, that some of the wall thicknesses employed are a trifle thin. But in my 30 years of working with metals I have acquired the 'gift' of knowing instinctively that the thicknesses are adequate. After many hours of continuous running the motor shows no signs of breaking up.

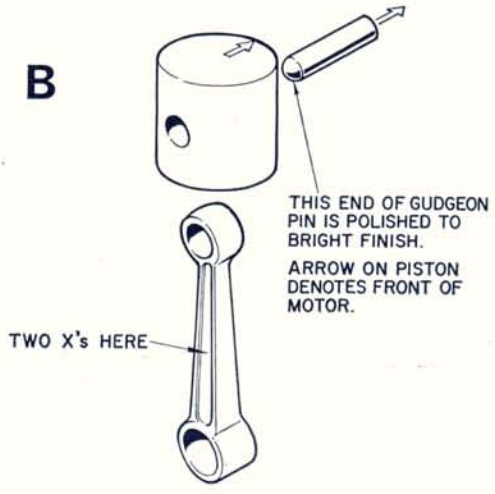
As to the manner of manufacture, I have compiled a planning sheet plus stage up drawings which should help to explain the various unorthodox methods of machining in order that it can be carried out with no other machine than a lathe. One or two fixtures and special purpose tools and laps have to be made, but nothing beyond that with which a handy amateur cannot cope.

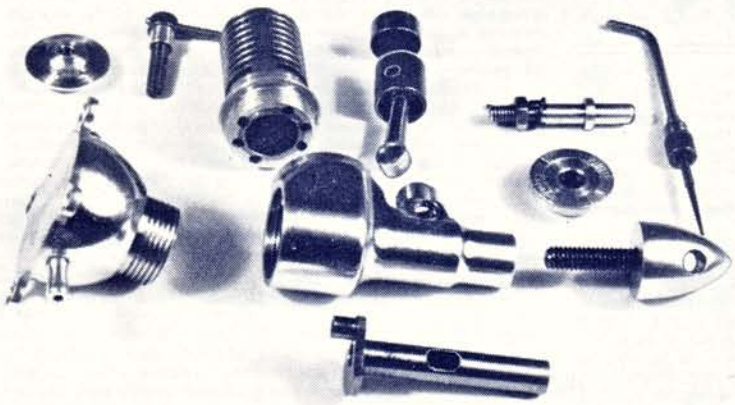
Please remember, there is one set of 'tools' that, above all, one cannot dispense with. They are painstaking patience and attention to accuracy. All parts that do the actual work have to be *right*. When the plan calls for a part to be square and smooth finish, it means *exactly* that. Another point to watch is that when assembling the cylinder and tank to the crankcase. The face to face joints are easily damaged if not scrupulously clean and although they need to be firmly screwed together *don't overdo it*. I never use more force than can be applied by using the forefinger and thumb applied to the base of the crankcase and the top of the cylinder.

End play on the crankshaft should be kept as small as possible consistent with free running, maybe .001 in. to .005 in. The gudgeon pin needs to be a light force fit as I have found that otherwise it tends to wear a slight depression in the cylinder wall if allowed to float. Immeasurable as this was, it was enough to allow gas to escape. In my engine, in fact, the pin and gudgeon pin hole were made so that there is a very slight difference in size between the two ends. This means that the gudgeon pin can only be inserted from one side. Therefore the pin enters easily the one side of the piston and doesn't become tight in the hole until nearly home. This obviates any tendency of squeezing the piston into an oval shape by having to drive the pin thro' first one tight hole and then another (**B**). Be careful to make sure that it does not protrude at either side of piston.

The contra piston, when in the correct firing position is a really firm fit so that when a pencil is placed on the bench with the cylinder threaded on to it, it requires *all* the weight of the arm and shoulder to force it out. Likewise, the prop driver when fully screwed home is sufficiently tight that it can only be removed by pulling hard with the engine between the two hands. The complete spraybar was assembled together with the needle with the brass thimble screwed tight. The thimble was then unscrewed about ½ to 1 turn and with the needle pushed firmly into jet orifice, solder was applied. The spinner was made and a stud of correct length inserted. The tommy bar hole was then drilled thro' spinner and stud, the burrs this formed effectively lock the stud in place. The profiles of the crankcase were formed by taking successive 'bites' at the component, rotating the part a degree or two between each cut, afterwards smoothing and blending out with a file and emery cloth, finally on a rotary mop with paste and metal polish.

On all the major working parts, *i.e.* crankcase, cylinder, crankshaft, main bearing, piston and contra piston, I always endeavoured to finish the non-working surfaces first, leaving a fraction to be removed on final finish machining. The sizes quoted with regard to most parts are not mandatory and can be varied slightly to suit your personal requirements. For example, I happened to have a reamer .311 in. dia., therefore this was used giving a size of .312 in. after lapping. Two spanners were also





Display of components at left and complete 'Topsy' below show the smaller capacity tank and the final selection of cylinder porting. Made entirely on a centre lathe, this 0.375 c.c. diesel is an ideal workshop exercise for the model engineer or school handicrafts dept. and that, of course, includes many, many aeromodellers.

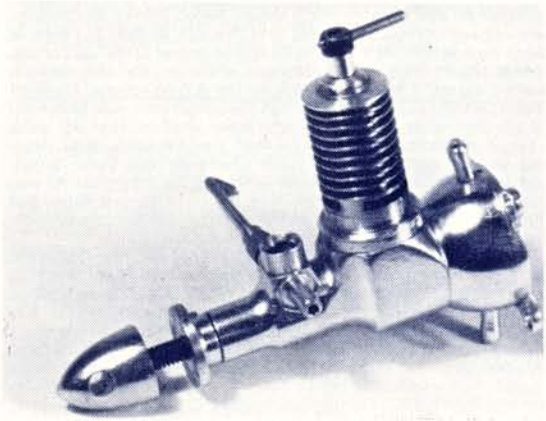
manufactured to facilitate easy removal of cylinder head and cylinder. The one for the cylinder took the form of a 'C' spanner. Don't make the hook long enough to pass through exhaust ports or damage to bore may result.

Always wash the moving parts in clean petrol, not paraffin before assembly, finally wiping the bore and piston with a clean tissue. I have found that after dismantling the cylinder and handling the piston with apparently moderately clean hands, that if this is not done followed by a spot of thin oil, the piston can be felt to 'grind' slightly as it enters.

Mark the piston with a scriber on the crown and always fit into the cylinder the same way round. The tool for forming the exhausts ports was turned from tool steel rather in the shape of a nail with a large head. The head was then machined away barely encroaching on the shank until the end view resembled a half disc. Cutting clearances were filed and after hardening a final touch on a tool grinder gave the finished cutting edge.

Materials used were as follows: Crankcase, cylinder base, con-rod, tank fuel connectors, cylinder head and all other dual parts were all made from round dural stock bar of a fairly high tensile content such as L 65. Cylinder was high tensile steel. The present one is of unhardened S96, but I have also used with success S2, Silver Steel hardened and tempered to dark straw over a bunsen. A high tensile bolt would also be suitable. This also applies to crankshaft. The current one is made from an Allen cap screw, but it is extremely tough to machine. A similar one made from silver steel in a soft state performs equally well. Gudgeon pin is Silver Steel hardened tempered to light straw colour. Piston and contra piston must be made from a close grained high quality cast iron, ideally Mehanite or other similar material. The main bearing of my motor is also made of this material. The cylinder base, fuel tank sealing disc and fuel connectors are all cemented in place with Araldite epoxy resin metal to metal adhesive of the two shot variety.

Whenever possible, always use the lathe indexes for measuring off distances unless you have precision equipment of a better nature, for example, when drilling the con-rod ends at the correct centres. The special fixtures and jigs mentioned in the subsequent stages are designated with a number to avoid confusion. I would suggest that when making Fixture No. 1 that you mount it on a flat and parallel base, say a ¼ parallel strip, so that later on in the machining you can easily remount it after removal at the correct centre line relative to the lathe. Squareness is also essential. When in this position use



the lathe to drill and ream the location hole in it. This saves a lot of 'juggling' later on, and remember while making the motor, that *near enough is not good enough.* After all, you'll be manufacturing what could almost be termed a quite precise bit of machinery!

I do not wish for a moment to pretend that everything in the motor is easy to make, especially for the type of person who is temperamentally unsuited for meticulous attention to detail. But if you have patience and can work to fine limits, you shouldn't experience too much difficulty. Lapping paste used for the removal of the last thou' or so from bores, should be very fine, working down from grades around 400 progressing to grades around 800 and finishing off with metal polish.

If I had to do it all again I would change only one thing. The cylinder base would be an integral part of the crankcase. But I started out with an entirely different type of cylinder in mind and so I was 'stuck' with it, the Araldite has done its job well!

Next month we'll start the machining operations.

Topsy Contest '69

Generous prizes for winners in classes for Power, Workmanship, Individually constructed or made as School projects. Details next month.

CLUB NEWS

THE MODEL PLANE is a long time in the making, and a short time in the breaking. Thus the test flying of a newly-built model is certain to be a heart in mouth affair, but a satisfactory outcome makes all worth while, and if you do have a spot of wreckage to dispose of, the lessons learned will have their value, though you are not likely to appreciate this at the time. These thoughts are inspired by the thought of trying out a new radio glider. Press, press-release-press. . . .

One way to hang on to your models is by the well-tried two-wire method. Exponents of this captive form of control are the very C/L conscious members of the **Dewsbury M.A.C.** (Bradford). Much activity reported from Sands Lane flying field, where club comps. for Stunt, Combat and Rat Race were held. But not so much sand as bog down the lane, it seems, as the Rat Race had to be a hand launched affair. The immediate club ambition is to broaden the contest scope by getting on competitive terms with neighbouring clubs. Any club with a handle to its name that would like a get-together with the Dewsbury boys, should contact the Secretary, B. Benson, 5 Edge Lane, Thornhill, Dewsbury.

Aching for those broad acres, the **Leicester M.A.C.**, is still on the look-out for one of those much valued curios, known to connoisseurs of such things, as a flying field. No luck to date, but there is every confidence that a bargain lot will be picked up by the coming season. Apart from the liebensraum situation, the club wears a healthy aspect, if we are to judge by the A.G.M. reports. Plenty of contest activity during 1968, though the programme was blown off course somewhat by all that gusty, rusty weather. Even so, quite a range of events was held, with such way out contests as Jetex and Vintage getting support. Club Champion was Derek Sirrall, and Junior Champion, Gary Player (a chip off the old green). Ah yes, the sad loss of Saddington also took its toll of contest dates. But through it all the club bulletin made its monthly appearance, although the new postal rates add to the burden.

Analysis in the **R.A.F.M.A.A.** Newsletter of the Inter-Command Championships 1968, reveals a slight drop in Free Flight, a strong revival in C/L, and a steady increase in R/C. Statistics were based on pre-entry figures rather than field participation, as the off-putting weather was of that particular 1968 vintage which made many a good intention miscarry. Intentions that were satisfactorily resolved, however, were the successful entries in the civvy street contest field, particularly Flt.-Lt. Knight's R/C Thermal Soaring win, and the high placings at the East Anglian C/L Rally. Of interest to us civilian flyers is the decision of the R.A.F. Sports Board not, repeat not, to admit civilians to full membership of the Association. The decision has been made on the grounds of legal and insurance difficulties, and was not influenced by any service rigidity. In fact the signs are that civilians will be able to operate within Service clubs, subject to the permission of the Station Commander and the proviso that the honorary member is a fully insured S.M.A.E. member. This could well open up welcome facilities for the responsible enthusiast. Just a back reference to the Inter-Command Champs. In the concours event, Chief Tech. Hadland entered a Wakefield, with, of all things, a metal fuselage. Remember that old fashioned stuff called balsa wood?

Full of native cunning, the model flyer, when fighting for his survival. Report in the **Fylde R.C.M.S.'s** 'Relay', to the effect that a 'new flying field' demo given before the Mayor and Corporation was prepared so to give the august audience the most favourable of impressions. The model flown was equipped with a super, pin-dropping, highly secret silencer, and operated at a safe, sounds-away distance downwind. The report perhaps exaggerates when it says you could hear the fuel slopping about in the tank, but the municipal luminaries were suitably impressed, and it was roses and red carpets all the way to the Town Hall. Let us hope, however, that the exemplar of quietitude, Tony Lewis's well muffled Merco 61, sets a standard for all to follow, so that the club and silence reign long on the council patch.

A club very much on the way up is the **Market Harb'ro M.A.C.**, with an absolutely rocketing membership, which now stands, or rather runs, at an octegenarian 81. Plenty of projects going on to keep the vast brood in good fettle, and club nights tend to get a bit hectic with three to four such projects on at one and the same time. Most successful are the Beginners' sessions; six seniors have already produced completed models, and nine juniors are at grips with the A.P.S. Aiglet Glider. But such progressive news must be tempered with the story of a set back. The club has lost the use of Clipston flying field, and for a reason that must be unique in the history of model abusage: the model flying has been disturbing the hares! Seems the shooting club pays more for the privilege of using the field than it can afford, and the owner reluctantly etc. Talk about splitting hares! Four displays were put on in 1968, but the hoped-for R/C demo at the Cricket Club Fete was knocked for six by the high winds, although the C/L boys put their best bat wings forward as usual. The club Min-rally, held at Shangton Field back in October, proved to be not so mini as planned. No high skirted girls turned up, but seven clubs did. Northampton won all but two or the seven events, which suggests that the M.H. boys should get their talent scouts working on that 81 membership. To end with a bang rather than a whimper, member Vince Redfern put in a full multi-type performance with his S/C Bazz-Bomb, but the fact of a skipping escapement and a pair of glazed eyes suggested something of an involuntary element.

A new club to the fold, or should I say herd? is the **Herefordshire Model Club**. Trouble though is that they have no pasture of their own, although green meadows abound in plenty. However, it is hoped that the odd prize herd or two will be asked to shift over a bit, and the club gentry will be landed for the coming season. Pro tem some accommodation was made by the C.O. of R.A.F., Credenhall in offering the field for the club 'Button-Control Spot Landing Competition'. Tempting prizes of an R.C.P. Radio and several Radio model kits brought in competitors from Kidderminster, Worcester, and as far afield as Cornwall. Good nurgling was had by all, with local modellers getting prizes of Bulmers Cider. So, if you've a thirst for model flying, get in touch with gaffer, K. L. James, P.R.O., 48 Ryeland Street, Hereford. Phone OHE2 5302.

Sounds rather fearsome: an alliance between the **Glasgow Hornets** and the **Vikings**, but the merger has now got the go-ahead from the Hornets Committee. The Vikings, for information, are a Radio group and will retain their distinctive identity within the alliance. This follows something of a shake-up in the Hornets' affairs, which haven't been quite as rosy of late as they have in the past. One persisting trouble is the lack of a flying field, but it is hoped to obtain the use of the Sports Ground at Cowglen, presumably for C/L and Radio. However, Bishopbriggs is available for R/C on a fee-paying basis. Let's hope that the Hornets/Vikings have a bright future to look forward to.

'Seadog', the newsletter of the **South East Area**, once again draws attention to the apathetic attitude of modellers generally to the S.M.A.E. and the vital role it plays in the model movement. Too many, it seems, are prepared to sit back and let the other bloke drive. Trouble is, the service looks like running out of chauffeurs unless the lesson can be driven home to the rank and file. But why the apathy? There must be a reason, or number of same, but I have yet to come across a convincing thesis. Referring to the Radio Rally held by the Sevenoaks club at Westerham back in September, mention is made of the tight car park squeeze, though model space was adequate. Odd tendency this in the Radio world. Models can now cope with most winds, and so need only minimal operating space. Thus the modern requirement is not so much for flying area, but for spectator and car parking room. Note of warning. Power Duration models can be just as dangerous as the rampant radio breed. At the Trials, Dave Welch's model took a violent dislike to Jack Allen's caravan, and sought to demolish same. Moral: be careful where you rest your caravan. Incidentally, did you read that folksy bit in the tabloid press about a wayward model plane crashing through Fred's bathroom window and giving him a close shave? Report from John Wingate, the R/C Comp. Secretary, gives Brian Burt as Area Multi Champion for 1968. He also tells of two meetings being planned for the coming season. One an all-Pylon affair, including Goodyear, Open, Bi-plane, Scale and Novelty, and the other a Thermal Soaring event perhaps later in the year.

The Newsletter of the **Buckaneers** Model Club contains an end of the year report from the Secretary, D. Giles. Apparently, 1968 was a good year competitively, with the old piratical flag flying high at a great number of meetings. This was paralleled by a membership boom, which some suggest is due to all those inviting flying facilities of which the Buckaneers boast. A view that the Secretary would readily have subscribed to if the said facilities had been utilised pro rata to the membership increase ('where is everybody'?, as the little ostrich cried, seeing the others with their heads in the sand.) Mr. Giles, however, is very much a presence on the field, particularly for that neck stiffening pastime known as R/C judging. His only complaint is of the number of collar backs he wears out, but perhaps he should try a 'roll' necked sweater. Incidentally, he absolutely refutes any suggestion of bias on the part of Trade connected judges. He deems them to be completely impartial. He is obviously right.

Unlike the previous club, **Crawley** confesses that it has not been so well represented on the contest fields during the past season, but better participation is hoped for this year. By way of compensation the homestead is showing something of a boom, with well supported club nights and a steady influx of new members. Booming, too, in the quietest possible way, is indoor flying, the high standard of which – 2½ minute flights – is helping to attract adherents to the micro sport. Going Vintage in a big way, Jack Darby and helpers marched into Hazelwick School carrying the components of a giant, 1/9th Scale 'Dakota'. This huge model was constructed by the late Fred Borders, way back in that truly vintage modelling year of 1949. It was to be powered by two Forster 99 spark-ignition engines, having two speed control. This two speed was to be linked to two radio receivers, and the engine speed variation thus achieved would provide a form of directional control. Would it have worked? Anyway, the model was taxied but never flown. Span is 10 ft. 11 in., and length is 7ft. 8 in. But what now to do with such a magnificent relic of yesteryear? Suggestion is that, with 1968 knowhow, it could be got into an airborne state. What about it forming the nucleus of a model museum?

A very serious and disturbing situation is revealed in 'The Circuit', the newsletter of the **Elliott Model Eng. Club.** There would appear to be a forceful campaign being waged against model flying in the Medway towns area by the local councils. The newsletter suggests that the desire to stifle model flying in the district far outweighs any possible nuisance factor involved, and that the authorities concerned are acting on the inspiration of a militant few trouble seekers rather than on the general attitude of the public towards model flying, which is one of tolerance of interest. One council, Gillingham, is seeking permission to introduce a bye-law to ban model flying in most of the flyable spaces in its precincts. This would impose a maximum fine of £20 for a contravention. Sad and bad, we say. But how did the situation arise? On this evidence the Council's action does seem unduly harsh, but we do not know quite what pressures it has been subjected to, nor the nature, and frequency, of the incidents and complaints which have given rise to the severe measures. Surely, though, this is a situation where the S.M.A.E. might be asked to intervene, and the model flyers affected do not have to stand helplessly by whilst their fate is decided. Letters, stating their case, can be sent to the Home Secretary, whose office in the past has quashed unjustified model bans, and also to the local Member of Parliament, who might also be prepared to act on behalf of the model flyers. We must, at the same time, realise that, in our crowded, space-starved island, the trend towards faster and noisier models must, and will, have repercussions; we can only safeguard our interests by getting on terms with the councils and local authorities, but this must be done before complaints reach an actionable level.

Going very much northward, from the beleaguered South East to the more openly optimistic environs of **Thirsk & D.M.A.C.** Though long established, the club has been revitalised by the acquisition of a fine clubroom in Thirsk, where fortnightly meetings are held. The club has 20 members strung out over a wide area between Harrogate and Teaside. Interest centres mainly on guess what? Yes, R/C, with slope soaring as a popular byline. Well equipped, too, this small club; not less than five members are flying proportional with varying degrees of success. Something of a blow to the club is the Secretary going absent to learn to fly the full-size stuff. They can only hope he'll come down to earth sometime. New members invited. Apply to John Grange Newsham Grange, Newsham, Thirsk, Yorks.

Still up North we have news of a new club based on Newcastle and Gateshead. It is known as the **Tyneside Valley M.A.C.** and embraces Northumberland and Durham. Seems these wide ranging clubs are all the rage these days, far different from my modelling infancy when you had the choice of three clubs within walking distance. Anyway, the club has the use of Newcastle Town Moor, where Radio modellers are welcome every Sunday. It also has the use of Gladstone Community Centre, Gateshead, for meetings. The Secretary suggests that the new club should fill the vacuum that exists at present between England and Scotland. New members are asked to contact B. Grant, Secretary, 111 Fulwell Road, Fulwell, Sunderland, Co. Durham.

A young lady complains to the **Belfast M.F.C.,** Newsletter that she doesn't get the respect in Aeromodelling circles she feels a lady is entitled to. Truly the flying field flapper of today is the grass widow of to-morrow, but can we make life more tolerable for our ladies in waiting? Having lived with this problem for umpteen number of years, I for one, have no answer. Flying field troubles. The club has ruled out R/C flying at Sydenham because of possible damage to airfield property. As f/f is restricted to specified times, this leaves Sydenham mainly a C/L amenity. However, Bishopscourt and Hightown are available for R/C. A suggested extension of Vintage is Post Vintage Thorobred events. This updates the breed to a mere 10 historic years. But has anything changed in the past 10 years apart from improved R/C equipment?

Space is not quite so much at a premium in sunny South Africa as it is over here. Level out a few anthills and you have your own private flying field, which you might share with an odd gnu or two, but otherwise the sky's the limit. Anyway, according to Tarmac Torqu, the Newsletter of the **Rand M.A.C.,** a S.A. Radio group has a 10-year lease on a 12-acre site, and is now contemplating laying a 300 ft. by 30 ft. runway. Reason for the concrete is more to provide a dust proof area than a super take-off srrip.

I'll be taking off myself, now. See you next month.

CLUBMAN

Contest Calendar

February 9th	"Crookham Winter Gala" Open Rubber/ Glider/Power ½A Power, Venue Chobham Common.
March 16th	St. Albans R/C Thermal Soaring Rally (Gliders only) Nomansland.
April 6/7th	Sheffield R/C Glider Scale, plus Magnet and Free Flight, details P. Scaife, 44 Todwick Road, Sheffield 8. Send 9" x 6" S.A.E..
October 5th	Performance Kits Sports Rally, Old Warden.

RICHMOND WINTER GALA CONTEST

Chobham Common, November 10th

ARMISTICE SUNDAY has always been calm and this year was no exception. F.A.I. was the experimental target this year with 3 x 3's followed immediately by a progressive fly-off. In the nearly neutral conditions this worked well, Jack North maxed out in Wakefield then did 3:15 going for 4:00. John West and Pete Buskell went for 5:00 late in the day, John pipping Pete by a few seconds, in F.A.I. Power. The two models were very well matched, John just had the edge on the climb while Pete's glide looked just that much better. Doubling up, Pete used his five minute round to win open power.

A precision event – 1 model, marked and to be produced at the end of the comp., total time of three flights. no max – was poorly supported. Ken Smith doubling up his rubber flights, was the clear winner.

Jack and Kathy Allan had the hardest luck of the day. Jack's Dixielander climbed highest in the power fly-off only to go O.O.S. in an odd patch of mist. Kathy's motor 'blew-up' in the rubber fly-off and put paid to her chances.

F.A.I. Power—1, J. West (Brighton) 9+4+4:22; 2, P. Buskell (Surbiton) 9+4+4:12; 3, R. Johnson St. Albans) 9+3:08. **F.A.I. Glider**—1, J. Mabey (Croydon) 8:58; 2. M. Coombs (E. Grinstead) 8:57); 3, A. Young (Croydon) 8:40. **F.A.I. Rubber** (*Wakefield*)—1, J. North (Croydon) 9+3:15; 2, J. Blount (Croydon) 8:55; 3, A. Wells (Norwich) 8:52. **Open Power**—1, P. Buskell (Surbiton) 9+4:12; 2, G. Fuller (St. Albans) 9+4:10; 3, J. Allan (Brighton) 9+3:56. **Open Rubber**—1, D. Hipperson (Croydon) 9+6:33; 2, B. Rowe (St. Albans) 9+5:07; 3, L. Burrows (Blackheath) 9+4:17. **Open Glider**—1, J. Baguley (Hayes) 8:35; 2, C. Morris (St. Albans) 8:13; 3, N. Clark (Sperry) 8:13. **Coupe d'Hiver**—B. Honan (Richmond) 4:12. **A/1** R. Kenward (Croydon); **Chuck Glider** A. Slater (Leatherhead).

St. Albans Winter Gala, Chobham, October 27th

Rally clashed with this event, thus the north country contingent was absent. Nevertheless, an enjoyable day's flying was had by all in calm weather and patchy lift with the result that retrieving was easy (if Chobham can ever be described as easy) and no one returning 'full house'.

All-in F.A.I. (5 flights) 21 entries. 1, J. Baguley (Hayes) 14:55; 2, J. Mabey (Croydon) 14:01; 3, C. Batty (Bath) 13:39. **A/1 Glider** (16 entries). 1, J. Punter (Hayes) 7:12; 2, C. Morris (St. Albans) 6:58; 3, R. Bailey (St. Albans) 6:18. **Coupe d'Hiver** (10 entries). 1, D. Hipperson (Croydon) 5:25; 2, C. Hadland (R.A.F.M.A.A.) 5:22; 3, A. Crisp (Croydon) 4:17.

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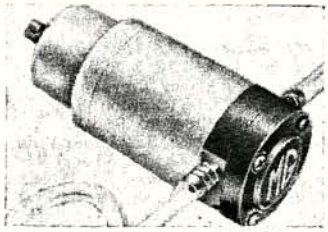

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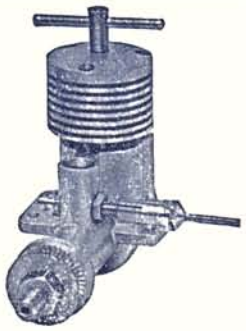

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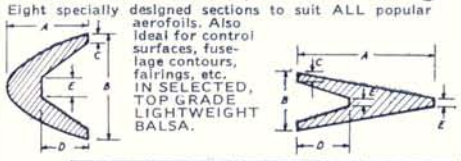

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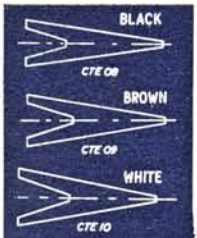

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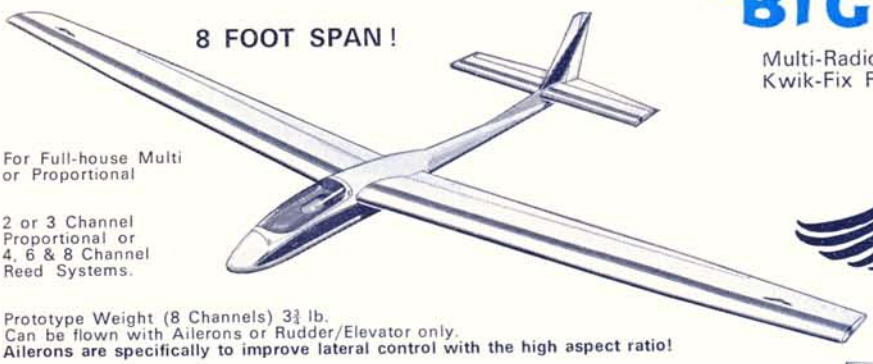

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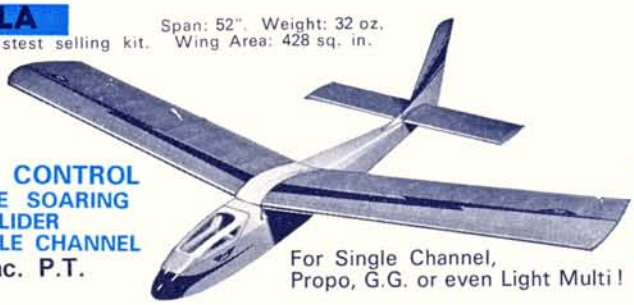

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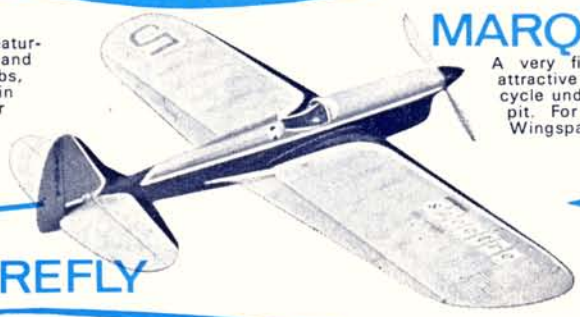

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