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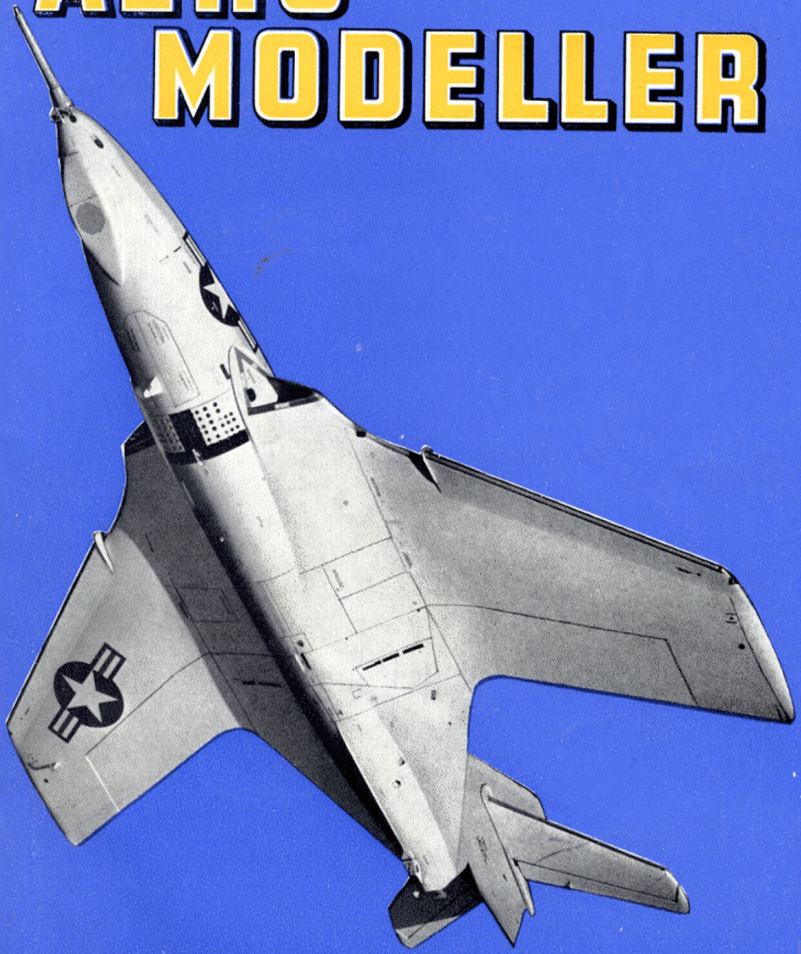
APRIL 1957



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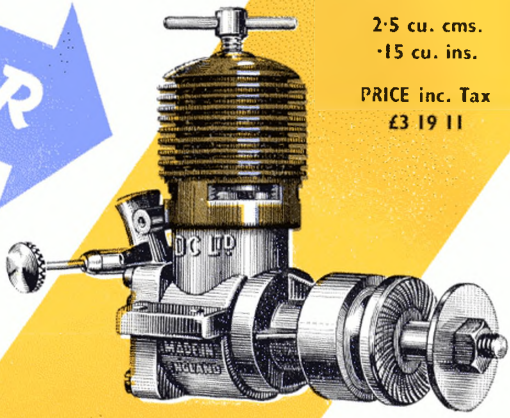

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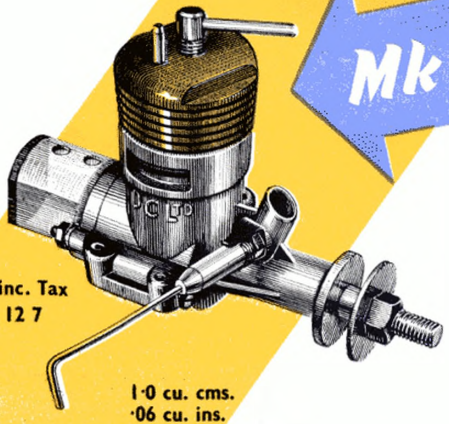

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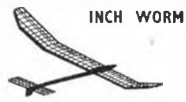

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AERO MODELLER

"Covers the world of Aeromodelling"

VOLUME XXII
NUMBER 255
APRIL 1957

Managing Editor — C. S. RUSHBROOKE
Editor — H. G. HUNDLEBY
Assistant Editor — R. G. MOULTON

★

Special features

★

Regular features

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

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Towards Radio Control Progress

THE ADVANCE IN radio control activity and technology in the United States these past two years has been little short of prodigious. A high living standard permits greater spending power for the interested modeller, and a large modelling population provides economic support for between 20 and 30 manufacturers producing an infinite variety of equipment on at least three frequencies. These factors coupled with the temperate climate, particularly on the Californian coast of America where activity seems greatest, are bringing forth a wealth of designs and ideas.

Readers may well ask why radio control flying in this country, which was away to such a promising start in the early '50's should have fallen so much in the doldrums this last few years. The answer is, of course, that most of America's advantages simply do not apply over here. Our inclement weather permits only a modicum of flying hours even in the summer, and there are at present only two concerns manufacturing radio control equipment, both, we imagine, on a minute profit margin.

In the past unreliable commercial equipment may have deterred many enthusiasts who found this particular aspect of aero-modelling could be a costly business, but this is certainly not the case today.

Economics seem to be the major factor governing the radio control situation in Great Britain, and this aspect has undoubtedly resulted in a great number of enthusiasts building their own equipment. This is definitely borne out by the volume of our reader query service which deals with numerous letters daily on the subject of radio control. We also know that several thousand AEROMODELLER receivers and transmitters have been *built*, not forgetting recent items such as the Hill 2 valve set.

With the advent of transistors there is hope in the immediate future of even better equipment of fractional size and weight with far greater reliability and AEROMODELLER intends providing the British radio enthusiast with fully constructional information at the earliest possible date. We also intend bringing our readers the latest details of American developments and hope by this means to stimulate increased interest in this fascinating branch of aeromodelling in the home country.

In this issue we make a start with plans of "*Smog Hog*" (Howard Bonner's successful aerobatic model that took top honours at the last American Nationals) and trust that the accompanying article which shows that extensive aerobatics are commonplace, even at local Club meetings in America, will inspire British radio enthusiasts to greater efforts.

One factor that cannot be over-emphasised, particularly to the home constructor of radio equipment, is the high standard of workmanship required to ensure successful and trouble-free operation. A radio control outfit can be likened to a chain, being only as strong as its weakest link, and undoubtedly there have been too many "weak links" in the past. Infinite care must be taken, particularly with soldering which is the item most commonly at fault, and it is our considered opinion that people who are not prepared to make a first-class job of their radio-controlled model aircraft should leave this branch of model flying severely alone.

On the cover . . .

SHOWING IT'S off-white underbelly, a Grumman F9F-8 Cougar fitted with flight refuelling nose probe soars upwards on test from its Bethpage, Long Island, factory. Large area flaps and absence of ailerons are prominent features of this striking photograph, which will add useful modellers using the article on pages 210-211 for a true-scale replica.

Heard at the Hangar Doors

Philip Wills flying his Slingsby "SKY" over Lasham for the benefit of Charles E. Brown's camera

Gliding Holidays

If you have not already fixed your annual holidays, we thoroughly advise all aeromodellers to firmly consider a gliding holiday at any of the eight gliding courses which will be run in 1957 (see page 223). Tuition is given by qualified instructors in dual controlled gliders, either the Slingsby T.31 or T.21 and given good weather, an apt pupil may achieve sufficient skill after about 40 two-minute circuits to fly solo in the Tutor single seater and qualify for a gliding certificate with A and B endorsements. Gliding is very closely allied to aeromodelling and without exception, all of the gliding clubs have told us that a large number of modellers attend their annual course and always make full use of their aeromodelling experience to speed up their tuition, particularly during the lecture stages when theory of flight is explained.

Prices are extremely reasonable, ranging from 11-17 gns. (all-inclusive) according to the actual site, duration of the course and time of the year. The season at Lasham is open now with a full programme right through to December 21st, whilst the majority of other gliding clubs arrange their courses from May to September.

If you have the slightest inkling to want to fly full-size, then we suggest that you write straight-away to the club which takes your fancy.

Incidentally, one of the latest additions to the A.P.S. solid scale plans range of accurate drawings is number 2682 "*R.A.F. Training Gliders*" which includes a series of 1/144th scale drawings of the types of glider used on the above courses and is sold as an "N" type plan, price 1/-.

Have YOU seen this Trophy ?

See paragraph on right

Save Those Copies!

January, February and March issues of this year's volume of AEROMODELLER are completely sold out, and we regret that we are unable to meet requests for back numbers. Readers are advised to hang on to their copies which are sure to be in demand later in the year when volumes are being made up for binding.

Wayward Creep

D. C. Barber of Southport, Lancs., launched his Oliver Tiger powered A.P.S. *Creep* at the Club flying ground on Southport Beach, but a combined timer and dethermaliser failure caused a flyaway with the model out of sight at a terrific height. It was heading across the Ribble Estuary and Mr. Barber had high hopes of being able to retrieve his model if it landed on the mud banks and became washed up at high tide. One can imagine his pleasure and surprise when he was notified by postcard that the model actually landed in the Dockyard in Barrow-in-Furness, 53 miles away. The model hit one of the cranes and was damaged, the engine falling into the sea. But fate was kind to Mr. Barber for the cranedriver's son managed to recover the engine at low tide. Lucky man!

"The bells are ringing . . . . "

Word reaches us that Carl Wheeley, technical advisor to the American Academy of Model Aeronautics, and winner of the 1954 World Power Championships, married Miss Martha Cornelia Lyon of Arlington, Virginia, on December 22nd last. Here's hoping that the new Mrs. Wheeley has a tolerant outlook on aeromodelling, and that Carl will be able to impregnate the carpets with balsa dust without hindrance!

Lost, Stolen, or Strayed

In a final effort to trace the missing S.M.A.E. "Whitney Straight Trophy", we publish herewith a photograph of the missing silverware in the hopes that someone will now recognise what they are looking for. This magnificent trophy, awarded annually to the Champion Area, was not forth-coming at the annual recall for re-distribution, and the Society asks that anyone having information of the whereabouts of this important trophy will

immediately contact us or the Secretary in order to effect recovery without further delay.

Great Honour

For his meritorious achievements in speed flying, including two World Records and three British record speeds, Ray Gibbs has been awarded the Royal Aero Club Bronze Medal for 1956.

This is the first time that the Royal Aero Club award has been made to a modeller and in fact this medal has only been awarded eight times since its inception in 1913. Congratulations are due to Ray Gibbs on his achievement which has brought more official attention to our hobby than any other single effort over the past years.

More on Plastics

Following our feature last month, we have had a number of letters suggesting various methods of painting plastic models, among them one from Mr. W. J. Dorrington of Brighton, who disagrees with us on the subject of painting with silver. Like ourselves, he does not like the flow-lines in some models, and invested in a *Celspray* and found that provided the surface was first rubbed down with finest "0" grade paper and using the paint water-thin, 3-4 coats result in an extremely neat effect, and he sent along some photos to prove his point.

Whilst on the subject of plastics, we quote verbatim a letter received from reader Antonio V. Alvarado of Havana:

"I applaud the stand of the AEROMODELLER on the new plastic solids, available here since '49 or '50. U.S. model mags. have taken the 'maybe if we ignore them they'll go away' attitude. Speaking for myself, I can say these plastics have broadened my interest in full scale aircraft, even though I have been building models since 1938, and have also improved my workmanship on flying models. Most of my models are on display at the Hobby centre in downtown Havana, for there they are safer from my 15 months' old daughter. All are painted in their correct colour schemes whenever possible, but with no extra details added, to avoid customer complaints. That is, except for the camouflage, they are built according to manufacturer's instructions."

As stated in our February editorial, we consider plastic kits a part of the general theme of aero-modelling, and feel they will eventually introduce many newcomers to more advanced phases of the hobby. All the more reason for encouraging them.

Triplane Gen

Since the appearance of the Fokker Dr.1 article in March issue the following information has been made known to contributor Peter Gray through the good offices of Mr. J. M. Bruce.

"Many more than 150 Fokker Dr.1s were built. The maximum number in service at any one time was 171 and that was in June, 1918. By October, 1918, 637 of all types of triplane (*i.e.*, including those made by other firms—experimental prototypes, etc.) had been delivered. As the only other triplane to go into (limited) production was the Pfalz Dr.1, that means that about 600 Fokker Dr.1s must have been built.

The interplane struts, contrary to popular legend, fulfilled a necessary function, for without them the wings vibrated badly. Gontermann's machine in which he met his death was No. 115/17".

Light-fingered Gentry

Sunday, February 3rd was an ominous day for G. Robertson of Dundee when he had his workshop entered and approximately £50 worth of aero-modelling equipment stolen. Among the missing items were a Webra Mach 1, Oliver Tiger, E.D. Racer, O.S. 15 plus one Rowell 10 c.c. racing engine. Since the latter is somewhat of a *Rara Avis* we suggest that any suspicious offers of such an engine be immediately notified to us, when we will place the information into the correct hands.

Solid Contest

Manufacturers of *Newmark* watches, Louis Newmark Ltd., organised a model making competition in conjunction with the Schoolboys' Own Exhibition. In the photo below, mounted high on the stand is Louis Newmark's own semi-scale Hunter (minus tailplane) which is used to demonstrate gyroscopic instruments manufactured by this company. Flt.-Lt. Steele is seen presenting prize winner Graham Probst with a specially engraved wristlet watch for his efforts with a solid model of the Follan I Gnat.

SMOG HOG

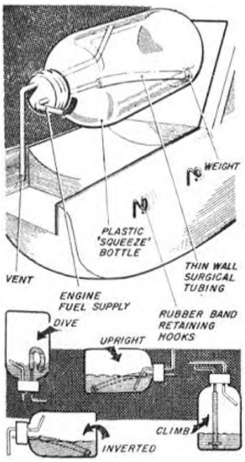
Howard Bonner's successful aerobatic multi-controlled radio model for 3·5 c.c. to 6 c.c. motors described by Robert E. Bowen

Left: Maestro Bonner, complete with broad grin and Smog Hog, snapped at Dallas, scene of the 1956 Nationals

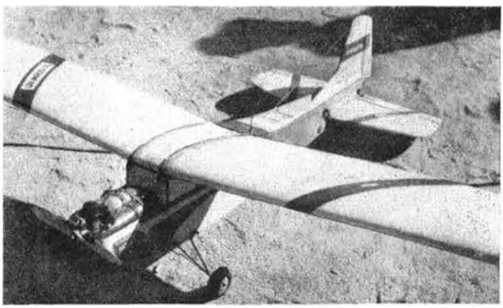
FROM SUNNY CALIFORNIA, land of perpetual flying weather, we have the latest news and views of American radio control activity. Let us start with a brief description, including basic building instructions of Howard Bonner's "Smog Hog". Designed for ease of construction and good flight characteristics, it utilises Grant's theories of lateral area, has a light wing loading and first made its appearance in the Spring of 1956. Since then the model has built up a terrific reputation, winning five first places and one second place including the 1956 American National Championship and the Californian State Meet. In this latter event it was the first R/C model to score over 200 points which it has been topping consistently ever since. All of this would not have been possible without a first rate pilot and dependable radio equipment. Howard Bonner believes in plenty of practice and during the 1956 season used C.G. Electronics 5 channel equipment with Bonner servo motors for rudder and elevator controls and presumably a Bonner Motor Control Unit for engine control. We have shown this type of installation on our drawing as it will also be quite suitable for E. D. Reed equipment with motorised servos, but also show amendments for those people who would like to start off with rudder only.

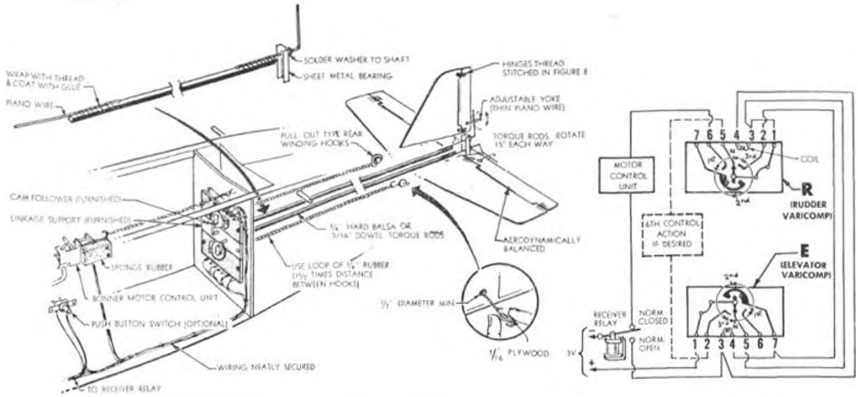
Systems such as Bonner's own "VariComp" illustrated opposite can also be used successfully, it is, however, essential to balance the control surfaces aerodynamically so that there is not too much load on the escapements. Our American friends do this by means of a "speeding nuto", presumably of the open type!

Bob Bowen tells us that "Smog Hog" ground handling is just like a full size kite, with Howard Bonner taxiing it out to the line, applying the tailwheel brake to bring the model to a halt before opening up to full throttle for take-off. In the air it performs snap rolls, spins, inverted flight, loops inside and out, Cuban 8's and feather-like



Close-up of model below shows fuel tank installation described diagrammatically on left. Span is 74½ inches, wing area 6 sq. ft., and all up weight 5½ lb.



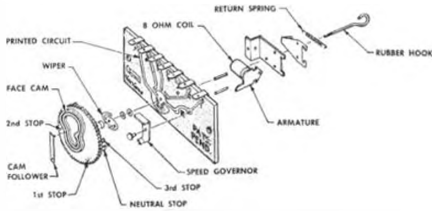


touch-and-go's. A version using a single channel Deltron receiver and Bonner "VariComps" cascaded, won a recent "Larks" Club contest, one of the great features of the design being its hand-off recovery characteristics. If you get confused or do the wrong thing in the middle of a manoeuvre, merely return all controls to neutral and the model will recover itself.

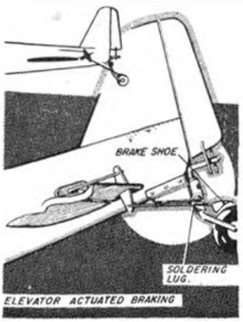
The latest ideas for easy maintenance are incorporated, such as the two-wheel knock-off landing gear and the expendable engine mounting plate that permits quick engine changes, or will break in a crash without damaging the engine or fuselage. The fuel tank scheme is strictly practical using a clear 4 ounce plastic bottle held by bands, as shown in our sketch, which permits easy filling and a visual fuel supply.

General construction is quite straightforward, the fuselage being the conventional strong box type with sheet balsa sides, top and bottom. Parallel sides aid considerably in squaring up the fuselage during the initial stages of assembly and great care should be taken when aligning the noseblocks and F.1 to result in a 0 degree thrustline.

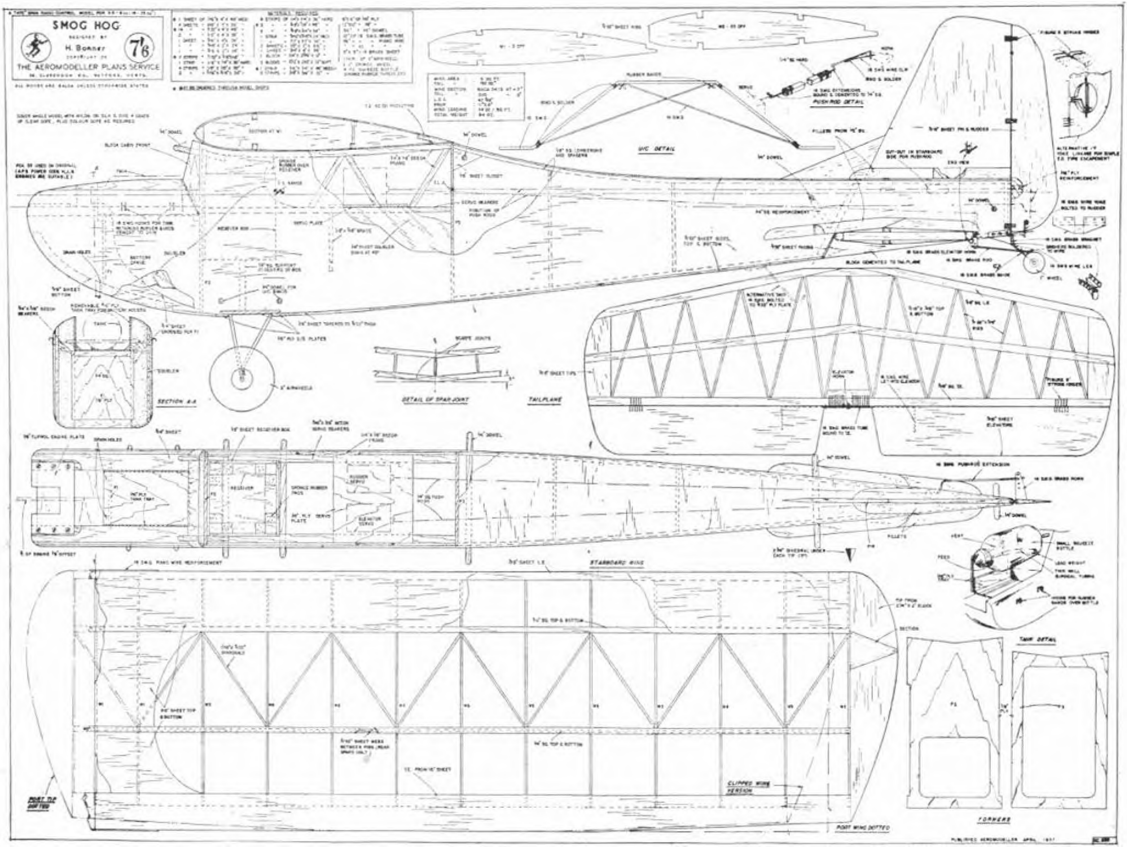
Remember to instal and line up the various control rods before planking the top and bottom of fuselage



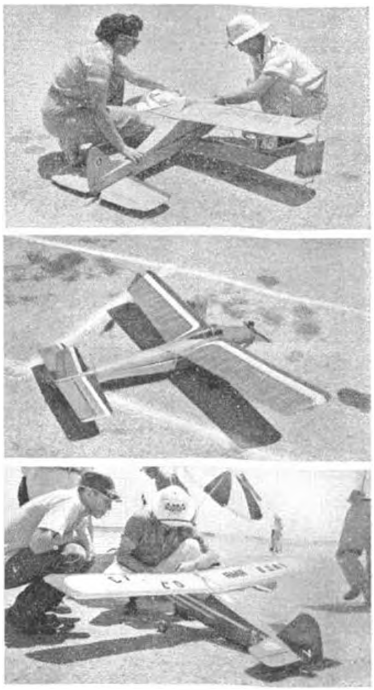
Installation of two Bonner VariComps to provide rudder and elevator control from a single channel outfit is shown above. This also permits engine control and a further control if required. Keying system is: "Right", hold; "Left", press hold; "Up", press press hold; "Down", press press press hold. For motor control the button is tapped quickly. No signal gives "Neutral" of course. Recommended scheme is to start with rudder only with one Vari Comp and progress to two or more cascaded as experience grows. Exploded drawing above, shows general construction, printed circuits are used and the face cam wheel is of nylon with the steps on the side nearest the panel. We rigged up samples sent as per photo below. This clearly shows cam followers which are soldered to torque rods that provide link to controls



Sketch on left shows alternative system for elevator crank operated tailwheel brake, whilst centre photo details close-up of assembly on Bonner's own model



Of interest to readers will be other "Larks" members. Top is, Ray Downs with Mrs. Downs assisting and smart R/C Bipe. Centre, is Dale Root's "Ascender", which has semi-symmetrical wing and a fast flying speed. Uses Babcock 3-channel tone filter radio and a Torp 35. Bottom: Dean Kenny, President of the "Larks" starts up at the 1956 Nationals where he placed 4th in R/C Multi.



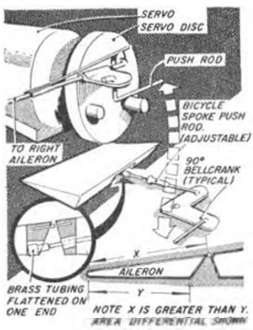
aft of F3 which will necessitate temporarily fitting the servo motors. Fuselage is nylon covered for strength and both the battery and receiver compartments are well packed with sponge rubber in the usual way. The motor control escapement on Howard Bonner's original is mounted on the right side of the fuselage just behind the receiver box operating the throttle by means of a 16 s.w.g. push rod.

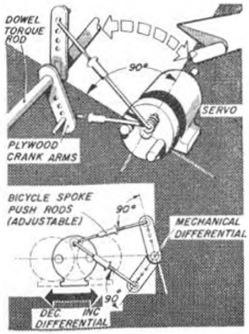
Wing construction is conventional although the absence of plywood dihedral braces may shock a few of the old hands. This is a case of "absence makes the wing grow stronger", for the lack of braces prevents shear stresses converging where the plywood finishes. Centre section strength is achieved by scarf splicing the spars. The top and bottom pieces of the front and rear spars should be spliced in opposite directions. If desired a conventional trailing edge can replace the one shown on the drawing, in which case it will be necessary to notch the spars and modify the rib section. You may, however, get the pucker that so often occurs with this type of joint which the somewhat unusual joint shown, tends to prevent. Shorter wing given as alternative on plan increases the flying speed but otherwise does not alter the flight characteristics.

Fin, rudder, tailplane and elevators should offer no difficulty to the average builder, the latter items are linked by 16 s.w.g. piano wire which has a brass control horn soldered to it and the hinges are fabricated from fairly stout twine for both elevators and the rudder.

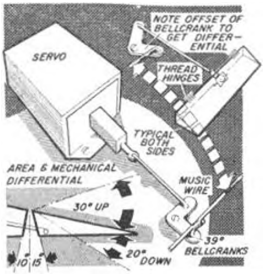
The model should balance within the C.G. range shown on the drawing and with the tailplane rigged at zero degrees the centre of the wing leading edge should be 7/16th inches above the centre of the trailing edge. This can be checked by setting the model up on a level surface with flying surfaces in position.

Bonner does not recommend hand gliding with a model of this size. His scheme for test flying is to use engine control to give moderate power for R.O.G. take-off after thoroughly checking all controls with engine running.





Three alternative differential elevator systems published in the "Larks" Newsletter should provide British multi enthusiasts with ideas



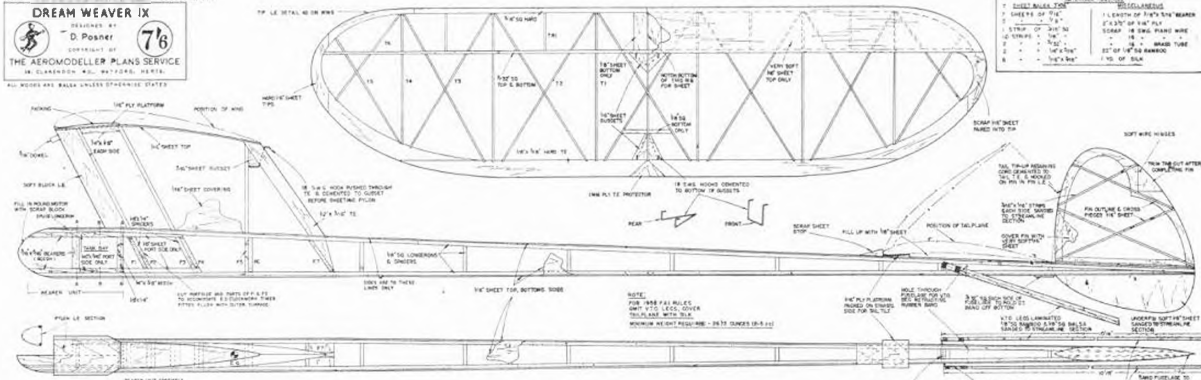
DREAM WEAVER IX

DESIGNED BY
D. Posner
COPYRIGHT BY
THE AERO MODELLER PLANS SERVICE
181 CLARENDON RD., WATFORD, HERTS.

7½

ALL WOODS ARE BALSA UNLESS OTHERWISE STATED

MATERIALS REQUIRED	
7 SHEET BALSA, 3/32"	MISCELLANEOUS
1 SHEET OF 1/16"	1 LENGTH OF 3/16"x 3/16" BEARER
1 STRIP OF 3/32" SQ	2'6"x 3/8" OF 1/16" PLY
10 STRIPS 1/16" x 1/16"	SCRAP 18 SWG MUSIC WIRE
2 " " 1/16" x 1/8"	18 "
2 " " 1/16" x 3/16"	2 " BRASS TUBE
2 " " 1/16" x 3/8"	22" OF 1/8" SQ BAMBOO
8 " " 1/16" x 1/2"	1 YD. OF SILK



DREAM WEAVER I was built in time for the 1954 Northern Heights Gala. This model was E.D. 2·46 powered, 400 square inch wing with straight ribs and cross-bracing, having a sheet fin on the tailplane. The model placed 2nd in the Open Power event and 4th on two flights in the Queen's Cup. The model never returned from the second flight. An identical model was built, powered with an Oliver Tiger and numbered II, whilst at the same time, III, a beam 2·49 Elfin model was built with a smaller 375 sq. in. wing. III was not fortunate and never returned from its only Comp., the first 1955 Eliminator.

This model was replaced with IV, powered by a Webra Mach I, the model being similar to III with the smaller wing but this was the first model of the series to have the fin behind the tailplane resulting in the present V.T.O. leg system. The 1955 Competition Season was flown off with II and IV, although an Oliver powered version of IV was built but was the only model of the series to end its career by hitting the deck and this after a first 4-minute Max. Comp. flight. No. II placed second at the Nationals, having d/t'd 8 seconds short of a 12-minute maximum. II and IV were used at the Trials and both were lost, II after the first maximum with a rather long fuse and IV when the fuse went out in the rain. Both were recovered and the following week, II repeated I's success by placing 2nd in the 1955 Northern Heights Gala. IV won the Power event at the Croydon Gala with 11 minutes and II and IV made 13 : 35 to help qualify for the '56 Trials. During the winter VI and VII were built for the '56 International events since II was showing the worse for wear. VI and VII were identical models and both Oliver powered with 400 sq. in. wings. Wing tips had been lengthened and the wings were fully "geodetic", this resulting in a lighter wing than the previous cross-braced versions and giving less twist. Moment arm was increased slightly and the tailplanes, also now fully "geodetic", were increased to 6¼" chord. Thick fins were fitted in place of the previous sheet which were liable to twist. The models proved to be much less erratic than their predecessors. For use in open events, the Webra in II was replaced with an AM.35 and the sheet fin replaced with a thick one. The small model coped easily with the increased power but lacked somewhat on the glide and this was partly cured in the year by replacing the 375 wing with the 400 wing from II. No. VII was lost at the Trials due to a d/t failure and took four months to return home, but VIII was built in a hurry to provide a reserve for the Championships. This model was Oliver powered and identical to VI and VIII save for the addition of two extra spars in the wing. Since there was still little time before the championships, I built a new wing with an increase in span giving 426 sq. ins. Section was slightly changed and so was the construction mainly with regard to spar arrangement and the numbers thereof. Due to trouble with tissue splitting on the standard wings when the models d/t'd, I decided to cover the wing with silk. The slight increase in weight appeared well worthwhile, and the wing was tried on VI which required practically no re-trimming.

Dave Posner's own development story of his fast climbing

Dream Weaver

The increased area seemed to give a better glide and did not slow the model very much on the climb. I considered matters very carefully and came to the conclusion that the silk wing was not liable to changes and that with its better glide the model would be more capable of a maximum time if something went wrong on the climb. I therefore decided to use VI, with the silk wing, which I numbered IX at the Cranfield Championships, and the model proved its worth by achieving five maximums at the championships and placed 2nd after the fly-off. As a matter of fact, all the flights were over 4 mins and apart from a 13·5 secs. motor run in the fly-off the motor runs were 13 secs. The model was flown in a 10-sec. Comp. and placed 1st but missed one maximum in the Halfax Trophy and placed 5th. Dream Weavers have been flown in competitions this year in places ranging from Chobham Common to Baildon Moor and have achieved 88·8 per cent. of the maximum possible time.

COMPLETE 1956 CONTEST RECORD

(resthout excuses)

Contest (rules)	*Time*	*Model*	*Position*
Astral Trophy ... (5 × 3 15 secs.)	12:12 ... VII ... (3 max. + 2:04, 2:08)	...	18th
Sir J. Shelley ... (3 × 4 15 secs.)	8:48 ... IV (AM) and VI ... (2 flights) 4:0 + 1:48)		38th
Trials ... (5 × 3 15 secs.)	11:58 ... VI and VII ... (3 max. + 1:41, 1:17)		5th
Kell Trophy ... (3 × 4 15 secs.)	8:44 ... IV (AM) ... (3:47, 1:23, 3:34)	...	22nd
Northern Heights ... (2 × 4 10 secs.)	4:24 ... IV (AM) ... (1:27, 2:57)	...	6th
Croydon Gala ... (3 × 4 15 secs.)	11:00 ... IV (AM and II wing) (3:42, 3:18, 4:0)		3rd
Championships ... (5 × 3 13 secs.)	13:00 + 4:52 IX ... (5 max.)	... ...	2nd
South Midland ... (3 × 3 10 secs.)	9:0 ... IV (AM and II wing) (3 max.)		1st
Northern Area ... (1 × 2 10 secs.)	14:35 ... IV (AM and II wing) (1:27, 1:36, 1:32)		2nd
Halfax Trophy ... (5 × 3 15 secs.)	14:35 ... IX ... (4 max. + 2:35)	... ...	5th
All Britain ... (3 × 3 10 secs.)	8:21 ... IX ... (2 max. + 2:21)	... ...	1st
Frog Senior ... (3 × 4 15 secs.)	10:09 ... VIII ... (2 max. + 2:09)	...	6th

Total maximum possible 136 minutes. Total flight time 116:46 (excluding fly-off). Number of flights 42. Average flight time 2:48.6. Average percentage 88.8 per cent. (all excluding sole fly-off).

Trimming

The model should fly right-right. The motor is mounted straight and glide turn obtained with tilt, the power turn being controlled with the trim tab which should be slightly left for the first flight on low power. A vertical spiral climb should be aimed for, and any tendency to loop unless cured by the trim tab should be cured by packing up the leading edge of the tailplane and adding weight to the rear of the fuselage when the cure is affected, to retain the glide.

New Zealand Nationals

OMAKA

Full account of the 1956/7 meeting from PHIL RAMSAY, *(here with A/2)*

OMAKA AERODROME near Blenheim (N.E. tip of South Island) was the venue of N.Z. Championships, the ninth "Nationals" since the New Zealand Model Aeronautical Association became the controlling body for 2,000 members in some 50 clubs. Omaka had not known such bustling activity since the war years. Flying was set forward to 5 a.m. starts and late evening in order to escape the full fury of winds which were general throughout the country during the Christmas/New Year period. This was only a partial answer for 25-30 m.p.h. was rather constant. However, it was a fair test of skill and those modellers who mastered the conditions merited their wins. The recovery area off the airfield was easy enough and the retrieving service, in the opinion of N.Z.M.A.A. President, Mr. A. R. Rowe (of *R 6-B* fame) the best he had seen at any "Nationals".

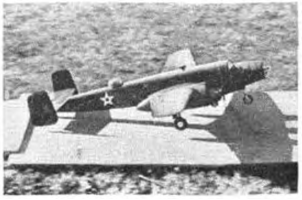
First event to be decided was **Nordic A/2** on Friday morning. Arthur Priest of Hamilton emerged as winner with an aggregate score of 489·6 secs. and a series of consistent if unspectacular flights. Here was a veteran control-line modeller showing the way to handle the severest conditions. Many of the glider experts could have learned from his towing into strong winds, but will probably refer to the meritorious performance as "beginner's luck"—for this was Arthur's first Nordic and stranger still, had only been airborne four times before the contest flights. It was D. C. Butler's A.P.S. "*Seraph*" design. P. Carter second, 460·8; D. Lugg, a junior, 456, third; and R. W. Hind 446·6 fourth. These four become the N.Z. team for the 1957 world championships.

In the afternoon, with winds even fiercer, the strong arm boys lined up for the **hand-launch Glider** contest. And with the success of a junior from the morning in mind, it was noteworthy that juniors secured first places. Final placings and aggregate times were: M. Sexton, New Plymouth 222·5 secs., 1; G. Westland, Kaiapoi, 205·4, 2; R. N. Hewitson 189·6, 3; D. Watson, 188·9, 4.

The weather people forecast continued strong winds for Saturday, so in order to get as much flying through as possible, another 5 a.m. start was made. The free flight **Scale** entrants found even at this early hour that wind was against them, making the last stage of most flights appear undignified and damaging. Final placings were not at all upset by adverse conditions, for the models which gained most points in static judging emerged the winners—an emphasis on building accuracy which this class tries to encourage. The winner was L. Ackroyd of Hawera (Bébé Jodel) 60·5 points, B. Keegan of Auckland (Cessna 170) 57·5, 2; and N. Maurice of Auckland (Nieuport 17) 49·5 points, third.

The **Payload** event, run concurrently with F/F scale was not greatly affected by the windy conditions and good times were recorded. N.Z. rules for this event are motors up to 2·5 c.c., 20 secs. motor run, five 3-min. rounds and a dummy weighted to 5 ozs. per c.c. Jack

At left, Happy teamwork! Mrs. Maiden launches for her husband during the Nordic contest. Jim is an architect and a modelling non-conformist. Can be relied upon to produce unorthodox and beautifully constructed models in all free flight classes. Below: Culmination of six months' labours and immeasurable hope! The moment N. Dawson has been waiting for. In spite of a shed starboard cowling his B-25 Mitchell, winner of C/L scale, is airborne! Right: Arthur Priest of Hamilton has every reason to wear a proud look and red ribbon. He's trying to hide the tissue tears on winning A 2



At left: There's R&B parentage in every line of Mort Glading's lively model, RG winner from Wellington Model Aero Club and Mills 1.3 powered. Centre: R. W. Hind's stunt champion with 6-ft. span McCoy powered model flown on 110-ft. lines. Ron alan piloted winning Class "A" Team Racer, coming fourth in A/2, hails from Kaingoi. Right: Peter Carter of Hutt Valley Aeromodelling Club, who gained a place both in Wakefield and Nordic A/2 Team Racing, is holding winning Wakefield designed by club-mate John Upton who placed fourth

O'Brien of Wanganui, in winning this event (and a handsome stop-watch prize from Pan American Airways) lost his model—which meant making another "on the premises" for the F.A.I. Gas contest the next day. His aggregate time was 423·4 secs., J. Upton 388·8, 2; J. Sheppard proxy flown by A. Macdonald 384·1, 3. This event, with Nordic and F.A.I. Gas, drew the greatest number of entries.

The unkindest cut of all came from the weather man during the **Radio Control** event, when rain throughout was an unwelcome addition to the strong wind. Of the sixteen entries, only ten flew and from this number C. Dann was the only man to make a successful R.O.G., thus gaining valuable points to secure third place. M. Glading, winner in 1954 came in first with an outstanding performance under such arduous conditions with W. Cook, last year's winner in second place. Both 1st and 2nd were flying modified R 6-B's, using Mills 1·3 motors, and all three using H.M.V. Design radio equipment.

The **Wakefield** generated great interest. Entries were large, and the best gathering of the public was watching. More important, the weather came right for the first two rounds flown on the Sunday evening. But the 10 m.p.h. wind was brief respite for the Monday evening final two rounds, "win or bust" mood really paid off for Peter Carter, the eventual winner. Aggregate times for the first four places (four rounds) were: P. Carter 599·8, 1; A. Barnes, 571·3, 2; J. Upton, 439·3, 3; J. Malkin, 437·4, 4. Reporting on the "Wakefield" would be incomplete without a word of praise for the army of volunteer retrievers, who waited downwind during the final two rounds. Contestants were indebted to them for quick recovery. One remarked on Peter Carter's model which flew high overhead on the third round, making a good 30 m.p.h. with its nose steady into wind. Shades of canard flight!

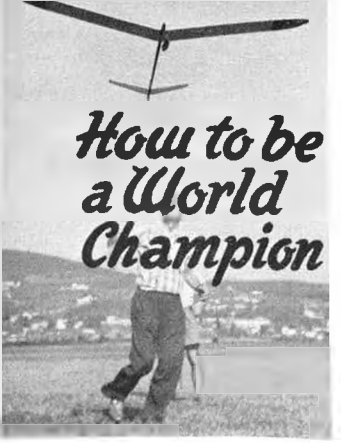
Diverting from the models for a moment, but pursuing this theme, Mr. P. Carmody, instructor to the Marlborough Aero Club, gave some wonderful demonstrations with the full-size Auster "Helicoptering" into wind, he remained stationary overhead for half-an-hour at a time, descended vertically, and in the last few feet applied a little power whilst dipping the nose to come in for perfect landings. He was obviously enjoying himself and at the same time cheering the modellers who battled on the lower levels with a certain amount of frustration and chagrin.

Brightest spot in the day of circle burning was the C/L **Scale** class, thanks to ingenuity and quick action. An adjoining property to the lee of tall pine trees was mown and take-off boards laid down. The winning model was a large B-25 Mitchell, built by N. Dawson with total points (static judging and flight realism) of 67. Second with 57 points was J. Pickford's Skyraider, which was actually completed in the two days previous at Omaka.

The **Class "A" team race** was the first final to be decided and these rugged little models did their best against a 40 m.p.h. wind, beating across the airfield. It was a losing battle in such conditions and N. Dalziel was the first to retire on the 28th lap. R. Wilson of Auckland, whose model was flying fastest and very steadily, was unlucky to have the skilful pilot B. Stanisch slip in the central melee and land heavily. They restarted, but apparently engine bearers must have broken for soon after, on the 139th lap, the motor flew off the airframe. Arthur Priest had been having his share of misfortune with broken propellers on landing, losing one wheel and having damage that made elevator control ineffective. With 152 laps counted and a mere eight to go, the model broke its back. Only machine left was N. Ferguson's, expertly piloted by R. Hind, which finished the course in the understandably slow time of 14 min. 58·2 secs. The familiar story in recent

(*Continued on page 188*)

Champion of Champions R. N. Hewitson with a payload of booty. The premier award carries with it by tradition a specially blended fuel! NZM 4·4 President Allan R. Rowe (of R6-B fame) makes the presentation amidst cheers from Auckland Club members



How to be a World Champion

An exclusive pen-picture of German Champion Rudi Lindner

By

U. A. WANNOP

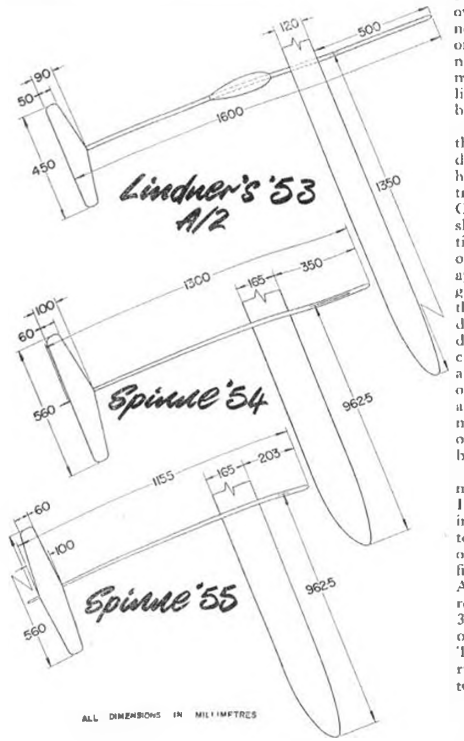
RUDI LINDNER is one of the least assuming of all world champions—an eager friendly young man, with a quick and generous sense of humour and an almost nervously quick laugh. Champion in Denmark in 1954, again in 1955 in Germany, Lindner was only seventeenth in Italy last year—but none the less still one of the finest fliers in world competition.

During the war Lindner flew Wakefields, but his aeromodelling was restricted after 1945 when the occupying powers in Germany eliminated all the remaining evidence of the Hitler youth movements. Not till 1950 was there sufficient freedom of operations and materials in Germany to allow a revival of model flying. In the years of restriction Lindner worked with a friend in building a motor-boat, but in 1950 became an aeromodeller again. Not Wakefields now, but gliders.

Within three years he flew for Germany at the Lesce Bled championship, but placed little higher than the two gallantly-built *Last Straws* of the British team. His model in Yugoslavia was of just over 100 in. span, a sheet wing weighing only 3 oz.—no more than the built-up tissue covered wing used on *Spinne* the following year. This 1953 A/2 of notably high aspect ratio had a still air (genuine mid-European still air) time of 3 : 20 off a 50 metre line, but was decidedly a calm weather model, being quite inconsistent in disturbed air.

Winning a place in the German team again for the 1954 World Championship at Odense, Lindner decided that another critically trimmed model of high aspect ratio was too much of a risk, and travelled to Denmark with his 77 in. span *Spinne*. Out of the storm at Odense he took the Championship, and at Finthen the following year retained his title with a new version of the *Spinne*. The evolution of the 1955 model is interesting, because in appearance it seems more "dated" than the 1954 glider. With one of his easy laughs Lindner admits that by 1955 he had become tired of comments disparaging his astringent "stick" fuselages, and so designed a bulbous pod nose that brooked no criticism. But he also considers the increased side area of the nose to give improved stability in circling on the glide, and also to be a help in towing. In a successful attempt at reducing the pitching moment of the tail assembly, the geodetic bracing of the 1954 tailplane was eliminated in 1955 as being unnecessarily weighty.

In 1956 Lindner took the winning and reserve models he had at Finthen the previous years to Italy. The winning model of 1955 had deteriorated in trim during the months after its victory, and in test flying before being taken to Florence would do only 2 : 50 in calm air off a 50-metre line, more than fifteen seconds less than its normal time in 1955. Accordingly, at Florence, Lindner flew his 1955 reserve, which he had been flying consistently for 3 : 20 in the calm European air. This was a model of 90 in. span the wings sheeted on the top surface. The wing section was turbulated by a length of rubber of 1 mm. circular cross-section, pulled out to twice its unstretched length, and set ahead of the



WING SECTION

TAIL SECTION

R. Lindner Wing Section	0	1·25	2·5	5	7·5	10	15	20	25	30	40	50	60	70	80	90	95	100
	1·09	2·73	3·52	4·78	5·62	6·37	7·36	8·05	8·40	8·65	8·68	8·20	7·32	6·06	4·58	2·67	1·52	0·25
	1·09	0·09	0	0·20	0·55	0·85	1·52	2·13	2·58	2·97	3·64	3·88	3·82	3·40	2·81	1·52	0·85	0

R. Lindner Tailplane Section	0	1·25	2·5	5	7·5	10	15	20	25	30	40	50	60	70	80	90	95	100
	1·30	2·80	3·50	4·80	5·55	6·20	7·45	8·10	8·90	9·30	9·70	9·45	8·85	7·75	6·10	3·90	2·40	0·40
	1·30	0·50	0·25	0	0	0·20	0·95	1·60	2·25	2·90	3·70	4·30	4·50	4·40	3·70	2·20	1·30	0

leading edge at a distance of 10 per cent. of the wing chord. In calm weather this turbulator gives no obvious benefit, but in a wind does help the model to maintain stability.

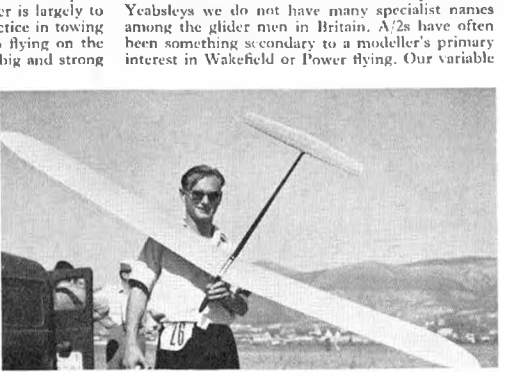
While capable of over 3 : 00 in calm air, the model flown by Lindner at Florence scored only two maximums in the contest. The reason was largely that although there was no wind at all on the hot airfield, the air certainly was not calm, patches of gentle but firm lift alternating with sudden sickening areas of dead and sinking air. These unfortunate conditions affected the chances of several of the best fliers. Despite careful towing, feeling on the line for the pull of thermals, Lindner fell short of a maximum on his second and fourth flights.

A fifth round maximum would have given him equal fourth place, but he lost this by a foolish error. After towing over a wide area till finding lift, the model was kept so long on the line that on the glide it dethermalised at only 1 : 47, while flying at a height quite sufficient for a maximum.

British weather effect

In the past two World Championships Gilroy and Amor have won second place in the individual results. This must not allow us to think that we are becoming equal in glider skill to the mid-European countries; we are not. British weather is largely to blame, not allowing us sufficient practice in towing and trimming techniques suitable to flying on the Continent. Thermals in Britain rise big and strong from the always moist ground, thermal bases are broad and obvious. But despite the fiercer Continental sun, the ground in Italy or Czechoslovakia just does not hold sufficient moisture to breed large bursting thermals. Towing is therefore a more important skill on the European mainland than in Britain, where it seldom is practised with patience. Towing is something we must practise whenever we get calm weather, just keeping the model on the line like a kite, walking over the flying field. Lindner does not look at his model, when it is released by his helper and climbs to the towing height. On he walks, head down and looking at the ground, feeling the tension on the line there is no need to watch the model. Trotting occasionally if there comes any slackness in the nylon, keeping the model almost above his head. Then, thinking he's gone far enough, Lindner at last watches the model, pulling it carefully around in a half circle to walk back to the launching point. This is in calm air. At last, feeling the line pull tight and stretch from his fingers as the model rises in lift, there is a final gallop by Lindner to get the model to the maximum height, when he leaps in the air throwing his winch up to let the tow ring fall free of the hook. On his final flight at Florence, Lindner twice pulled the model around through 180° to retrace his steps searching for a patch of lift. Now, if in Britain we are ever to produce a team to win the team event at the World Championships, we shall have to learn to tow as do the Hungarians and Germans, not just towing till the model is overhead, but till it is overhead and in lift.

Lindner is a glider specialist, as Hacklinger or the several Hansens of Denmark. Except for the Yeabsleys we do not have many specialist names among the glider men in Britain. A/2s have often been something secondary to a modeller's primary interest in Wakefield or Power flying. Our variable



Rudi Lindner at Florence last year with his 1955 reserve, said to be capable of over three minutes in calm air from a normal 164-ft. launch

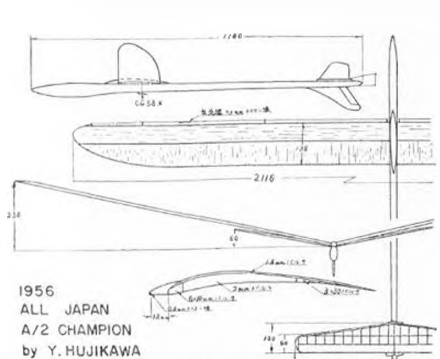
How to be a World Champion (continued)

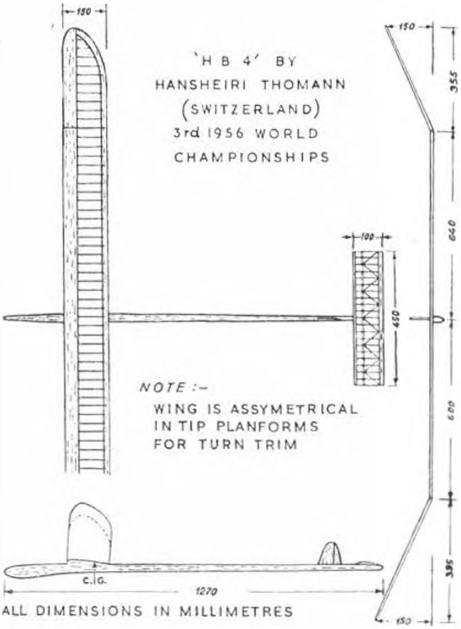
and usually windy weather is again at fault, the glider more easily upset by these conditions than a powered model. Glider flying has always been a chancy business in Britain, producing less reward for hard work than in the calm weather of Central Europe. The Lindner type of model seems something of an answer to this problem, as it flies almost as well in wind as in calm. A strong pair of wings and carefully designed stability are the essentials.

Rudi Lindner is a precision machinist. He produces a limited number of immaculately-finished hand-winches to distribute to friends and fortunate contestants at the World Championships. To his own design, the winches have two bearings and a polished wooden drum, finished to the standard of his models. The wings of *Spinne* are covered in medium weight Japanese tissue, with three coats of thin dope and a final coat of high gloss varnish. Lindner does not strap his flying surfaces to a system of jigs to maintain their setting—as did the others of the German team at Florence. In trimming he twists his wing by hand through 30 or 40 degrees to set in the extra degree or two of washout he thinks he needs on any particular day.

Lindner is now working in Stuttgart with Hugo Leppert and Dr. Eppler on the design of full-size sailplanes. He seems inclined to spend more time in the future in gliding full-size aircraft. Certainly, he has not qualified for the German team that already has been chosen to fly in the 1957 Czechoslovakian championships. The two most impressive fliers at Florence were probably Lindner and Thomann of Switzerland. But Thomann will not be flying in Czechoslovakia either. The absence of these two men makes the competition at the 1957 World Championship just a little more open.

International influence of Hacklinger/Lindner design is evident in Japanese Champion model below. At right, the Swiss model which performed so well at Florence





New Zealand Nationals (*Continued from page* 185)

years is again repeated—all finalists were Oliver Tiger powered. **Class "B" final** was a much briefer story with three machines pranged and out of the race before any of them had completed one lap! At the first pit stop the model with the circle to itself stalled upwind in the glide and was blown high in the air and destined to land in the centre of the circle. Its pilot did the obvious—caught it in mid-air—and rushed it out to the mechanic for re-starting. The referee disqualified him, of course, for leaving the centre of the circle and the Contest Director ruled it "No Race". First three places were thereupon decided as the best times in the qualifying heats and awarded to F. A. Macauley (flown proxy by B. Williams), R. N. Hewitson, and N. Dalziel in that order.

Champion of Champions: R. N. Hewitson, 93 points—Auckland; L. Ackroyd, 56½ points—runner-up.

Junior Champion: Derek Lugg of Auckland 53 points (second year in succession); D. Watson of Auckland, 42 points, runner-up.

Points of note

Champion Club: 1. Kaiapoi 324 points; 2. Auckland 261½ points.

Aeromodellers at Omaka were not the only ones to suffer damage through high winds. At the nearby Seddon gliding site, the Marlborough Aero Club's Slingsby T.31 B Tandem trainer received general structural damage, thus bringing their gliding camp to an end. At Hanmer, 79 miles away, Canterbury Gliding Club's high performance Weihe sailplane was overturned by a heavy gust just after landing. It suffered serious damage. The pilot, Mr. Christopher Wills, elder son of famous British and former world glider champion, Mr. Phillip Wills was unhurt.

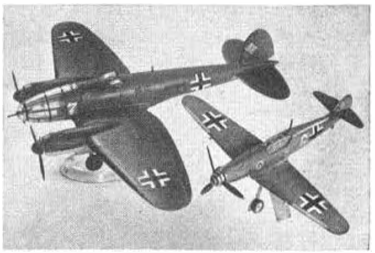
At the Annual General Meeting there was some plain talking on N.Z. participation in International contests. The complete uncertainty of good organization, good proxy fliers, plus high cost of entry fees and transport, make it a doubtful proposition. Members felt that we have models up to world class and would keep sending teams if they had something like a 50/50 chance under the proxy method. Rule changes at A.G.M. were Class "A" line length increased to 52 ft. 6 in. and Nordic A/1 replacing Class 1 glider.

Trade Notes

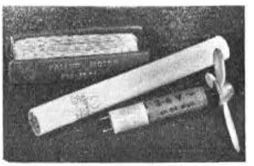
PLASTIC KIT MODELS continue to steal the bulk of most model shop turnover figures, and it is not surprising that our recent feature on plastic model improvements should have aroused great interest. Following last month's article on painting, we have received a number of letters pointing out that matt black plastic paints *are* available and that there is no need to go hunting for photographic "dead" black. In particular, the **Revell** paint set, and **Humbrol** half-ounce tins include a most useful black in their respective ranges. Incidentally, the *Republic F-84* Thunderstreak is soon to hit the market in the Revell range, and we note that here is one model where the wheel well is already cut away in the lower wing surface for added realism (see photo, foot of centre column). This Revell kit will also lend itself to elaborate extra painting treatment, as the F-84F was the mount for the famous "Thunderbird" U.S.A.F. aerobatic team, carrying the same red, white and blue decor as the F-100 modelled by us and shown on page 128 last month.

Mercury Spitfire and Marvin kits will soon be in the shops. Marvin is for the AM.10 or any 1.5 c.c. engine

German plastic kits by **Faller** of Gutenbach start their range with the Heinkel He.111 and Messerschmitt Me.109F, as seen above right. These kits have different assembly procedure and are to smaller scale (100th) than those on the British market: but in spite of their smallness, they are the first to provide for motorisation. Motor for 3 to 6 volts A.C. is less than half the size of a cigarette! It enables the prop to spin realistically, at 1,000 revs per minute—comes with sufficient lead wire for remote displays, but does not, of course, provide enough urge for RTP flying. These are *not* available in the U.K.

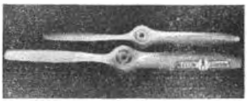


New German plastic kits for Heinkel and Messerschmitt can accommodate Faller motor as below with cigarette for comparison



A bird whispers from **Mercury** that the pre-fubbed *Spitfire*, to partner the already established *Mustang*, is being delivered to the shops, retailing at 37s. 6d. including tax. This series of all-balsa control-liners is known as the "Masterbilds", and as hinted last month, the Lockheed P-38 Lightning is next in line for production. Along with the Spitfire, the shops should be getting their first deliveries of the Mercury *Marvin* this month. Designed by Dave Platt of the Wanstead club for the AM 10, it is a coupled flap model that will go right through the "book" using this powerful 1 c.c. or any 1·5 engine. All-up weight is in the region of 12 ounces and already the prototype has distinguished itself by winning a stunt contest against much bigger fare. (Picture, left column.)

Another new Mercury accessory will be greatly welcomed by all who want to make FAI size team racers, and the new SMAE 1A class. It is a 10 c.c. tank built on the same



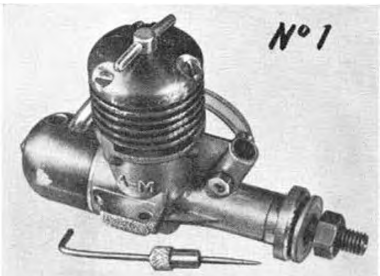
Latest Frog airscrews in Nylon and plastic, intended for the Frog 80 and of the toothpick variety

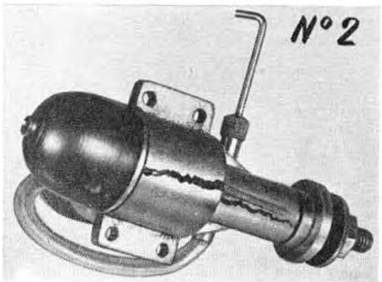
proportions as the successful 15 and 30 c.c. versions, and neatly soldered in tinplate, it is only ¾ in. wide and should be useful for sports models too.

Below: Mercury 10 c.c. tank and new nylon tanks to be sold as accessories for Frog 80. Bottom: New Revell F-84F plastic has undercarriage well in wing

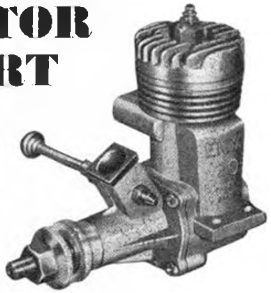
New plastic airscrews from **Frog** are the toothpick shape 6 x 6 and a 7 x 4, priced at 1s. 9d. and 2s. in Nylon, or 1s. each in Polystyrene. They are much thinner than the earlier props, and apt to flex on a rough running motor until right compression and needle settings are found. Designed for the Frog 80, they have been tested up to 17,000 r.p.m. for safety in Nylon, but 13,000 is an advised limiting figure for Polystyrene. Also for the "80" are the new Nylon tanks as pictured at left, large holes at top are tight fit for standard fuel tube conduits.

MOTOR MART





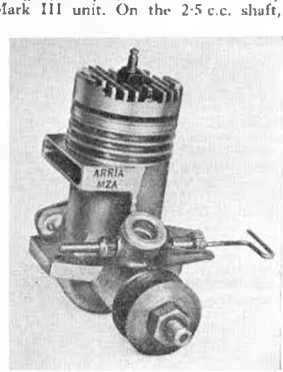
ALL SELF-RESPECTING engine manufacturers conduct an efficient repair and maintenance service and many obligate themselves by issuing a guarantee against defective workmanship in their products, but they do *not* undertake to make good the ravages of appalling maltreatment. A glance at the two photographs above will illustrate the point effectively. It is not a difficult matter to detect the manufacturer concerned, and knowing the high standard which they so carefully maintain in their engines, it is especially understandable why they should accept no responsibility for replacement of any part in case *No.* 1. This engine bears evidence of every possible form of mishandling. If it had been run over by a steam-roller it might have fared better. Lugs broken, vice marked, fins battered and needle body sheared, it is the picture of ruination by one who does not deserve to handle such a product. Case No. 2 is different and more baffling. The split case on an otherwise good engine *could* have been due to a number of possibilities, not the least being a sharp upward blow on the shaft—certainly it indicates application of abnormal stress out of the sphere of correct motor operation. In such cases can one blame the manufacturer for not adhering to his guarantee? Of course one cannot: but we would mention that a sincere explanation of the true reason for case No. 2 resulted in this engine being serviced good as new. Actually, the engine fractured because it had been mounted between tight fitting bearers, using *only one bolt*, and was "hydraulieed" badly.



At left: two motors sent to the manufacturers for repair under guarantee! (See text.) At right: among new series of outstanding Enya engines is the new 19-III, called Super-Typhoon, bore .725 in., stroke .704 in. Note plastic venturi insert

New engines continue to appear almost at the rate of one per week and some of this month's batch are shown on these pages. One firm that has announced plans is **Allen-Mercury**, now to be known as D. J. Allen Engineering Ltd., and moving to new, larger premises where it will be possible to manufacture all components. Production rate will be doubled by the end of the year and new equipment promises an even higher standard in the popular A-M engines. The expert workmanship of well-known modellers Dennis Allen and Len Steward in grinding, honing and performance checking, will continue to show itself in the "10", "25" and "35".

Few people realise that the **Oliver Tiger** can be sleeved as a 1·5 by a manufacturers' kit, while the Cub is temporarily withdrawn. Sold at £2 14s. 6d. the conversion outfit includes cylinder, piston, contra, gudgeon pin, fins and carb: body to fit any Mark III unit. On the 2·5 c.c. shaft,



Arria 35 and 29 engines now in production in Buenos Aires, Argentina have a distinct Fox-like appearance and have already distinguished themselves in team racing and stunt events, said to turn o 10 x 6 at 11,800 r.p.m.

this 1·5 stands "all-comers", and can be bought direct as a 1·5 unit for normal Tiger price.

The **Frog "50"**—baby of the half c.c. motors—has been withdrawn from production and we gather that no replacement design is being considered at the moment. Obviously International Model Aircraft feel that the small size field is now covered by their new **Frog "80"**.

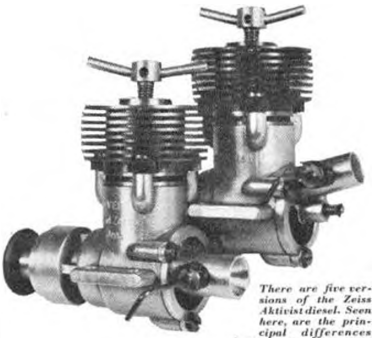
The original Frog "50" was designed by A. A. Judge in 1951 and went into production early in 1952. It was a feature of the "50" that it was designed down to minimum sizes throughout—perhaps rather too fine, in fact, for it was subsequently found necessary to boost the original 3/16 in. crankshaft diameter to 13/64 in. and also increase the size of the crank pin. Another subsequent modification was the adaption of transfer porting inside the cylinder walls, instead of outside. Later modifications included an alteration in the contra-piston construction and the introduction of Vandervell sintered main bearings, although relatively few of the latter came off production line.

In all, some 14,000 Frog "50's" were produced and were sold in all parts of the world. Present owners need have no worries about repairs, etc., for ample spares are held and servicing is unaffected.

More news from Frog is that all production motors are now using blued nuts and bolts as standard; the "249" has a (red) anodised cylinder jacket; and a Mark II version of this engine is rumoured. International Model Aircraft themselves have no comment to make on this latter point, but an American agent advertises "hotted up" Frog "249's".

Incidentally, this month's double feature engine analysis reports might never have appeared. Ron Warring was recently involved in a car crash, but escaped with a few bruises, although his car was just about written off (did a couple of flick rolls; and the Vanguard showed that it wasn't really stressed for aerobatics!) Test gear and engines were loaded into a borrowed, brand new Consul Convertible, and our bruised contributor proceeded most conscientiously to the test room, seeing "double" as it were, with two engines to set up on the dynamometer.

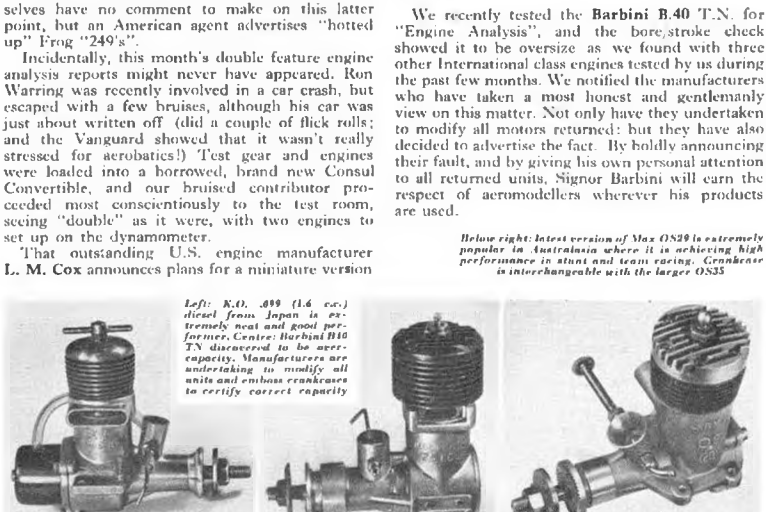
That outstanding U.S. engine manufacturer **L. M. Cox** announces plans for a miniature version of the famous Thermal Hopper ·8 c.c., to be known as the **Pee Wee** ·020 (·3 c.c.). Measuring only 1½ in. high, it will retail at $7.95 and is said to be capable of flying anything that goes up with ·8 c.c., and knowing the Cox tradition for performance out of small capacities, we can expect great things of this tiddler.



There are five versions of the Zeiss Aktivist diesel. Seen here, are the principal differences between the reed valve and disc valve variants

We recently tested the **Barbini B.40** T.N. for "Engine Analysis", and the bore/stroke check showed it to be oversize as we found with three other International class engines tested by us during the past few months. We notified the manufacturers who have taken a most honest and gentlemanly view on this matter. Not only have they undertaken to modify all motors returned: but they have also decided to advertise the fact. By boldly announcing their fault, and by giving his own personal attention to all returned units, Signor Barbini will earn the respect of aeromodellers wherever his products are used.

Below right: latest version of Max OS29 is extremely popular in Australasia where it is achieving high performance in stunt and team racing. Crankcase is interchangeable with the larger OS35



Left: K.O. .099 (1.6 c.c.) diesel from Japan is extremely neat and good performer. Centre: Barbini B40 T.N discovered to be over-capacity. Manufacturers are undertaking to modify all units and emboss crankcases to certify correct capacity

Winning model at the 1956 "Stockport Express" Rally—

De Havilland 83

FOX MOTH

a free-flight scale model for .5 - .8 c.c. by B. BARTON

IT IS RATHER surprising that there are so few examples of this most economic light transport flying in the world today.

Using only enlarged fuselage proportions with more or less standard D.H. 82 Tiger Moth wing and tailplane units, the Fox Moth served a useful life with small airlines, charter companies and air circuses in pre-war years. G-ABVK which is chosen for Bernard Barton's model, was finished in two tones of blue for Hillman's Air Services operating out of Stapleford Tawney Aerodrome in Essex, whilst another colour scheme on G-ACEJ giving pleasure flights at Southport last year, inspired Mr. Barton to make a 30 in. scale model for his Mills .75 diesel. This was all silver with cream decking on the fuselage, registration letters in dark blue, and distinguished by not having a spinner. Unfortunately, G-ACEJ no longer exists as it crashed into the sea and was a total wreck.

Now for the model, two basic fuselage sides are cut from 1/16 in. medium sheet. Mark cabin windows on the outsides, but *do not* cut them out at this stage. Mark positions of formers on inside of each half, all formers are cut from 1/16 in. medium sheet except formers F 1 and F 2 which are 1/16 in. ply. Cement formers F 3, 4, 5 in position, using a square as shown in sketch and ensuring that the tail ends will meet correctly—cement formers F 2, 6, 7 in position when dry. Then cement tailpost in position (undercarriage wire is sewn to F 2 before assembly).

Carve noseblock to profile from 2½ x 1¾ x 1 in. block balsa with rebated grooves to take fuselage sides and engine bearers. The engine bearers, noseblock and F 1 are now cemented in position. Cabane struts are cemented to formers 2 and 3 with silk patches. Cement backbone in position and cover top of fuselage with 1/16 in. medium sheet, one piece each side from F 4 to former F 1, add ⅛ in. x ¼ in. doublers between F 2 and F 3, paint inside of cockpit and cabin light green. The cabin floor can be painted when the windows are cut out after top planking is completed. Cement 18 s.w.g. wire hook to F 1 and 18 s.w.g. wire in position for undercarriage legs, cover bottom of fuselage with 1/16 in. sheet from F 2 to tail in one piece, plank bottom with ⅛ in. x 1/16 in. strips from F 1 to F 2, add ⅛ in. sheet balsa tailplane platform.

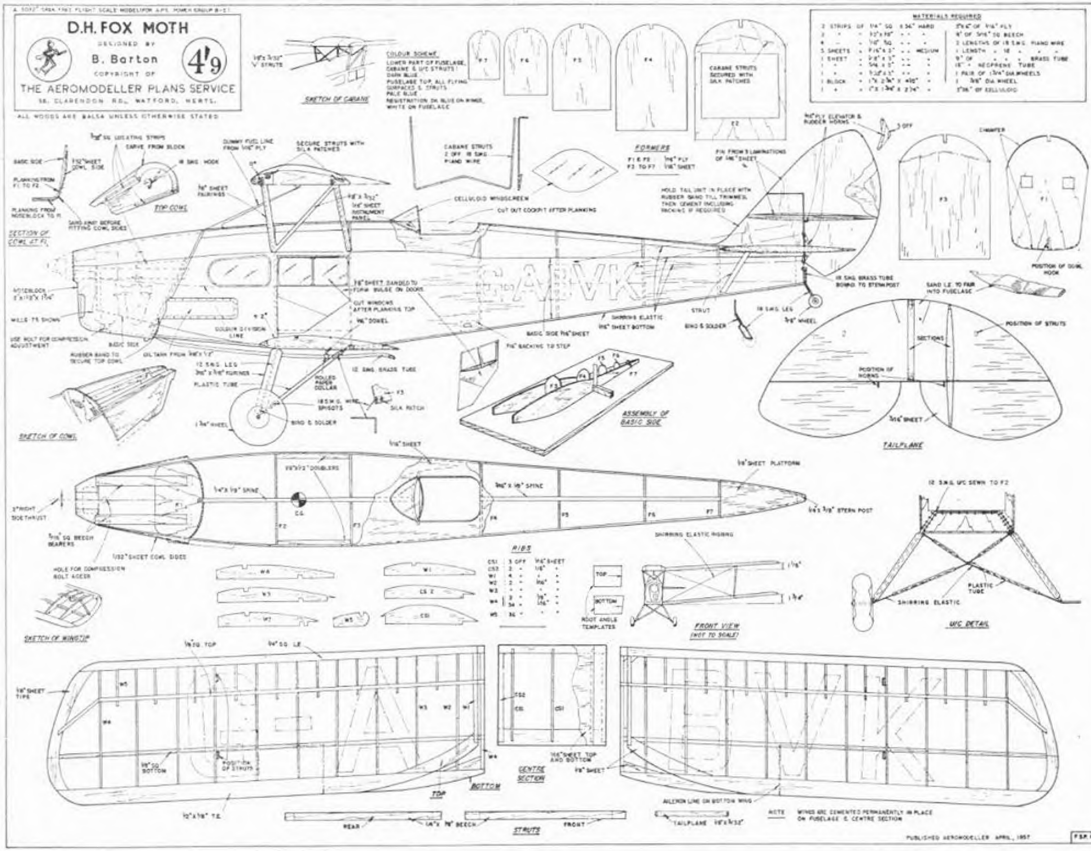
Finish carving the noseblock, noting the offset intake hole, cover bottom of cowling with 1/16 in. sheet back to overlap on F 1. The curved cowling sides which are 1/32 sheet should overlap the basic sides. Top cover of cowling is carved from block balsa 4½ x 2¾ x 1 in. The cockpit can now be opened up, blisters fitted to passenger's doors and oil tank to cowling side.

Wings are of straightforward construction—lay down the bottom spar leading edge and trailing edge over the plan, cement ribs in position, then add tips and top spar, cover with heavy grade tissue, remove as many wrinkles as possible, tighten with clear dope, *do not water shrink* in an effort to avoid warps on this narrow chord structure.

Flying

The model should be trimmed for first test flights with the rudder lightly cemented to the tailplane, the assembly being held to the fuselage by rubber bands to allow any adjustment required prior to permanent attachments. The rudder can be warped if necessary with a little heat after model is completed and the original was trimmed to fly in left hand power and left hand glide circles.

Enclosed cockpit on Canadian version of full size can make use of commercial bubble canopy. Colour scheme is apparently silver with red lettering and nose cowl, note bulged passenger cabin door in this view



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FAMOUS BIPLANES

Number 8

The SPAD XIII

by G. A. G. COX

THE SPAD (Société Pour Aviation et ses Dérivés) was by far the best "Avion de Chasse" produced by France during the first war. It was the most famous, too, not solely because of its technical superiority over its predecessors, but also because we always associate the SPAD with the great fighter pilots who flew in it. René Fonck (75 victories), Charles Nungesser (45 victories), and Georges Guynemer (53 victories) of France all flew SPADs, and so did America's two aces Edward Rickenbacker and Raoul Lufbery who scored 25 and 17 victories respectively.

The first SPAD to be produced in quantity was the S7, deliveries to the "Escadrilles" beginning in the autumn of 1916. The demand for this pursuit was so great that it was manufactured by Mann, Egerton and Co. of Norwich and by the British Blériot and SPAD Co. at Addlestone in Surrey as well as in France, and it was used by the French, British, Italian, American and Belgian air services. The S7 was powered by 140, 150 and 175 h.p. Hispano Suiza engines and in its most powerful form had a speed of 119 m.p.h. at 6,500 ft.

In the following summer came the S13 - very similar to the S7 but with two guns instead of one, greater power, and slightly different tail surfaces and centre section struts. The wings, as on the S7, were single bay, *i.e.*, like the Gloster "Gladiator" as opposed to the "Gauntlet"; the framework halfway along the wing being merely spacers and not interplane struts as such. The SXIII was not from any aspect a thing of beauty: it was immensely strong but heavy and it had the grace and delicacy of a hurtling brick. Its stalling speed of 70 m.p.h. made it a difficult machine to fly, but what it lacked in stability it made up for in manoeuvrability and in the hands of a good pilot it was a formidable fighting machine, giving a good account of itself in combat even against the superior Fokker DVII.

The SPAD XIII enjoyed a long life: it formed the fighter equipment of many foreign air forces including those of Japan and Siam, and in the nineteen-twenties at least one squadron was flying in the United States. Several machines have been restored to flying condition, notably in America where one fine example is owned by Paul Mantz. Others occupy permanent positions of honour in museums, including the Musée de l'Air in Paris and the Smithsonian Institute in Washington.

Building the Model

Where a process in the building of this model has already been described in a previous article, reference is made to the appropriate back-issue to avoid repetition.

1.(*) Make the fuselage of hardwood. Before shaping to the plan profile, drill the exhaust holes and cut grooves for the centre-section struts. Note the three stages in reproducing the effect of the side stringers. (December, 1956.)

2. Make fibre wings and tail surfaces. Drill all strut holes right through the wings. (December, 1956.)

3.(*) When the cockpit interior is complete and the fuselage halves are joined, trim off the front $\frac{1}{8}$ in. then add the $\frac{1}{16}$ in. section "W". To make the cowl front "X", drill a $\frac{1}{8}$ in. hole in $\frac{1}{16}$ in. fibre, bevel the inside edge, then saw a little oversize. Glue to the nose, file and sand to fit, then remove until the shutters are in place.

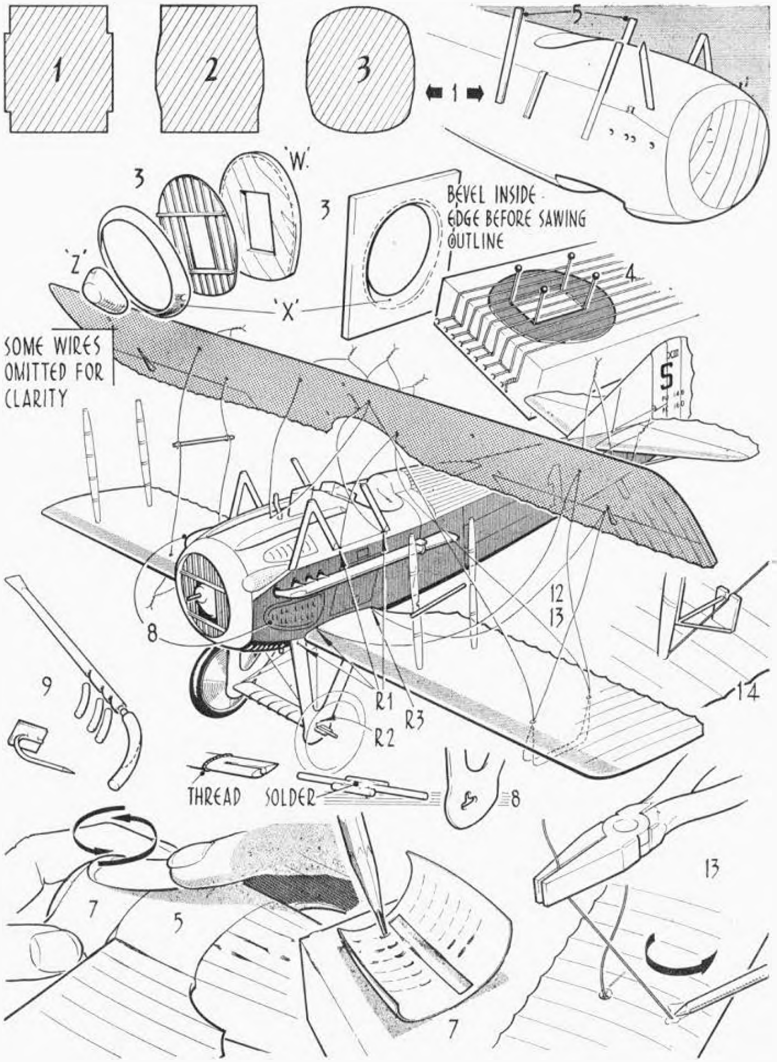
4.(*) Cut the radiator from tinplate or very thin brass so that it exactly fits inside the rear edge of "X", pin it to a block of wood, and apply the 5 amp. fuse wire as shown. Coat liberally with flux, then solder with a hot iron, taking care to prevent excess solder from collecting round the wires. To fit the horizontal strips, cut away the wire along these lines with a fine piercing saw then glue into position very narrow strips of celluloid or wire. Add the crankcase front "Z", reassemble the nose.

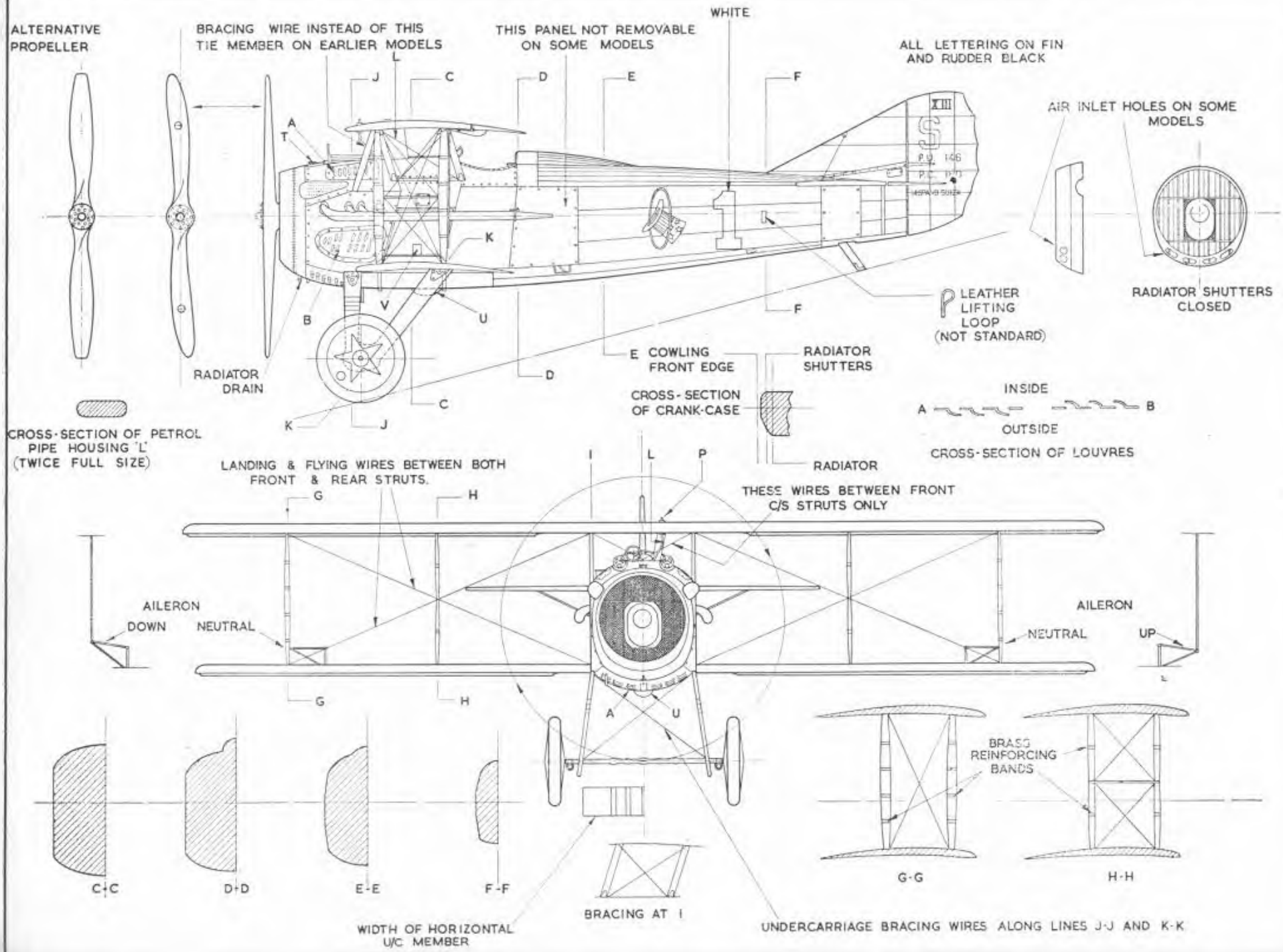
5.(*) Make the gun troughs, score all cowling lines, then paint the lower centre-section grey. Attach to it a control column and rudder pedals and glue the wing into position. Fill in the gap in the belly, then add centre-section struts of boxwood (from an old ruler) or bamboo.

6. Cut recesses for the landing gear struts and drill all necessary bracing wire holes before the metal louvre panels are fitted, because all operations requiring firm handling should be kept to a minimum once these fragile parts are in place.

7.(*) Cut panels, a little oversize, from heavy metal foil. Many food products are sold in excellent malleable metal foil containers and will provide all the material one needs. A few examples are "Lushus" table jellies for thin metal and some "Birdseye" frosted foods and cakes from "Tip-Top" bakeries for thicker stuff. Gentle stroking with the thumbnail or the handle of a teaspoon will work the metal to the compound curve of the fuselage, when it can be trimmed to size. Make an

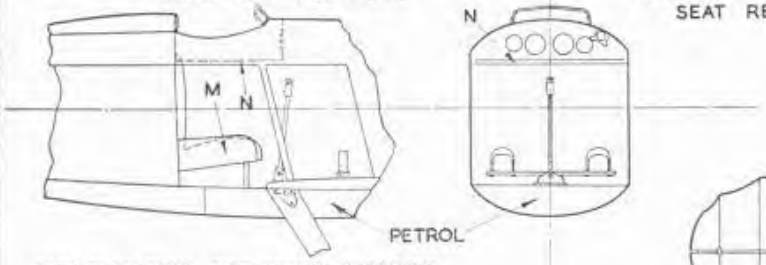
Heading shows author George Cox's beautifully constructed model posed with spinning propeller and decorated in authentic Rickenbacker insignia. At left, a newly constructed SPAD is ferried from its island factory for air test. This view gives a good impression of its small dimensions


1
2
3
1
5
3
'W'
'Z'
'X'
3
BEVEL INSIDE EDGE BEFORE SAWING OUTLINE
4
SOME WIRES OMITTED FOR CLARITY
S
8
9
12
13
14
R1
R2
R3
THREAD
SOLDER
8
7
5
7
13


ALTERNATIVE PROPELLER
BRACING WIRE INSTEAD OF THIS TIE MEMBER ON EARLIER MODELS
THIS PANEL NOT REMOVABLE ON SOME MODELS
WHITE
ALL LETTERING ON FIN AND RUDDER BLACK
AIR INLET HOLES ON SOME MODELS
RADIATOR SHUTTERS CLOSED
LEATHER LIFTING LOOP (NOT STANDARD)
RADIATOR DRAIN
CROSS-SECTION OF PETROL PIPE HOUSING 'L' (TWICE FULL SIZE)
E COWLING FRONT EDGE
RADIATOR SHUTTERS
CROSS-SECTION OF CRANK-CASE
RADIATOR
INSIDE
OUTSIDE
CROSS-SECTION OF LOUVRES
LANDING & FLYING WIRES BETWEEN BOTH FRONT & REAR STRUTS.
THESE WIRES BETWEEN FRONT C/S STRUTS ONLY
AILERON DOWN
NEUTRAL
AILERON NEUTRAL
AILERON UP
C-C
D-D
E-E
F-F
BRACING AT I
WIDTH OF HORIZONTAL U/C MEMBER
UNDERCARRIAGE BRACING WIRES ALONG LINES J-J AND K-K
BRASS REINFORCING BANDS
G-G
H-H

'M' SQUAB CUSHION

'N' COCKPIT FRAMING LEVEL WITH UPPER LONGERONS (SEE PLAN)



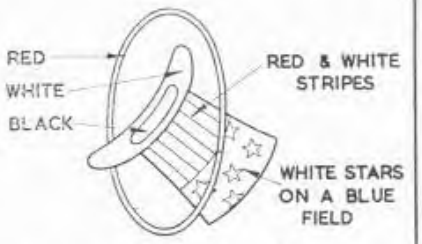
PART ELEVATION, SIDE PANELS REMOVED SHOWING BASIC COCKPIT ARRANGEMENT

FORWARD VIEW OF COCKPIT, SEAT REMOVED

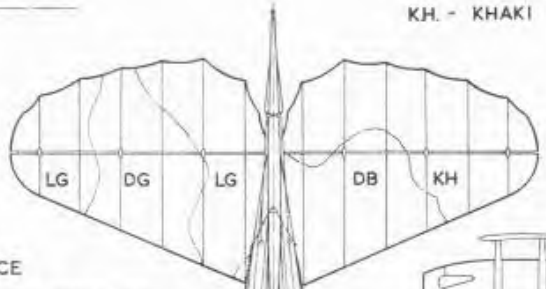
COLOURING

ALL UNDERSURFACES - LIGHT GREY
STRUTS - EXCEPT U/C VARNISHED WOOD

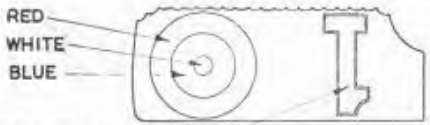
DB. - DARK BROWN
DG. - DARK GREEN
LG. - LIGHT GREEN
KH. - KHAKI



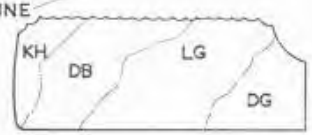
94 TH. PURSUIT SQUADRON



LOWER WING

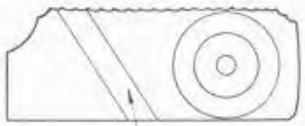


WHITE WITH BLACK OUTLINE

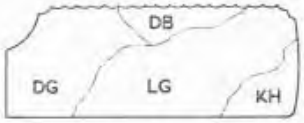


LOWER WING

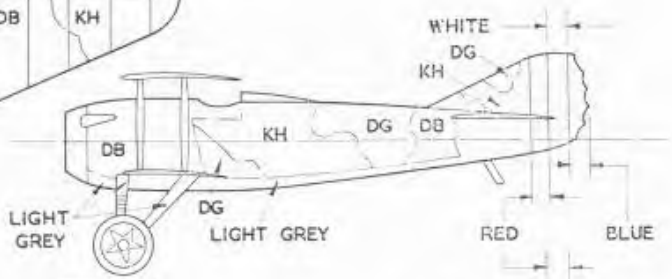
UNDERSURFACE

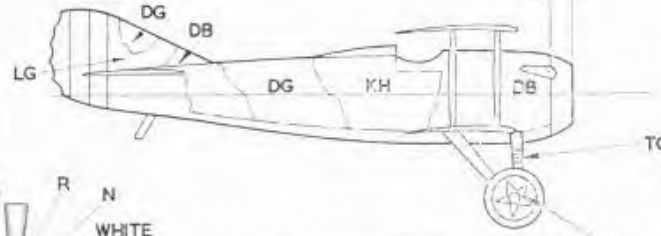


BLACK



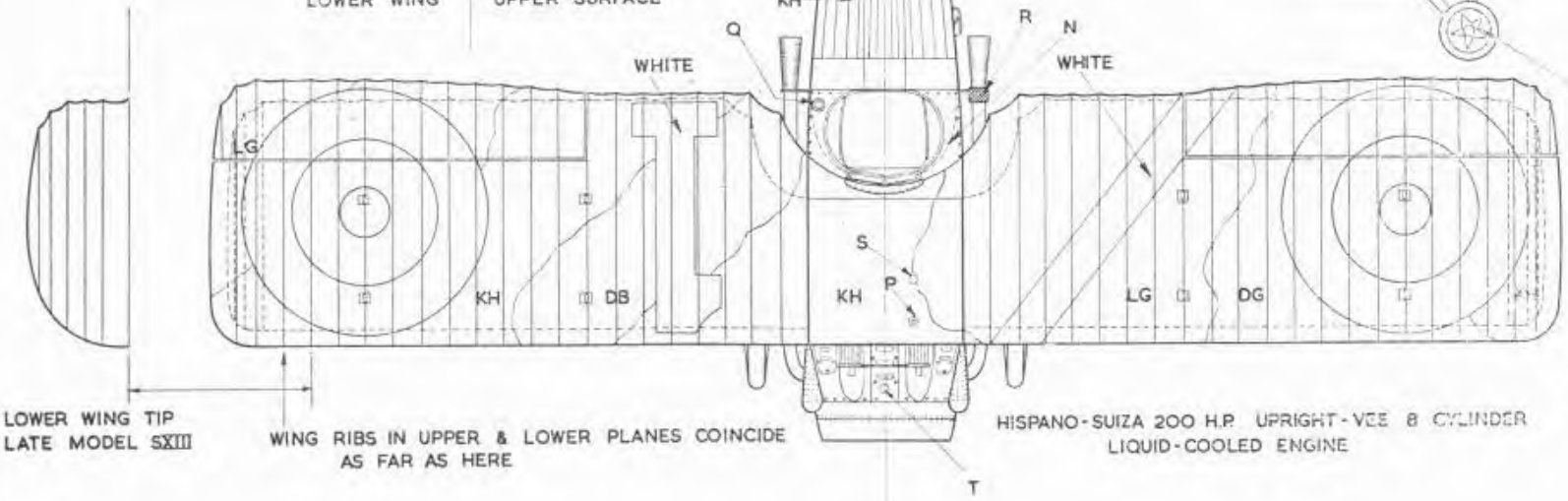
UPPER SURFACE





TOP TO BOTTOM
RED
WHITE
BLUE

WHITE STAR
BLUE FIELD
RED SPOT



P. RAD. SAFETY VALVE
Q. PETROL PIPE TO MAIN TANK
R. STEP PLATE
S. INLET TO WING TANK
T. RAD FILLER CAP
U. PETROL PUMP
V. SPENT CARTRIDGE CHUTE

LOWER WING TIP LATE MODEL SXIII

WING RIBS IN UPPER & LOWER PLANES COINCIDE AS FAR AS HERE

HISPANO-SUIZA 200 H.P. UPRIGHT-VEE 8 CYLINDER LIQUID-COOLED ENGINE

SPAD S XIII C1

THE MACHINE SHOWN WAS FLOWN BY CAPT. E. RICKENBACKER, COMMANDER OF 94 TH. PURSUIT SQUADRON

DRAWN BY G.A.G. COX

FT

incision at each louvre, then place the panel on soft balsa while pressing the louvre out with a sharp pencil. Fix the panels into position using a generous coating of glue so that it oozes into the louvres to reinforce them against outside pressure.

8.(*) The recessed louvres in the side panels may be made by burning with a steel wire filed to the correct shape. A "dummy-run" should be made on a spare piece of wood to determine the minimum temperature necessary. Add the cowl "bumps" and pinprick the cooling holes.

The undercarriage members may be made from brass, with spikes at the upper ends of the legs to drive into the fuselage, or of fibre. If the latter, the axle assembly will have to be made as illustrated. Drilling the holes in the axle cover is not difficult if the fibre is held in the vice. The drill will run in the fibre rather than wander into the steel vice jaws.

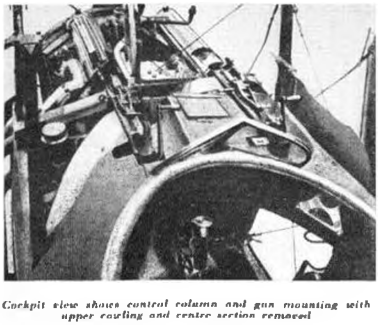
9.(*) Make the exhausts from 16 s.w.g. *seamless* brass wire as shown. A squeeze with pliers will flatten the rear end. Solder the exhaust assembly in a jig similar to the one recommended for the Albatros (December, 1956). Bend pins to form exhaust clips and to the port one add a brass step. Burn teardrop shaped recesses around the exhaust holes.

10. Paint the entire model except the upper surface of the top wing and the underneath surface of the lower. Use "Humbrol" or "O-My" matt enamel and don't be too fussy about achieving a straight line where the light grey meets the other colours. Score all rib lines using a home-made flexible "try-square" (April, 1956). Add squadron and individual markings, masking with cellulose tape (February, 1957).

11. Make the interplane struts and spacers either from brass, masking the binding strips before painting a pale straw colour, or from boxwood. If wooden struts are used, narrow strips of gold foil from a toffee wrapper should be glued round them.

12.(*) Readers may like to try wire bracing, using a method which requires no binding at the strut ends. It is a difficult process and a practice run should be made on a rough framework before the model is attempted. There is, of course, every justification for using Terylene thread on this model.

For wire bracing use 5 amp. fuse wire, preferably from a reel since the straightening of kinks in card-wound wire creates weak spots. Cut each wire to a generous length. Coil one end of a wire and touch the coil with the soldering iron to make a blob. Thread the wire through the hole R1 in the undercart leg and then through the hole R2. Pull the wire tight, wind round the axle, and solder. Take the wire back through R2,



Cockpit view shows control column and gun mounting with upper cowling and centre section removed

and up to the rear leg R3. This wire will go to the upper wing at the interplane strut position. Countersink the hole R1 in the wing root and through this pass another wire with one end soldered. Pass wires through the holes R1 at the lower ends of the centre-section struts, pull them through the cockpit opening to solder their ends, then pull them back the way they came until they are stopped by the solder. When all the wires are in position as illustrated, the model is ready for the final assembly stage.

13.(*) Countersink every hole on the outside, then hold the upper wing in position with elastic bands. Take the wires emerging from each hole in turn, pull tight, and fill the countersink with solder. This can only be done with an iron at the melting temperature of the solder, so a thin brass rod filled to a point is the ideal "iron". It heats and cools very rapidly and is thus a great time and temper saver. Note the stroking action of the brass rod. Only by doing it this way can you completely fill the cavity and lock the wires in solder. Note that the horizontal wire at section 11-11 on the plan has to be turned 180 degrees and soldered to the landing and flying wires before the diagonal wires are soldered outside the wings. When all the soldering is done, trim off the spare wire and smooth with a very fine needle file.

14.(*) Finish painting the model and add the remaining details. Note that the vertical aileron rod is in one piece with the *diagonal* member. The horizontal wire is added afterwards.

Two famous aces. Major Francesco Baracca, founder of the Squadron which still exists today and bears the prancing horse insignia, gained 34 victories flying for the Italian Air Force. At right, Captain Eddie Rickenbacker with his famous aircraft (photo by courtesy of Air Photos, Box 111, Jamestown, New York)

Aeromodelling Step-by-Step

APPLICATION OF METAL COVERING

FOR GIVING an authentic polished metal finish on models, a covering of metallised wallpaper or metal foil can be used. The former is the more suitable material as it is somewhat easier to cut to shape and work without creasing or marking and the paper backing gives better adhesion.

Main limitations are that the metallised paper *must* be applied over a substantially "solid" surface (i.e. solid wood or sheet covering) and the correct type of adhesive must be used. The weight of metallised paper is not excessive and it can be used on free flight models, particularly on sheet covered fuselages.

The best types of adhesives to use are rubber-based. Latex rubber adhesives (recognisable as being white in colour) give quite good results, but rubber solutions are generally better—e.g. "Titebond" is exceptionally good for the purpose. Rubber gums are not usually satisfactory since they do not completely dry and tend to seep through the paper backing and penetrate the foil, leading eventually to apparent corrosion of the metal (i.e. white patches appear on the covered surface).

A metallised covering job can only be as good as the surface on which it is laid. The highly polished metal surface exaggerates even slight irregularities on the surface, so the first stage is to finish the basic (wood) model with up to ten coats of sanding sealer, sanding down between each with finest garnet paper and finishing to the equivalent of a glass-smooth surface (**1**).

The covering scheme should then be planned out. Rounded fuselage shapes are best divided up into panels. Wing surfaces can usually be covered in one piece, cutting the covering slightly oversize and trimming off after fixing—(**2**).

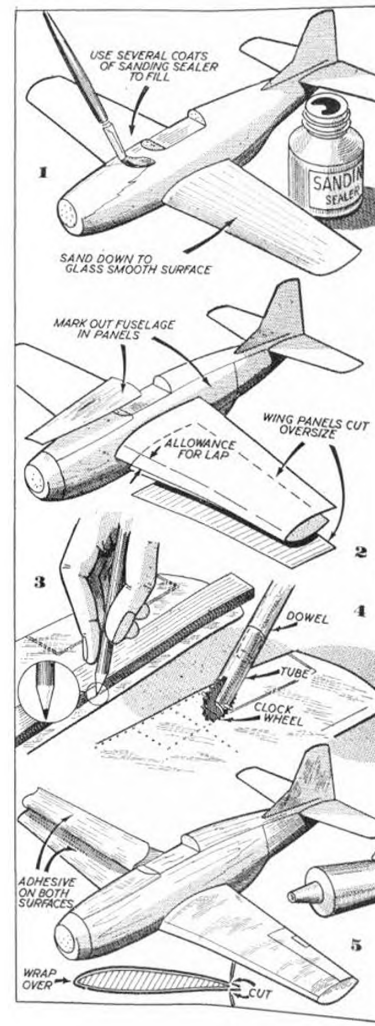
Any irregularities in the cut panels should be removed by laying the metallised paper over a sheet of glass and rubbing smooth. Detail lines such as control surface outlines, etc., can be scored into the metallised paper with a hard pencil (e.g. 2H or 4H) with a slightly rounded point (**3**). Rivet lines can be drawn on with a simple tool made from an old clock wheel pivoted in a length of slotted tubing (**4**). A dowel can be plugged into the tubing to act as a handle. Detail lines, etc., can be ruled on either side of the metallised paper, depending on whether you want them to appear raised or countersunk. Circular outlines are best marked by lightly punching with a piece of tubing, etc. Freehand work should be avoided as it will tend to look untidy on the finished model.

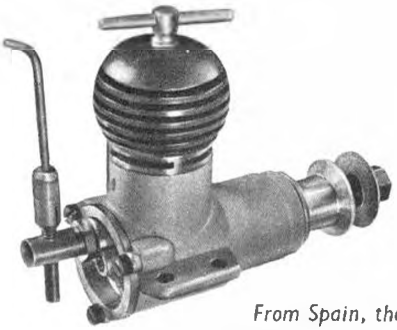
The model should be covered one panel at a time. Apply adhesive to both surfaces (i.e. the underside of the metallised paper and the basic model) and carefully smooth the covering down in place. It is particularly important to see that there is no dust on the surface of the model as this will show through the covering.

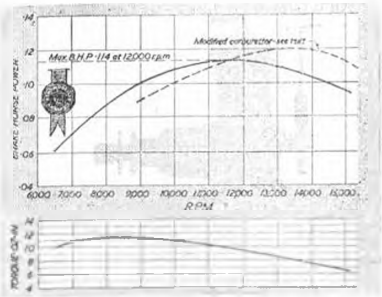
Wings are best covered on the top side first, smoothing the front of the panel around the leading edge. If necessary the finished edge can be trimmed off straight with a razor blade after fixing. The covering should be cut flush with the trailing edge (**5**). The underside panel is then applied butting against the leading edge covering.

Compound curves on fuselage panels can readily be moulded in with finger pressure, taking care not to crease the covering material. A small crease developing can usually be smoothed out, but in the case of a bad crease, remove the covering and try again with a new piece. If still difficult, use smaller panels to cover the same area.

Metallised wallpapers are sold by most Sandersons agents for approximately 12/- per roll, in various metal finishes.







From Spain, the

Byra 1·5

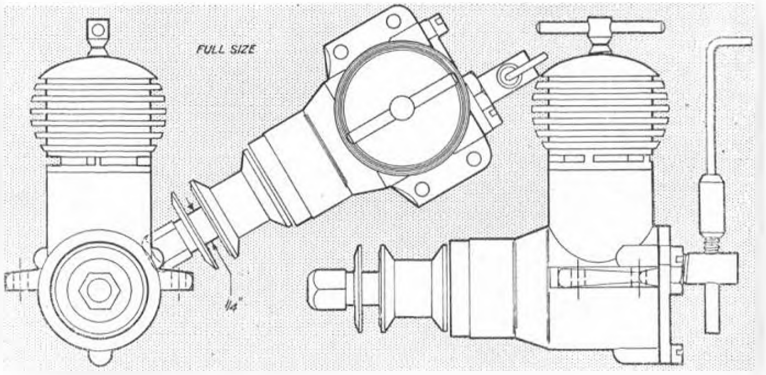
THIS SPANISH ENGINE is, in effect, a scaled down version of the 2·5 c.c. "Byra" (reported in the December, 1955, issue of THE AEROMODELLER) and had a similar fault in that wear on the driving slots in the back rotor disc was very high. We have long since come to the conclusion that light alloy rotors are quite unsatisfactory, but in the Byra wear is undoubtedly aggravated by the fact that the slotted end of the crankpin is not truly radial and so produces rapid wear by virtue of the fact that it does not line up perfectly with the slot in the rotor. The resulting motion also reduces the life of the rotor bearing, so that after some half an hour's running time there is appreciable play between the rotor and the back cover. However, despite this the Byra continued to run quite satisfactorily, started easily and turned in a very creditable performance.

As received the engine was set up for clockwise rotation. The rotor disc has two slots for alternative positioning of the crankpin pick-up. To change from one direction of rotation to the other the pin is engaged in the opposite side slot and the whole back cover rotated 120 degrees when refitting. This corresponds to the intake tube coming at the top left hand side for clockwise rotation and the top right hand side for anti-clockwise rotation. Unless the cover is rotated during the change over the resulting timing is 120 degrees too far advanced. In this state the Byra will start and run quite well, and also run in both directions, but r.p.m. is some 2-3,000 down on any propeller size. Set up properly, the Byra cannot be started in the opposite direction. The best check on the set up is to remove the intake pipe and view the port opening as the engine is turned over to ensure that intake opening and closing occurs at the proper time.

ENGINE ANALYSIS

NUMBER 32

A double feature with two Continental engines reviewed by *R. H. Warring*



For a ball race engine the "Byra" proved quite stiff and needed an appreciable amount of running-in time to free properly. Starting and general handling characteristics are excellent, the contra piston holding its setting at high speeds without working back (a fault found with the larger engine) and with little falling off in power as the engine warmed up. Mercury No. 8 fuel appeared to suit the engine very well.

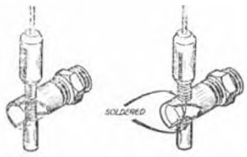
Constructionally, the Byra features a gravity die-cast crankcase unit carrying two ball races to support the shaft, and a conventional screwed-in cylinder. The cylinder is of substantial wall thickness, the four transfer ports being formed on the inside. These are a little unusual in being quite wide and terminating under the exhaust ports, *i.e.*, not corresponding to the "pillar" positions in the exhaust flange. Both the cylinder and piston are of hardened steel, which is again different from conventional practice where a soft rubbing surface is usually used against a hard one.

The connecting rod is a relatively crude casting (or possibly a rough forging), but more than generous in size. Piston fit is generally excellent; also the fit of the mild steel contra piston. The cylinder jacket follows orthodox practice in being turned from dural and is anodised black. The quality of the anodising is somewhat higher than that usually found on contemporary British engines.

The hardened steel crankshaft has a diameter of 6 mm. (·236 in.) reducing to 5 mm. (·197 in.) at the front. The crankshaft thread is 4·5 mm. metric size. The propeller hub fitting screwing on to the crankshaft is of steel, the depth of thread cut on the inside being inadequate and as a consequence the threads are easily stripped.

In general, however, the workmanship throughout is high, considerable care having been taken with regards to fits and alignment.

Being a symmetrical engine (provided the rear cover is rotated 120 degrees in changing the direction of running), performance is virtually the same in either direction. R.p.m. figures for clockwise running cannot be given since these would necessitate a set of opposite-hand propellers, but torque output figures were similar for similar speeds. Hand starting (for a right-handed person) with clockwise rotation and a small propeller is a little hazardous for after all this is a racing type engine! Performance is somewhat higher than the 1·5 c.c. plain bearing engines.



Standard spray bar and modified carb. for Byra which provided comparison figures as below

Propeller dia. x pitch	r.p.m.	Propeller dia. x pitch	r.p.m.
	Propeller R.P.M. Figures		Propeller R.P.M. Figures with Modified Carb.
8 x 5 (Stant)	9,500	8 x 5 (Stant)	8,200
8 x 4 (Stant)	10,400	8 x 4 (Stant)	9,500
7 x 6 (Stant)	10,300	7 x 6 (Stant)	9,900
7 x 4 (Stant)	11,500	7 x 4 (Stant)	11,200
6 x 4 (Stant)	13,600	6 x 4 (Stant)	14,200
6 x 4 (Frog nylon)	16,000	6 x 4 (Frog nylon)	16,000

Fuel used: Mercury No. 8

THE BYRA WAS subsequently re-tested with a new "straight through" carburettor unit (*see* diagrams) which appreciably modified the performance. Performance was similar at about 11,000 r.p.m., fell off as compared with the original at lower speeds, but gave better results at all higher speeds up to 16,000 r.p.m. The approximate equivalent power curve is plotted on the main graph as a dotted line, where it will be seen that the peak is pushed up to the ·12 B.H.P. mark and occurs at 14,000 r.p.m.—some 2,000 r.p.m. up on the original figure.

DATA

Bore: ·494 in.
Stroke: ·455 in.
Displacement: 1·43 c.c. (·087 cu. in.)
Bore/stroke ratio: 1·085
Weight: 3¼ ounces
Max. B.H.P.: ·114 at 12,000 r.p.m.
Max. torque: 11·4 ounce-inches at 8,500 r.p.m.
Power rating: ·08 B.H.P. per c.c.
Power/weight ratio: ·0314 B.H.P. per ounce

Material specification:
Crankcase: light alloy gravity die casting
Cylinder: hardened steel (D-3)
Piston: hardened steel
Contra piston: mild steel
Crankshaft: hardened steel (A-4
Crankshaft: hardened steel (A-4)
Connecting rod: light alloy
Main bearings: two ball races
Cylinder jacket: light alloy (anodised black)
Rotor disc: aluminium

Manufacturers: F. Batllo, Barcelona, Spain *Price:* 515 Pesetas

THE 1·7 C.C. WEBRA is a strange design in some ways. The integral exhaust stack is on the left (port) side of the engine, or diametrically opposite to the theoretical optimum position for anti-clockwise rotation. This exhaust stack, too, continues in the form of a collector ring right round the cylinder and the cylinder exhaust ports themselves are diametrically opposite and at an angle of some 45 degrees to the axis of the engine. As a consequence, whichever way the cylinder is assembled (and there are only two alternative positions, 180 degrees apart) one exhaust port faces forwards and into the exhaust stack and the other backwards and into the collector wing, whence this exhaust has to escape round the ring into the stack. This has the effect of giving a "four-stroke" noise superimposed on the normal exhaust note at certain speeds when the engine is running on minimum lean mixture.

Another unusual feature is that the steel cylinder is not hardened, possibly because this would have made the thin integral fins too brittle. This unit has, however, been particularly well machined, even to the rounding off of the edges of the individual fins.

Care must be taken in screwing down the two holding bolts not to distort the cylinder. The two exhaust ports

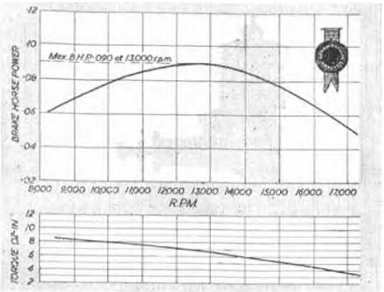
cut in the cylinder wall are of generous size. Two transfer ports are cut inside the bore up between the exhaust ports with an appreciable overlap. Sufficient metal then remains for a "clear-run" for the gudgeon pin up and down the cylinder so that there is no chance of it getting trapped in either an exhaust or transfer port.

The piston is of cast iron, flat topped and light in construction. The connecting rod is machined from steel and remarkably slender with ball-shaped ends. Obviously adequate for the job, it appears to have been influenced by American technique.

The crankcase casting is relatively complex (as a production job) with a space between the intake tube and the cylinder base. If it is to keep the pipe cool by reducing heat transfer from the cylinder, then it fails in its object since it is virtually impossible to choke the engine without touching the very hot collector ring.

The hardened steel crankshaft is 7 mm. (·276 in.) diameter drilled at the front end and threaded (internally) 4 mm. metric for the hub screw. This hole is taken well back down the shaft to lighten, the port opening hole from the other end terminating at the port itself. This is a good feature in that it avoids a "dead" gas space in a hollow crankshaft drilled past the port but still achieves approximately the same degree of weight saving. The crank web is circular (unbalanced) and machined to a saucer-shaped section, presumably to lighten. The crank pin is 4·1 mm. (·161 in.) diameter. Crankcase volume is quite small with bare clearance for the big end.

Starting characteristics are good with the needle opened one turn or more beyond the normal running setting, one or two finger chokes then being adequate to prime. Once the engine is "wet" it continues to run as soon as it fires, when adjustment can be taken up on the needle valve, as necessary. With the smaller propeller sizes there is a noticeable "kick" when starting which calls for a smart flick in order to avoid a backfire and a smart rap on the finger. It was, however, an engine which could be approached with confidence for starting on any propeller size. Running was quite consistent at all speeds, but somewhat happier at the upper end where tests were pushed up to some 16,000 r.p.m. plus. Mercury No. 7 was a satisfactory fuel, but good running was also achieved on a lower nitrate fuel. A K.L.G. glow plug gave equally good results, possibly slightly better, than the original German plug—a rather neat



affair in brass. The latter burnt out after some thirty minutes running time.

PROPELLER R.P.M. DATA

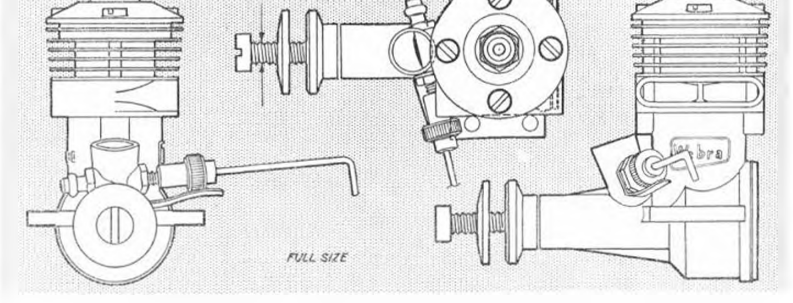
Propeller dia.—pitch	*r.p.m.*
8 x 5 (Stunt)	7,800
8 x 4 (Stunt)	9,000
7 x 4 (Stunt)	10,800
7 x 3 (Stunt)	11,600
6 x 4 (Stunt)	12,200
6 x 3 (Trucut)	13,000
6 x 3 (American)	14,300
6 x 4 (Frog nylon)	14,500

Fuel used: Mercury No. 7. A fine pitch propeller would appear best for this engine, to give a static r.p.m. figure of 11,000 to 12,000.

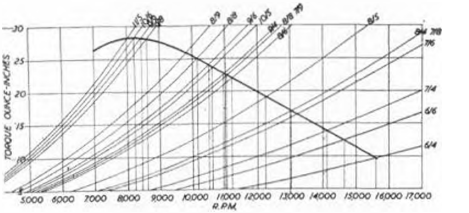
DATA

Displacement: 1·745 c.c. (·1064 cu. in.)
Bore: ·513 in.
Stroke: ·515 in.
Bore/stroke ratio: 1·0
Weight: 2¾ ounces
Max. B.H.P.: ·090 at 13,000 r.p.m.
Max. torque: 8·5 ounce-inches at 8,500 r.p.m.
Power rating: ·0515 B.H.P. per c.c.
Power/weight ratio: ·036 B.H.P. per ounce

Material Specification:
Crankcase: light alloy pressure die casting
Cylinder: soft steel
Piston: cast iron
Cylinder head: dural
Crankshaft: hardened steel (journal length 1·03 in.)
Bearing: plain (reamed and lightly honed)
Con. rod: steel (turned)
Manufacturers: Fein und Modell technik, Genestrasse 5, Berlin-Schoneberg-Germany.



How fast will your engine turn a 7x6, 8x5 or 9x4? You can estimate expected r.p.m. by using these curves plus Aeromodeller torque curves



Propeller—R.P.M. figures

DATA ON TORQUE ABSORPTION FOR THE STANT PROP RANGE

IN JANUARY ISSUE we introduced this scheme of reading torque absorption curves with particular application to the Frog range of plastic propellers. This month we are dealing with the popular STANT range of wooden props, and the torque curves for each of eight sizes are given below.

Given such a set of curves and the torque curve for any engine (such as obtained from AERO-MODELLER Engine Analysis), the theoretical r.p.m. figure with that engine for any of the propellers detailed can readily be obtained. The most direct way of doing this is to plot the engine torque curve on the same graph and read off the corresponding r.p.m. figures where the torque curve cuts the appropriate propeller curves. In practice, the engine torque curve is best drawn on a sheet of tracing paper to the same scale, laid over the propeller curves and the intersection points traced down to the horizontal axis. In the other diagram the two graphs are shown drawn as one, with the table listing the theoretical r.p.m. figures so derived and the actual r.p.m. values obtained with that engine and the same propellers on test. Agreement in this case is certainly well within the limits of accuracy one would expect.

From the *testing* point of view the main value of these curves is for a quick check on test propeller-r.p.m. figures so that where any wide discrepancies show up the run with that particular propeller can be repeated as necessary, to fully investigate the anomaly whilst the rig is still set up for use. From the readers' point of view they should be of value in estimating probable r.p.m. figures with standard commercial propellers against an engine performance curve—subject to a rather wide range of tolerance and the fact that discrepancies may well show up related back to some of the earlier test reports because of the different conditions under which some of these figures were obtained.

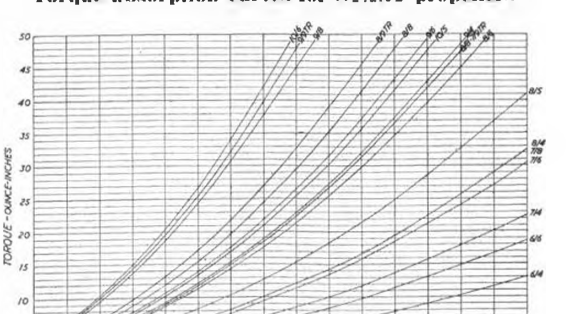
It is hoped to finalise similar propeller curves for other families of commercial propellers to follow.

Table below gives comparison of figures measured from graph and actual readings taken on test bench from engine, discrepancies of up to 200 r.p.m. are insignificant

PROPELLER	R.P.M. FROM GRAPH	R.P.M. AS MEASURED
11 x 5	8,000	8,000
10 x 6	8,250	8,200
10 x 6	8,250	8,200
9 x 9	8,450	8,400
9 x 8	8,650	8,600
8 x 9	10,200	9,600*
9 x 6	10,500	Not tested
10 x 5	10,650	10,500
9 x 4	10,950	11,000
8 x 8	11,050	10,900
7 x 9	11,050	11,000
8 x 6	11,250	11,200
8 x 5	12,350	12,250
8 x 9	13,050	13,000
7 x 4	14,200	Not tested
6 x 6	14,700	Not tested
6 x 4	15,750	Not tested

* Test report reads . . . "motor was not happy with this prop."

Torque absorption curves for STANT propellers



World News

Specially big picture of the pioneer pylon flier, Carl Goldberg, with his latest FAI model, known as the Blazer and soon to be kitted in the U.S.A. For Carl, this is a functional design with longer nose than he usually employs

PRIVATE ENTERPRISE is always something we admire: but the opportunity to bestow our admiration occurs all too rarely. What is about to happen in **South Africa** is, however, sufficient to satisfy our quest for enterprise for quite a considerable time. Jix (Pty.) Ltd. is a Hobby store with branches Pretoria, Durban, and soon to open in Johannesburg. It is directed by three go-ahead types, including well-known modellers Monty Malherbe and "Doc" Allen, and has agencies for most of the world's leading model kit ranges. As will be appreciated by all lone-hands who read these columns whether in the bush and outback, tropical countries or frozen lands, the greatest need any modeller has, is to see and learn what the other fellow is doing in order to progress in his own efforts. Jix intend to bring progress to South African aeromodellers in one big (and very expensive swoop) One could also call it a major scoop.

They are covering all expenses for Bob Palmer and Howard Bonner of "*Thunderbird*" and "*Smog Hog*" fame to fly from Los Angeles, California, to Pretoria, Transvaal, for the express purpose of demonstrating the highest standard of control-line and radio control flying in the world today. Both men are top of their class and need no introduction from us, for their names have appeared in AERO-MODELLER so frequently. They will be flying at Wembley Statium (Johannesburg), Palmietfontein, Waverley (Pretoria), Durban, Pietermaritzburg, Springs and Rustenburg, so there is a full programme to fill between their stay from April 1 to May 2, including the S.A. Nationals. Such a visit can only result in a terrific boost for Aeromodelling in South Africa, thanks to Jix Ltd.

On their way home again, it is hoped that AEROMODELLER will be able to play host to the American experts, and show them some British flying at the Woburn Park radio rally.

News from the **U.S.A.** includes newsletters with

From Germany, two designs built by Bernhard Lorenz of famous scale subjects. At left, an 88-in. span Flexler Storch with radio control, for Webra Mach. 1; at right, a "single" engined Junkers 52 3-m with OS Max 35 and two freewheeling props, with a span of 98 in.—takes 60 ft. to rise off ground

cartoons showing the above-mentioned travellers mixed up with native life. Seems like the following in California is as excited about the trip as the South Africans. Claude McCullough has been elected A.M.A. President for 1957 by an all-time record vote. Claude was Chairman of the '55 and '56 Contest Boards and has always been a protagonist of competitive model flying as a means to promoting the American movement. An Iowa farmer, he is also the author of many interesting f/f power and r/c designs that have appeared in the model press. A new event in the U.S.A. is the All-Army meeting set for an August date and open to all aeromodellers who have been in the Army for more than 90 days except in training centres where participation would interrupt instruction. All classes are covered, including a special scale contest for models of U.S. Army Aircraft of between 12 and 24 inches on the major dimension. Three winning models are to be kept for display in the Pentagon.

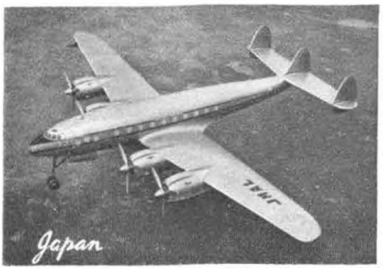
Above: Vietnamese Nguyen-Quang-Ru, instructing modeller at Saigon with Hawker Tempest c/l. Right: High thrust f/f for OS 29 by Russ Murrison of Queensland at Australian Nats. Tiger Moth is by H. L. Jones of West Australia from Mercury kit, with Mills .75

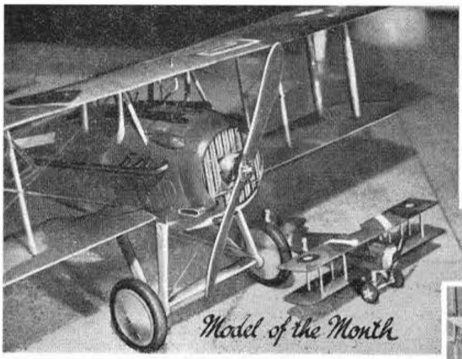
The U.S. Nationals are to be at Willow Grove, Penna, from July 29th to August 4th this year, taking the event to within three hours by car from New York City. Over 400 trophies and awards are to be presented to winners of the 72 contests.

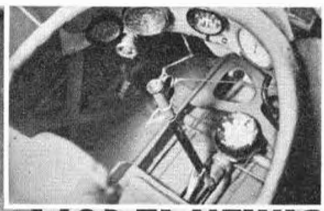
Last month we brought up the question of the world's finest flying site. Taft, in California, would do for us, for at a *night* meeting (lights under every fuselage), 61 flights were timed, five for the six-minute max., and Ron St. Jean, the *Ramrod* designer, made three of these max.'s between 2.00 and 4.20 a.m.! Of the 265 daylight flights timed, 43 per cent. were over six minutes, and 14 people tied with perfect 18 minute totals!

In South America, the Clube dos Manicacas in **Brazil,** is fostering interest through regular modelling features in the "Vida Juvenil" boys' paper, which we trust will eventually result in participation of International events by this very large country.

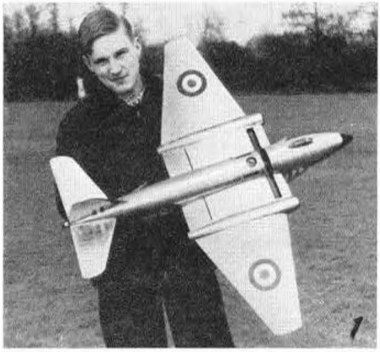
Yet more Japanese Multi-engined scale control-line models, each with 5 c.c. "29" engines. At left, a Constellation, at right, an Amphibious Canaan

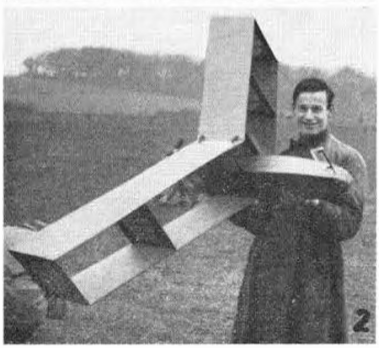






MODEL·NEWS





WE COULD NOT have a more opportune selection for Model of the Month than the latest product of Captain Milani's workshop, an exact scale SPAD XIII controline with an Ohlsson 10 c.c. For comparison in size, George Cox's own solid scale model is seen in two of the photos and it will also be noticed that Captain Milani has chosen the decoration of the *Escadrille Lafayette* with the Indian Chief's head on the fuselage side.

For detail, particularly in the cockpit interior, guns, radiator and remote access to engine controls, this is certainly the finest scale controline model we have seen and we look forward to witnessing its flights at the year's rallies.

Peter Holland's prop-in-the-slot system introduced by *Prop Secret* in the AEROMODELLER ANNUAL has started a new phase in aeromodelling, and as will be seen in picture **1**, Mr. Thomas of Hayes has made a pseudo Jet Canberra PR.9 for his Amco BB.3·5 fitted with a flutter valve, span 40 in., weight 29 ounces and airspeed 45 m.p.h. The model is covered with aluminium-surfaced wallpaper.

Remember the Dunne Type Tailless last month? R. Devereux who is Mr. Males' club-mate at Letchworth has an E.D. 2·46 powered radio version, 5 ft. span with a perspex steering vane on the nose, as will be seen in picture **2**. Extremely stable and having a good glide in spite of its 4 lb. weight, it is a fine radio subject.

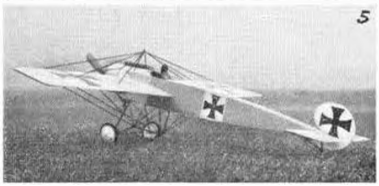
Attractively posed Sopwith Pup in picture **3** tends to belie its miniature proportions, as this model is a mere 15¼ in. span, weighs only 2¼ ozs. and has logged a total of three hours flying time with Bambi power. Made by D. E. Thumpston of Birmingham, it had a pendulum rudder originally, but this was proved unnecessary.

Mr. Thumpston is obviously an enthusiast for W.W.I. scale models, for he also provided pictures **1** and **5** showing his Avro 504K and Fokker Eindekker, the latter also Bambi powered weighing a mere 1¼ ozs. and 18 in. span, performance is said to be quite exhilarating with fairly tight left hand spiral climbs and slow glides. This model now has almost 1½ hours flying time. Interesting point is that it is fitted with tyres made from cycle valve rubber.

For realism, it would take a lot to beat picture **6**, by D. R. Smith of Tooting. The model is, of course, the A.P.S. Handley Page Hannibal and the scene, the actual Croydon Airport buildings. The model was actually being tested whilst this photo was being taken, and we only hope that it managed to pull out of the uncharacteristic shallow dive!

Reverting to miniature scale models, how about this one in picture **7**, where we find ye local serving wench of ye old model shoppe, Gloucester, holding B. Passey's Sopwith Camel for rubber power which is usually flown R.T.P. at those Gloucester indoor meetings. We can now understand the popularity of the local model shop!

One advantage of service life is that it gives one opportunity of making very accurate scale models through close study of the subject. Earl Williams of the U.S. Navy was particularly fortunate, working on R7V-1 Super Constellations at Haneda air base near Tokyo, Japan. He made his 12 lb. replica for four Japanese 29 engines (span 6 ft.) and in picture **8** we see him posed with his model in front of the full-size subject.



RADIO CONTROL NOTES

BY HOWARD BOYS

ROGER BLUNT, who emigrated to Canada some time ago, sends us a letter describing his latest equipment. He says he is the only modeller in Hamilton using multi-channel control, and mentions that there are about two people in Toronto using E.D. equipment, who have not yet flown. One enthusiast he saw in Toronto had a four reed outfit specially made by George Honnest-Redlich, and fitted to an E.D. Queen powered with a Frog 500 with barrel valve engine control. He goes on to say—"An interesting feature was flaps operated by a timer. Engine pressure is fed from the cylinder head to hold the timer open. The pressure is controlled by a needle valve close to the engine to prevent leakage when starting the motor".

Roger himself, has a 68 in. plane with left and right, slow and fast, using four reeds of a six reed unit. The receiver with six reed unit, six relays and three valves weighs 8 ounces. The receiver and transmitter are to his old circuit, which was published in the AEROMODELLER for August, 1955. He uses two magnetic actuators, one for rudder, and one to operate the double butterfly type throttle on the Hunter engine. All his take-offs from land have resulted in excellent flights. He finishes by saying, "Give my regards to all the boys back home who remember me".

McQue Crystal Equipment

Mr. McQue has sent along a few more notes on his crystal controlled transmitter, published in the March, 1956, AEROMODELLER.

Firstly R 6 can be anything between 500 and 1,500 ohms. One constructor found trouble through getting V 1 and V 2 reversed in the layout, which produced leads much too long. C 11 has P.A. circulating current in it, and must therefore be a good quality mica type that can preferably be bolted down. Miniature ceramic and paper types are not good enough in this position, though they

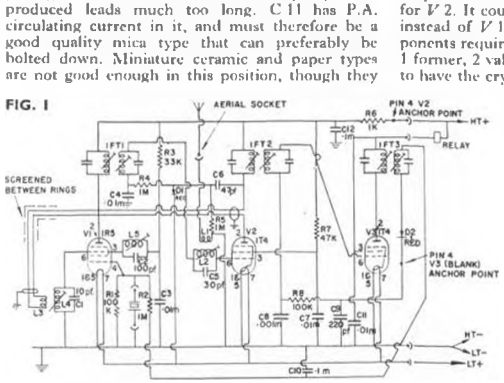
"Windy" Kreulen, well-known Dutch modeller, with his radio version of Laurie Ellis' "Valian". Model uses a miniature 3 valve receiver and a flatrack escapement operates the forward fin for directional control

are all right in other positions such as C 1 and C 12.

After tuning L 1 for dip in the anode current, tune L 1 and L 2 for maximum grid current in the meter inserted for neutralising. Neutralising. Disconnect R.F.C.2 from H.T. line as well as switching to low power. Swing C 10 through complete range and adjust C 9 for minimum kick in grid current. With some sets, a fixed capacitor of 5 pf. has been required across C 9 to reduce kick to zero. Grid current will be 0·4 to 0·6 ma. depending on the H.T. For fast keying speeds such as for mark/space, reduce R 7 to 1,000 pf. (0·001 mfd.) or remove entirely.

Enquiries have been received regarding the use of crystals between 6,740 and 6,820 kc/s, which require V 1 to be used as a quadrupler instead of tripler. This can be accomplished by increasing C 2 to 200 pf. Mr. McQue has tried this, but the output is much lower as there is not enough drive for V 2. It could be done by using two 1 S 4 valves instead of V 1, each doubling, but the extra components required amount to 3 resistors, 3 capacitors, 1 former, 2 valves and holders. It would be cheaper to have the crystal re-ground to 9,000 kc/s.

FIG. 1



Now for some details of the Mk. II McQue Crystal controlled superhet receiver. Only three valves are used and the circuit is given in *Fig.* 1. It is a reflex type, the signal first being amplified by V 2 then converted by V 1 to 465 kc/s, this being then amplified by V 2 and V 3, rectified by the diode D 2, passed back into V 3, which now acts as a D.C. amplifier to operate the relay. This has been done to reduce battery consumption and therefore weight. Current rise through the relay is from 0·5 to 2·5 ma. David and his friends have

built four of these receivers and all give identical performance. Range with a 1/10 watt transmitter is ½ mile. Here are the component values.

L 1 4 to 5 turns of small single flex, close wound on top of *L* 2.

L 2 15 turns 28 gauge D.S.C. spaced by winding thread (No. 40) between turns.

L 3 5 turns of small flex close wound over *L* 4, the ends being continued through screening braiding to I.F.T. 2 and V 2 anode.

L 4 15 turns as L 2.

L 5 20 turns No. 28 gauge D.S.C. close wound.

All the coil formers are 7 millimetre diameter Aladdin. All 28 gauge windings should start close to the former end remote from the fixing lugs, to give greatest range of tuning by the slug. Fix the coils with proper coil locking compound, not balsa cement, which is liable to ignite with a hot soldering iron and may alter tuning capacity slightly.

Capacitors		Resistors	
C 1	10 pf Silver mica or ceramic	R 1	100 k ohms.
C 2	100pf " "	R 2	1 meg. "
C 3	0·01 mfd High K ceramic	R 3	33 k "
C 4	0·1mfd min. paper 150V Wkg.	R 4	1 meg "
C 5	30 pf silver mica or ceramic	R 5	1 meg "
C 6	47 or 50 pf silver mica or ceramic	R 6	1 k "
C 7	0·01 high K ceramic	R 7	47 k "
C 8	·001 " "	R 8	100 k "
C 9	2 pf or 220 pf silver mica or cer.	Note: R 3 should be adjusted if necessary to get 0·5 ma. in the output stage with the osc. core set to give minimum current.	
C 10	0·1 mfd min. paper 150 V		
C 11	0·01 mfd high K ceramic		
C 12	0·1 mfd min. paper 150 V		
D 1 and D 2 high back resistance type Germanium diodes.			

IFT 1, IFT 2, IFT 3 are Denco IFT 11/465 Kc/s transformers.

Bias is obtained from the oscillator of V 1 rising and falling automatically with H.T. volts.

Notes on adjustment:

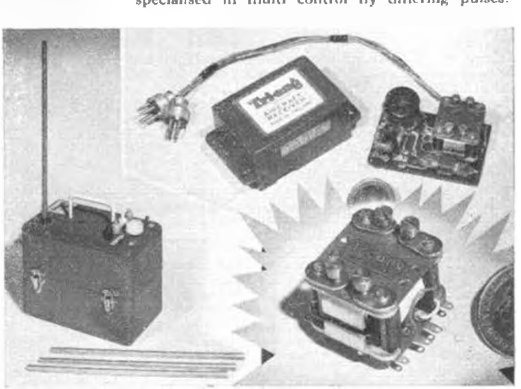
1. Insert crystal and tune *L* 5 for minimum current through relay. It should be between 0·4 and 0·6 ma. If less, unscrew core to obtain reading of 0·5 ma. If more, reduce *R* 3.
2. Connect 465 kc/s signal generator to *V* 2 grid and tune *IFT* 3 and *IFT* 2 for rise in relay current, reducing output of sig. gen. progressively as circuits come into line.
3. Connect sig. gen. to *V*1 *G* 3 (signal grid) and adjust *IFT* 1. Note *D* 1 provides delayed A.G.C. for *V* 2 to avoid blocking of *V* 3 and reduction of current rise for strong signals (close range).
4. Switch on transmitter on low power and adjust *L*4 and *L* 2 for max. current rise in relay, moving away from transmitter as necessary, to keep the peak rise at less than 2 ma. (Unscrewing *L* 5 core to allow standing current to rise temporarily to 0·9 ma. makes these adjustments easier).
5. Touch up *IFT* cores (as for 4) so that they peak at actual difference frequency determined by crystals. This may be a few kc/s above or below 465 kc/s.

The chassis is the same as for the previously described 4-valve, leaving the fourth space vacant, or mounting the crystal there.

Tri-ang Equipment

The writer has recently had the opportunity of examining the Tri-ang Mk. II transmitter and Aircraft receiver. There are a number of interesting points regarding the transmitter. It has crystal control at 27·255 mc/s, which suits America as well as European countries. Without the aerial it will emit a weak signal that is spot on for tuning the receiver. The tank circuit can be tuned to give maximum output with any aerial length used, still at the spot frequency, and there is an indicator for this purpose. There is a built-in filter circuit to eliminate T.V. interference. There is an on/off switch for the battery, and another switch puts on a pulsed carrier wave. The mark/space ratio can be varied by a knob from 1 to 10 to 1·2 to 1, when further turning of the knob gives an abrupt change to full signal. The pulse rate can be increased from 2 to 3 pulses per second to about 40 p.p.s by pressing a button. Another button will stop the signal when the pulse switch is on. With the pulse switch off, another button is used to give carrier wave signals as desired. Provision is made for a remote push-button in the H.T. lead if required. Only one valve is used, and the signal output is very good. An attractive metal box houses the electronics in the top and batteries in the bottom, and has a convenient carrying handle.

The receiver uses a subminiature valve and 60 volts H.T. It is plastic cased and has flexible leads terminating in suitable plugs. It seemed a bit tricky to adjust, but when adjusted was very sensitive. The range with the Tri-ang transmitter was not checked beyond half a mile, since this seemed adequate. An unusual item in the receiver is the relay which is polarised, and has two balanced armatures which give two separate sets of change-over contacts. This facilitates multi control at different pulse rates. The equipment has been designed by Mr. G. Somerhoff, who has specialised in multi control by differing pulses.



Aeroplanes in Outline

Number 49

Grumman F9F-8 Cougar

THE NAME OF Grumman is synonymous with U.S. Naval fighters. For years, the Bethpage company has been responsible for a succession of single seat shipboard interceptors, and in the Cougar, they have produced the U.S. Navy's standard jet for carrier operation. It was a notable "first" swept wing naval type to see service, and though by no means a small aircraft, its transonic performance makes it a fine air-to-air missile platform for 4 Philco Sidewinders and at the low speed range, its large area flaps and droop snoot leading edge permit an approach speed of not much more than 100 m.p.h. For lateral control the Cougar uses wing spoilers to replace ailerons, with a small area trimmer at the port tip only. Another unusual distinction is the blunt edge to the large root fillet from wing to fuselage.

The F9F-8 is a vastly improved version of the original F9F-6, which was basically a Panther fuselage with 35° swept wings. This was fitted with a 6,250 lb. thrust Pratt and Whitney J 48 P6A, and a subsequent development, the F9F-7 with Allison J 33 gave opportunity for comparative assessment. In the current -9 version, the power unit is a P & W.J.48.P8 of 7,250 lb.

thrust, and wing chord increased by 15 per cent. over previous marks to lower the thickness chord ratio and raise speed in level flight by at least 25 m.p.h. The armament consists of four 20 mm. cannon and in the fighter-bomber role, it can carry assorted loads of up to two 1,000 lb. bombs, rockets or napalm tanks.

An unarmed photo recce version, the F9F-8P has the very latest in Fairchild and Mitchell cameras and can fly across the United States in less than four hours, photographing a ten-mile wide strip continuously on the way. Despite its lengthened fuselage, with necessary droop to keep the lower surface parallel to ground, the speed of the "P" is equal to the cleaner fighter.

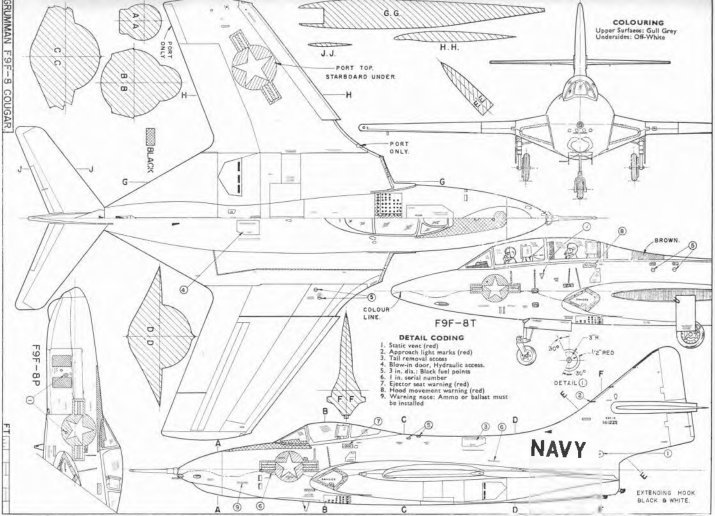
Latest variant (save for the missile carrying "M") is the "T" 2-seater, one hundred of which are being delivered for jet training as well as fighter roles. Cockpits are exact duplicates, and Martin Baker ejector seats have been specially designed for the particular difficulties involved, not the least of which must have been the need to conserve weight. Two cannon are carried, and the power unit is the J 48 as in other versions.

Span: 34 ft. 6 ins. Length: (F9F-8) 41 ft. 8 ins. Height: 12 ft. 3 ins. Max. level speed: 714 m.p.h.

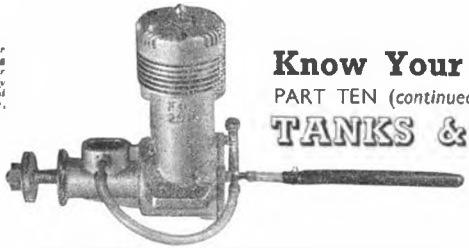
Above: Three variants show nose changes. Top: the Transonic 2-seater with prototype nose probe. Centre: the Photo Reconnaissance version with kinked underbelly to obtain vertical views. Bottom: the Transonic fighter with probe refuelling. Other variant not shown is the M, for missile carrier, similar to the fighter

Left: Wings folded on earlier Cougar without refuelling probe reveal the two wing insignia and proximity of tail bumper to ground (nose leg compresses under thrust at take-off)

Below: Anglo-American co-operation provides this action shot during the NATO exercise "Unitex 56" as a Cougar in earlier Glossy Sea Blue, Silver and White markings from VF 61, U.S.S. Intrepid, makes a "touch and go" approach on the angled deck of H.M.S. "Eagle", introducing U.S. Navy pilots to the new deck and landing mirror technique


GRUMMAN F9F-8 COUGAR.
COLOURING
Upper Surfaces: Gull Grey
Undersides: Off-White
G. G.
H. H.
J. J.
A A
B B
C C
D D
E E
F F
PORT ONLY.
PORT TOP.
STARBOARD UNDER.
BLACK
BROWN.
COLOUR LINE.
F9F-8T
F9F-8P
DETAIL CODING
1. Static vent (red)
2. Approach light marks (red)
3. Tail removal access
4. Blow-in door, Hydraulic access.
5. 3 in. dia.: Black fuel points
6. 1 in. serial number
7. Ejector seat warning (red)
8. Hood movement warning (red)
9. Warning note: Ammo or ballast must be installed
3"R.
1/2" RED
30°
DETAIL (1)
141225
NAVY
EXTENDING HOOK
BLACK & WHITE.
FT

Pressure feed is essential for the American Fox 29R racing engine. Ordinary pen bladder is bound to needle valve body via length of fuel tubing, and inflated under fuel pressure, capacity 36 c.c.



Know Your Engine

PART TEN (*continued*)

TANKS & FUEL FEEDS

IN LAST MONTH'S feature we dealt with the tank position and compensation required for fuel movement during normal flight attitudes through climbs and other manoeuvres. We continue now with the accent on control line models, and some of the more common shapes used are illustrated in *Fig.* 6. Actual shape will depend on the type of model. A rectangular shape is popular for team racers, and variations in vent positions are shown for two types. Where the tank has to be negotiated around an engine bearer or in a confined space, the piano shape is good as it allows for the wall of fuel to be constant when centrifugal force comes into effect.

Some advantage is claimed for utilising ram air pressure to provide a positive pressure in the tank, *e.g.*, most simply achieved by using forward facing vents. Straight (vertical) vents may actually have fuel sucked out of them at speed if normal to the airflow; or have fuel thrown out by centrifugal force (pressure build-up) if located on the *outboard* side of the tank. It is therefore the general rule on speed tanks to locate vent pipes on the inboard side, either facing forwards or outwards—*Fig.* 7. If only one vent is facing forwards there will be no pressure build-up in the tank due to ram air.

Since the fuel pipe requires always to be submerged, the obvious location for this is as near to the outboard wall of the tank as possible, usually terminating near the bottom rear corner. A point to watch here is that the pipe should end well short of the actual corner—*e.g.*, by at least ½ in. and preferably more—as there is a tendency for cavitation pockets to appear in the extreme corner when the pipe may momentarily be sucking air instead of fuel.

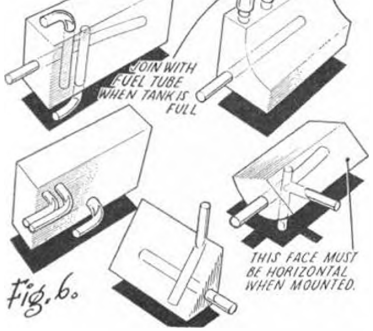


Fig. 6.

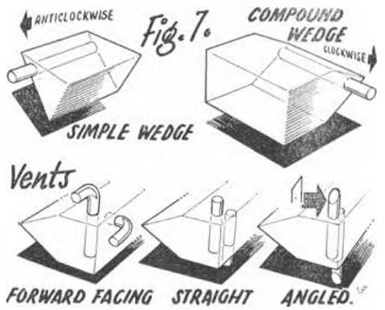


Fig. 7.

Tanks for stunt control line models are developed on slightly different lines. A wide variety of different shapes have appeared from time to time but the wedge has become more or less standard and perfectly satisfactory for most needs. This takes the form of either a triangular wedge or a compound wedge, with the fuel feed taken from the apex—*Fig.* 7—and the vents on the inboard side again. A wedge tank is symmetrical as regards feed both upright and inverted although, of course, there is a change in fuel head unless the spray bar of the engine is on the same level as the fuel pipe to start with. This will give gravity feed to the spray bar under static conditions with the tank full and it is more usual to arrange for zero head for "upright" running and accept the small change in head (tending to richen the mixture) in inverted flight. Usually this is not significant enough to cause trouble, except on a very "fussy" engine. Internal baffles are sometimes included in stunt and combat model tanks to minimise fuel surge during violent manoeuvres but this normally not necessary except on the larger sizes feeding the bigger engines. Baffles should be quite unnecessary on a wedge or "speed" tank used on any size of team racer.

Most wedge tanks are "handed" by arrangement of vents (*i.e.*, are usually designed for normal anti-clockwise control line circuits). A non-handed type of stunt tank which has regained popularity with radio control models is the de Bolt—*Fig.* 8. The original de Bolt tank was rectangular in form with a weighted swivelling tube attached to the fuel pipe so that its end always tended to remain in the fuel, irrespective of the attitude of the tank.

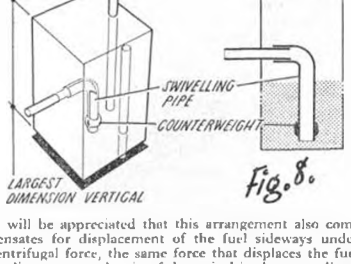


Fig. 8.

It will be appreciated that this arrangement also compensates for displacement of the fuel sideways under centrifugal force, the same force that displaces the fuel tending to carry the tip of the swivel in the same direction. It cannot, however, compensate for fore and aft displacement of the fuel, so to minimise such changes the de Bolt tank is made tall and relatively short. A later de Bolt swivel tank (and a British counterpart, the EmDee, which appeared in the later 1940's) was cylindrical in shape and not so satisfactory in this respect.

The de Bolt tank is well suited to the modern aerobatic radio control model since it can be made of ample capacity for the size of engine used and is generally fool-proof and trouble-free in operation. Some special forms of tanks developed specifically for radio control models are sketched in *Fig.* 9. Normal stunt tanks, where used, generally benefit from having internal baffles fitted.

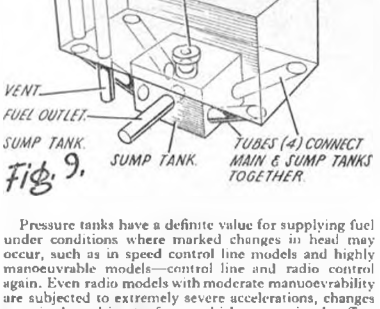


Fig. 9.

Pressure tanks have a definite value for supplying fuel under conditions where marked changes in head may occur, such as in speed control line models and highly manoeuvrable models—control line and radio control again. Even radio models with moderate manuoevrability are subjected to extremely severe accelerations, changes in attitude and inertia forces which may seriously affect the mixture setting of an engine.

The simplest form of pressure tank can consist of nothing more than a fountain pen bladder (for small capacity tank, such as on a speed model) or a rubber balloon (more suitable for a stunt model). An ordinary rubber balloon is satisfactory for accommodating glow fuels but with diesel fuels a synthetic rubber variety must be used. A pen bladder can be filled *in situ* (*i.e.*, still attached to the engine) by means of a veterinary hypodermic to contain up to 30 c.c. of fuel. Alternatively, it can be filled with a pressure bulb. Balloon tanks are usually best filled by removing from the fuel line and pumped up with a pressure-type oilcan—*Fig.* 10.

Jim Walker introduced a commercial pressure tank on these lines, the tank material being synthetic rubber. Pressure is applied by rubber bands looped over the cover plates—*Fig.* 11—and the tank is connected to the engine via a pressure regulator. The regulator is necessary to equalise the pressure of the fuel as fed to the engine, as otherwise the change between "maximum" and "low" pressure would be too great for consistent running on a single needle valve setting.

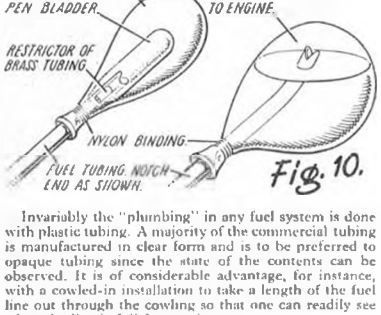


Fig. 10.

Invariably the "plumbing" in any fuel system is done with plastic tubing. A majority of the commercial tubing is manufactured in clear form and is to be preferred to opaque tubing since the state of the contents can be observed. It is of considerable advantage, for instance, with a cowled-in installation to take a length of the fuel line out through the cowling so that one can readily see when the line is full for starting.

Tubing is normally made either from synthetic rubbers or P.V.C., both of which materials are fully resistant to fuel and oils. Neoprene tubing is the best from the point of view of remaining flexible in contact with fuels. Most of the plastic tubing age hardens to a rigid, brittle state in a matter of weeks after being in contact with fuel and the length usually requires renewing should it be disconnected for any purpose.

Most of the fuel tubing sold through British model shops is manufactured originally for surgical drain tubes, etc., and is therefore expected to remain flexible. A good tip for softening the hardened type is to warm it slowly then flush through with petrol.

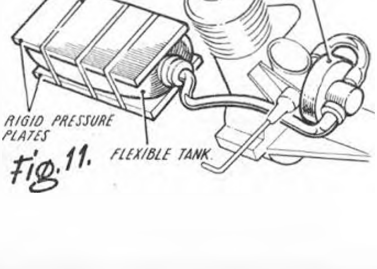


Fig. 11.

Club News

London

All London Area Clubs are reminded that the monthly L.A. Committee Meetings are held on the second Monday of each month at the Crown Hotel, 51 New Oxford Street, 7.30 p.m. These meetings are far from dry in all senses, and everyone has the opportunity of having his say in S.M.A.E. administrations, so why not go along? The Area has its annual Dinner and Dance for 1957 on Friday, May 3rd, at Beales Restaurant, Holloway Road. Tickets are 18s. 6d. each and can be obtained on application to the Area Chairman, Norman Butcher, 78 Grange Road, Sutton, Surrey. The Area has formed a Team Racing League, the first of a series of meetings taking place at Heston on March 3rd.

Annual competition organised by Dee's Model Shop of Wallington in connection with their exhibition, resulted in a win for T. Lewington for the best model with G. Stacey and P. E. Nye taking Junior and Senior Trophies. This type of local exhibition sponsored by model shops is to be encouraged. Why not ask your dealer to do the same?

LEWISHAM ORBITS M.A.C. are firm in their intent to regain or retain the position as leading club south of the river, an honour which I am sure others will intend to contest. Club night is Friday at 8 p.m. at Waverley Cafe, 147 Lewisham Way.

WEST LONDON M.A.C. have a half-dozen Eta 29's in the Club, promoting a rash of Class B Team Racing all clocking around 90 m.p.h. They also have an Eta in an A.P.S. *Flamingo* and warn everyone to get their shovels ready! Paul Fynn is a promising junior in the **ST. ALBANS M.A.C.**, in fact he has turned out to be the 1956 Club Champion. The Club has decided to put aside a sum for badly needed clubhouse redecorations before the rest of the ceiling comes down.

NORTHWICK PARK M.A.C. have had the misfortune of seeing their flying field reduced to half its original size, and this has promoted a C/L section run by E. Rowntree with two Frog-powered trainers provided by Club funds. February 6th was the day for the first indoor competition won by Geoff Jones and this has sparked off enthusiasm for more indoor ultra lightweights. Easter promises an open glider contest for **VICKERS ARMSTRONG M.A.C.**, and any locals are welcome to join the club c/o of the Secretary, 49 New Haw Road, Addlestone, Surrey.

To liven things up a bit during the otherwise dull winter meetings, the **ENFIELD** and District Model Aero Club held an indoor chuck glider comp., and the idea seems to have caught on. The Club's controline rally is definitely fixed for July 7th on the usual field. **SIDCUP A.S.** had the kindly thought to decorate the Men's Surgical Ward at Queen Mary's Hospital, Sidcup, for Christmas. The main theme was to depict London Airport through models, and each bedside lamp was given a miniature parachute complete with descending pilot, whilst a half-size Father Christmas, complete with twin engine transport roared down the centre aisle. Many individual thanks are due to members who put in much hard work to make a success of the entertainment which was much appreciated. Incidentally latest member of this Benevolent Club is Ray Gibbs.

There are thirty members in the **BROMLEY M.A.C.**, and their major interest seems to be A/1 and A/2 Comps., while G. Goldsmith has a 6 reed radio job, and A. W. Evans is also working with the latter on all-plywood 7 channel model! A steep drop in membership from sixty at the beginning of last season to eighteen now, is reported by the **CHINGFORD M.A.C.**, and it is hoped to do something to remedy the situation in the coming season. This is the 21st Anniversary year of the Club, and a programme of film shows and more contests is planned for general enjoyment.

INDOOR MEETING
Corn Exchange, Manchester
Saturday and Sunday,
April 13th and 14th, 1957

Chuck Glider.—Limit of ½ oz. weight, on account of damage that may be done with heavier Gliders.
Free Flight Microfilm.—2 Classes—over and under 100 sq. inches Wing Area.
Free Flight Tissue.—2 oz. weight limit. No unorthodox classes.

Best of six flights to count for Chuck Glider.

Best flights for Microfilm and tissue. Flights to be taken in order, and as many attempts as time permits.

N.W. Area will give money prizes in each class to the value of 30/- and 10/-.

Test Flying and Record attempts, Saturday afternoon.

Sunday—Competition proper.

Unattached aeromodellers in the Chingford area welcome on Fridays at Wellington Avenue Youth Centre, Chingford Mount.

Keil Kraft "Senator" was adopted by **WEST MIDDLESEX M.F.C.** for one design contest run on the basis of 5 2-min. flight r.o.g. on February 24th. Non-stop drizzle dampened models and bods considerably, but the result was Senior L. M. Sargent 9 : 16, Junior D. R. Allan 5 : 11.

South Midland

OXFORD METEORS report a swing to model railways (why couldn't they keep to piano wire lines?). Local design known as Scarlet Pimpernel for the A.M.10 is proving very popular.

HIGH WYCOMBE M.A.C. announce that their Rally will take place in May, using the Kings Mead Recreation Ground, and with A and B Team Racing and Combat. Greenline Coach 711 from Reigate to London stops right outside the ground and the Loudwater Railway Station is only half a mile away. Send for further information to R. Edmonds, 24 Carrington Road, High Wycombe, Bucks.

On May 5th, the South Midland Area will be much enlivened by a RADIO RALLY at the famous Woburn Abbey Park, ancestral home of the Duke of Bedford, the grounds for which contain a large landing area which was used by the Duchess of Bedford, and as a secret airfield during the war years. This Rally is intended to be a social event and it is just the place to take along the wife and kiddies to see the famous buildings and beautiful grounds. Attendance at the Rally will be enhanced by the presence of world-famous Howard Bonner, the American multi channel champion, who will be *en route* from his trip between South Africa and Los Angeles.

APSLEY M.F.C. report that the Annual Party time this year was enlivened by certain "frozen felines", who regaled the other members with their Skiffle Group. Films of the Club's contest activities taken by Chairman Frank Drewe were an inspiration to the many new members. The Club is swelling rapidly, after many years of membership of around a couple of dozen. Apsley were part of West Herts group, which has been broken up into separate clubs, the original **WAYFARERS** being re-formed as a competitive group centred at Watford.

S.M.A.E. Contest Calendar

Date	Event	Type
March 17th		
	GAMAGE CUP: Unrestricted Rubber	De-centralised
March 31st		
	S.M.A.E. CUP: A/2 Eliminator	Area Centralised
	KEIL TROPHY: Team Power	Area Centralised
April 28th		
	WESTON CUP: Unrestricted Rubber	De-centralised
	LADY SHELLEY CUP: Open Tailless	De-centralised
May 19th		
	ASTRAL TROPHY: F.A.I. Power	Area Centralised
	GUTTERIDGE TROPHY: Wakefield	Area Centralised

Southern

Reason why no venue could be announced for the Southern Area Rally was that formal permission was not obtained then to use the aerodrome at Stoney Cross, Cadnum, in the New Forest. I should point out that this Mar. 31 Rally is for Southern Clubs only, but the lads tell me that they intend to make their annual summer Rally an open affair. *Other Rally organisers should note that when announcing their dates they must specify to me whether they are to be open events or restricted to their own areas.* T. Woods was the eventual winner of the **SOUTHAMPTON M.A.C.** Stunt Contest held in very high winds. J. Moxham had the misfortune of missing an Eta 29 and 5-ft. span controline model stolen from the clubroom, and if any of you see an Eta Series IV, serial number 0429009, please let me know immediately.

Two R.T.P. Contests, one of them Team Racing for 26-in. span limitations are organised by **READING D.M.A.C.** for winter activity. The Club hopes to have a lecture by John Paterson, Director of Solarbo Limited on his recent trip to Ecuador. Windy conditions prevailed for the **FARNBOROUGH F.M.A.C.**, when they ran their winter contest at Pirbright. J. Kerry, a Junior, did well to win the January event with the A.P.S. *Shorty*, and another A.P.S. design the *Seraph* won the February event for J. Arscott. Quite a few *Calypsos* are built for the coming season.

South Eastern

SOUTHERN CROSS had a most successful club Dinner with nearly 50 members and their guests partaking of good food and drink. Replying to the toast to the visitors, "Rushy" mentioned that the Club's International success was due in no small way to their team work in the contest. Prizes were presented by Mrs. Rushbrooke, and after formalities, a film show concluded a very pleasant evening.

East Anglia

After a period of twelve months' dormancy, the **BELFAIRS M.A.C.** has suddenly sprung to life again and an extraordinary Annual General Meeting brought forth nine members and the results to attend the Nationals at Waterbeach. Combat flying has become well established and a Combat League devised. A very ambitious project has just begun, the building of a C/L scale Percival Prince 8-ft. span for two Frog 500's with electrically controlled u/c and four lines.

Midland

Everyone in Birmingham is cordially invited to the film show on Friday, 29th, at Haslucks Green Road School. The film will be on modelling and the British Grand Prix. This show is organised by **MONKSPATH M.A.C.**, membership now standing at twenty-five, but they are looking for new members and welcome everyone to regular meetings on Fridays at Salter Street Vicarage. M. Kendrick is a Combat king of the moment in **WEST BROMWICH M.A.C.**, although he is a junior. Members

placed 1, 2, 3 out of eight in the Tern Hill Rally, but of other events, the weather has been a serious setback for the club meetings with the **WOLVES M.A.C.** They had to scrub the meeting as everything came down from the heavens including large hailstones.

At **SHEFFIELD** most interest has been seriously influenced by F.A.I. Rules changes, and they are concentrating towards lightweight and open power designs. An Annual Exhibition to be held in St. Mary's Church Community Centre from June 13th-15th and a joint effort with the model Ship Society should provide a good show. Record flight to date under their 30-ft. ceiling for indoor chuck gliders is 18 secs., and if you don't think that very long—try it yourself under the same ceiling. **QUEENSWAY AND D.M.A.C.** have risen to twenty members with J. Corbett placing first in the Wellingborough School A.S. All-in Duration Comp. A.P.S. designs are very popular, including all types from *Swiss Miss* to *Calmitied*.

Northern

To support the local showing of the film "Brink of Hell" at the Ritz Cinema, **LEEDS AND BRADFORD M.F.C.** ran an Exhibition in the Foyer and much valuable publicity was gained by the club. Some hot models are on their way in coming contests, including a light rubber job by P. Lawson with a long moment arm, 4 ounces rubber, and 24 x 20 propeller.

North Eastern

Main interest at **TYNEMOUTH M.A.C.** is that there is a rise in membership and with access to the sports ground, the boys are preparing in Combat and Team Racing. The Club Room is also by the sports ground of George Argus & Co. Ltd., to non-members, please visit at Whitley Road, Benton. Tommy Stoker has a corking M.P.12 *Hucklinger Alt* and current craze is chuck gliders of which *Long Tom* is the most popular. At the Area Annual General Meeting held at the **NOVOCASTRIA** Club Rooms, four clubs attended and Secretary for the Area is now J. Heads, 80 Strathmore Road, North Gosforth, Newcastle-on-Tyne 3. All officers of the Area are members of Novocastria, so there will be no trouble contacting the committee. The Mayor of **STOCKTON** presented the cups at their Annual Club Dinner, and the film "Model Flight" was shown after enjoyment of the meal. Members of Darlington, West Hartlepool, Middlesbrough and Redcar contributed to the cheerful spirit.

North Western

HYDE M.A.C. sent me very full details of their Rally, but unfortunately I just do not have the space to include everything. All enquiries on this meeting to be held on July 8th should be sent to the Secretary, 21 Harding Street, Hythe, and it should be noted that pre-entry is required for all events with double entry fees after July 1st. No entries will be accepted after 1 p.m. on the day of the Rally. Enquiries can be phoned to Hyde 2287 if urgently requiring answers. Mr. Herbett of **BLACKBURN M.A.C.** is building a massive scale Spitfire for radio control and Oblisco 60. New members will be welcome at the Club Rooms in New Water Street, Blackburn, on Wednesdays and Friday nights, where all interests are catered for, latest venture being Team Racing, now that an Oliver Tiger has come to the Club. Flying Saucers by Mr. Adler of the **OLDHAM & D.M.A.C.** are now considerably more advanced, I am told, than earlier versions. He is even contemplating twin engines. The Club has the ever-present flying field problem, their regular field being under water, full of hen pens and shortly to be built on! Membership is around 35, and club night is apparently the date for table tennis sessions. A new model club has been formed in **BRINSTON**, where they are using the local Youth Club as a meeting place, and I suggest that anyone on this side of Stockport go along to the Youth Centre on Wednesday.

SHARSTON D.M.S. is now coming out of hibernation with a few new members and club contest successes for E. Helliwell for 3rd in Glider at Colne and also 3rd in Glider at Tern Hill Rally. Over at **CHEADLE AND D.M.A.C.**, a construction course for junior members building a club designed *Aft* glider is resulting in six fuselages being produced. Construction and flight tests will take place later this year, where points will be awarded. Membership is 56, half of which is most active and preparing for the coming season. Members are welcome at the A.T.C. Headquarters Bank Street, Cheadle, on Tuesday evenings. The Education course had a good send-off this year, with Garth Evans coming top in Glider at the Area Winter Rally and 2nd in rubber for Brian Faulkner 2nd in power.

Those hardy Northwesterners who attended the Winter Rally on February 3rd, experienced high winds which kept many coffin lids shut, and caused a high casualty rate to those who ventured to fly. All three placing rubber competitors suffered damage in the first round, O'Donnell and Evans both breaking a wing, and Hanney the fuselage. Reserve models were brought out for the second round, the Maestro J.O.D. maintaining his lead, this proved to be the result, since Evans did not dare to make a third flight on the assumption that O'Donnell would still maintain a lead.

The force of the wind was shown by the number of towline casualties, John Bone of Wallasey bent his aluminium wing torque up to an angle of 45 degrees in spite of running top speed downwind during the towing operation. The models that go away were out of sight in seconds and finished up a mile and a half away.

The power models suffered least of all. Eric Lord proved to be the eventual winner with a conventional pylon design powered with the Webra 15, this engine was turning a cut down nylon prop at peak r.p.m.

Combat

1. Kendrick	W. Brom.	
2. Raybould	W. Brom.	
3. Fenton	W. Brom.	

Rubber

1. J. O'Donnell	W.F.	4 : 32
2. G. Evans	Cheadle	2 : 48
3. J. Hanney	Wallasey	2 : 25

Power

1. E. Lord	Accrington	5 : 24
2. B. Faulkner	Cheadle	4 : 40
3. J. Hanney	Wallasey	3 : 40

Glider

1. G. Evans	Cheadle	4 : 42
2. J. O'Donnell	W.F.	3 : 18
3. E. Helliwell	Sharston	2 : 26

East Midland

I have one of the first notes from **HULL PEGASUS M.F.C.** for some time, but they excuse themselves from lack of reports due to lack of clubroom facilities. However, the proprietor of "Sportcraft" of Hull, a new Model Shop, has offered a regular meeting room which is large enough for R.T.P. as well as ordinary meetings, and since then, I am pleased to learn that there has been a stimulating revival in the interest. At **GRIMSBY**, the Annual General Meeting and Dinner was held on January 19th, followed by the giving of many certificates and pots to the lucky winners by the Area Chairman Mr. H. Barker. Notable successes during 1956 were E. Cartwright, **NORTH LINCS M.A.S.**, 2nd in the Thurston Cup, S. Marshal, **BOSTON M.A.S.**, 2nd in the Model Aircraft Cup and F. Fearnly, North Lincs M.A.S., 3rd in the Super Scale Trophy.

LONG EATON D.M.A.C., in Notts, have an up-and-coming young Combat group, and were rather disappointed, I feel, by the contest being called off due to high winds, on January 27th on Loughborough. The Club has already two requests for flying displays, and hope for more to come, they have also booked their coach for the Nationals

For Your Diary

April 13th/14th

Indoor Rally—Corn Exchange, Manchester—see separate announcement.

May 5th

Radio Rally—Woburn Park, Woburn, Bucks.

June 23rd

Northern Heights Gala—All Classes—R.A.F. Halton.

July 7th

Enfield Controline Rally—T/R, Combat and Speed.

July 7th

Hyde Rally—F/F all classes—R/C, Combat—Hyde, Cheshire.

August 25th

South Midland Rally—All Classes—Cranfield.

Western

At the Annual General Meeting on January 27th at **BRISTOL**, thirty-two turned up to discuss whether it was worth continuing the area in view of the feeble support it has received in recent times. Mr. Houlberg and Major Taylor of the S.M.A.E. were present, and their help and advice was invaluable. Though no one seemed to have any really sound theory why the present situation has developed, there were several suggestions for improvements, some of which will be adopted, and the majority of those present voted for its continuation. In the coming season they are concentrating their efforts on running three equi-spaced Rallies, designed to incorporate as many areas as possible. The first is to be held at Wroughton on May 19th, with Keevil for the second on July 7th, and the last on September 29th at a venue to be decided.

SOUTH BRISTOL M.A.C. R.T.P. is increasing in popularity, and several Jetex projectiles have been absorbed, encountered by the Sinell Barners. Two mults have taken to the air, an *Ambassador* and *Mosquito*, and two more, a *Dakota* and *Warfarer* are nearing completion in the hands of Messrs. Heritage and Hopkins. Bulgate opens as a Municipal Airport in April, and probably their last contest day there was held on February 10th, where many were blown out in more senses than one!

Wales

The centre of interest in the **CARDIFF M.A.C.** is L. Davies, the Club's Secretary. He has built a Brauner Pulse Jet (AERO-MODELLER, July 1955), and considerable interest was shown in the first attempt to start this, using first a car pump then compressed air. The latter provided bigger bangs, but still no burning. It was decided that the Jet was not getting sufficient petrol, so a thinner valve of 4 thou was used instead of 6 thou. Then the engine ran for the first time (needless to say, the last time) in the school workshop. Lessons were temporarily stopped until everyone regained their hearing. Indoor flying has been resumed (no connection with the above escapade) and competes very closely with the Goons for general popularity.

Pen Pals

Wanted in England for David W. Dew, 7742 Paddington Dr., St. Louis 21, Missouri, U.S.A.; Wlm. Emmen, Tramstraat 6, Dongen (N. Br.) Holland; Gentleman Cadet S. P. Singh, "N" Coy, Military College, Dehradun, India; Helmut Braun, Braunschweig, Kriemhildstrasse 6, Germany; and for radio enthusiasts especially J. E. Toomer, 172 W. Figuera Drive, Altadena, California, U.S.A. For a P.P. in America or Australia: W. M. Jackson, Pound Hill Cottage, Blechingly, Surrey.

That's your lot!

THE CLUBMAN.

With apologies to the 20 new club secretaries whose names and addresses cannot be included this month.

R.A.F. GEN

BRUCE FERGUSSON explains R.A.F. decorations

When the Royal Air Force became a separate Service on April 1st, 1918, the "powers that be" found it necessary to institute two new decorations, with their respective medals, to rank equally with the Distinguished Service Cross (and Medal) of the Royal Navy, and the Military Cross (and Medal) of the Army. These were the Distinguished Flying Cross (and Medal) and the Air Force Cross (and Medal).

The Distinguished Flying Cross (D.F.C.), which, like the Air Force Cross (A.F.C.) and the respective Medals, is of silver; consists of "a fiery Cross (or fleury—a heraldic term meaning decorated with fleurs-de-lis or flowery) terminated in the horizontal and base bars with bombs, the upper bar terminating with a rose, surmounted by another cross composed of aeroplane propellers charged in the centre with a roundel within a wreath of laurels, a rose winged and ensigned by an Imperial Crown thereon the letters R.A.F."

On the back, or reverse, is the Royal Cypher above the date, 1918, "the whole attached to the clasp and ribbon by two sprigs of laurel".

The Distinguished Flying Medal is oval and consists of an effigy of the King (now the Queen) and on the back, within a wreath of laurel, "a representation of Athena Niké* seated on an aeroplane, a hawk rising from her right arm above the words, 'for Courage'." The Medal is surmounted by a bomb attached to the clasp and ribbon by two wings.

The Air Force Cross and Medal are equally elaborate. The former consists of a "thunderbolt in the form of a cross, the arms conjoined by wings, the base bar terminating with a bomb surmounted by another cross composed of aeroplane propellers, the four ends enscribed with the letters 'G. VI. R.I.' In the centre a roundel thereon, a representation of Hermes mounted on a hawk in flight bestowing a wreath". The reverse consists of the Royal Cypher above the date 1918, the whole being ensigned by an Imperial Crown and attached to the clasp and ribbon by two sprigs of laurel.

The Medal is over-shaped "bearing the Effigy of the Sovereign" whilst on the back, "within a wreath of laurel" is an enlarged replica of the centre of the Air Force Cross—namely, Hermes, mounted on a hawk in flight, bestowing a wreath.

When these two crosses and Medals were officially instituted on June 3rd, 1918, the stripes on the ribbon were horizontal, but, owing to the difficulty in manufacturing such ribbons and the awkwardness in sewing them on jackets, a change was made in 1919, to the present form.

Today the ribbons of the D.F.C. and the A.F.C. are violet and white, and red and white, alternate diagonal stripes respectively, one-eighth of an inch wide which run at an angle of 45° from left to right. The D.F.M. and A.F.M. are similar in colour but the stripes are one-sixteenth of an inch in width.

The D.F.C. and D.F.M. are still awarded for exceptional valour, courage and devotion to duty, whilst flying in active operations against the enemy, whereas the A.F.C. and A.F.M. are awarded for courage, exceptional valour and devotion to duty in peace time.

One Medal worthy of passing reference is the Conspicuous Gallantry Medal, which is higher than the D.F.M. according to the Regulations governing these matters. The ribbon consists of two dark blue marginal edges, the centre being light blue, and the C.G.M. is awarded for "gallantry in air operations against the enemy". It is a very rare, and much coveted, award.

* The goddess of the air—daughter of Zeus in Greek Mythology. (Gk—Nike pronounced NIKEY) means Victorious.

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91 AEROMODELLERS, 1950/56. 12 missing. 11 *Model Aircraft*, six other magazines. Various plans. Box 514.

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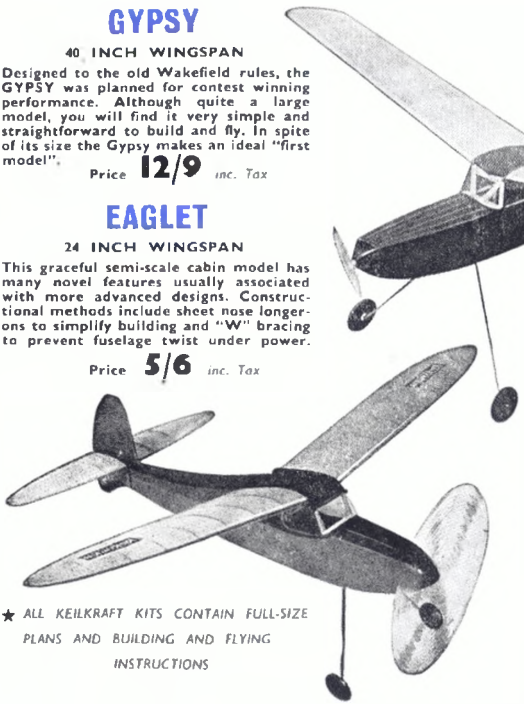

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