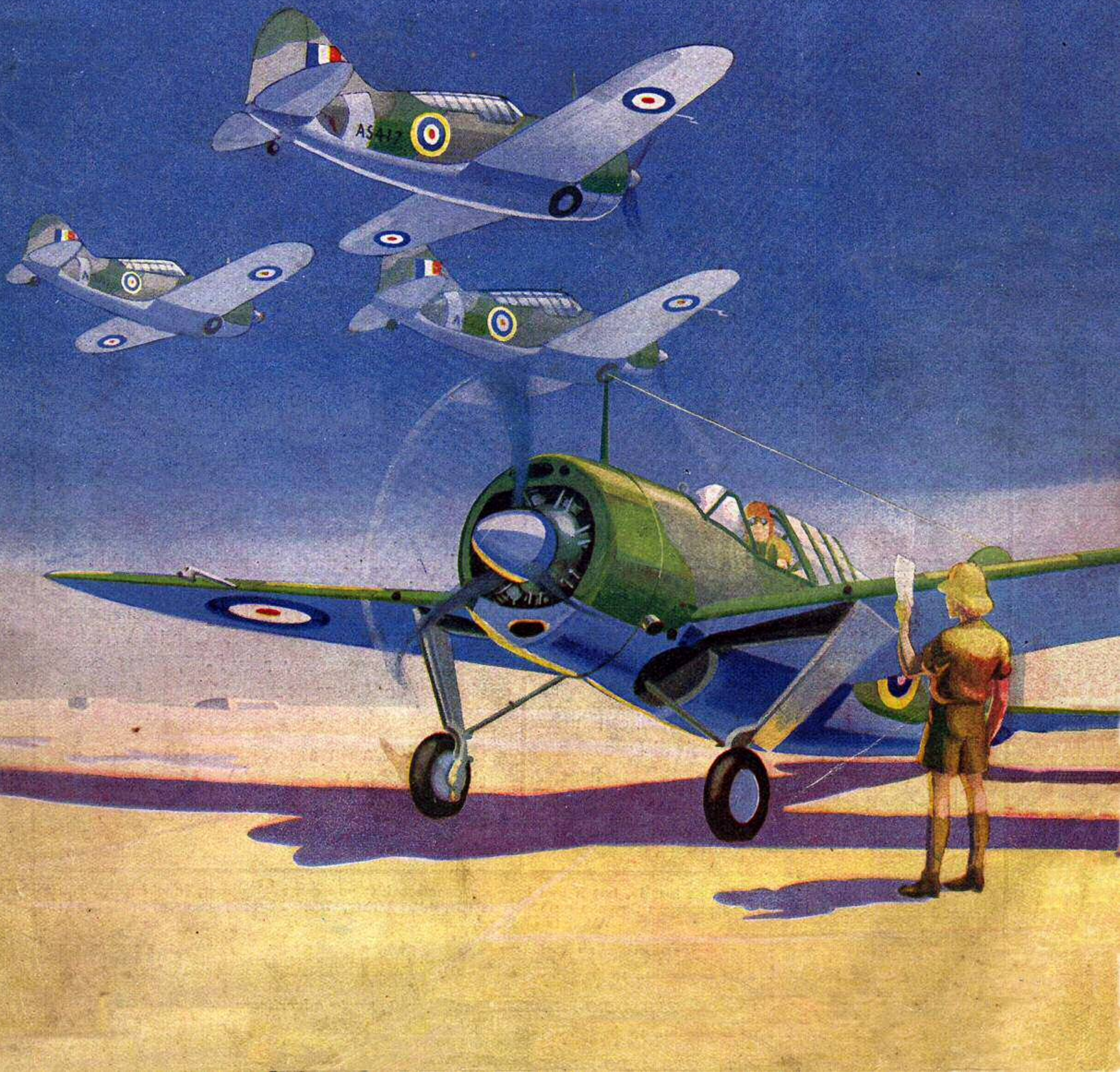
AERO MODELLER

APRIL 1942
VOL. 7. No. 77
ONE SHILLING



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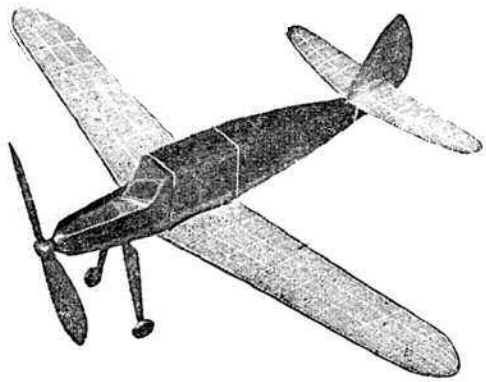

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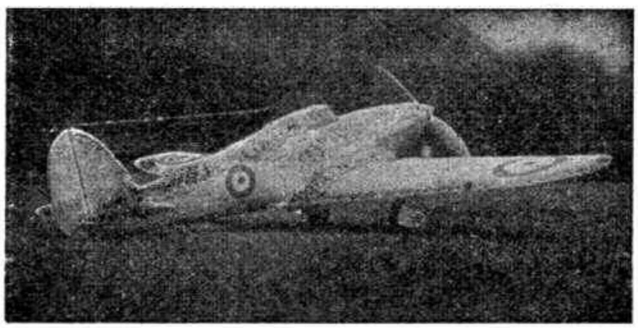

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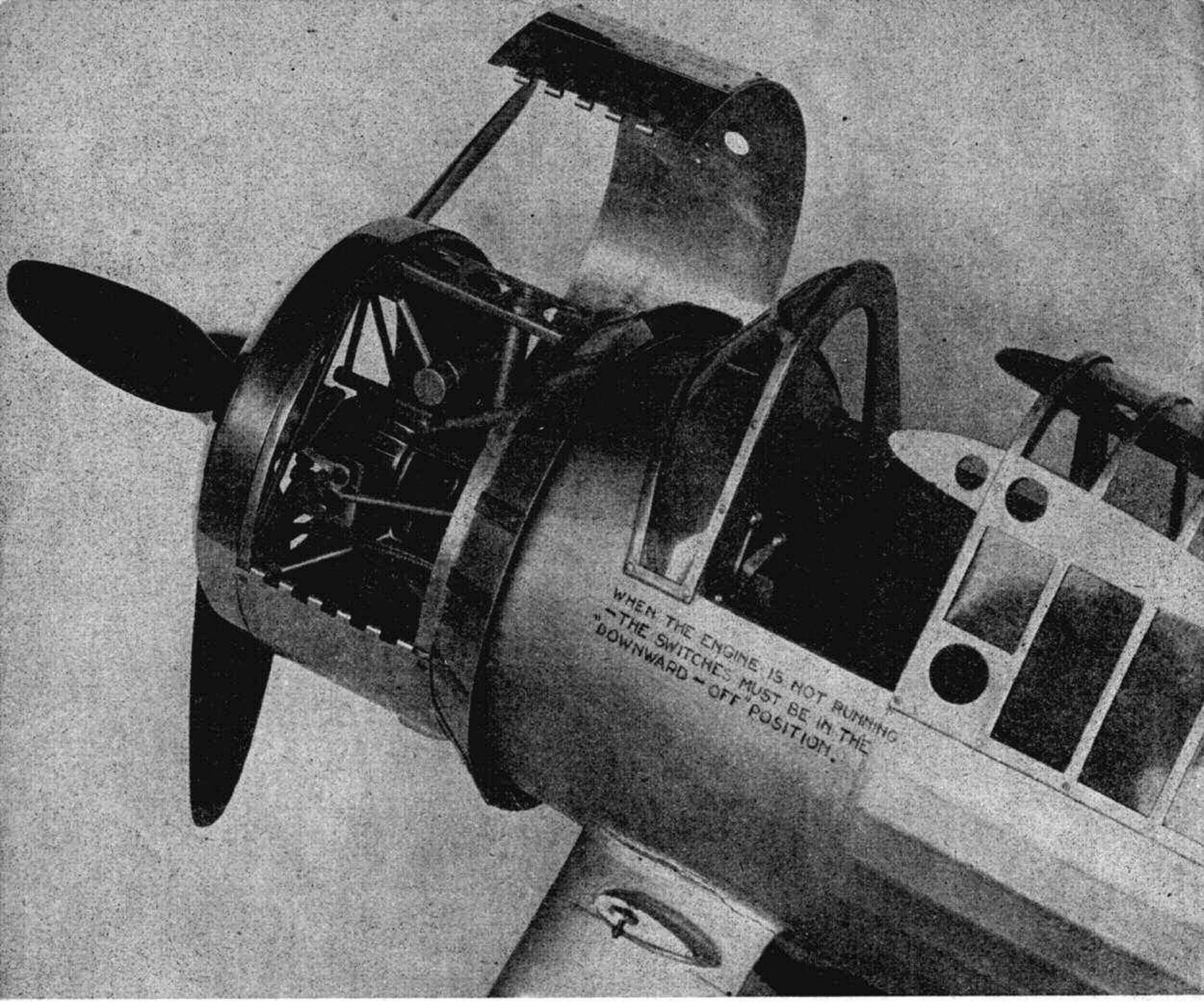

Above is shown the "engine room" of the 1-inch scale petrol engine driven "Lysander," which is fully described on pages 156–7 of this issue. Owing to war-time restrictions, free flight tests have not been possible, but we understand that "round-the-pole" trials have been successfully carried out.

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THE AERO MODELLER

Established in 1936

(INCORPORATING "THE MODEL AEROPLANE CONSTRUCTOR")

(Proprietors : Model Aeronautical Press, Ltd.)

THE MODEL AERONAUTICAL JOURNAL OF THE BRITISH EMPIRE

Managing Editor : D. A. Russell, A.M.I.Mech.E.   *Editor :* C. S. Rushbrooke

Vol. VII - No. 77   APRIL, 1942

ALLEN HOUSE, NEWARKE ST., LEICESTER

EDITORIAL

LAST month we gave a few notes on the rapid growth of radio control and promised some observations by experimenters in this country. Lack of space only permits us to publish one of these letters which we have chosen as representative of a pretty good number. We also pointed out that a radio controlled model is a highly specialised type for the really expert modeller and, whilst not wishing to dampen anyone's enthusiasm, we do *not* recommend it to beginners!

A word of caution, too, about the actual controls themselves. Rudder control is essential (at first this was the only control experimented with), but this in itself is sufficient for turning and so aileron control is not necessary. Elevator control seems the next logical choice so that the attitude of the 'plane may be changed at will to climb, dive or level flight. Each additional control complicates the receiver and thus adds weight but some form of engine control is necessary. Here we are unfortunate as the type of carburettion employed on small engines does not lend itself to efficient throttling and so it would appear best to rely on simply " engine on " and " off," control, although in the larger capacity types this failing may be overcome.

We are inclined to agree with readers in that Audio Frequency Control is far too susceptible to temperature change, etc., for general adoption and so the use of Sequence Control would appear to be the best practical solution. Considerable ingenuity is then required to obtain a workable control unit which does give you some indication of the exact position of the model's control surfaces. A cool head is required here since, as the name " sequence " implies, the controls are operated in a pre-determined order. Thus to operate right rudder, say, you may have to pass over left rudder, rudder central, and then over to right rudder. When one wing tip suddenly drops with only about twenty feet of altitude something has got to be done quickly and if you have no indication as to the control position it will probably be just too bad!

The weight of the receiver has been reduced surprisingly. Whereas the weight of the old type of equipment worked out at about two or three pounds per control modern sets average less than half this. Certain special components have been produced, as for example a special gas filled triode allowing a single valve receiver to be used, which have helped considerably in this development.

We feel sure that there are still many more readers in this country interested in radio control who have not yet written to us and we cordially invite them to send in their views. An exchange of ideas, especially on a subject such as this, is always helpful and will benefit the movement as a whole.

Aeromodelling and Education.

Our article on " Aero-modelling and Education " in the February issue has aroused nation-wide interest. From all parts of the country letters of appreciation and praise have come in and we take pleasure in quoting from a letter by Mr. J. Kasher of the Durham County Association of Boys' Clubs.

" I have suggested to our Association that a course of instruction in Model Aircraft should be held in this County. Our Association is prepared to approach the County Education Authorities for a course on Model Aircraft for Instructors, providing that they are over twenty years of age, who are prepared to attend. After training these persons would be expected to go back to their areas and form a Model Aero Club, or help in the Boys' Clubs that have Model Sections. We hope that the C.E.A. would place these instructors on their panel of qualified Craft Instructors, and they would then receive payment for classes under the usual evening class scale."

Last season this particular Association started a combined camping and flying ground for clubs in the county of Durham and the invitation to attend is now extended to everyone interested wherever they may be. We hope that aero-modellers will endeavour to support this project to the fullest extent and take advantage of the splendid opportunities offered.

Clubs and the N.G.A.

The rush of applications for N.G.A. membership has taxed the facilities of our organisation to the utmost, and we tender our apologies to those readers who may have had to wait a short period before receiving their membership cards, transfers, and badges.

Clubs are taking up group membership in ever increasing numbers, and this indicates a better appreciation of the benefits to be obtained by such comprehensive cover as procured through the Guild. The Northants, Mobberley, Chingford, are a few of the groups who have undertaken membership as a whole, and it is now becoming a standard rule in many clubs that N.G.A. insurance must be undertaken.

The comprehensive policy shared by all members of the Guild is unique, and the only one of its kind in this country, if not in the world. A little study will make it apparent that the modest outlay of 6d. is more than repaid in the security—both real and moral—that is enjoyed when flying your models throughout the season, so . . . to those of you who have not yet joined, send in today for an application form, and swell the ranks of the " safe and secure."

D. A. R.

A LETTER ON RADIO CONTROL.

Dear Sir,—I have read through with great care and interest the illuminating article on Radio Control for Model Aircraft by G. F. Penver in the January, 1942, issue of The Aero-Modeller. Being a keen Radio Controller myself, with nearly five years of experiment to my credit, some of his revelations have struck me as peculiar, to say the least of it. Destructive criticism always flows freely—especially from the pen of a supporter of a different school of thought. I am (by experience, mark you) a Sequence Control exponent. However, to revert to the script of the article.

1. The receiver merits little or no comment, apart from the

fact that using a wavelength of 10 m. lays the receiver open to the trickiest of all problems, namely, aerial-earth capacity; i.e. the receiver must be tuned to the transmitter (presumably on the ground), and this can be done to the nearest K.C.; but the moment the model leaves the ground (without a W/Op. !) the tuning tends to become unstuck and bang goes our one way communication; but we'll skip that point as there is a way to overcome it, even on such a short wavelength.

2. The reed system. This, as Mr. Penver says (and I heartily agree) is beautiful in the extreme (not his exact words). Theoretically, yes; *but* taking for granted that his system has worked satisfactorily, has he taken into account that easily overlooked bugbear (to his school)—temperature change. If reeds are to be operated by A.F. they must be accurately tuned to within 0.78 cycles, and it does not take much intelligence to realise that a model climbing to 1,000 ft. or so, does definitely go through quite a gamut of temperature change. (Thermals to some people.)

3. Secondly, the very act of tuning a buzzer modulator and a "relay" reed would try the patience of the average oyster (we'll overlook that). I note that the reed system employed is a cast-iron copy of the now rather old-fashioned frequency meter used for guessing at the frequence of electric currents, but in adding the contacts mounted on springs which are "slow in movement" compared with the A.F. reeds, he has defeated his own end. How much better and sounder, mechanically speaking, to have mounted the moving contact on a spring (very thin and flexible) attached to the vibrating reed itself. This would not upset the A.F. response half as much as his method obviously does—this from my own experiences. Besides, what of the periodicity of his two springs?

4. The Relay. This piece of apparatus is clever in the extreme, but how—oh how!—does Mr. Penver expect his small spring contact (very light and slow in movement) to pass enough *current* to operate a solenoid which has to release a pawl on a ratchet? Remember, the servo motor (rubber driven) must be fairly powerful to operate the control surfaces, and there will be considerable magnetic flux required from the solenoid to release this pawl. Hence the heavy current. I notice, also, that there is no mention whatsoever of condensers being fitted across any of the contacts to cut down "arcing" and subsequent interference with receiver. Especially on 10 metres!

If Mr. Penver has had satisfactory results from his apparatus, I'll take my hat off to him and eat my words; but I have one really snappy comeback, that is:—What would Mr. P. say to a sequence control whose maximum time lag is one second (intentionally at that), and whose minimum time lag is about one-fifth of a second and whose action does not depend on uniformity of temperature, and is moderately vibration proof, and whose receiver does not, and cannot be affected by aerial earth capacitance?

Yours faithfully,

"HERTZIAN."

A petrol driven model airship, designed by Ted Alexander of Didban, U.S.A., is now nearing completion after 415 hours work on its construction. Main dimensions are as follows:—

Length	10 ft. 2 in.
Maximum diameter	4 ft.
Cabin length	1 ft. 6 in.
Estimated weight	36 ounces.

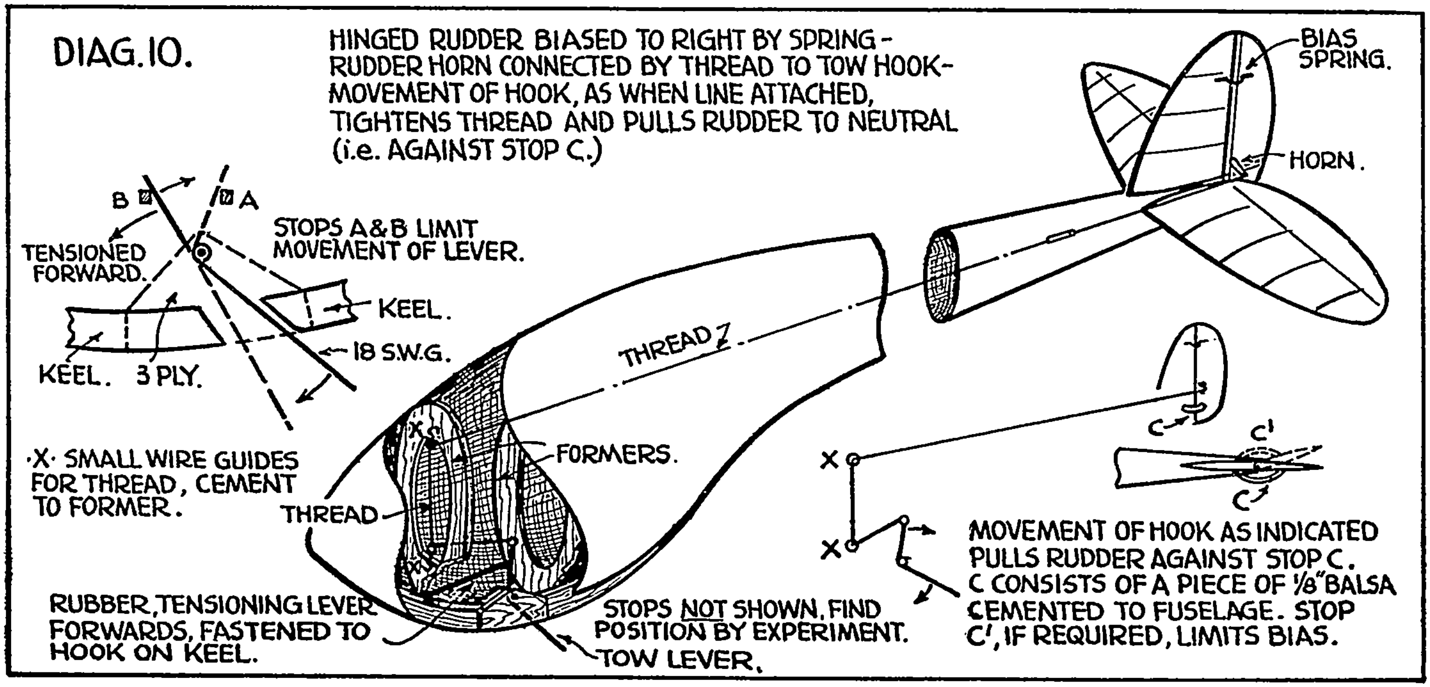
Hydrogen gas is employed and is contained in three balloonettes of latex rubber. The motor has a bore of ⅝ in. and weighs 10 ounces, complete with airscrew, batteries, etc.

Constructed entirely of balsa the body is built up of 172 stringers spaced around 31 rings, *i.e.* formers. Each stringer is fitted flush with the former outline and this operation alone entailed the cutting of over five thousand notches! The nose section is of plastic, whilst the remainder is fabricated, presumably either with tissue or lightweight silk. This model has been licensed by the National Aeronautical Association of America, and as such, is the first model dirigible to come under their jurisdiction.

The Aeromodeller has secured exclusive photographs of this model airship, and these, together with a detailed description of its construction, will be published in our next issue.

Flight test reports are promised in the near future, and will be published as soon as possible after receipt.

One of the greatest difficulties associated with a winch launch glider is to get a straight tow with maximum altitude from the launch and then a sufficiently small circle in free flight to take advantage of thermal currents. On pages 162 and 163 of this issue a 4 ft. span high performance glider is detailed, incorporating an automatic rudder control which overcomes this bugbear and allows full adjustment for any radius of circle after a perfectly straight launch. The scheme, which is illustrated below, has been developed over a number of years, and has been thoroughly proven in flight. It can be adapted to suit any type of model glider and should help to eliminate a considerable number of those crashes occurring during launching with the model still on the two-line.



AEROMODELLING FOR THE A.T.C.

By Gordon Allen

Photograph opposite shows No. 1548 Squadron, St. Helens, at work.

MANY and varied are the subjects which are now being taken by the Cadets of the A.T.C. These boys are keen, deadly keen; their enthusiasm is almost unbounded, while their thirst for knowledge often creates a problem for the officers of the Corps.

One certain outlet for their enthusiasm is aero-modelling. This subject will present both practical and theoretical problems. Having solved them they will have gained an insight into the actual construction of full-sized craft, for modern model aircraft possess similar constructional characteristics. On the flying field they will likewise realise why an aeroplane flies, they will learn the theory of aerofoils, and the different effects certain adjustments have on their miniature craft—adjustments which would have the same effect on their full-sized counterparts. Apart from all this, aircraft modelling develops a keen eye, patience, and a sense of true sportsmanship.

It is the aim of all the members of the Air Training Corps to graduate eventually to the R.A.F., and, in fact, the majority of them will—that is, of course, if they pass the examinations set by the Corps. No matter what branch of the service they may enter, whether they choose aircrew, fitter, armourer, or rigger a knowledge of the " ins and outs " of aircraft will prove invaluable. What then, is more desirable than to obtain this information cheaply and thoroughly in the A.T.C., through the medium of model aircraft.

It is surprising, however, to learn how few squadrons have tackled this intriguing subject. Whether those concerned do not realise its value, or are rather " in the dark " as to how to commence such a class, I cannot tell. If it is the former, then I hope my foregoing remarks will have cleared that situation. On the other hand, if the officers in charge *do* realise its significance but are prevented from commencing by the fact that they know nothing of the subject themselves, then the purpose of this article will have been fulfilled if the following outline of a scheme proves of value—a scheme by the way, which I am now operating with great success in a squadron.

Aeromodels can be divided into four main classes, namely, petrol-driven aircraft, rubber-driven flying scale and duration machines, and solid models. They all have their separate interests, but for A.T.C. purposes, and especially for a new class, the duration type is by far the best.

Although petrol-driven aircraft are the most advanced, that fact, coupled with the expense and the present flying ban, immediately puts them out of range of the newly inaugurated training class. Flying scale models are intricate in construction while their flying performances do not provide sufficient scope for useful observation. While solid scale modelling serves admirably for aircraft recognition purposes, no useful information can be gleaned from them aerodynamically. What then, does duration modelling provide ?

In the first place, small endurance models are easy to assemble, and should present no great difficulties. In spite of this, however, their construction does follow, to a great extent, full-sized practice, as do their flight characteristics. By a small endurance model, I mean one in the neighbourhood of thirty inches wing span.

Nowadays models of this type are attractively offered in kit form, and are obtainable at all good sportshops at reasonable prices. The kits include all materials to make the complete model (ready for flying) together with a full-size drawing and instructions to explain the method of construction. Nevertheless a certain amount of supplementary equipment will be necessary. This includes pliers, straight modelling pins (ordinary pins will do), tracing paper to protect the plans, balsa cutters (single-edged razor blades serve this purpose), set squares, and above all, good flat building boards. For these, lengths of planed six-inch board half-an-inch thick and about two feet long will do nicely.

Now a class of this type will, in all probability, attract anything from thirty to sixty members, according to the personnel of the squadron concerned. To provide material (kits) and equipment in order that cadets could work individually would therefore prove something of a problem, to say nothing of the expense which it would entail. To overcome this, the best method to adopt is one whereby the members work in groups of say three or four. By this means, the expense of providing for the class can be minimised. This system in itself develops the team spirit, a quality which is essential in the Services. If it is desirable, the cost of the materials can be shared by the groups, every member subscribing a little to meet it.

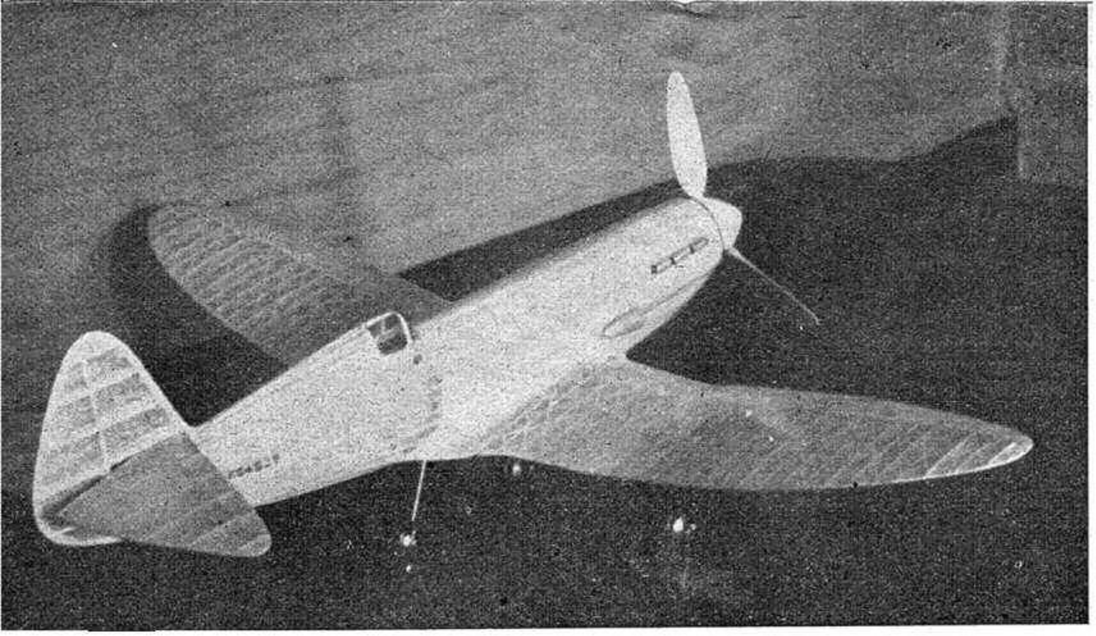
While such a group is working on the model, a different job can be assigned to its cadets. For instance while a member is building up one side of say, the fuselage, another can be given the job of cutting out various parts, etc., and so on until the machine is completed.

Like any other class, there will have to be someone in charge —someone who can guide and direct the cadets along the correct paths. A great deal can be gained therefore by choosing the correct person. He must be keen to start the subject (as must the cadets themselves), and should have a good knowledge of handicrafts, with a moderate understanding of an engineering drawing. The ideal instructor for the job, of course, is one who has had long experience of aeromodelling. Such a person could be selected from the ranks of the local model aero club. However, provided he is keen, no trouble should arise from this angle, for concise instructions are provided with all kits, while for the benefit of the instructor who has had no previous experience, there are several comprehensive " grounding " textbooks on the subject.

With regard to flying the 'planes, this could again be done in conjunction with the local aero club, or under the supervision of an instructor well versed in the theory of flight.

As a side light to the actual work, the officers in charge could organise competitions in which small prizes are given for standard of workmanship, general finish, and flying performances. This would stimulate sportsmanship and the competitive spirit. Public exhibitions of the cadet's work could be staged, the money realised going to swell the A.T.C. funds.

This article has but outlined the scheme, for it could be amplified greatly. However, I trust it has provided food for thought and action for many Air Training Corps Commanders.



LONACH—

tube must be built round cardboard formers first; correct alignment is essential as any warp or twist may be imparted to the fuselage. The sheet should be wetted, the formers inserted and the whole weighted down between two flat surfaces. The joint must be lined by a strip of ¼ in. by 1/32 in. on the *outside* and both sides covered with a strip of tissue. The whole tube should then be covered with tissue. The rear end has to be cut away in various places to accommodate tail and motor fittings, but that should not be done till all danger of twist is gone.

The rear wheel is of 1 in. diam. The shaft is 16 s.w.g. piano wire in ⅛ in. diam. curtain spring. The curtain spring covers only the distance between wheel and fuselage bottom and is soldered at both ends. The wire takes a bend in the fuselage and runs along the bottom of the tube. Glue it to the two formers it passes through and lightly reinforce the tube bottom where it touches. The wire passes through a cut-out in the main bottom stringer and this should be strengthened with a small amount of plastic wood.

The lower motor peg fixing is a block of wood some ½ in. by ½ in. by ½ in., with the two bound and glued brick dowels firmly glued into it. The block is fixed to both stringers and motor tube—it goes right through the motor tube so a cut-out must be made for it. The top of the pegs plug into a similar block in the tail assembly. The block should have the grain running at right angles to the tension applied to it.

Cover the fuselage with super fine tissue. The construction is extremely strong, so strong dope may be used.

Fuselage.

THE fuselage is built on four main stringers, ¼ in. by 1/16 in.; these run the whole length of the fuselage except for the top one which is interrupted by the cockpit.

After al the formers have been cut out and glued together, they should be assembled lightly on the four stringers. When all are well and truly in position check the alignment and glue them all firmly in place.

The 1/16 in. by ¼ in. sheet planking should then be put on. Start at the side stringers and add planks to both sides alternately; starting at the sides prevents distortion as little bending of the planks is necessary. Underneath, where the bend becomes sharper, the wood should be soaked or steamed first. Leave ¼ in. of planking projecting into the first stringer bay. In this overlap notches for the stringers should be cut and the stringer ends embedded smoothly into it.

It is advisable only to notch the first and last stringer-bearing formers and to cut the rest of the notches by eye; in this way good curves are obtained. The ⅛ in. by 1/16 in. stringers must project by 1/16 in. and the former between them should be sanded away by 1/16 in. to prevent any chance of it bearing against the tissue covering.

For the cockpit opening, two pieces of 1/32 in. sheet should be bent to form the cockpit sides and joined smoothly to the stringer below. The aperture for the sheet celluloid is then cut out. The cockpit support is a hoop made of two laminated ⅛ in. by 1/32 in. sheet strips; curve one and hold it down, then glue the other one to it still in the curved position. When dry little or no tendency to spring back will remain. A piece of 1/16 in. square should be placed between the top of the hoop and the former at the back of the cockpit to support the sheet celluloid. All joints in the windscreen, etc., should be covered with ⅛ in. strips of glued tissue. Seccotine should be used, not durofix as this tends to melt the celluloid; also seccotine that wanders where it shouldn't may be rubbed off before it is dry.

All planking and sheeting should be given two coats of banana with intermediate sandings, and one coat of high-gloss. The nose formers are both three-ply (⅛ in.) and the front one must cover the whole circular area (*i.e.*, cover ends of planking and ends of main stringers). The box it contains is made of four pieces of 1/32 in. sheet, fitted into the formers cut out to receive them. A similar box fitting into it and containing the gear mechanism must be built by careful fitting.

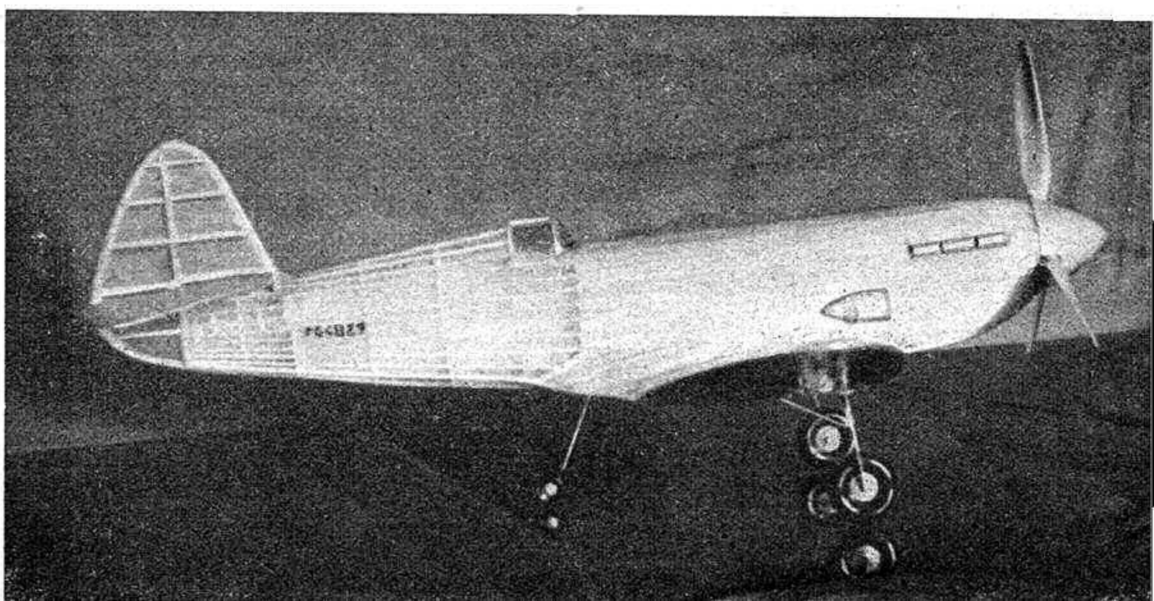
The 1/32 in. sheet motor

Stub Wings.

The stub wing spars are continuations of the fuselage formers, so the 1/16 in. ribs should be assembled with the fuselage. The L.E. spar (¼ in. by 1/16 in.) should be fitted early in the proceedings to ensure that it crosses the bottom main stringer at 90 degrees.

N.B.—The T.E. should curve round gently and be faired smoothly into the most convenient stringer. Wet it and work to the curve with the fingers.

The tongues are built up of 1/16 in. sheet laminations with two mm. three-ply backbones to keep the dihedral constant during building and flying. If these are omitted the dihedral will decrease slowly. When the tongues have been



A 42 in. SPAN HIGH-SPEED SEMI-SCALE LOW-WING FIGHTER, WITH TRICYCLE UNDERCARRIAGE AND OF GEODETIC CONSTRUCTION

lightly fitted, fit them into the wings (both wings and fuselage should be built before tongues or tongue boxes are assembled in them), and install the correct dihedral by placing something under the tips. Then firmly glue them into the spars and ribs of the stub wings.

Firmly pin down the fuselage on its centre-section and put in all the geodetic on the top surface. Then do the bottom surface. When the geodetic is done put in the undercarriage. Do not put on the undercarriage before the geodetic because you will not be able to be sure there is no twist.

The wire of the undercarriage is 16 s.w.g. in curtain spring as in the tail wheel. When inside the wing it bends and is firmly glued to the underside of both the tongues. Another wire is soldered on and leads to the 1/16 in. rib nearest the fuselage and is glued to this. This wire provides support in sideways thrust. The other vertical strut is also soldered. The geodetic will have to be cut away to make room for the soldering operation, but the same piece is of course put back again. The wheels are 2 in. diam. air wheels, but if celluloid ones are used the gauge of the wire should be reduced to 18 s.w.g. to provide the necessary give.

When undercarriage and geodetic are done, the L.E. covering of 1/32 in. balsa should be put on. Soak it well, as the double curvature where the dihedral starts will make things a little difficult. The covering should be done in two pieces meeting on the L.E. spar. It must be glued fast to the planking of the fuselage where it meets it and the planking should be cut away to accommodate it. The 1/32 in. sheet projects ⅛ in. or so inside the fuselage.

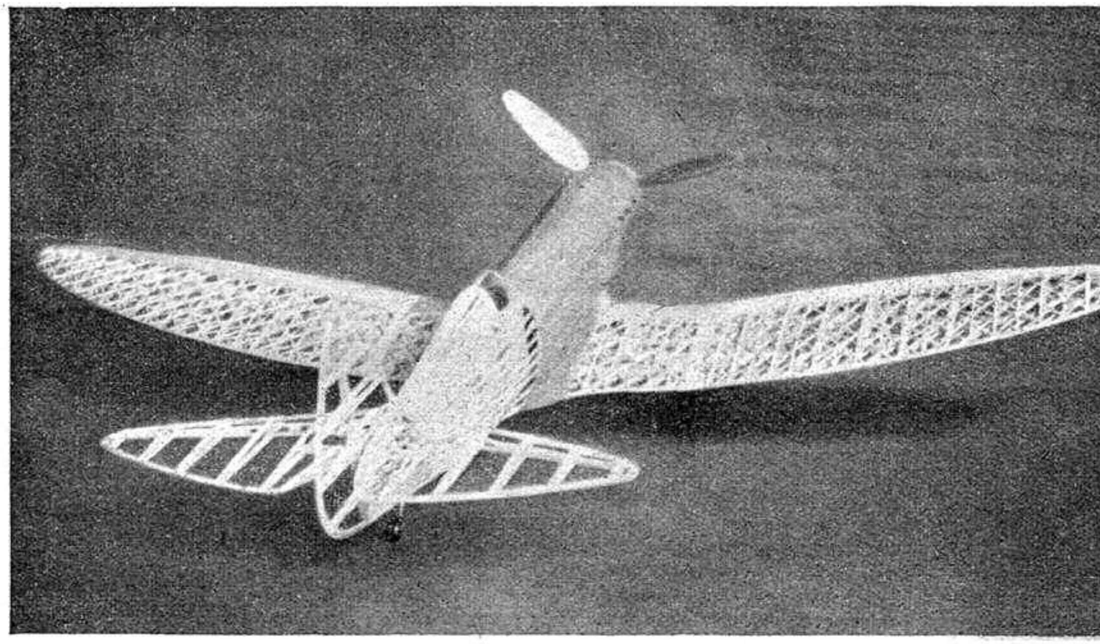
The rear part of the wing is faired into the body by a piece of 1/32 in. sheet. It must be fitted so as to give a smooth curve and should be thoroughly soaked to make it do so with more ease. The front part, *i.e.*, forward of the main spar and where the L.E. covering ends is faired with plastic wood, moulded to continue the curves of the fairing right round. The whole wing must merge gently into the fuselage. The ribs and mid-way between them should be overlaid with strips of 1/16 in. by 1/32 in. sheet to raise the covering of the geodetic.

The Wings.

First make identical outlines: ⅛ in. by 1/16 in. is the measurement for all outline surfaces. When the ribs and spar have been lightly assembled, slip the outline over them and after pinning the whole thing down, glue it in real earnest. The ribs are all of 1/32 in. sheet and lightened where suitable, except for those holding the tongue box. These are of 1/16 in. sheet.

When the skeleton has been finished, pin it down firmly on a dead flat board by the main spar and T.E. Start the geodetic by laying in all the 1/16 in. square pieces *one way*. They must be let into the tops of the ribs so as to be flush. When all those one way are in, cut channels 1/16 in. wide through them and the intervening ribs to accommodate all the parts the other way. In this manner complete the whole upper surface. Wet the whole frame and let it dry on the board for 48 hours; then remove the pins and lay on all the components of the underside geodetic one way only and immediately pin the frame down again. Do exactly the same as with the upper surface, only *always pin it down flat* when leaving off work or leaving it to dry out. In this way a perfectly flat undersurface will result, and with the geodetic construction that undersurface or the whole wing for that matter will never develop any kind of warp or fatal twist.

When the geodetic is done, assemble the boxes (which must be built round the tongues to ensure a good fit) in the wings and the fuselage, install the correct dihedral and glue thoroughly the boxes into the wing ribs and spar. The wing boxes may relax a bit so add ½ in. extra dihedral when installing them. The L.E. covering of 1/32 in. sheet may now be put on; owing to double or even triple curvature, the sheet must be divided along the L.E. spar. Soak the wood well and when glued on to the underside pin down flat to avoid the L.E. being distorted by contraction of the wood on drying. When the underside is thoroughly dry put on the upper covering, leaving the joining of the two coverings till when the sheet is dry. Join the edges along the L.E. spar as well as possible and put a strip of tissue along to smooth out the crack. When the whole wing is finished, dip it (pinned down to the board with a piece of paper underneath to prevent sticking to board) in a fairly weak solution of Casco (waterproof glue, 6d. per tin at all hardware stores). This will harden the whole structure; give it a sanding to take off roughness. Dope the L.E. covering with two coats of banana oil and add the rib overlaying strips.



Covering is of superfine white tissue, overlapping the balsa covering by ¼ in. The double curvature of the rear wing surface will necessitate covering half at a time. Dope with two coats of ordinary wing dope and one of high-gloss.

Do not smooth the inside of the wing boxes as the friction developed in here keeps the wings on. If more friction is needed put a layer of sandpaper on the tongue. The wing should be firm on the tongues but should dislodge itself with a sharp blow.

Tail Assembly.

This is built round a 1/32 in. spar suitably lightened; also fitted is a short secondary spar of 1/32 in. sheet at the back that acts as a locating plate to the rudder post. It is glued to the rudder post when the correct angle of incidence is found.

THE "ANABASIS"

By W. G. SNOW

I DESIGNED this model, as one combining moderately good looks, performance and strength. I have only given 400 turns out of a possible 650 and have got many flights timed for over 30 seconds on them, from a small motor of 2 loops of $\frac{1}{4}$ in. flat rubber.

The Fuselage.

The four master stringers are cut from 1/16 in. hard sheet balsa and also the bulkheads. Assemble in the usual manner. Then add 1/16 in. square stringers, two between each master stringer—eight in all. When thoroughly dry cut away the wood between bulkheads D and G—the top master stringer and one 1/16 in. stringer on each side. This is the platform for the wing and it is best to plank it. Of course, formers E and F are not full circles at the start. The first former should be strengthened by the addition of a plywood duplicate. The nose block is of laminated sheet and bushed.

The Mainplane.

This is of the usual construction and care must be taken that the 1/32 in. ribs are not tight fits or they will warp. Stick the two halves together and when dry add the part-bulkheads D1, E1, F and F1, putting strips of their balsa along the bottom for runners. Then add the stringers and we have a nice streamlined centre-section. The distance from D to G is larger than the chord and the space can be filled with former F2 when the correct position for the wing has been found, so save planking the platform till then! Use elastic bands to hold wing on.

The Tailplane.

Like the wing this is straightforward in construction. For lightness the ribs can be hollowed out. I found it best not to use paper tubing for attachment to the stubs at the fuselage as it makes far too much rigidity. Without them the tail falls right off on a very heavy landing. The fitting will loosen after a time so put a hook under and on the first rib on each unit and pass a rubber band around them via the fuselage where the tissue is cut away for the motor peg. Cover the first panel with 1/64 in. sheet balsa. However, do make tube for the fin stubs to fit into. Also be sure to fit the elevator flush and glue it rigidly when the right position is found.

The Fins, Undercart and Tail Fixing.

The fin is very easy but be careful to see that the stubs are not more than $\frac{1}{2}$–$\frac{3}{4}$ in. long.

The undercart is of 18 gauge wire, is detachable, fits into aluminium tubing cemented and balsa packed in the fuselage, and is faired with $\frac{1}{8}\times\frac{1}{4}$ in. hard balsa sanded to an "O"-section. Bind the extremities and spring joint neatly and well. It pays.

The tail fixing or fairing may cause puzzled frowns. I couldn't depict very well but I will endeavour to elucidate: we have two ribs which are glued to the V (for victory—and backsweep) shaped piece sanded thus ▶. When dry fix on to the fuselage, the nose of the ribs touching at bulkhead J. Pack up the tail end parallel with the thrust or datum line (in this case obviously the same). When set, pass through holes which should already have been cut, the dowels. Glue on the *inside*, and reinforce with pieces of strip balsa. Get it now?

Final Stages.

Best cover the fuselage in 4 pieces. My scheme was black for fuselage and fins and white for the tailplane and wings. Spray with water *once* and pin out to stop warping. Then apply two coats of clear dope. I have got super flights from a 10-in. propeller and 4 strands of $\frac{1}{4}$ in. rubber. I think 6 strands—slightly larger—will give better climb and flight generally. The glide is about 8–11 in 1 according to conditions and weight $2\frac{1}{4}$ ozs. When a good glide is obtained, use down-thrust for power flight; don't alter the incidence on the wing.

LONACH I.—*contd.*

The L.E. and T.E. are built up in the same manner as the wings and the construction is the same. The ribs are of 1/32 in. sheet throughout, with lightening holes. The leading edge as far as the spar must be covered with 1/64 in. sheet to prevent excessive bending and drooping. The ribs are overlayed with 1/64 in. by $\frac{1}{8}$ in. strips running from back of L.E. covering to the rear of the T.E.

The main spar is interrupted in the centre-section by two pieces of 1/16 in. sheet that are flat against the pivot-post. The pivot (a piece of 16 s.w.g. wire) goes through all three and this allows the incidence of the tailplane to be altered at will. The pivot post is located in the top of the former underneath it. When the tail setting is formed, the L.E. is glued to the back of the top motor peg block and the rear spar to the rudder post; this locks the assembly.

The underside of the centre-section of the tailplane is covered with 1/32 in. sheet, a slot being cut for the pivot post. A $\frac{1}{2}$ in. of deflection up and $\frac{1}{4}$ in. down of the tailplane T.E. should be allowed for.

The fin is built round the rudder post which is of 1/16 in. sheet; the ribs are of 1/32 in. overlaid as usual *only* with $\frac{1}{8}$ in. by 1/64 in. sheet strips. The covering of the L.E. is very difficult, due to the excess curvature and thus a covering of 1/64 in. sheet back to a 1/16 in. square piece running down $1\frac{1}{2}$ in. from the L.E. would be beneficial.

The tail assembly is detachable with a portion of the top of the fuselage. The steps provide a very firm fixing and this is located by pieces of 1/16 in. sheet acting as guides. The rear peg is $\frac{1}{8}$ in. diam. birch dowel in paper tubing. The front attachment is the block plugging over the rubber peg tops. Rubber bands inside make the fixing rigid. The bands may be connected by holding the whole tail sidewise—so that the rudder is horizontal; connect to the hooks, lift the tail assembly up and then let it slip into place.

Propellor Assembly.

The spinner is turned from any light hard wood (if you do not possess a lathe cut a template and get a wood turner to do it for you; he will not charge much!). It is located by an inner block over which it plugs smoothly.

This inner block carries the lower halves of three large press studs; the upper halves are fixed to the bottom of the propellor hubs by the wire loop to which they are soldered and which is itself embedded in grooves up the side of the hub. The spinner behind the hub should be cut away to allow the blade to be knocked out; pressing the sides of the hub are two pieces of rubber; these stop the blade turning in the air, but allow a sharp blow to knock them off. The correct pitch must be found and a mark made. Any good free-wheel may be placed in the front of the inner block, with the exception of those working by rubber tension against a spring.

General.

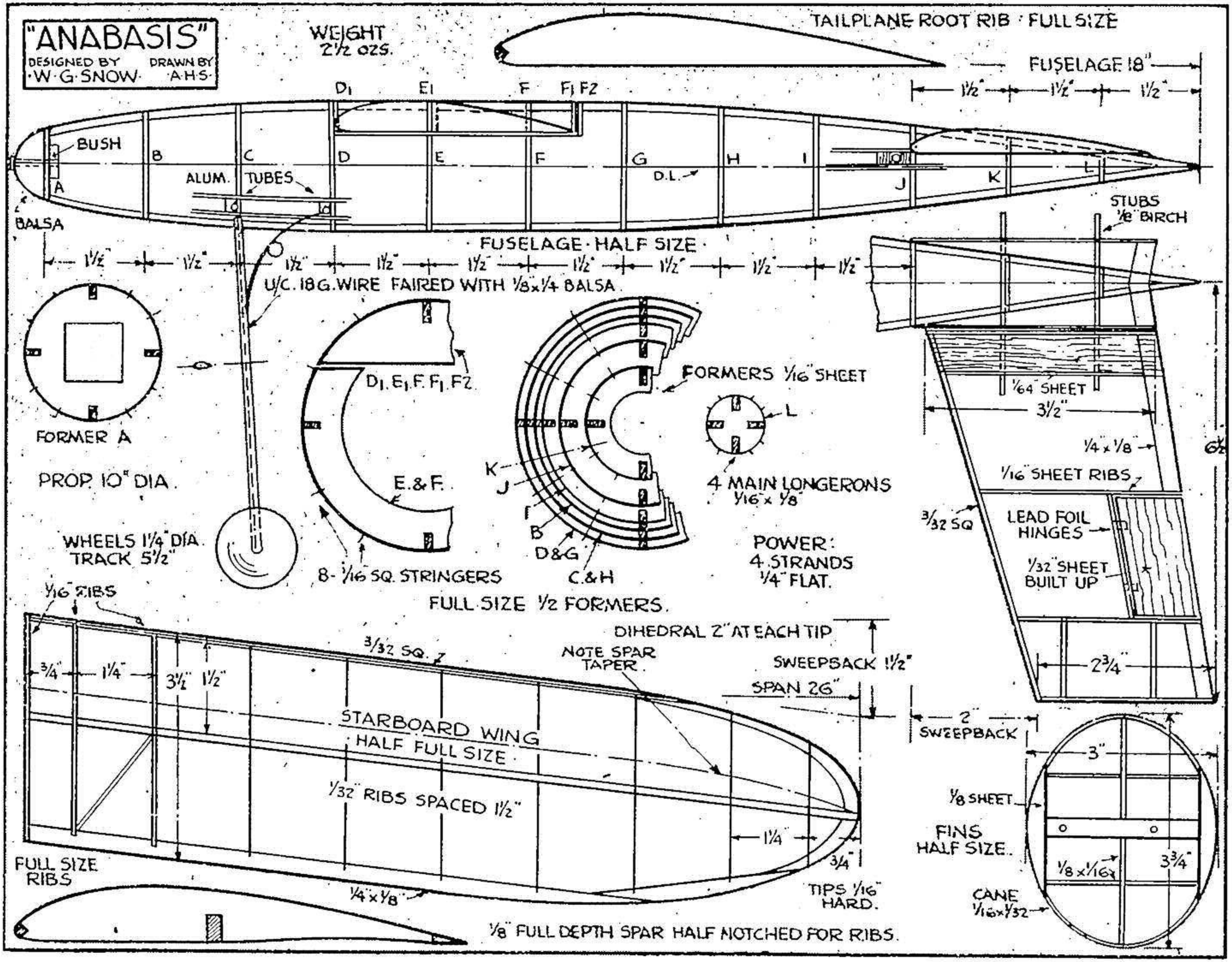
The power is arbitrary. Five skeins of two loops of $\frac{1}{4}$ in. by 1/20 in. strip rubber will give plenty of power.

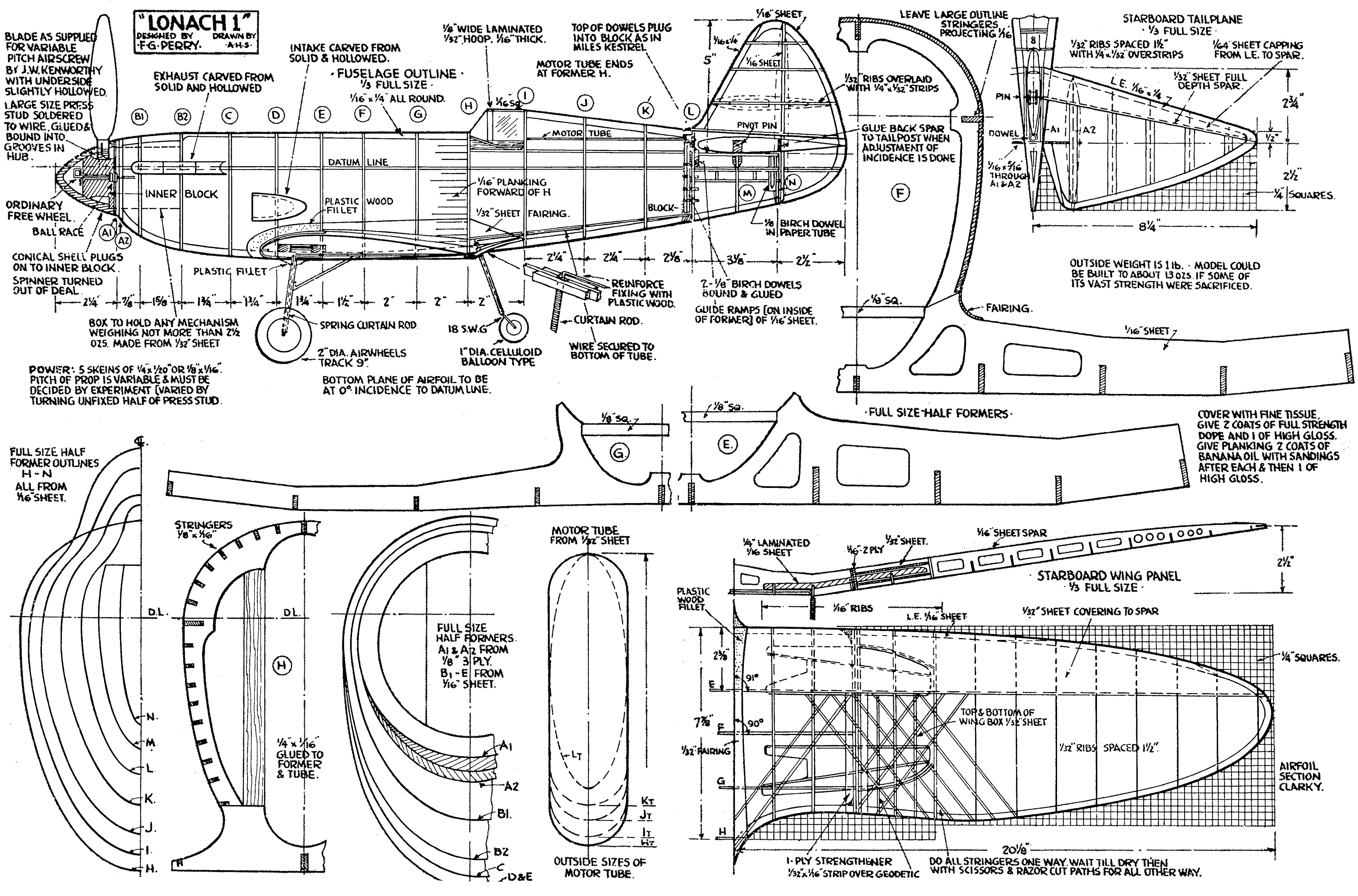
All the covering is superfine tissue. Make sure of a smooth finish everywhere. The high-gloss will help you a good deal but care in detail work is essential.

Above all do not tolerate the merest suspicion of wing or fuselage or tail warp; a spin will result or at any rate poor flying.

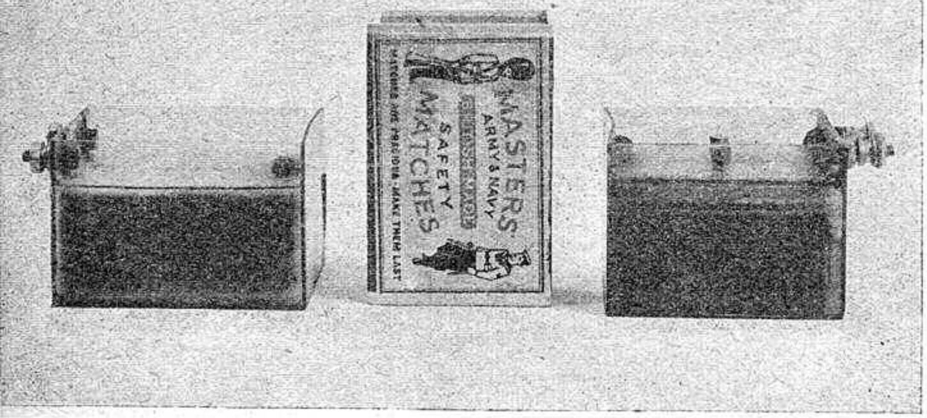
The flying speed is high (wing loading is about 8.5 for weight of $13\frac{1}{2}$ ozs.) so test by taking off with gradually increasing power; properly streamlined (*i.e.*, well finished) and a coat of high-gloss should see the model up to 50 m.p.h.

SCALE PLANS OF LONACH I. ON PAGES 152-3.


"ANABASIS"
DESIGNED BY W. G. SNOW
DRAWN BY A.H.S.
WEIGHT 2½ OZS.
TAILPLANE ROOT RIB · FULL SIZE
FUSELAGE 18"
BUSH
ALUM. TUBES
BALSA
D.L.
STUBS ⅛" BIRCH
FUSELAGE · HALF SIZE
U/C. 18 G. WIRE FAIRED WITH ⅛ x ¼ BALSA
FORMER A
PROP. 10" DIA.
WHEELS 1¼" DIA. TRACK 5½"
D1. E1. F. F1. F2.
E. & F.
8 - 1/16 SQ. STRINGERS
FORMERS 1/16" SHEET
4 MAIN LONGERONS 1/16" x ⅛"
POWER: 4 STRANDS ¼" FLAT.
C. & H
D & G
FULL SIZE ½ FORMERS.
1/64" SHEET
¼ x ⅛
1/16" SHEET RIBS
3/32 SQ
LEAD FOIL HINGES
1/32" SHEET BUILT UP
1/16" RIBS
3/32 SQ.
DIHEDRAL 2" AT EACH TIP
NOTE SPAR TAPER
SWEEPBACK 1½"
SPAN 26"
STARBOARD WING HALF FULL SIZE
1/32" RIBS SPACED 1½"
2" SWEEPBACK
⅛ SHEET
FINS HALF SIZE.
⅛ x 1/16
CANE 1/16 x 1/32
FULL SIZE RIBS
¼" x ⅛"
TIPS 1/16" HARD.
⅛" FULL DEPTH SPAR HALF NOTCHED FOR RIBS.


"LONACH 1"
DESIGNED BY F.G. PERRY. DRAWN BY A.H.S.
BLADE AS SUPPLIED FOR VARIABLE PITCH AIRSCREW BY J.W. KENWORTHY WITH UNDERSIDE SLIGHTLY HOLLOWED.
LARGE SIZE PRESS STUD SOLDERED TO WIRE, GLUED & BOUND INTO GROOVES IN HUB.
ORDINARY FREE WHEEL.
BALL RACE
CONICAL SHELL PLUGS ON TO INNER BLOCK.
SPINNER TURNED OUT OF DEAL.
EXHAUST CARVED FROM SOLID AND HOLLOWED
INTAKE CARVED FROM SOLID & HOLLOWED.
FUSELAGE OUTLINE 1/3 FULL SIZE
1/8" WIDE LAMINATED 1/32" HOOP. 1/16" THICK.
1/16" x 1/4" ALL ROUND.
TOP OF DOWELS PLUG INTO BLOCK AS IN MILES KESTREL
MOTOR TUBE ENDS AT FORMER H.
DATUM LINE
MOTOR TUBE
INNER BLOCK
1/16" PLANKING FORWARD OF H
PLASTIC WOOD FILLET
1/32" SHEET FAIRING.
PLASTIC FILLET
BLOCK
1/8" BIRCH DOWEL IN PAPER TUBE
REINFORCE FIXING WITH PLASTIC WOOD.
CURTAIN ROD.
2-1/8" BIRCH DOWELS BOUND & GLUED
GUIDE RAMPS (ON INSIDE OF FORMER) OF 1/16" SHEET.
BOX TO HOLD ANY MECHANISM WEIGHING NOT MORE THAN 2½ OZS. MADE FROM 1/32" SHEET
SPRING CURTAIN ROD.
18 S.W.G.
2" DIA. AIRWHEELS TRACK 9".
1" DIA. CELLULOID BALLOON TYPE
WIRE SECURED TO BOTTOM OF TUBE.
POWER: 5 SKEINS OF 1/4 x 1/20 OR 1/8 x 1/16. PITCH OF PROP IS VARIABLE & MUST BE DECIDED BY EXPERIMENT (VARIED BY TURNING UNFIXED HALF OF PRESS STUD.
BOTTOM PLANE OF AIRFOIL TO BE AT 0° INCIDENCE TO DATUM LINE.
1/16" SHEET
1/16" SHEET
1/32" RIBS OVERLAID WITH 1/4" x 1/32" STRIPS
PIVOT PIN
GLUE BACK SPAR TO TAILPOST WHEN ADJUSTMENT OF INCIDENCE IS DONE
LEAVE LARGE OUTLINE STRINGERS PROJECTING 1/16
STARBOARD TAILPLANE 1/3 FULL SIZE
1/32" RIBS SPACED 1½" WITH 1/4 x 1/32 OVERSTRIPS
1/64" SHEET CAPPING FROM L.E. TO SPAR.
1/32" SHEET FULL DEPTH SPAR.
L.E. 1/16" x 1/4
PIN
DOWEL
1/16 x 5/16 THROUGH A1 & A2
1/4" SQUARES.
OUTSIDE WEIGHT IS 1 lb. MODEL COULD BE BUILT TO ABOUT 13 OZS. IF SOME OF ITS VAST STRENGTH WERE SACRIFICED.
1/8" SQ.
FAIRING.
1/16" SHEET
FULL SIZE HALF FORMERS
COVER WITH FINE TISSUE, GIVE 2 COATS OF FULL STRENGTH DOPE AND 1 OF HIGH GLOSS. GIVE PLANKING 2 COATS OF BANANA OIL WITH SANDINGS AFTER EACH & THEN 1 OF HIGH GLOSS.
FULL SIZE HALF FORMER OUTLINES H - N ALL FROM 1/16" SHEET.
STRINGERS 1/8" x 1/16"
D.L.
1/4" x 1/16" GLUED TO FORMER & TUBE.
FULL SIZE HALF FORMERS. A1 & A2 FROM 1/8" 3 PLY. B1 - E FROM 1/16" SHEET.
MOTOR TUBE FROM 1/32" SHEET
OUTSIDE SIZES OF MOTOR TUBE.
1/4" LAMINATED 1/16 SHEET
1/16" 2 PLY
1/32" SHEET.
1/16" SHEET SPAR
STARBOARD WING PANEL 1/3 FULL SIZE
PLASTIC WOOD FILLET.
1/16" RIBS
L.E. 1/16" SHEET
1/32" SHEET COVERING TO SPAR
1/4" SQUARES.
TOP & BOTTOM OF WING BOX 1/32" SHEET
1/32" RIBS SPACED 1½".
1/32" FAIRING
AIRFOIL SECTION CLARK Y.
1-PLY STRENGTHENER
1/32" x 1/16" STRIP OVER GEODETIC
DO ALL STRINGERS ONE WAY. WAIT TILL DRY THEN WITH SCISSORS & RAZOR CUT PATHS FOR ALL OTHER WAY.

Small Accumulators



The majority of small petrol engine troubles are undoubtedly due to a faulty ignition system. This in turn can usually be traced to the battery; in the workshop the engine will run sweetly on large cells but there is often an appreciable drop in r.p.m. when changing over to a small flash-lamp battery for actual flying. Thus the need of a reliable, yet light, source of electrical energy has been apparent for a long time. A certain amount of research work has been carried out with small magnetos but it would appear that a small lightweight accumulator is the best solution and thus this survey of recent contributors' ideas and suggestions should be welcomed.

THE article by A. J. Watson on this subject published in a recent issue has re-awakened considerable interest and brought in many letters from readers all over the country. In this survey the main points of difference and agreement are presented together with practical hints which should be of great value to the interested constructor. Further comments and ideas are invited, especially from modellers who have actually made and used similar small accumulators but, as yet, have not put their ideas on paper.

Firstly, the accumulator intended for model petrol 'planes must be of reasonable size and light in weight and at the same time capable of standing up to a considerable amount of abuse. This latter may not be intentional but one cannot help but neglect it or ill treat it to some extent and so it cannot hope for the quiet, well attended life that many larger secondary cells secure.

Happily for us it appears that these baby cells are quite "tough." Lt.-Col: Bowden reports that the first 4½ oz. accumulator tested by Dr. Forster and himself often stood for long periods uncharged with the plates not fully covered by electrolyte and, when charged, this was carried out quite rapidly with a 6-volt accumulator. These tests were deliberate in order to find out the weak spots in the cell and the way that it stood up to mis-use is very encouraging.

The photographs give an idea of the size of the accumulators their average weight being about 4–5 oz., although Lt.-Col. Bowden's latest "baby" weighs only 2½ oz. and must be the smallest practicable working accumulator in the world! The plates should be cut from those of a standard accumulator, a backsaw or even a fretsaw is best for this operation and D. R. Barrett suggests that these be about ⅛ in. or 3/16 in. thick cut from a 50–100 ampere-hour capacity cell.

This latter reader also points out the necessity of guarding against internal short circuits. Briefly "gassing" occurs about two-thirds through a normal charge when little bubbles of gas collect on the plate and are cast off. Over charging or charging at a rapid rate produces an excess of gassing. Now when this is taking place particles of the plate are apt to be dislodged and fall to the bottom of the cell. Here it collects and forms a sediment known as "mud." This mud is a conductor and should two adjacent plates come in contact with it they will be short circuited.

The cell must thus be designed with this in view and D. R. Barrett suggests that the plates should not rest on the bottom of the cell case but on grooves or small blocks of celluloid or other non-conductor. As to the question of separaters between the plates to prevent them coming into contact, celluloid is favoured or ebonite, about ⅛ in. thick. Failing this a hardwood such as teak, but A. J. Watson's use of card is condemned as this will become a conductor when saturated.

These separators should be slightly larger than the plates themselves and perforated with tiny holes to allow free circulation of acid. If they are very thin it is better to dispense with the holes owing to the danger of "mud" creeping through (D. R. Barrett). The whole assembly is then fitted together as one compact unit and held by rubber bands although the effect of acid on the latter may cause it to rot in time.

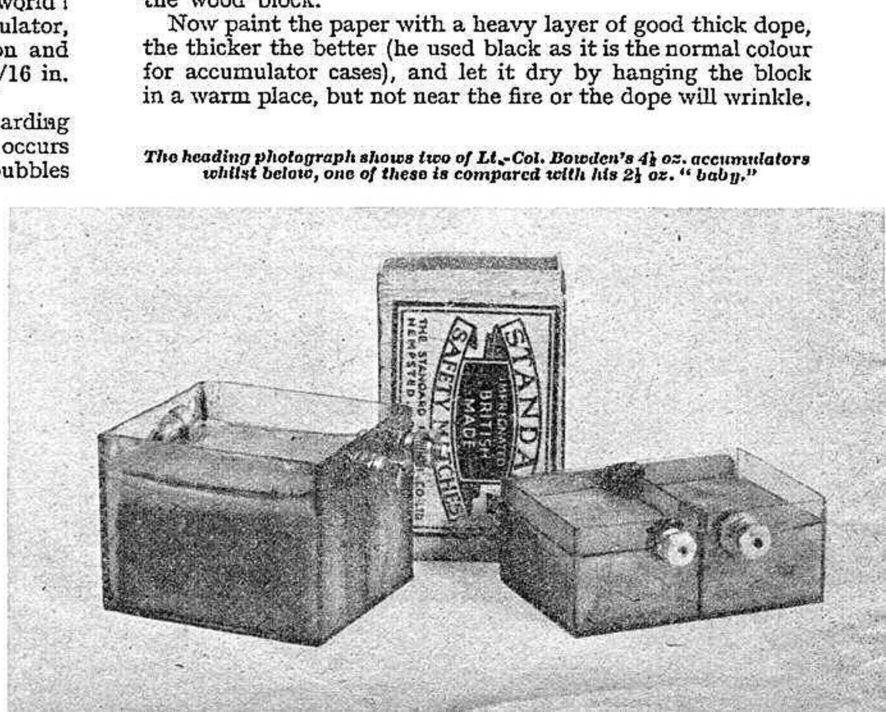
Celluloid appears to be the favourite, and practically exclusive, choice for the case. Giles Atherton suggests that Durofix gives a far better cement joint than the quick drying balsa type and it is extremely important that it should not leak. Another extremely interesting type of construction and one which should have great possibilities is as suggested by "Hertzian." He has evolved a method of making the accumulator case for which the following advantages are claimed:—

(*a*) The finished case resembles a moulding and is consequently very tough and light.
(*b*) The construction is simplicity itself.
(*c*) Any number of mouldings can be "built up" at the same time.

First take a block of wood and cut it to the required size of the case, sandpaper it well and round all the corners. Dip it in melted candle wax, and when the wax has almost set, cover it with thin paper (not too porous, by the way). One end should be left open. This makes a paper "box" around the wood block.

Now paint the paper with a heavy layer of good thick dope, the thicker the better (he used black as it is the normal colour for accumulator cases), and let it dry by hanging the block in a warm place, but not near the fire or the dope will wrinkle.

The heading photograph shows two of Lt.-Col. Bowden's 4½ oz. accumulators whilst below, one of these is compared with his 2½ oz. "baby."



Repeat the process when the dope is quite hard and build up to the required thickness. He found that twelve coats are ample, using dope that was about the consistency of golden syrup (shades of rationing !).

When the case is thick enough (about 3/64 in.) and quite dry, dip the whole block into hot water. This softens the wax and the case can be pulled off the block without difficulty, leaving the wax behind. Dry the case well and give the inside, which is still paper, of course, a good coat of dope. Repeat if necessary.

The strength of the case is quite astounding. There are only three points to watch :—

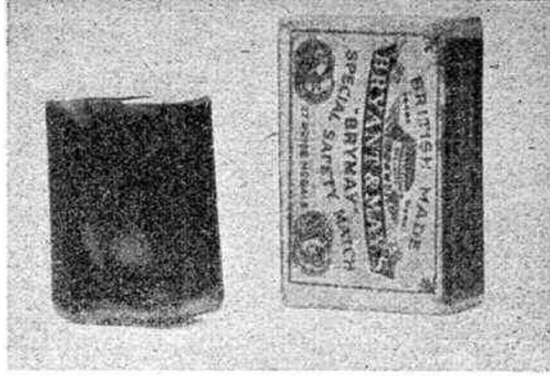
- (i) Make the wooden block about $\frac{1}{8}$ in. bigger all round than required to allow for the subsequent shrinkage of the dope.
- (ii) Use nice thick dope—there is bound to be some knocking around in most workshops. This speeds up the job.
- (iii) Don't be tempted to take the case off the wood until it is absolutely hard ; give it at least 48 hours after the last layer has been applied.

When the plates are placed in the case the acid should be poured in to about $\frac{1}{4}$ in. above the normal level (just covering the plates) and a little wax " floated " on to the surface. Before the wax sets push a small celluloid tube ($\frac{3}{8}$ in. diameter and $\frac{3}{4}$ in. long) through the wax and hold in position until the wax sets. Pour some of the thick dope on to the wax surface to form the top cover of the accumulator. When that is hard, pour out some of the acid through the tube (which is now the filling plug) and stop it with a small rubber " cork." The terminals connected to the plates must protrude through the top cover of dope.

The function of the wax is only to act as a base upon which the dope " top " can be formed, and the celluloid tube can be made in the same way as the case, on a paper covered piece of dowelling.

An example of a moulded case alone of size $1\frac{3}{4}$ in. by $1\frac{1}{4}$ in. by $\frac{3}{8}$ in. weighed $\frac{1}{4}$ oz. This is actually on the small side but, as claimed, it is really quite strong and absolutely free from leaks. The idea of " floating " the top on to the case should save time which would normally be required to cement a celluloid cover in place. Pitch tops have been used but do not appear to give a lasting seal (Giles Atherton) and vent and terminal leads protruding need to be protected by a " rubber washer " made from valve tubing.

It is generally agreed that the cell must be of the " non-spill " type. Some designs of Lt.-Col. Bowden's incorporate an anti-spillage space over the top of the plates. Most contributors, too, advocate the use of glass wool packing as a means to this end. This need not be tightly compressed but arranged so as to allow free circulation of the electrolyte around the plates without it splashing about.



A light and practicable accumulator case "moulded" from dope as suggested by "Hertzian." Weight of case is about $\frac{1}{4}$ oz. and size $1\frac{3}{4}$ in. by $1\frac{1}{4}$ in. by $\frac{3}{8}$ in.

To summarise briefly, the design of a suitable small accumulator should be as follows :—

Size : 2 in. by $1\frac{1}{2}$ in. by $1\frac{1}{2}$ in.
Weight : 3–5 ounces.

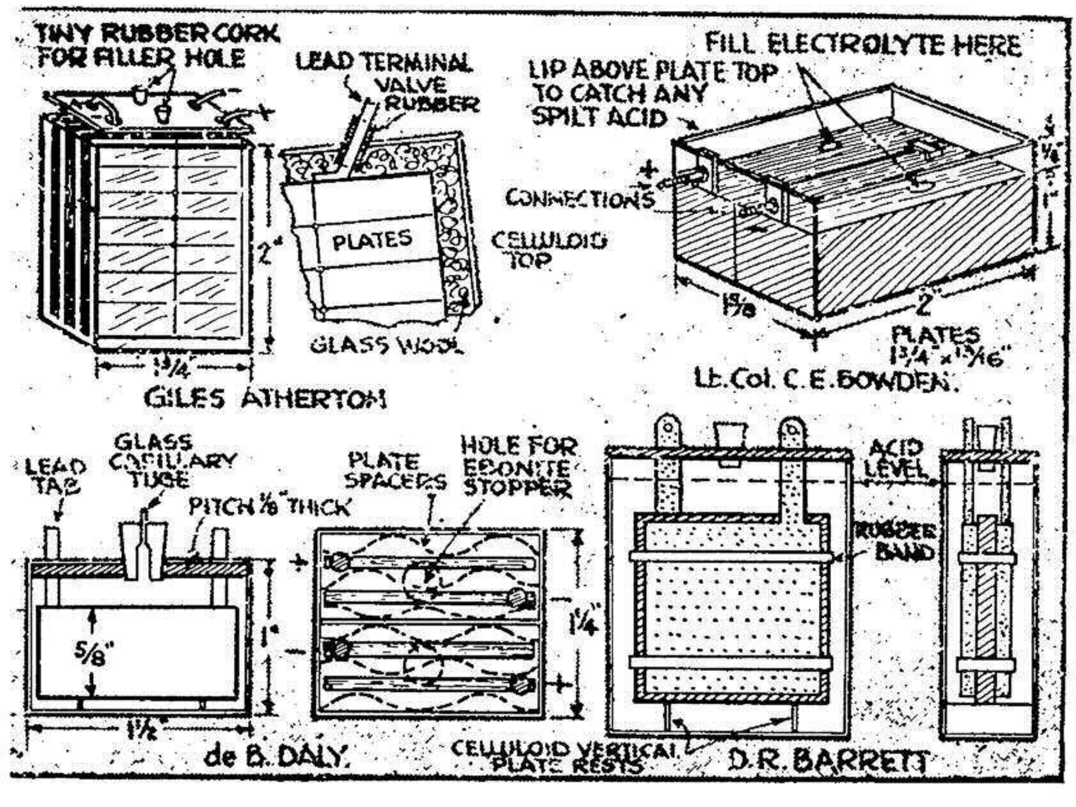
Non-spill type with glass wool " paacing." Two terminal leads conveniently situated and easy to connect. Layout of plates such as to prevent internal short circuits and general construction robust.

Charging.

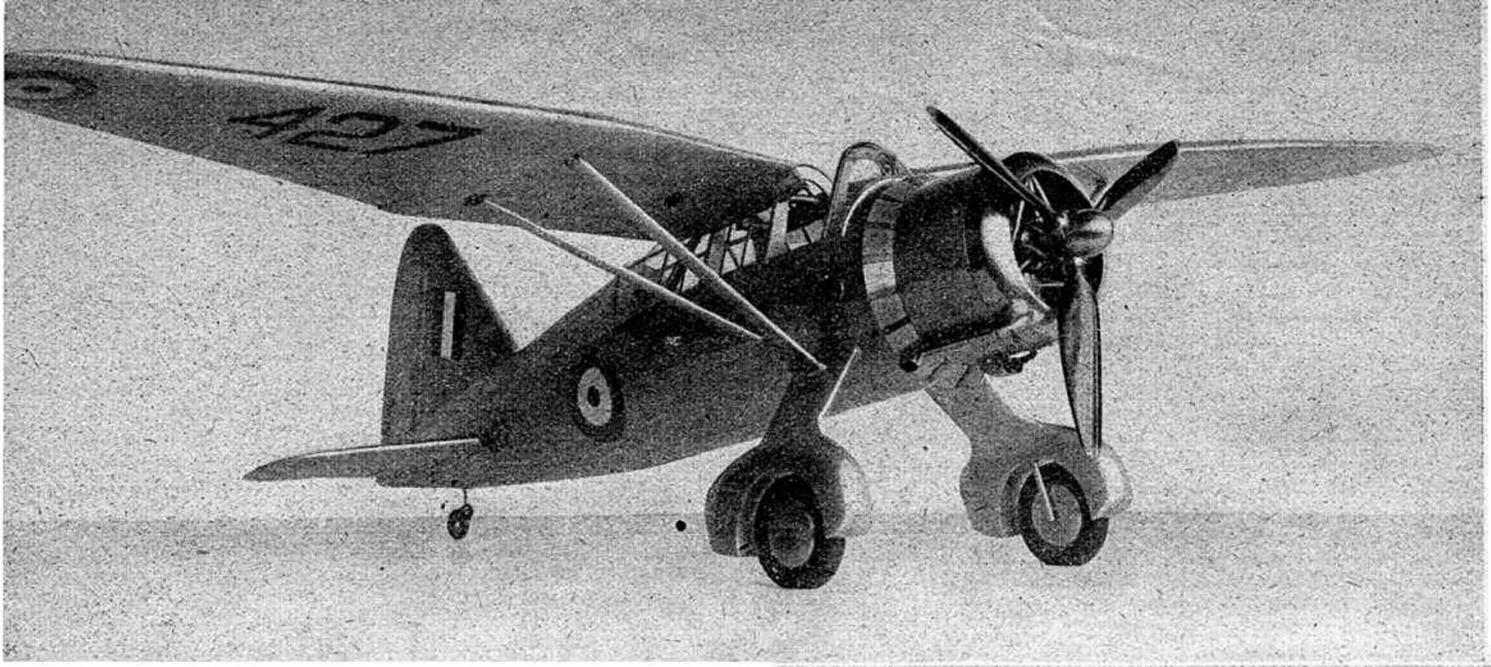
The subject of charging introduces several controversial ideas. The ideal charge rate should be such that the duration of charge should be about 10 hours according to D. R. Barrett, the charging current depending upon the capacity of the cell. Lt.-Col. Bowden suggests that if a trickle charger is available the accumulator could be charged for an hour or two at $\frac{1}{2}$ amp. Experience seems to show that the normal charging time can be shortened to advantage although if accomplished by means of a 6-volt accumulator the " baby " should be placed on charge before the day's flying. In the latter case a $2\frac{1}{2}$-volt flashlamp bulb or similar resistance should be placed in series to cut down the current.

Mr. M. de B. Daly has successfully used a 100 ohm. resistance in series with a 6-volt accumulator when the charging current is about 1/15 amp. He advises a low charging current, especially with very small plates. For " boosting " on the field, if this is found necessary this current may be safely exceeded for short periods.

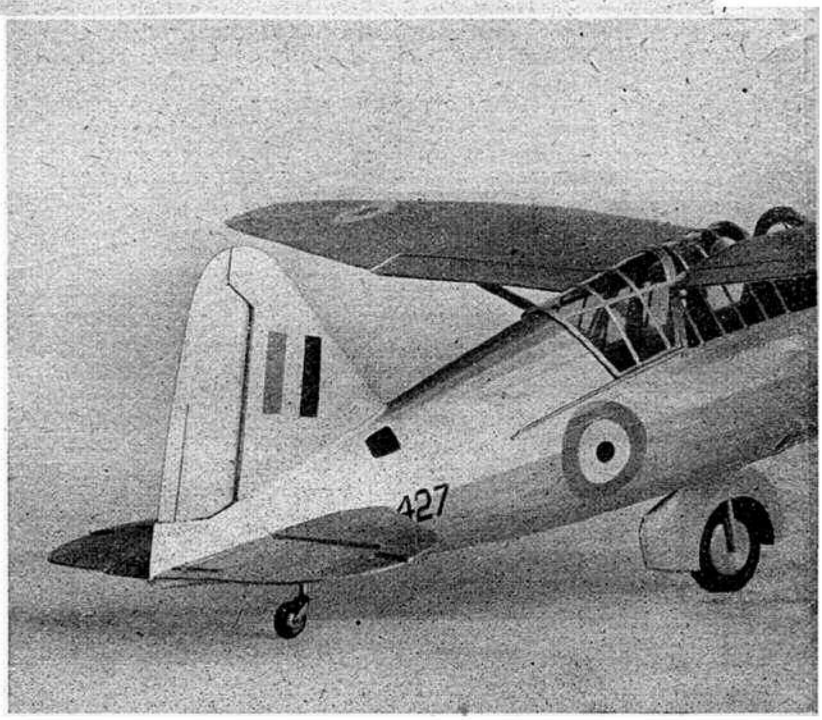
Whichever method is preferred violent " gassing " or overheating must be avoided. Note, however, that some " gassing " will occur and thus the cork must be removed from the filler tube. Rapid charging, and thus more " gassing," will cause the cell to require topping up with distilled water more frequently.



This diagram shows a number of suggested accumulator layouts. In all cases the plates used are cut down from a normal cell of approximately 50 - 100 ampere - hour capacity, but the method of attachment to the case, etc., is varied. The space between the plates and the outer case is filled with glass wool which allows for circulation of the electrolyte and at the same time prevents the latter from splashing about. Some designs advocate the use of an anti-spillage space above the plates, but this is not at all general. The location of the terminals is important as they must be kept free from corrosion and be readily accessible for attachment of the leads. Note also the spacers used to prevent adjacent plates coming into contact.



A 1/10 scale, i.e., 5 ft. span model of the Westland Lysander powered by a 3 c.c. Ohlsson engine. Construction and finish leave nothing to be desired and the builder, Corporal A. Welsberg of the Polish Air Force, is to be congratulated on a magnificent job of work. Details of the model are given below.



Fuselage.

Formers 1 to 4, including instrument panel half former, are cut from ⅛ in. three-ply; the remainder are from ⅛ in. balsa. A small section of three-ply between formers 1 and 2 carries the ignition leads, L.T., H.T., and earth.

Four battery tubes of stout paper are fitted between formers 3 and 4. Each tube is closed at one end by a plywood disc and electrical contact with the battery terminals is made by small metal bolts. The coil is housed in an aluminium tube which in turn is attached to a " C "-section aluminium frame bolted transversely across former No. 5. The coil holder then fits into a hole in former No. 9 and is adjustable fore and aft so varying the C.G. position as desired.

Stringers are of spruce and are securely cemented to all formers. At the extreme front and rear, i.e. formers Nos. 1, 2 and 3 and 9, 10 and 11 stringers are flush with the formers, i.e. fit in slots cut in the formers, whereas at other stations they project. The half former, i.e. the instrument panel, is added after the main stringers are in position and is then braced to former No. 1 by a short top stringer.

Two solid balsa blocks are cemented to the top and bottom of former No. 10. A ⅛ in. hole in the top block accommodates the upper end of the fin strut (internal) whilst the lower block carries a phosphor bronze bush for the tailwheel assembly. To ensure a good joint metal tubes are firstly wrapped with gummed paper and then cemented in position.

Three undercarriage bracing wires are firmly attached to the forepart of the fuselage, two of which serve the unique purpose of acting as positive and negative leads for the landing light. Booster plug sockets are located in a section of ⅛ in. balsa sheet cemented between formers 1 and 2 and then the whole of this bay covered with 1/32 in. sheet balsa.

Tail Assembly.

The tailwheel assembly consists of an aluminium tube to one end of which a brass plug is shrunk on. This plug projects from the tube and the external part is threaded and screws into the tailwheel yoke. The upper end of the aluminium tube fits into the brass bush and is sprung by suitable attachment of a coiled spring. The bottom rib of the fin is cemented to the fuselage and then the rear of the fuselage is covered with 1/32 in. sheet balsa.

Undercarriage.

Six formers of streamlined aerofoil section are required for each undercarriage leg. One is cemented to each side of the fuselage and the first section of each leg consists of a solid balsa block, hollowed out slightly to take the wire undercarriage leg. The remainder of the leg is built up from the other formers and covered with 1/32 in. balsa, well doped and then covered with silk.

Wheels are built up around a central hardwood disc carrying a short length of aluminium tube. Small brass bolts are screwed into each end of this tube and drilled to take the axle. The wheels are retained in position by small nuts screwed on to the axles.

Engine and Mounting.

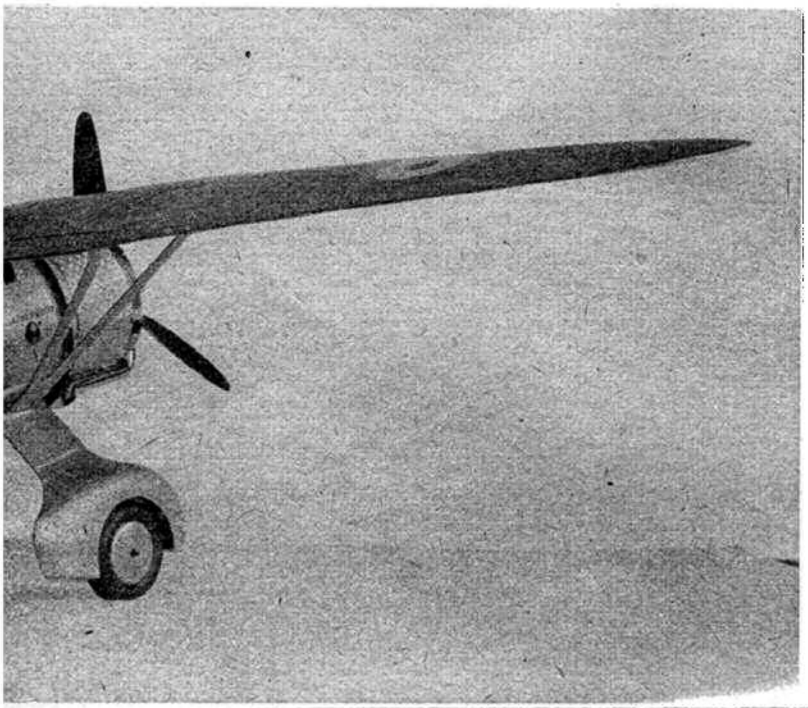
The four main bearers are internally tapped and secured to the front former by bolts passing through holes drilled in the former and screwing into the bearers. A 1/32 in. sheet aluminium bulkhead is attached to the bearers and is also connected to the first former by two auxiliary struts bolted to it.

A steel throttle tube is shrunk on to the carburettor pipe and a small throttle valve attached to the open end of this.

FIRST CLASS WORKMANSHIP

A five ft. Span Petrol Model Lysander ______________ by A. WELSBERG

The engine is mounted in position complete with cowling supports and is bolted to the aluminium bulkhead. Each of the three cowling supports are of 1/16 in. steel wire flattened and bushed with aluminium tubes. The front of the cowling, i.e. the collector ring, is of 1/32 in. sheet steel and is permanently bolted to the lower half of the cowling. The cowling itself and the gills are of 1/32 in. aluminium and the top half is hinged to open upwards thus allowing access to the engine and mounting. Engine controls are carried through the front former and terminate on two levers in the cockpit.



Airscrew.

The airscrew hub was machined from solid aluminium with each arm slotted to allow the blade retaining bolts to exert a clamping action. The blades themselves are of spruce, french polished, with phosphor bronze collars screwed on to the hubs.

Cockpit Enclosure.

The remainder of the fuselage is silk covered, with the exception of the cockpit enclosure. This is of celluloid sheet with thin aluminium strips to represent window frames. The windscreen is formed by soaking the celluloid in hot water. The gunner's hood slides to the rear on two steel runners attached to the fuselage.

Tail Unit.

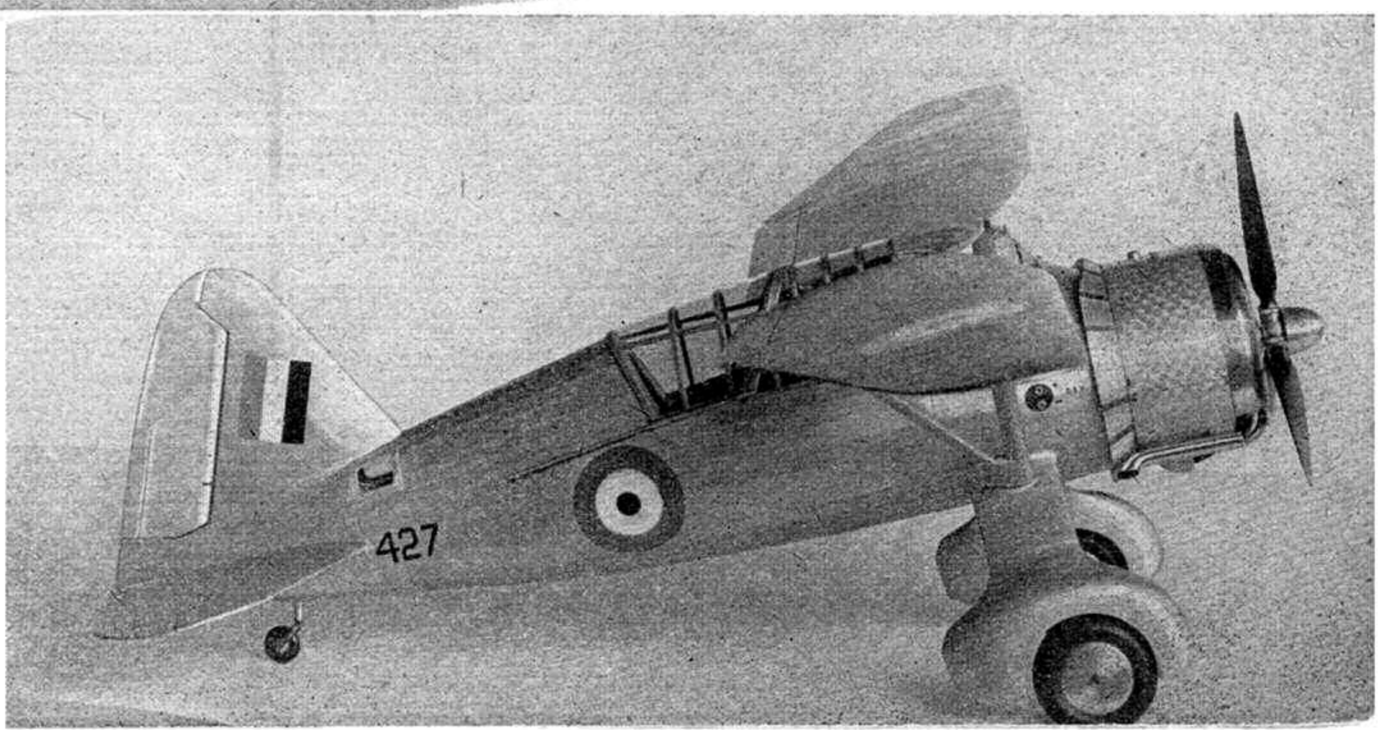
Tailplane and fin are built up in the conventional manner but strengthened by additional spars. These extend to the third rib in the tailplane and in the fin take the form of two additional stringers attached to former No. 10. Rudder and elevators, each with adjustable trimming tabs, are fitted.

Wings.

The wings are built up around $\frac{1}{8}$ in. square balsa spars suitably webbed and strengthened. Extensive use is made of balsa throughout. The leading edge is completely sheet-covered with 1/32 in. balsa to the spar whilst the remainder is silk covered. Hinged flaps are fitted and may be adjusted through a range of altitudes.

The wing struts are attached to the top of the undercarriage leg and also to suitable fittings on the undersurface of the wing.

As will be seen from the accompanying photographs the finish is perfect. This was obtained by silver dope applied after several coats of shrinking dope had been allowed to dry. The total weight in flying trim is just over 3 lb. and it has actually taken off on a short tethered flight with flaps down. The 3 c.c. engine should develop enough power to give a good performance since the wing loading works out at about 1.8 oz. per sq. ft.



GADGET REVIEW

CONDUCTED BY M·R·KNIGHT · ILLUSTRATED BY C·RUPERT·MOORE.

HAVE you heard of the fellow who recently enquired at a model aircraft store for some basswood ("balsa substitute" if you like)? He was told, "Sorry, we haven't any at the moment. But we have a fair amount of balsa, if that will do."

Truth is indeed stranger than fiction, as Byron has reminded us. Sad to relate, cheery spots where they have "a fair amount of balsa" are few and far between. Many modellers would be very glad to see some. And even where it is to be had, it is generally available only in the form of sheet. Small wonder that numerous readers are sending to Gadget Review descriptions of home-made cutters designed to transform sheet into strips of the various sizes commonly favoured.

From a batch of such contrivances, some quite fearsome in appearance, two have been selected for consideration.

Fig. 1 shows a compact and easily-made cutter by Mr. Donald Macdonald, of Giffnock, Glasgow. It consists of a safety-razor blade screwed to a small block of hardwood in such a position that the end of one cutting-edge is flush with the edge of the block. Between blade and block is interposed a piece of hardwood corresponding in thickness to the desired size of the balsa strips. Balsa will not do for this packing-piece as it can easily be compressed by the screws holding the blade in position, and this would result in the strips being thinner than intended. Holes for the screws should be drilled.

Care is needed in using the cutter if good results are to be obtained. The balsa sheet should be placed on a flat surface, such as a building-board, and held down firmly by the left hand. The cutter is drawn slowly and evenly along the further edge of the sheet, from left to right. Meanwhile the face of the block to which the blade is fixed should press against the edge of the sheet, and the lower face against the building-board. These faces of the block must be at right angles if the strips cut are to be truly rectangular in cross-section.

A variation in this form of cutter is submitted by Mr. W. Gordon Mason, of Peterborough, and is illustrated in Fig. 2. It is calculated to appeal to a modeller in a hurry! Several razor blades are used, thus enabling a number of strips to be cut at the same time. Six blades constitute the limit for convenience in using the cutter, and they are tilted as shown and allowed to project below the hardwood spacers to a distance fractionally greater than the depth of the strips to be cut. The size of the strips is determined, of course, by the width of the spacers. Blades and spacers are secured between stout end pieces by three bolts and nuts.

To use this cutter a straight-edge is placed on the balsa sheet, and the cutter is drawn along the wood and at the same time held firmly against the straight-edge.

A neat and effective freewheel device for use in conjunction with airscrews having a spinner is the subject of Fig. 3. It is by Mr. H. C. Aaron, of New Brighton, Cheshire. Thin wire, say 20 gauge, is wound on the airscrew-shaft, and a short piece—about 4 turns—is cut off. The larger portion is fitted firmly into the spinner. The airscrew-shaft is then slipped through the nose-block, and the short piece of coiled wire soldered to it as indicated to form the clutch. A blob of solder is needed on front end after passing through the spinner.

Under the tension of the rubber motor the spinner is pulled rearwards and the two pieces of coiled wire engage, thus turning the airscrew. When the motor runs out the coils disengage and the airscrew idles on its shaft.

Mr. David Anderson, of Kilmarnock, describes how he improvised a small lathe from a grinder mechanism purchased at a chain store. (See Fig. 4.) The chuck is formed from a brass ring 1½ in. in diameter and ¾ in. in depth. It is bored and tapped at equal distances along the circumference to take four ⅜ in by ⅞ in. setscrews which are to form the jaws. The brass plate forming the back of the chuck is bored to fit the grinder shaft; care being taken to centre the hole exactly, so that the chuck runs true. It is secured to the shaft by two bolts. The tail stock is made from mild steel and is bored to take a 3/16 in. screw, the latter being kept in the desired position by two lock-nuts. It is screwed to the bench as shown in the illustration. By moving the tail stock and adjusting setscrew work up to 2 ft. in length can be turned with ease. The lathe has produced satisfactory spinners and cowlings.

A method of plotting ellipses described some time ago in this magazine is referred to in a letter from Mr. L. Bird, of East Croydon. He suggests that what is known as the trammel method which, by the way, he is not claiming to have originated, will be found more satisfactory. The trammel can be a piece of smooth wood, a ruler, or even thin card, and on it two points are marked, shown as "A" and "B" in Fig. 5. They are measured from one end of the trammel, and represent half the minor axis of the desired ellipse, and half the major axis.

These axis are then set out on paper. The path of the ellipse can be obtained by plotting a number of points with the aid of the trammel and then joining them. To determine these points "B" on the trammel is placed at successive positions along the major axis "D," while in each case mark "A" touches the minor axis "C." The end of the trammel edge on which "A" and "B" are marked indicates the position of the dot.

Quite a different way of producing ellipses is described by Mr. Sherwill Cole, of Chalfont St. Peter, Bucks. It was suggested to him by the rib enlarger illustrated in the June, 1941, Gadget Review. As will be seen from Fig. 6 use is made of a drawing-board to which is attached a right-angled bracket. A bicycle lamp is mounted inverted on the upper arm, and a bar projecting from the vertical member holds an inclined disc between lamp and board, thus causing an elliptical shadow to be thrown on the latter. The major and minor axis can be varied by increasing or decreasing the tilt of the disc, and different sizes of ellipse can be obtained by sliding the arm which supports the disc up or down the vertical strut. Alternatively a 2-volt spotlight bulb could be used.

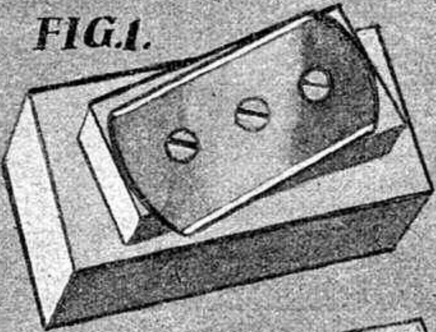
A simple machine which drills holes accurately in airscrews and nose-blocks, the work of Mr. T. Barton, of Sheffield, is illustrated in Fig. 7. It consists of a wooden frame carrying an ordinary hand drill. The base is ½ in. deep, and the 14 in. uprights and connecting bar are of ½ in. by ½ in. timber. Note the four triangular gussets made of plywood which hold the uprights at right angles to the base.

The sliding drill-carrier is made from two sheets of plywood wide enough to reach from one upright to the other, and about 6 in. in depth. They are separated by two pieces of ½ in. by ½ in. wood which must fit firmly between the uprights, but at the same time allow the carrier to slide up and down freely. If there is any side play the holes drilled will be out of truth, while if the carrier is difficult to move it will be found impossible to maintain even pressure on the drill.

Should there be a steadying handle at the side of the drill to be used it must be unscrewed. The spindle can then be passed through a hole cut in the drill-carrier. It may also be necessary to cut other holes to accommodate the drill gears. Small blocks of wood are then fastened to the carrier on each side of the drill to hold the latter vertical. Where there is no side handle these blocks have also to support the drill.

The work to be drilled is placed on the base of the machine, and "downthrust" or "sidethrust" can be incorporated in the case of a nose-block, by packing up one edge.

FIG.1.



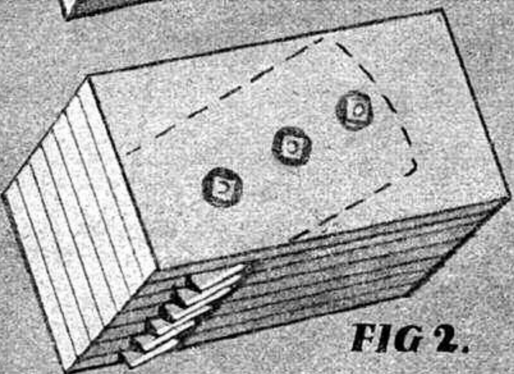
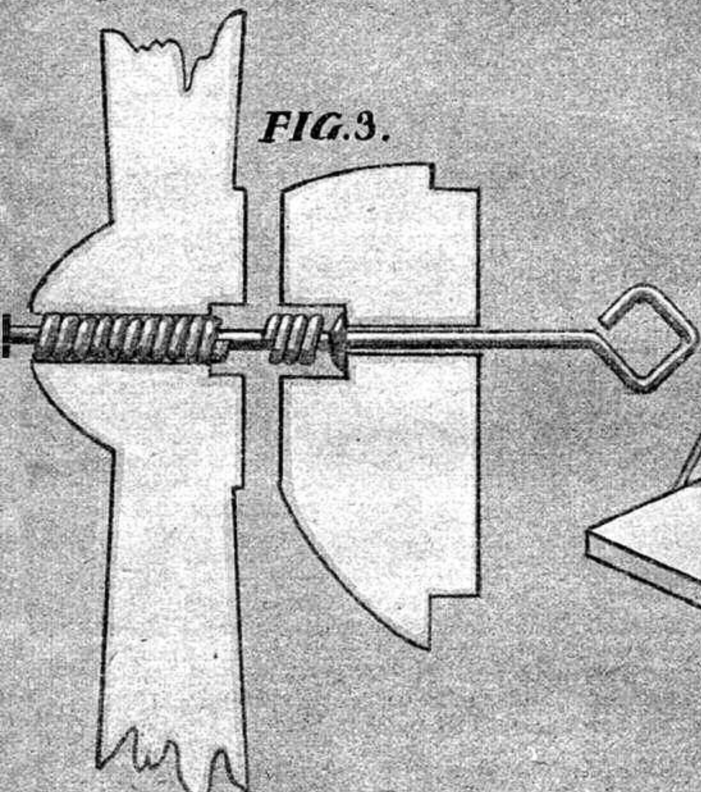


FIG 2.

FIG.3.



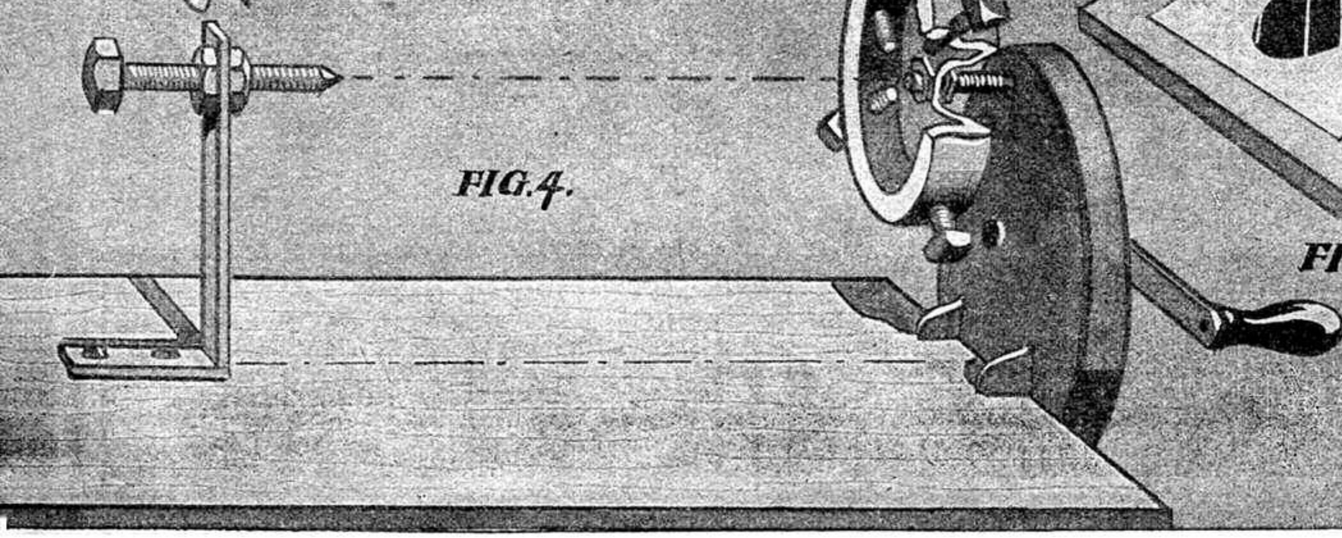


FIG.4.

FIG.5.

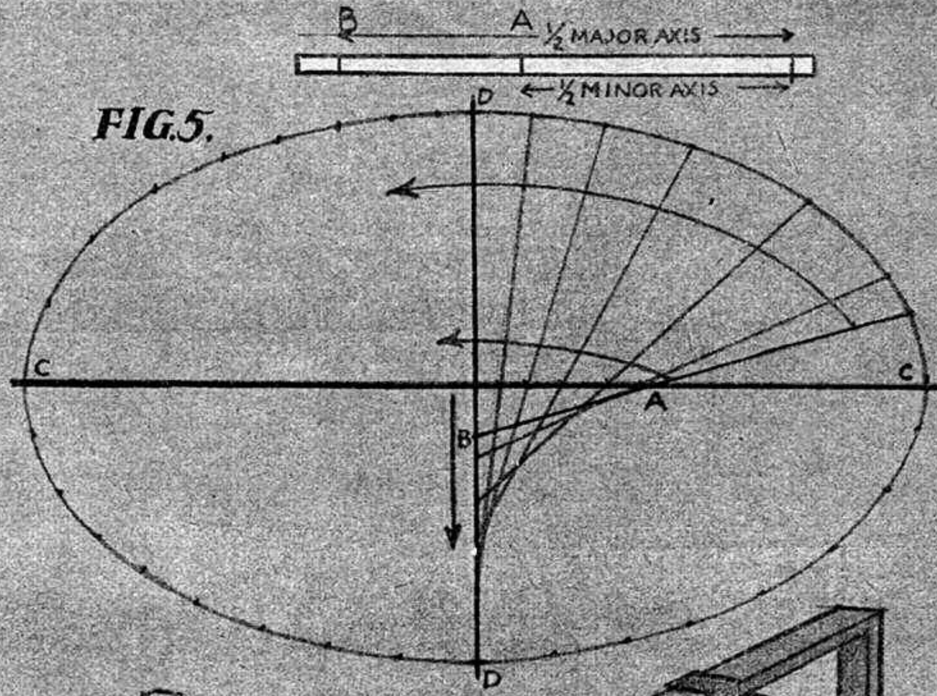
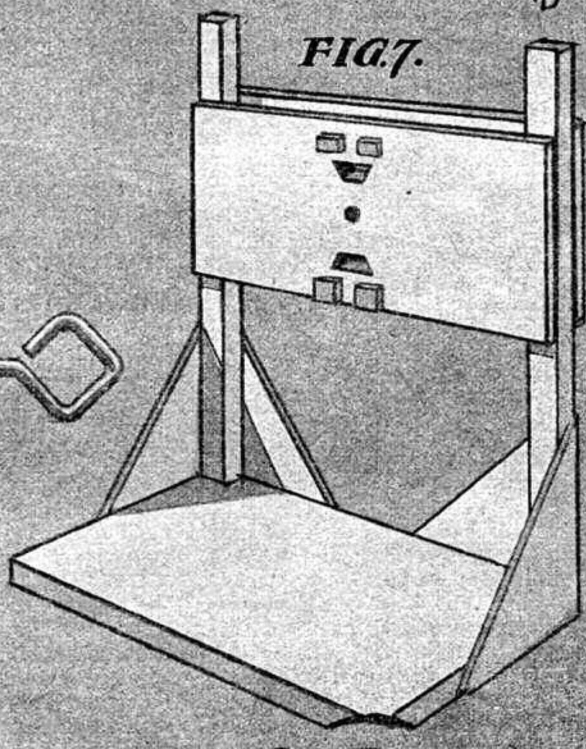


FIG.7.



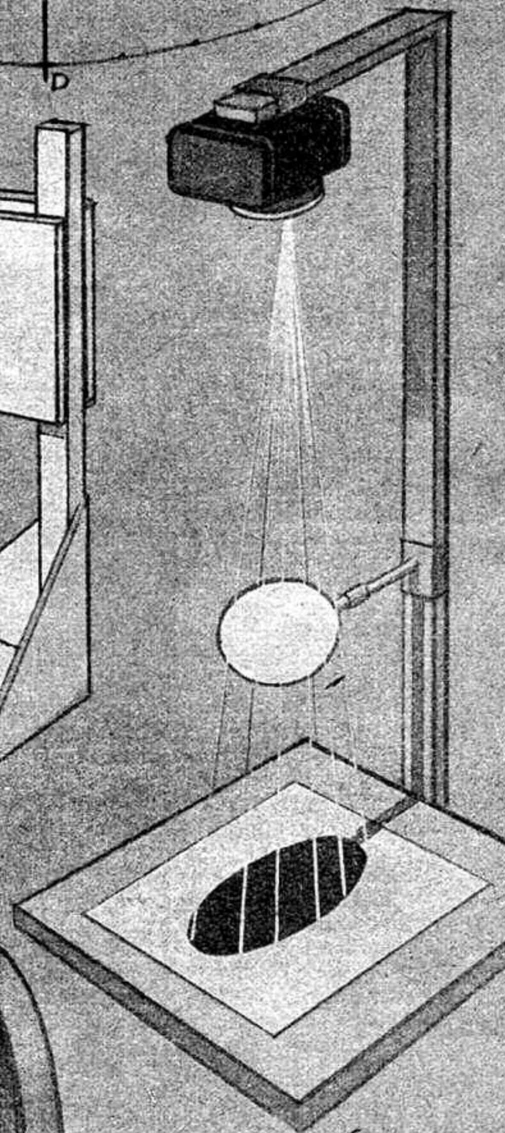
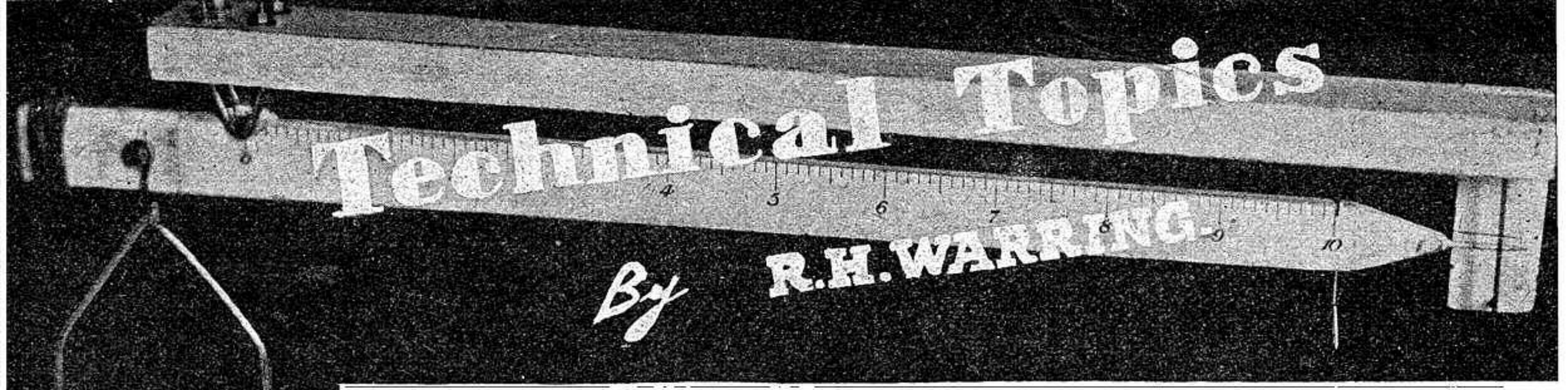


FIG.6.



Technical Topics

By R. H. Warring

THIS month we start a new feature in the form of a technical discussion corner. It is your own page—you supply the queries and suggestions and I'll pass the most interesting ones back to you each month with the answers and comments—so send in your letters by the thousand! Don't forget, THE AERO MODELLER is always willing to answer *all* queries (accompanied by a stamped addressed envelope please), so the more we have the more interesting we can make *your* page.

Now to the business in hand. We have for our heading an excellent photograph of a beam balance constructed by R. L. Meyer, of Hampstead. This is essentially the same as the one described in the July AERO-MODELLER but with several refinements. The knife-edge fulcrum is ground and stoned from "V"-section steel cleated and cemented to the beam. The beam supports are of silver steel threaded to take 6 B.A. nuts, thus allowing adjustment. Mr. Meyer also suggests that a 12 in. wooden ruler would make a good beam (he has not used one in this particular instance), and would obviate the need for making a paper scale.

Finally, he suggests a convenient way of making the weights. A fairly new sixpence weighs .1 oz. and if this is put in the pan and a piece of 20 s.w.g. wire about 4 in. long hung on the beam at the 10 division and cut down until the beam balances, it will weigh .01 oz. Remove the sixpence from the pan and make a further weight by winding soft wire around a 20 s.w.g. wire "former" until this, placed in the pan, exactly balances the beam once more. This new weight is obviously .1 oz. and the principle can be extended to make further weights of any size. This method should certainly prove worthwhile if no actual weights are available—always assuming, of course, that you have a new sixpence!

Next we have the question of venturi and pitot tubes. This has been the subject of considerable correspondence and much controversy recently and so I think that we had better start from first principles. Now a pitot tube is essentially an instrument for measuring dynamic pressures. In its simplest form it consists of a "U" tube manometer, open at both ends, with one limb bent at right angles above the liquid column. Thus when we direct a stream of air into this tube the difference in heights of the columns of liquid in each limb is a measure of the dynamic pressure of the airstream. The *dynamic pressure* is that exerted by a stream of fluid on a surface at right angles to the streamlines.

Then we have *static pressure*, which is merely the pressure that a fluid exerts on its boundaries when at rest. It is also sometimes called *wall* pressure. Dynamic pressure increases with velocity but wall pressure decreases, the two being connected by a law stating that their sum is a constant. This is expressed mathematically by Benoulli's Theorem as follows —

Total pressure (const.) = dynamic pressure + static pressure.

$$P_0 = \frac{1}{2}\rho V^2 + p.$$

This equation is true for ideal fluids but requires some modification when applied to real fluids to take into account frictional losses, etc. By the way, don't be confused by the word "fluid"; air is a fluid in the sense that it is used here.

Finally, there is the *venturi tube*. This is essentially a tube with a throat, *i.e.* it decreases in cross section to a certain point and then increases again. At the throat the velocity of an airstream flowing through it is the greatest and therefore the wall pressure is least. Thus if we connect a tube to the throat at right angles to the airstream we get a suction effect.

Now it is usual for an airspeed indicator to measure dynamic pressure as this is directly proportional to the square of the velocity. For convenience pressure measurement is carried out by a small diaphragm or "barometer" to which the pitot tube is connected directly. Thus one end of the pitot is sealed and the pressure registered is the *total* pressure. To get the *dynamic* pressure a *static* tube (which merely measures static pressure), is connected directly to the opposite side of the diaphragm, hence the diaphragm movement is a measure of the dynamic pressure. This movement is transformed by a suitable link arrangement to make a pointer move over a scale graduated in miles per hour (or other convenient units). Hence the airspeed indicator consists of a pitot-static head although the appearance of different types may vary considerably.

A venturi is also used as an airspeed indicator and at one time held great favour both in America and on the Continent. The decrease in wall pressure at the throat, being a function of the velocity, is connected to a suitable recording instrument and airspeed indicated on a dial as before. A pitot-venturi may also be used when the venturi takes the place of the static tube of the normal combination. By this means a greater pressure difference is recorded and the instrument is more sensitive. Yet another version employs the double venturi tube which is even more sensitive still.

However, the reduction in pressure in a venturi is extremely sensitive to the exact shape of the tube and great care must be taken in manufacture. Even so each instrument must still be calibrated separately. Further troubles may arise due to dents, etc., sustained by the venturi during its life and so the pitot-static head is usually preferred. The venturi tube is now mainly used as a source of power for such instruments employing small gyroscopes, *e.g.* blind flying instruments, although even this is being replaced by small ancillary motors or auxiliary drives from the main engine in many machines.

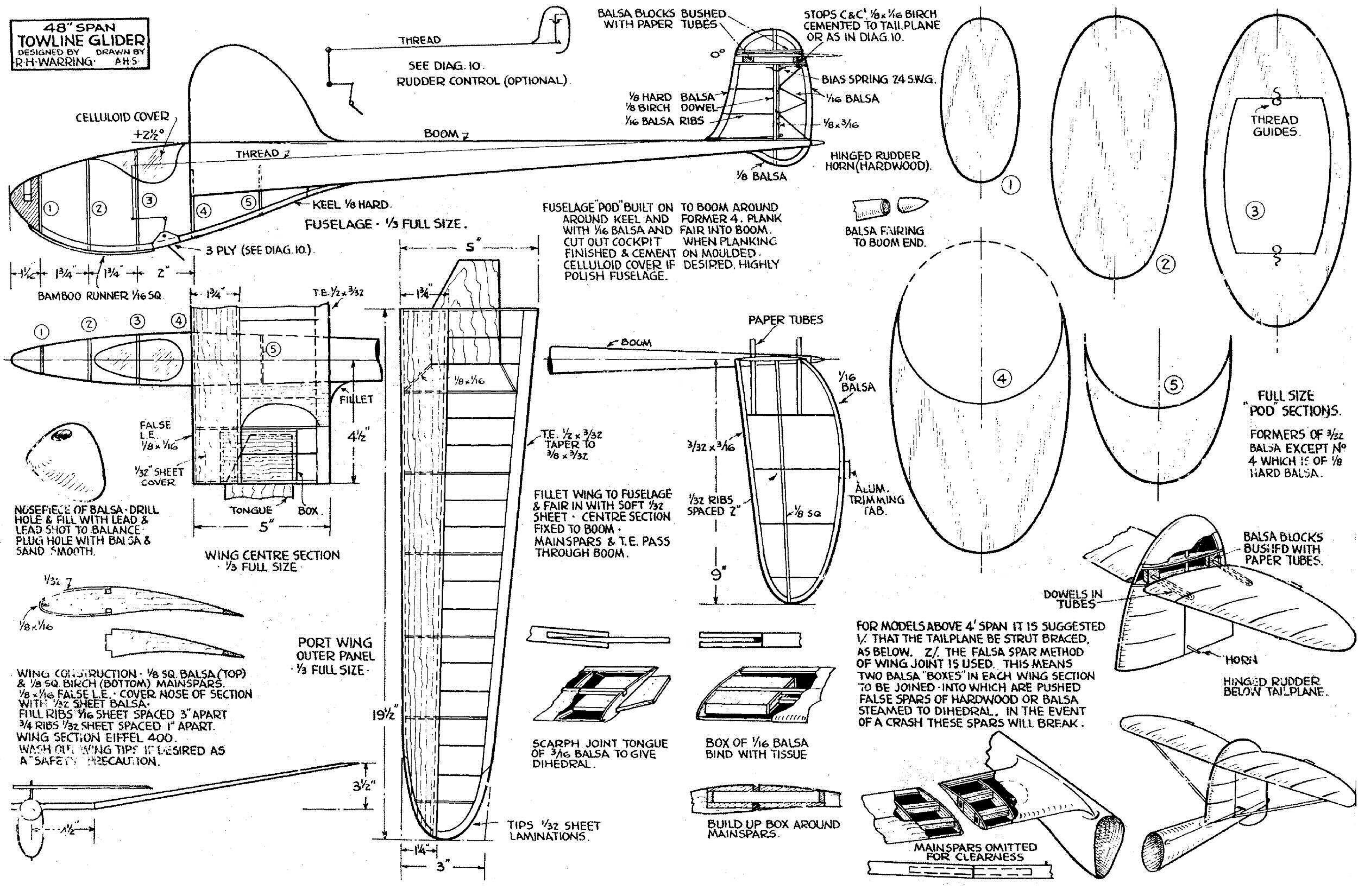
Last "topic" this month arises from Mr. B. Smith's enquiry as to the meaning of the term "*theoretical aerofoil.*" Well, strictly speaking, a theoretical aerofoil has a profile that has been derived mathematically as in the case of the Joukowski aerofoil obtained by conformal transformation of a circle. Knowing the transformal equations the majority of the aerofoil characteristics can be calculated directly and these results agree well with practice. However, there is no marked superiority in these types in spite of their theoretical derivation (the Davis section may prove the exception to this), and many profiles developed by practical methods show greater efficiency.

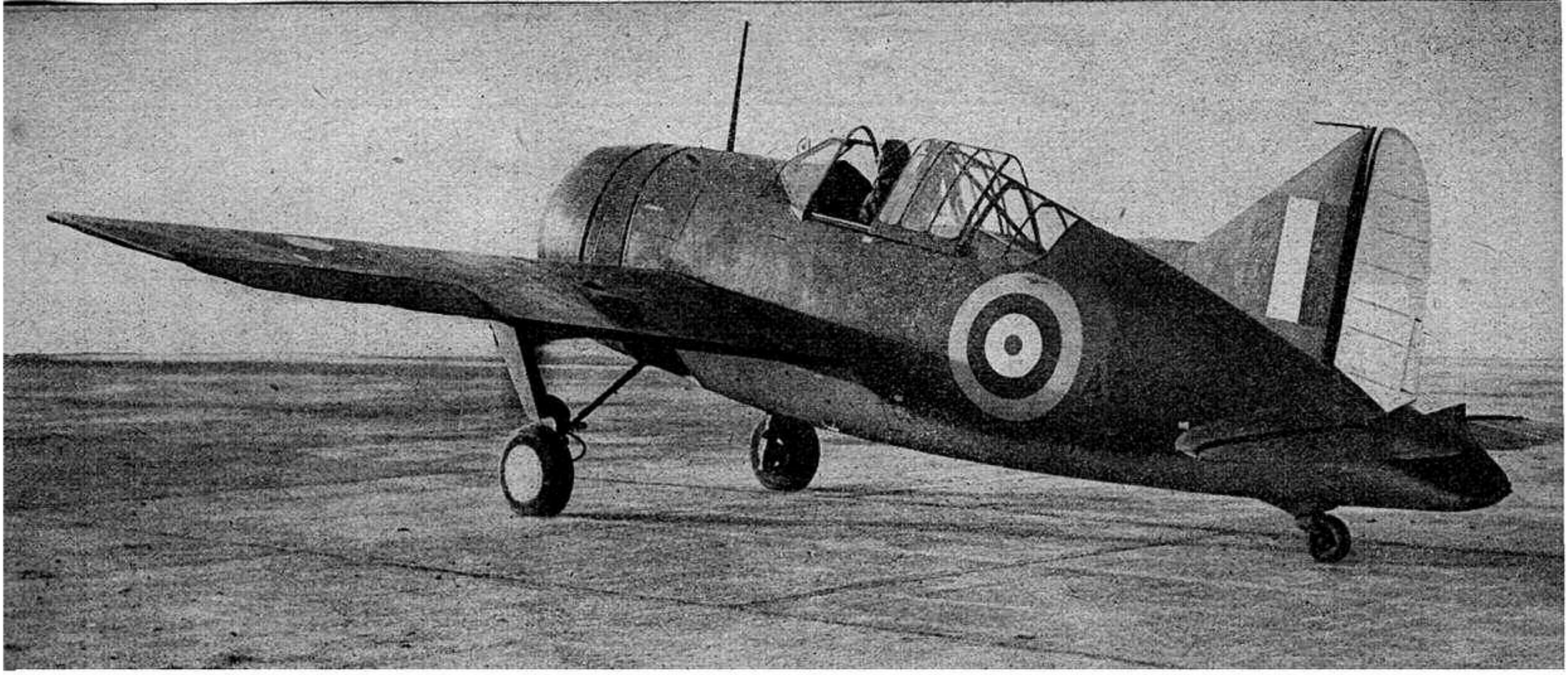
The term "theoretical aerofoil" is also applied, somewhat loosely, to sections in which the equation of the mean camber line is known. Here, however, all the characteristics cannot be analysed mathematically, but the known equations are extremely helpful for further development work.

The American N.A.C.A. sections have been developed along these lines and, being related, the effect of certain changes in camber line and profile can be predicted with a fair degree of accuracy. These calculated results can then be verified by a series of wind tunnel experiments on the sections themselves.

That's the quota for this month—now I'm waiting for more subject matter to roll in. There is sure to be a number of little points about which you are not clear, so let us have them, and by thrashing it out here we can benefit everyone. Send your letters along marked "Technical Topics," c/o The Editor; queries, criticisms, suggestions—all are welcome and we'll do our best to satisfy you.


FROG
SCALE
MODEL
AIRCRAFT
FROG
TRADE MARK
REGD.
MADE IN ENGLAND BY INTERNATIONAL MODEL AIRCRAFT LTD
For the Sole Concessionaires: LINES BROTHERS LTD. TRI-ANG WORKS. MORDEN ROAD, MERTON, LONDON, S.W.19. ENG.


48" SPAN
TOWLINE GLIDER
DESIGNED BY R·H·WARRING· DRAWN BY A·H·S·
THREAD
SEE DIAG. 10.
RUDDER CONTROL (OPTIONAL).
CELLULOID COVER
+2½°
BOOM
THREAD
KEEL 1/8 HARD.
FUSELAGE · 1/3 FULL SIZE.
3 PLY (SEE DIAG. 10.)
1⅛" 1¾" 1¾" 2"
BAMBOO RUNNER 1/16 SQ.
BALSA BLOCKS BUSHED WITH PAPER TUBES
STOPS C&C 1/8 x 1/16 BIRCH CEMENTED TO TAILPLANE OR AS IN DIAG. 10.
0°
BIAS SPRING 24 S.W.G.
1/8 HARD BALSA
1/8 BIRCH DOWEL
1/16 BALSA RIBS
1/16 BALSA
1/8 x 3/16
HINGED RUDDER HORN (HARDWOOD).
1/8 BALSA
FUSELAGE "POD" BUILT ON AROUND KEEL AND WITH 1/16 BALSA AND CUT OUT COCKPIT FINISHED & CEMENT CELLULOID COVER IF POLISH FUSELAGE.
TO BOOM AROUND FORMER 4. PLANK FAIR INTO BOOM. WHEN PLANKING ON MOULDED. DESIRED. HIGHLY
BALSA FAIRING TO BOOM END.
THREAD GUIDES.
FULL SIZE "POD" SECTIONS.
FORMERS OF 3/32 BALSA EXCEPT No 4 WHICH IS OF 1/8 HARD BALSA.
1¾"
T.E. 1/2 x 3/32
FILLET
FALSE L.E. 1/8 x 1/16
4½"
1/32" SHEET COVER
TONGUE
BOX.
5"
WING CENTRE SECTION · 1/3 FULL SIZE ·
NOSEPIECE OF BALSA · DRILL HOLE & FILL WITH LEAD & LEAD SHOT TO BALANCE · PLUG HOLE WITH BALSA & SAND SMOOTH.
1/8 x 1/16
T.E. 1/2 x 3/32 TAPER TO 3/8 x 3/32
19½"
3½"
1¼"
3"
TIPS 1/32 SHEET LAMINATIONS.
PORT WING OUTER PANEL · 1/3 FULL SIZE ·
FILLET WING TO FUSELAGE & FAIR IN WITH SOFT 1/32 SHEET · CENTRE SECTION FIXED TO BOOM · MAINSPARS & T.E. PASS THROUGH BOOM.
1/32
1/8 x 1/16
WING CONSTRUCTION · 1/8 SQ. BALSA (TOP) & 1/8 SQ. BIRCH (BOTTOM) MAINSPARS. 1/8 x 1/16 FALSE L.E. · COVER NOSE OF SECTION WITH 1/32 SHEET BALSA · FULL RIBS 1/16 SHEET SPACED 3" APART 3/4 RIBS 1/32 SHEET SPACED 1" APART. WING SECTION EIFFEL 400. WASH OUT WING TIPS IF DESIRED AS A SAFETY PRECAUTION.
4½"
PAPER TUBES
BOOM
1/16 BALSA
3/32 x 3/16
1/32 RIBS SPACED 2"
1/8 SQ
ALUM. TRIMMING TAB.
9"
SCARPH JOINT TONGUE OF 3/16 BALSA TO GIVE DIHEDRAL.
BOX OF 1/16 BALSA BIND WITH TISSUE
BUILD UP BOX AROUND MAINSPARS.
FOR MODELS ABOVE 4' SPAN IT IS SUGGESTED 1/. THAT THE TAILPLANE BE STRUT BRACED, AS BELOW. 2/. THE FALSA SPAR METHOD OF WING JOINT IS USED. THIS MEANS TWO BALSA "BOXES" IN EACH WING SECTION TO BE JOINED · INTO WHICH ARE PUSHED FALSE SPARS OF HARDWOOD OR BALSA STEAMED TO DIHEDRAL. IN THE EVENT OF A CRASH THESE SPARS WILL BREAK.
BALSA BLOCKS BUSHED WITH PAPER TUBES.
DOWELS IN TUBES
HORN
HINGED RUDDER BELOW TAILPLANE.
MAINSPARS OMITTED FOR CLEARNESS



BREWSTER "BUFFALO"

By W. R. JONES

THE "Buffalo" is one of the United States single-seat fighters ordered by the R.A.F. for Fleet Air Arm use. The maximum speed is given as 310 m.p.h. at 15,000 feet, cruising speed range is 2,500 miles. The model is designed to give a fair performance and still retain the lines of the full-size aeroplane. This required a lot of hard work and thought in the initial stages on the drawing board. I think that the result is quite pleasing and the performance, although not up to super-duration standard, is quite satisfactory. Longest flights to date have been around the 30 sec. mark with suitable weather conditions. The "Buffalo" can be relied upon to give fast steady flights up to 25 sec. Flying has to be done with great care because the model takes after the full-size plane and needs to be handled gently.

The construction of the "Buffalo" has been kept as simple as possible, in fact a beginner could tackle it with perfect confidence. The plans and perspective drawings give most of the information necessary to complete the model, so these instructions will be kept as brief as possible. I know from long experience in the "model" business how boring instructions *can* be. Individual modellers all have their "pet" ideas and "wild horses" will not make them change.

The FUSELAGE is quite simple to build. The top and bottom sections are built up and then joined at the keels. Draw a centre-line on paper first and then pin down the keels equally spaced from this line. Glue on the top former first and when dry remove from plan and start building the bottom section in the same way. When the two sections are finished, glue together at keels and glue former No. 1 in place.

Note.—This former must on no account be fitted before the two sections are fitted together.

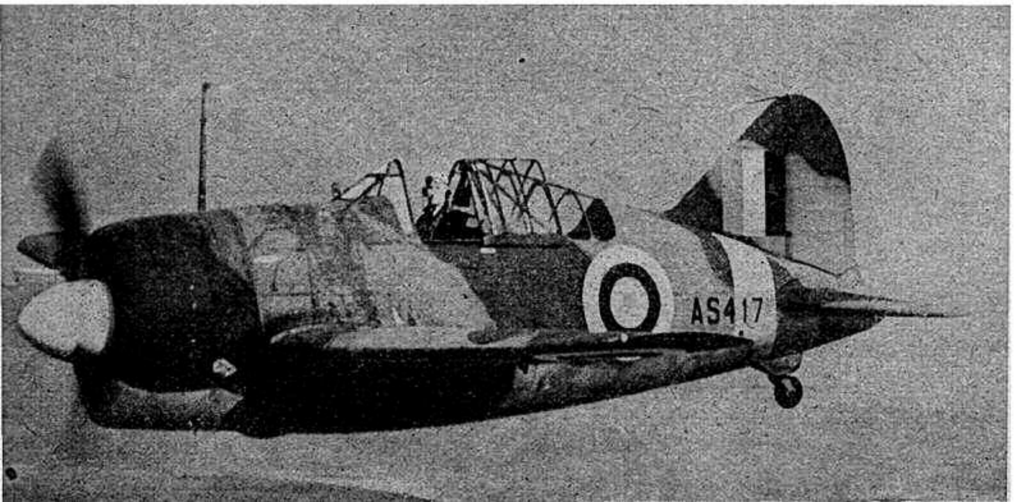
Build up FUSELAGE TUBE. Insert into SPARS after these have been fixed as shown. Build up MOTOR TUBE and COWLING as shown.

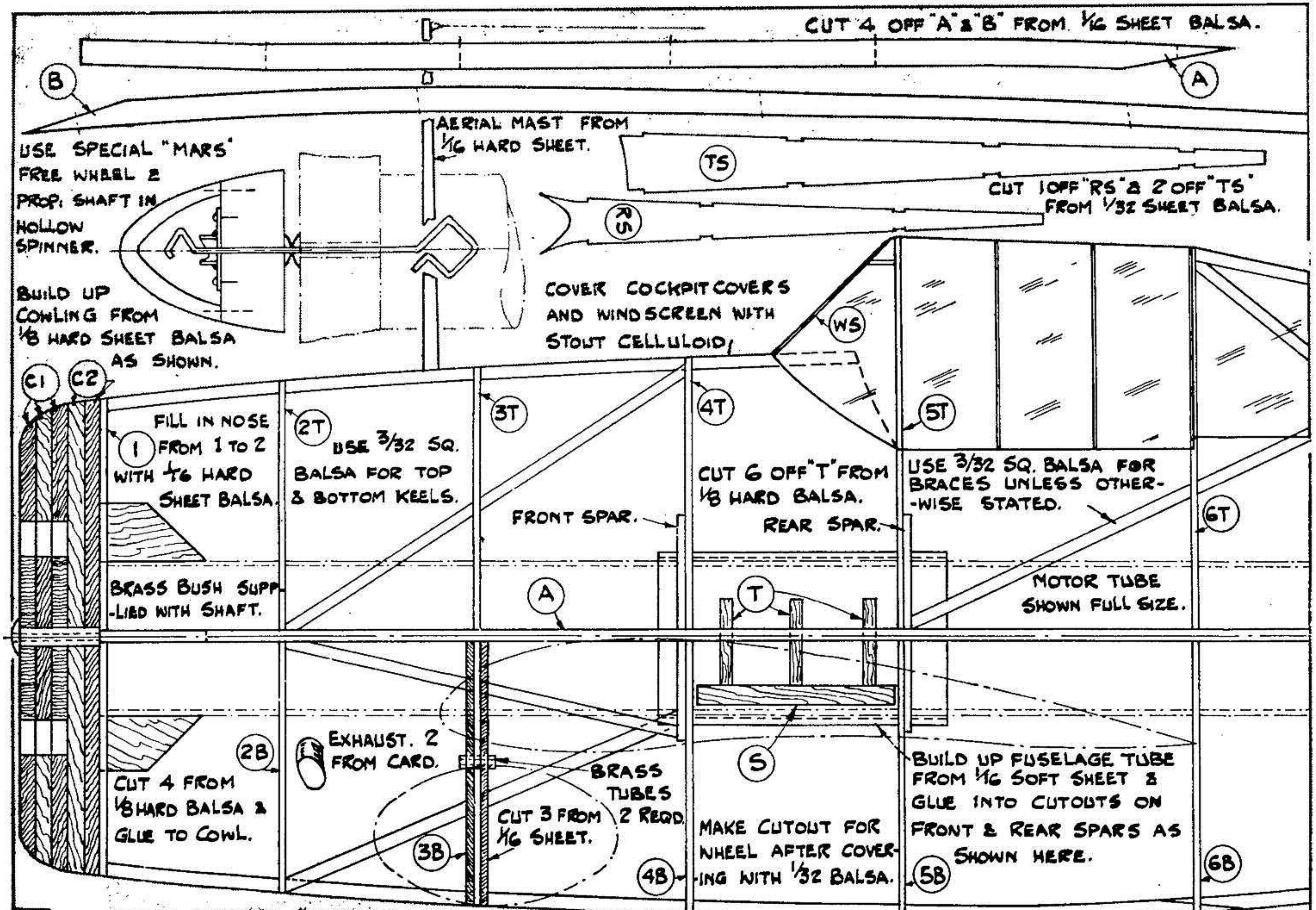
Note.—That REAR HOOK is "looped" to take piano wire pin just forward of former No. 7.

When all these details and the braces have been fixed in position, the fuselage is covered with $\frac{1}{32}$ in. sheet balsa in 1 in. wide strips. Fit celluloid as per instructions on plans. These notes apply to ALL difficult details. Build up the WINGS, RUDDER and TAILPLANE as shown on the plans, using the wood stated on drawings. Notes are given for *rudder* and *tailplane* outline construction. The wing boxes should be constructed so that parts "S" fit tightly into same. The UNDERCARRIAGE should be fitted with great care (see drawing on Plate 6 of plans). When it is required to dismantle wings from fuselage the *undercarriage stays* should be withdrawn from the tubes in former "3B." wing ribs and covering must be cut away so that piece "G" fits flush with underside of wing. If the undercarriage requires to be fully retractable, piece "E" should be hinged about the undercarriage stay tube. This allows the wheel to lie flush with the fuselage side. As stated above, the undercarriage fitting operations should be carried out so that everything fits "spot on" (to use an engineering term).

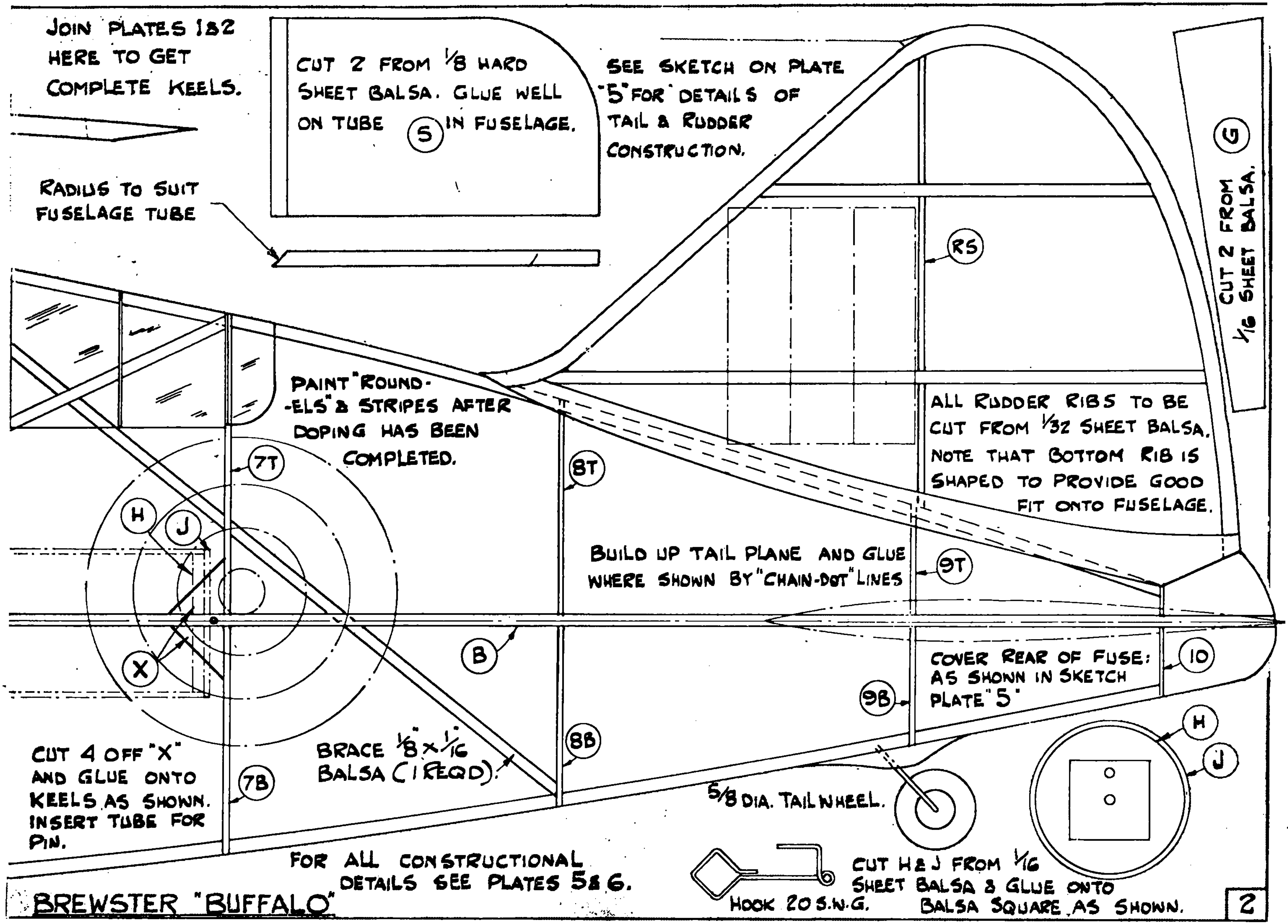
When everything has been completed to your satisfaction, the whole model should be covered with jap tissue, steam shrunk, and two coats of dope (except tail surfaces) applied. Waterproof with banana oil (two coats) and allow to dry. It is not desirable to put "shadow shading" on, if a "super" performance is the objective. If you care to sacrifice a little duration this may be done and will improve the appearance of the "Buffalo" 100 per cent. The underside is doped silver and the national markings are, of course, red, white and blue. Yellow ring surrounds the "rounders" on fuselage sides. Red and blue only on wings (top surface).

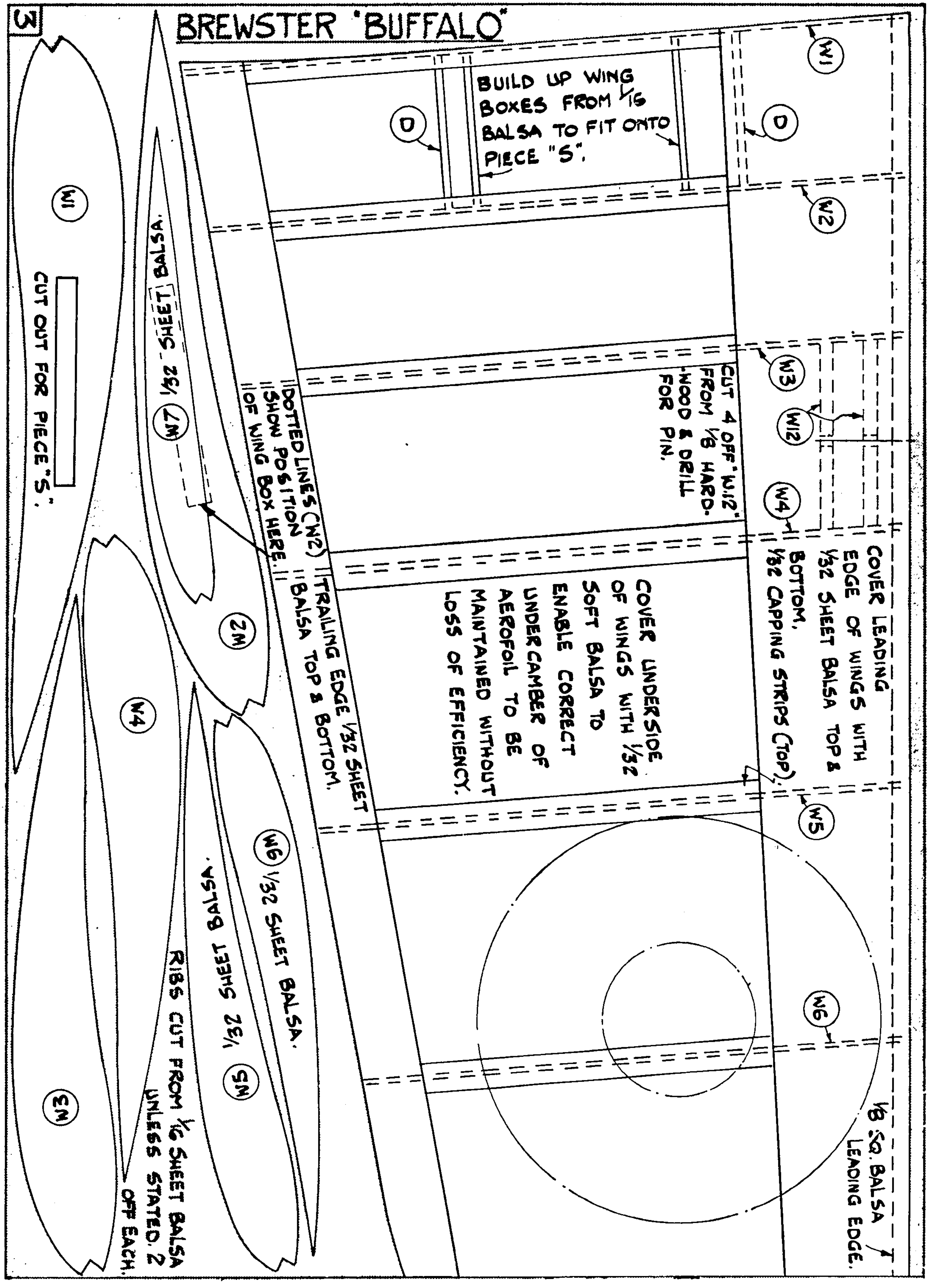
Use three or four loops of $\frac{3}{16}$ in. rubber with free wheel and attach to the PROPELLER, when this component has been carved to shape. Gliding tests should be carried out, and when satisfactory, power flights may be tried, starting with 150 turns on the rubber. The construction will stand "tons" of rough handling and should last indefinitely. The original has completed about 30 flights to date, and although it has hit several things it has not yet been repaired.

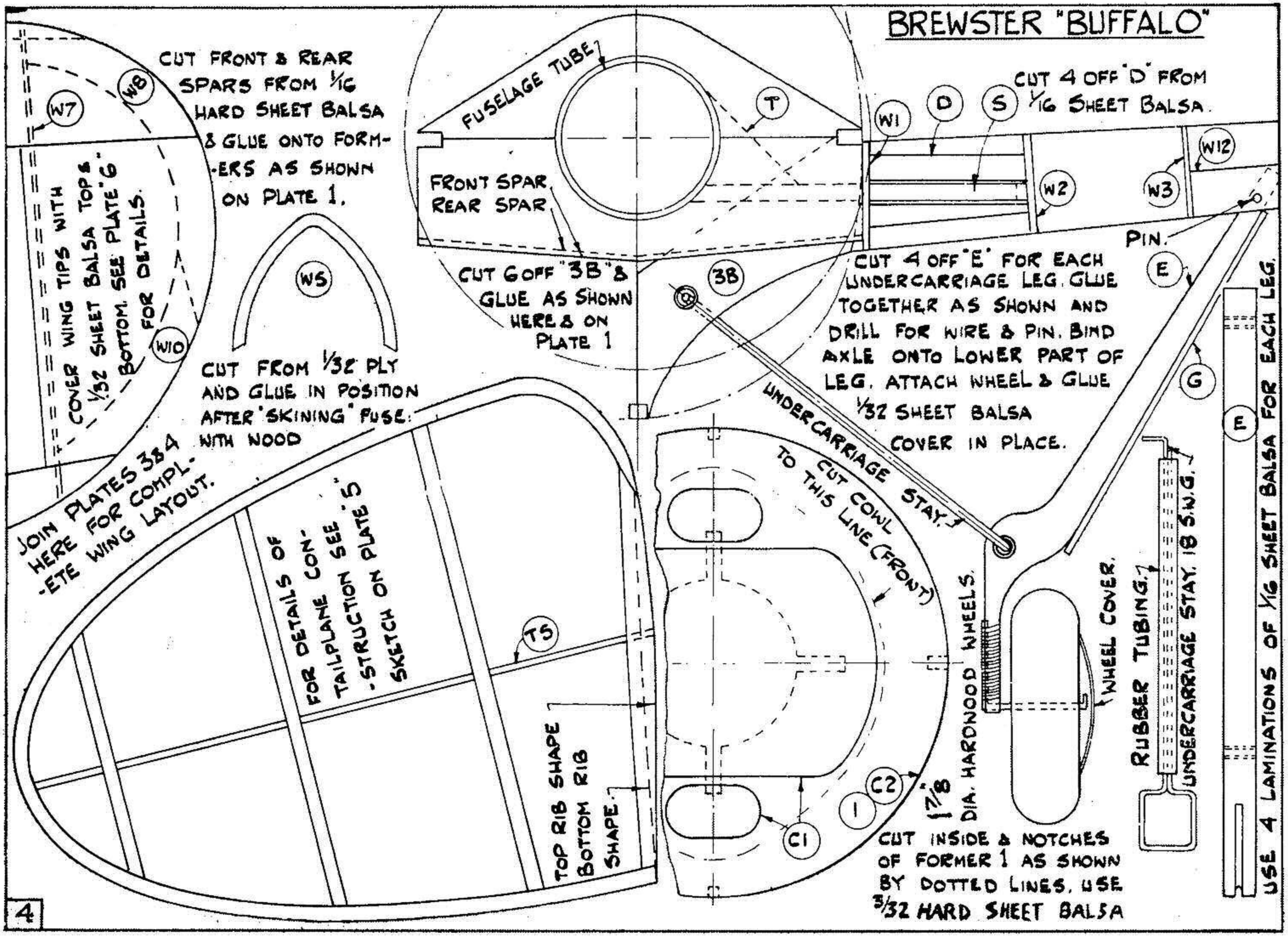


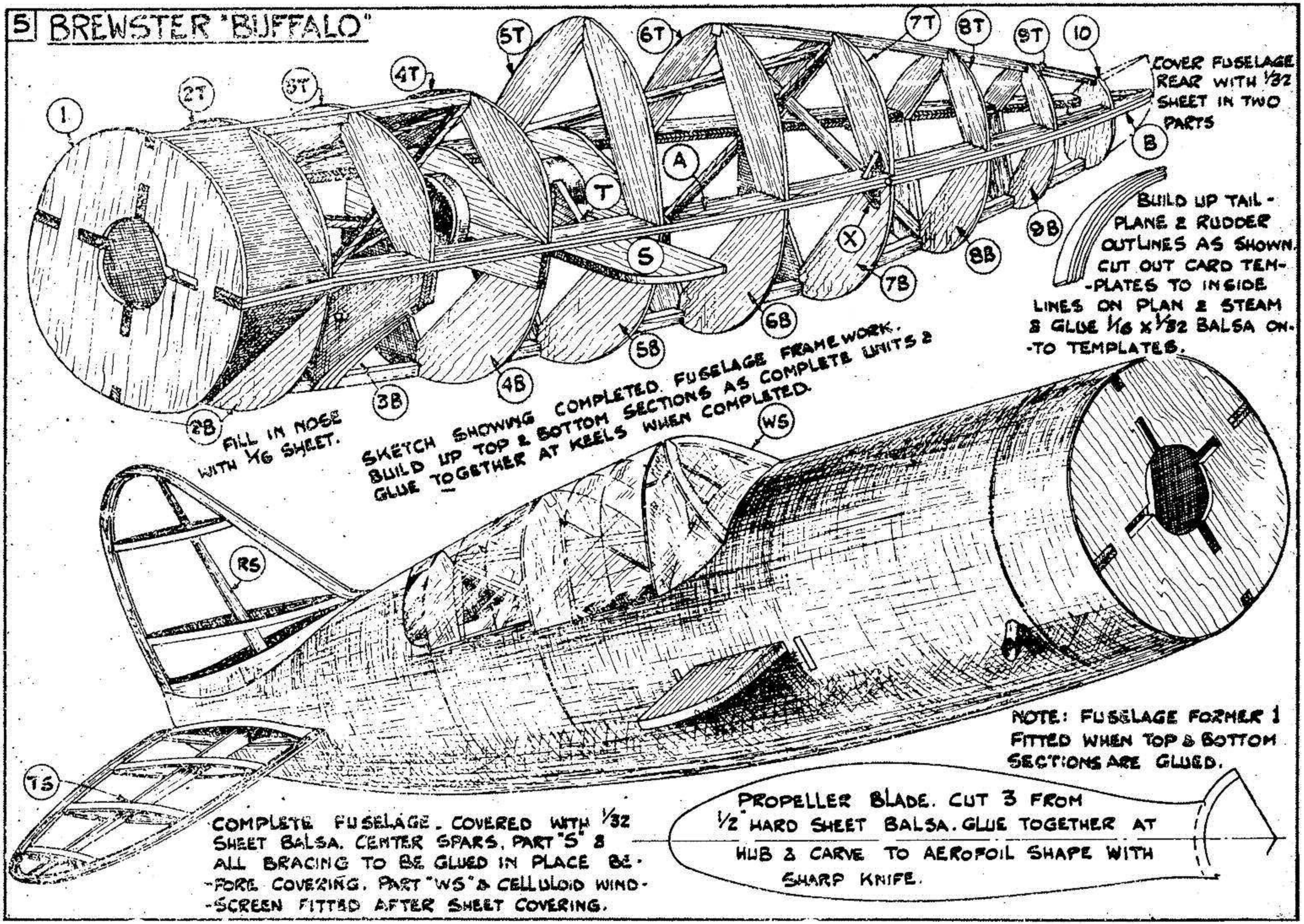


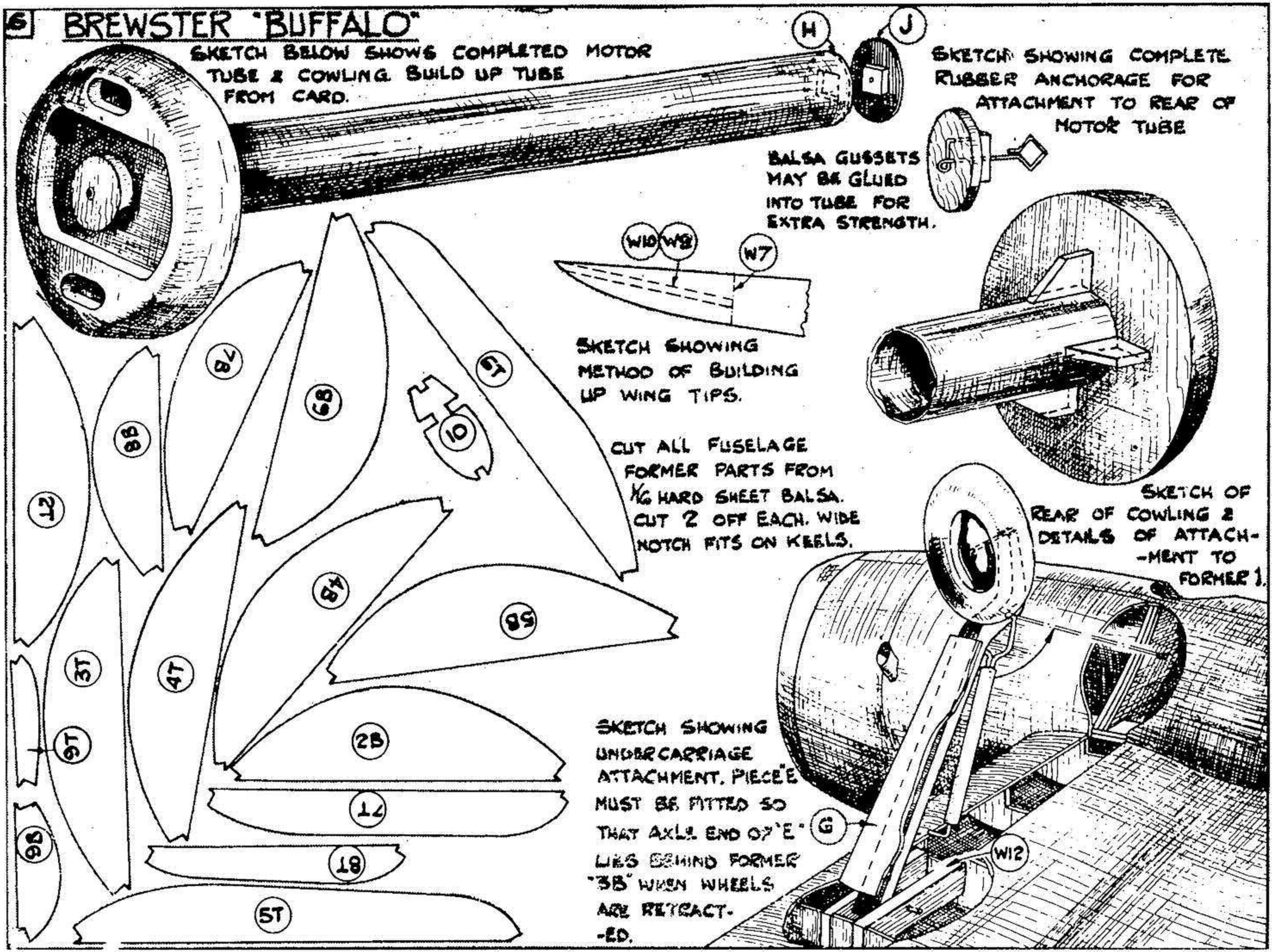
1 BREWSTER "BUFFALO"


JOIN PLATES 1&2 HERE TO GET COMPLETE KEELS.
CUT 2 FROM 1/8 HARD SHEET BALSA. GLUE WELL ON TUBE (S) IN FUSELAGE.
SEE SKETCH ON PLATE "5" FOR DETAILS OF TAIL & RUDDER CONSTRUCTION.
(G) CUT 2 FROM 1/16 SHEET BALSA.
RADIUS TO SUIT FUSELAGE TUBE
RS
PAINT "ROUNDELS" & STRIPES AFTER DOPING HAS BEEN COMPLETED.
ALL RUDDER RIBS TO BE CUT FROM 1/32 SHEET BALSA. NOTE THAT BOTTOM RIB IS SHAPED TO PROVIDE GOOD FIT ONTO FUSELAGE.
7T
8T
H
J
BUILD UP TAIL PLANE AND GLUE WHERE SHOWN BY "CHAIN-DOT" LINES
9T
B
X
10
COVER REAR OF FUSE: AS SHOWN IN SKETCH PLATE "5"
9B
H
8B
J
CUT 4 OFF "X" AND GLUE ONTO KEELS AS SHOWN. INSERT TUBE FOR PIN.
BRACE 1/8" x 1/16" BALSA (1 REQD).
7B
5/8 DIA. TAILWHEEL.
FOR ALL CONSTRUCTIONAL DETAILS SEE PLATES 5 & 6.
CUT H & J FROM 1/16 SHEET BALSA & GLUE ONTO BALSA SQUARE AS SHOWN.
HOOK 20 S.W.G.
BREWSTER "BUFFALO"
2


3
BREWSTER "BUFFALO"
BUILD UP WING BOXES FROM 1/16 BALSA TO FIT ONTO PIECE "S".
D
D
W1
W2
W3
W12
W4
W5
W6
CUT 4 OFF "W.12" FROM 1/8 HARD-WOOD & DRILL FOR PIN.
COVER LEADING EDGE OF WINGS WITH 1/32 SHEET BALSA TOP & BOTTOM, 1/32 CAPPING STRIPS (TOP).
COVER UNDERSIDE OF WINGS WITH 1/32 SOFT BALSA TO ENABLE CORRECT UNDERCAMBER OF AEROFOIL TO BE MAINTAINED WITHOUT LOSS OF EFFICIENCY.
DOTTED LINES (W2) SHOW POSITION OF WING BOX HERE.
TRAILING EDGE 1/32 SHEET BALSA TOP & BOTTOM.
1/8 SQ. BALSA LEADING EDGE.
W1
CUT OUT FOR PIECE "S".
W7 1/32 SHEET BALSA.
W2
W4
W6 1/32 SHEET BALSA.
W5 1/32 SHEET BALSA.
W3
RIBS CUT FROM 1/16 SHEET BALSA UNLESS STATED. 2 OFF EACH.


BREWSTER "BUFFALO"
4
CUT FRONT & REAR SPARS FROM 1/16 HARD SHEET BALSA & GLUE ONTO FORMERS AS SHOWN ON PLATE 1.
COVER WING TIPS WITH 1/32 SHEET BALSA TOP & BOTTOM. SEE PLATE "6" FOR DETAILS.
W7
W8
W10
W5
CUT FROM 1/32 PLY AND GLUE IN POSITION AFTER "SKINING" FUSE. WITH NOOD
JOIN PLATES 3 & 4 HERE FOR COMPLETE WING LAYOUT.
FUSELAGE TUBE
FRONT SPAR
REAR SPAR
T
CUT 6 OFF "3B" & GLUE AS SHOWN HERE & ON PLATE 1
3B
CUT 4 OFF "D" FROM 1/16 SHEET BALSA.
W1
D
S
W2
W3
W12
PIN.
E
G
CUT 4 OFF "E" FOR EACH UNDERCARRIAGE LEG. GLUE TOGETHER AS SHOWN AND DRILL FOR WIRE & PIN. BIND AXLE ONTO LOWER PART OF LEG. ATTACH WHEEL & GLUE 1/32 SHEET BALSA COVER IN PLACE.
UNDERCARRIAGE STAY.
CUT COWL TO THIS LINE (FRONT)
FOR DETAILS OF TAILPLANE CONSTRUCTION SEE SKETCH ON PLATE "5"
T5
TOP RIB SHAPE
BOTTOM RIB SHAPE.
C1
C2
1
1 7/8 DIA. HARDWOOD WHEELS.
WHEEL COVER.
RUBBER TUBING.
UNDERCARRIAGE STAY. 18 S.W.G.
CUT INSIDE & NOTCHES OF FORMER 1 AS SHOWN BY DOTTED LINES. USE 3/32 HARD SHEET BALSA
USE 4 LAMINATIONS OF 1/16 SHEET BALSA FOR EACH LEG.


5 BREWSTER "BUFFALO"
1
2T
3T
4T
5T
6T
7T
8T
9T
10
2B
3B
4B
5B
6B
7B
8B
9B
A
B
S
T
X
WS
RS
TS
COVER FUSELAGE REAR WITH 1/32 SHEET IN TWO PARTS
BUILD UP TAIL-PLANE & RUDDER OUTLINES AS SHOWN. CUT OUT CARD TEMPLATES TO INSIDE LINES ON PLAN & STEAM & GLUE 1/16 X 1/32 BALSA ON-TO TEMPLATES.
FILL IN NOSE WITH 1/16 SHEET.
SKETCH SHOWING COMPLETED FUSELAGE FRAMEWORK. BUILD UP TOP & BOTTOM SECTIONS AS COMPLETE UNITS & GLUE TOGETHER AT KEELS WHEN COMPLETED.
NOTE: FUSELAGE FORMER 1 FITTED WHEN TOP & BOTTOM SECTIONS ARE GLUED.
COMPLETE FUSELAGE COVERED WITH 1/32 SHEET BALSA. CENTER SPARS, PART "S" & ALL BRACING TO BE GLUED IN PLACE BEFORE COVERING. PART "WS" & CELLULOID WINDSCREEN FITTED AFTER SHEET COVERING.
PROPELLER BLADE. CUT 3 FROM 1/2" HARD SHEET BALSA. GLUE TOGETHER AT HUB & CARVE TO AEROFOIL SHAPE WITH SHARP KNIFE.


6
BREWSTER "BUFFALO"
SKETCH BELOW SHOWS COMPLETED MOTOR TUBE & COWLING. BUILD UP TUBE FROM CARD.
H
J
SKETCH SHOWING COMPLETE RUBBER ANCHORAGE FOR ATTACHMENT TO REAR OF MOTOR TUBE
BALSA GUSSETS MAY BE GLUED INTO TUBE FOR EXTRA STRENGTH.
W10 W8
W7
SKETCH SHOWING METHOD OF BUILDING UP WING TIPS.
CUT ALL FUSELAGE FORMER PARTS FROM 1/16 HARD SHEET BALSA. CUT 2 OFF EACH. WIDE NOTCH FITS ON KEELS.
SKETCH OF REAR OF COWLING & DETAILS OF ATTACH-MENT TO FORMER 1.
SKETCH SHOWING UNDERCARRIAGE ATTACHMENT. PIECE "E" MUST BE FITTED SO THAT AXLE END OF "E" LIES BEHIND FORMER "3B" WHEN WHEELS ARE RETRACT-ED.
G
W12
7B
6B
6T
10
8B
2T
4B
5B
3T
4T
9T
2B
7T
9B
8T
5T

GLIDERS

by R. H. WARRING

Continuing our series of glider articles we present the following, contributed by a well-known aero-modeller who believes in combining theory with practice. Double-page plans of a highly successful model are also given and the design lends itself admirably to scaling up, should you wish for a larger model. It is specially designed for winch launching and features an automatic rudder control, which allows a "thermal circle" in free flight but with complete stability during the actual launch.

Theoretical Considerations.

FIRST of all let us consider the theoretical side of the question and the aerodynamics involved as simply as possible, and then see about effecting a compromise between this and any practical limits we may find.

To ensure a slow flying speed, slow sinking speed, and consequently greater heights in gusts or thermals, a wing section with a high value of C_L maximum is desirable. Coupled with this we want a high L/D ratio maximum and a high *power factor*. The latter is given by $L^{1.5}/D$.

Diagram 2 gives an idea how the power factor varies with C_L, and thus angle of incidence. By plotting $C_L^{1.5}/C_D$ against C_L for various sections you can get a good idea of which section to employ, but bear in mind the other requirements as well. These requirements are very exacting, and it is quite impossible to attain perfection. Our wing section must also have a fairly small C.P. movement to aid longitudinal stability and allow for a smallish tail plane to be employed. It must also have a low profile drag.

Diagram 3 shows how the aspect ratio of a glider affects the sinking speed. Taking an A.R. of 15 as an average value for full size gliders we should seek to approach this in model work *without having an unduly weak or heavy wing in consequence*—this being hard to avoid in small models. Taking a standard value of 5, the value of C_L maximum increases by 3 per cent., and L/D maximum by 8 per cent. for every unit increase in aspect ratio.

This is best brought about by employing a tapered wing where the constructional inertia forces are smaller also. An elliptical plan form is most desirable, but a straight taper is almost as good. In the latter case the tip chord should be one-half the root chord and never less than 4 in. Above all, a pointed tip should be avoided; an elliptical tip is far better.

The actual rigging angles to be employed are not too easy to find. In any case the tail-plane is usually set at its angle of minimum drag, and since a streamlined section is used in the majority of cases this is 0°.

To return to our original argument. If only we could take our model and place it in a wind tunnel measuring C_L and C_D *for the whole model* over various angles of attack it would be easy to find the best angle of incidence to use. By plotting $C_D/C_L^{1.5}$ against angles of incidence we get a curve with a minimum point. The angle of incidence corresponding to that point is the one we want. The best results, theoretically, would be from a flying wing with an extremely high aspect ratio—diagram 4.

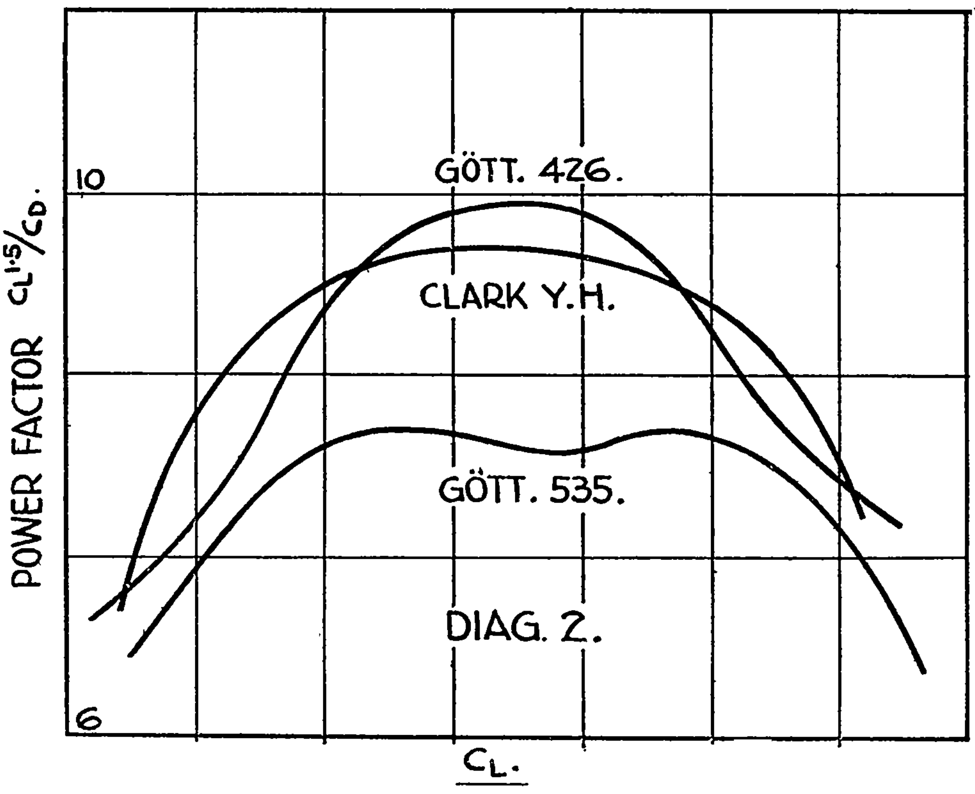
We can get round this in another way, however. The drag coeff. of fuselage, tail-plane, etc. is C_{DF}. Putting this in terms of the wing drag coefficient this equals $(A_F \times C_{DF})A$ and its numerical values varies from ·005 to ·015.

Now, by plotting polars for our wing section, diagram 5, we can associate the fuselage drag and obtain the required angle of incidence. Mark off the fuselage drag area coefficient to the left of the origin on the drag axis, and through this point draw a tangent to the polar concerned. The value of C_L corresponding to the point of tangency gives the associated angle of incidence which we are to use. Remember we are aiming at the lowest sinking speed, and this is *not* the *flattest* gliding angle, which is obtained by setting the wing at L/D maximum. The latter trim will give you the *greatest distance* from a given height, but the sinking speed will be slightly *greater* than Vs minimum when the angle of incidence is greater than that corresponding to L/D maximum.

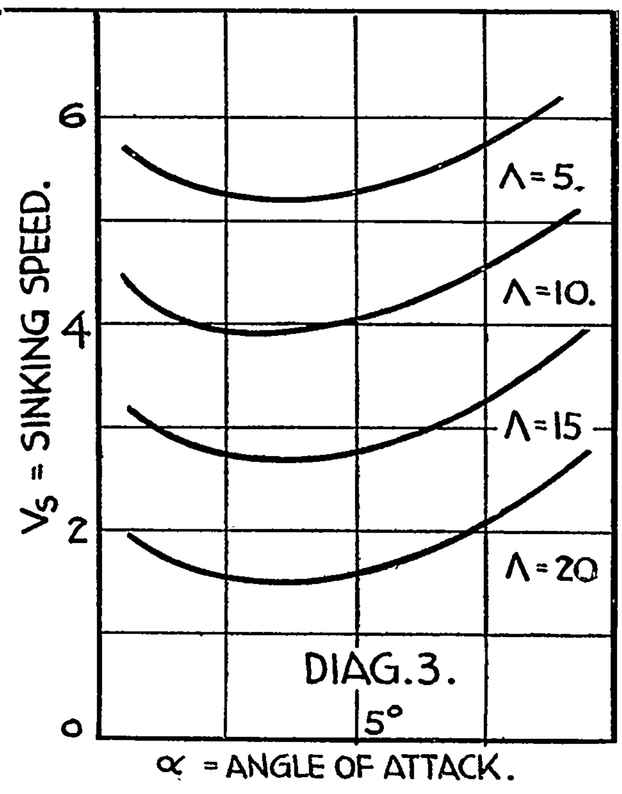
To continue, and still carefully avoiding controversial points, we hope, let us consider the L/D ratio of the whole model at the angle of incidence it is proposed to fly the model. This affords a measurement of the efficiency, and obviously we must do everything possible to reduce the D (drag) part of it.

A midway position gives the least interference drag, and should be easy to employ, as there is no motor to get in the way of wing fixings. For stability reasons a shoulder wing is usually employed, however, and nicely faired into the fuselage. In the case of fairing, note that little or no fairing is needed at the leading edge, but a fairly large one at the trailing edge.

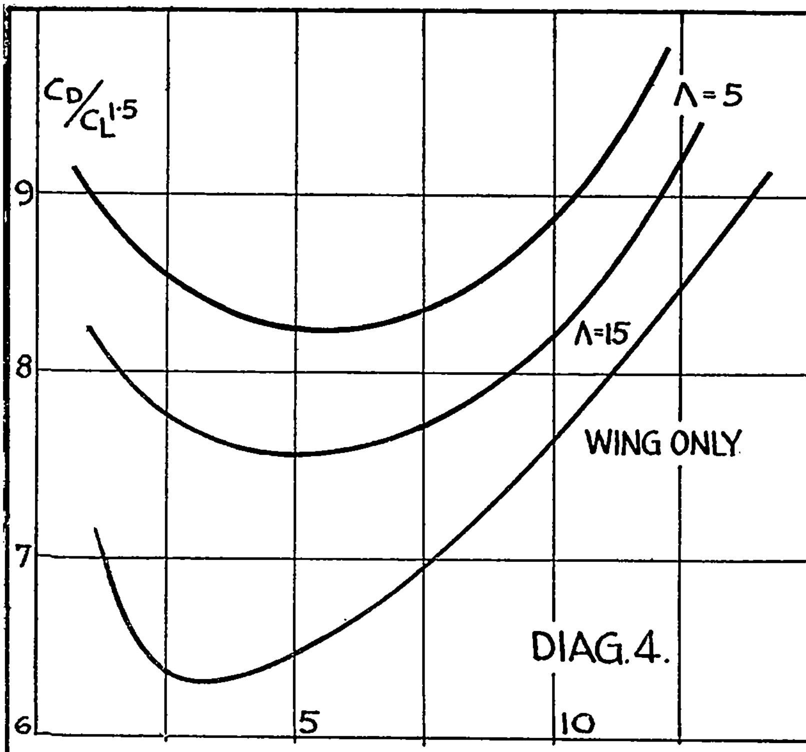
There are lots of other little details, too, that must be carefully considered. Make sure that you have no awkward



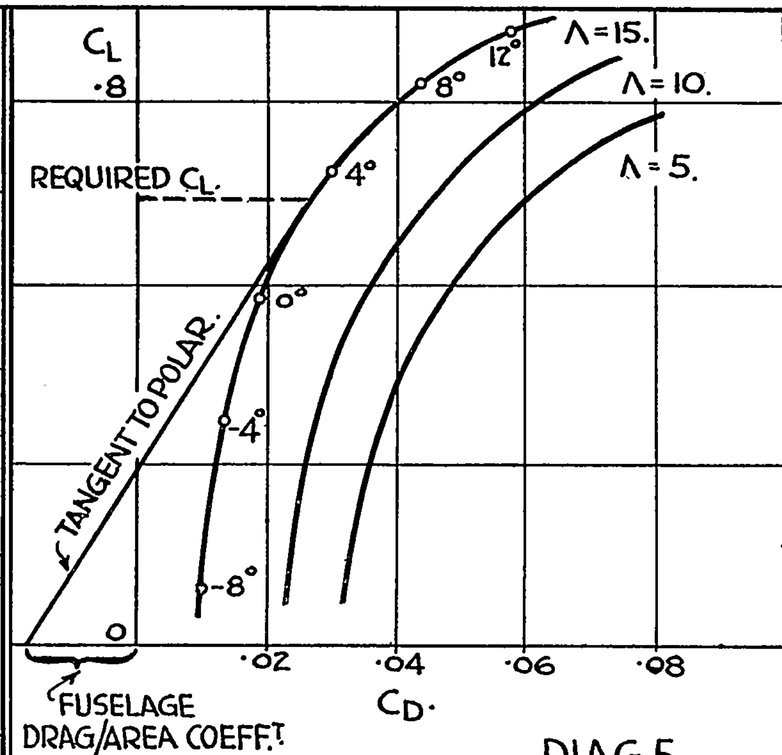
DIAG. 2.



DIAG. 3.



DIAG. 4.



DIAG. 5.

" humps " or projections to disturb the airflow and cause turbulence, thus increasing the " interference " drag.

Fuselage shape should be circular or elliptical and sheet covered, if possible. In my opinion, the " pod " and boom fuselage is possibly the best type—such a model is described later. Rectangular, triangular, or similar sections should only be employed on small models, where lightness is the main aim. An adjustable weight for altering the trim should be included inside the fuselage and be easily accessible. Adjustment by screw thread is the best method because other methods are liable to let the weight shift in a rough landing and, if this is not noticed, the next flight is likely to be disastrous!

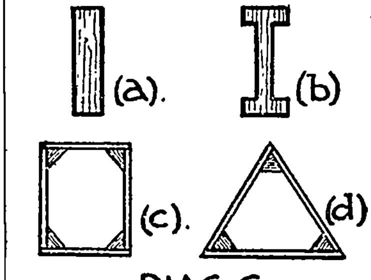
The wing is the all important part, and presents us a pretty problem. A high aspect ratio leads to constructional difficulties. When tow-launched there is a considerable strain imposed on the spars, and if they are capable of flexure a violent flutter is likely to occur. A straight spar, diagram (a), an I section spar (b), and a box spar (c), are all likely to suffer from this defect, especially in smaller wings. By employing two spars, diagram (a), the flutter liability is reduced, but the weight is increased beyond that which we wanted. A single spar of triangular section, diagram (d), is likely to yield better results, or even a tubular spar, but these are rather cumbersome. Diagram 7 (b) shows a large " box " spar, formed by a single spar in the wing attached to sheet covering extending forwards, around the leading edge to the spar again underneath. This takes the place of the leading edge, as well as forming a perfect wing section forward, and an extremely strong wing. Even in small sizes it pays.

However, the type of construction chosen depends mainly upon the size of the model. It may even pay to strut brace large wings and employ smaller spar sizes, but a cantilever wing has a greater ability to ride over gusts on account of its greater flexibility. Let us set them out as below, however.

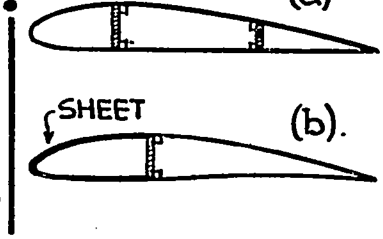
1. Small gliders up to 250 sq. in. An aspect ratio of not more than 10 should be employed. Wing construction—single spar, single spar and " box " leading edge, or large leading and trailing edge, with no intermediate spars. Tissue covered.

2. Intermediate gliders, 4 ft. to 7 ft. span. Aspect ratio approaching 15. Single spar and " box " leading edge, or triangular or tubular main spar. Silk or tissue covered.

3. Large gliders—over 7 ft. span. Aspect ratio 12 to 20. Multi-spar, single spar, and " box " leading edge, triangular or tubular, with perhaps auxiliary spars. Wing bracing, both internal and external, may be employed to advantage. Invariably silk covered.



DIAG. 6.



DIAG. 7.

Tail-plane and Fin.

Two formulæ, giving the required areas, may be used if desired. These are:

$$\text{Area tail-plane} = \frac{x_1 AC}{l_1}$$

$$\text{Area fin} = \frac{x_2 A}{l_2}$$

where A = Wing area.
C = Wing chord (average).
l_1 = Moment arm of tail-plane.
l_2 = Moment arm of fin.
x_1 = ·25 to ·8.
x_2 = ·4 to 1·1.

The coefficients, x_1 and x_2 should be found by calculations on a previously successful machine.

Actually, however, it is impossible to give a " foolproof " formula for these areas, as so many factors are likely to influence the final result.

For successful winch launches it is found best to increase the moment arm of the fin beyond that we normally used for the old catapult launch. In the latter the fuselage was usually 35 per cent.—45 per cent. of the wing span, but it has now increased to as much as 70 per cent. A model which would oscillate from side to side on a catapult meets with disaster on a winch launch. This " wig-wagging " is the result of the rudder being offset for a circle, and merely pulls the model over and eventually into the ground on the winch. If the rudder is *straight* this will not occur, but for duration purposes we must have circular flight.

Thus some sort of rudder control, which holds it straight during the launching period and allows it to turn as soon as the model is released, is required.

The disposition of the tail surfaces is important also, for since these are of frail construction we do not want the whole weight of the model to be supported by the tail-plane after the model has landed and come to rest. For this reason the tail plane should be set high on the fin, so that it clears the ground when the model leans over, or dihedralled to give the same result. A heavily dihedralled tail-plane and no fin may give fair lateral stability in normal flight, but when winch launches are attempted with such a combination everyone holds their breath !—at least they did at the attempts I saw to launch such a model.

For the correct positioning of the towing hook let us consult full-size practice. Taking an imaginary horizontal line through the C.G. the position of attachment of the line should lie between two points on the fuselage belly, these points being defined as the intersection of a line 10° with the horizontal and the bottom line of the fuselage, and a similar line 40° to the horizontal cutting bottom line of fuselage. The space between these two points can, therefore, be considered " safe " for model work.

Advanced sail-planes have a wider range, between a 10° line and an 80° line, diagram 8. A point of attachment near the C.G. has certain advantages, but it is better to " play safe." Two alternative positions are usually employed on models, one on the 30° line for rough weather, and one on the 60° line for calm weather. Control is noticeably better on the 30° position.

A High Performance Glider Design.

Fuselage.—This is built in two entirely different ways. Firstly, there is the boom of 1/32 in. plywood, lap jointed and sanded smooth again, and the " pod," which is of monocoque construction on formers. The master former for the pod is cemented to the end of the boom. The boom also carries the permanent centre section of the wing, thus allowing it to be smoothly faired into the fuselage.

To take landing knocks a bamboo runner or skid is cemented to the underside of the pod. The towing hook is used to control the rudder, as in a previous paragraph. The celluloid cockpit cover allows access to the interior for any minor repairs.

L.O.A. of fuselage = 30 in.

$\therefore$ Min. fuselage cross section (max.) $= L^2/200 = 4{\cdot}5$ sq. in.

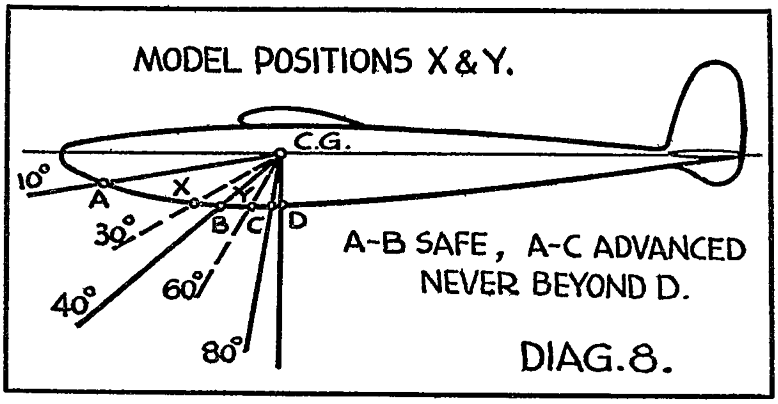
Max. cross sectional area of pod $= \pi$ a.b. $= \pi \times 2$ in. $\times$ 1 in. $= 6{\cdot}28$ sq. in.

Commence with the boom noting that when completed it is tapered towards the tail end. Take a sheet of plywood and cut a 22⅝ in. length, tapering from 6½ in. to 1½ in. Now form this into what is actually a conic section, lapping the edges ½ in. along its entire length, cementing well and holding in position until dry. It may be difficult at first, but warming the wood, or even steaming, will often assist in this operation ; above all, the lap joint must be well made. When dry sand the lap smooth, and cover the whole with silk or tissue and give two coats of dope.

The master former is cut from ⅛ in. hard balsa, and cemented to the larger end of the tube or boom. The keel, of ⅛ in. sheet also, is then added, and the other formers cemented in position. The keel must be built up before fitting, as it acts as the pivot for the launching hook, and " anchor " for the rudder control.

In this stage now it is possible to fit the rudder control. The " lever " or towing hook is of 18 s.w.g. wire bent as shown. This is pivoted between two pieces of 1/16 in. 3-ply which are cemented on either side of the balsa keel, and the hook is free to move backwards and forwards. In the forward position, governed by the stop A, it is approximately 45° to fuselage datum line. A short length of rubber fixed to former 2, or hook on keel, and the top of the lever tensions the latter forwards, i.e. hook part backwards, the whole lever movement being about ½ in. Stop B limits this movement. A length of stout, inextensible thread is fastened to the top of the lever through the eyelets on former 3, and then back through the boom, through the small tube at the tail end, and on to the rudder boom on the left side of the rudder. In the normal free flying position the hook is " backwards." i.e. the *lever* is forwards, and there is little tension in the thread. The rudder is turned to the right under the action of a small spring bearing on it. An adjustable stop governs the amount of turn.

When the model is hooked on to the tow-line the hook is pulled forwards, the lever backwards, and the tension of the thread is transmitted to the rudder boom, and the rudder is pulled straight (against the stop C). When released from the line the lever moved forwards, the tension is released, and the rudder turns under the spring again.



The rudder should be built on to the tail-boom *before* the fuselage is completed, and the control system *completely* installed. Adjustment of stop B will give the required movement for adequate rudder control. *It is quite possible to install this control completely inside the boom,* but it was fitted externally on this model for simplicity and further experiment, if necessary.

Fin construction is more robust than usual, for it also carries the tail-plane to ensure that the latter does not foul the ground with the model " at rest," and also increases the anti-spinning power of the rudder.

When the control system is working to satisfaction, the fuselage may be completed by installing the movable trim weight and planking over the formers with 1/16-in. sheet balsa. When sanded smooth the pod is covered with silk and well doped. Both pod and boom are either highly polished or lacquered to reduce skin friction. The cockpit may be cut out and a cover, moulded from celluloid, cemented over it. This allows access for internal repairs, e.g. control system, as the cover can be cut off and re-cemented at will, although it is to be hoped this will not be very often.

The wing centre section, of 9 in. span, is built permanently on to the boom. Its construction is quite straightforward, as shown on the plan. The main spar goes right through the boom, as also does the trailing edge. The leading edge is sheet covered top and bottom, and this covering terminates at the boom. The whole is nicely faired into the boom, with additional soft 1/32 in. sheet balsa, and the whole centre section tissue covered. The boxes into which the outboard wings plug are of ⅛ in. sheet balsa wrapped with tissue.

The two wing panels are both 19½ in. span, and are given a dihedral of 10°. They are of compound ellipse plan form, the leading edge being rather straighter than that of a true ellipse, to facilitate sheet covering. A tongue plugs into the box in the centre section, and should be a tight fit, but loose enough to knock out in a crash landing. Care is needed in fitting this to ensure that the wing panel fits *absolutely* flush with the centre section.

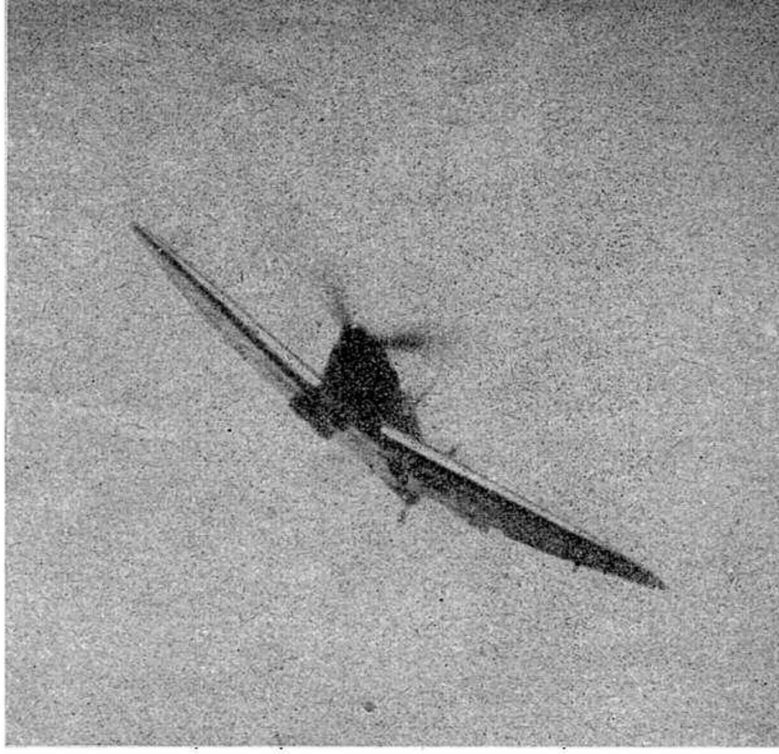
Mixed construction is employed, the two main spars being ⅛ in. square, lower one of birch, upper of balsa. A false leading edge of light, ⅛ in. by 1/16 in. balsa, is fitted so that the sheet covering may be done in two separate pieces. Trailing edge is from 3/32 in. sheet balsa, and tips from laminated 1/32 in. sheet balsa. Each panel is covered with tissue.

The tail-plane is built in two halves, one to plug into the other *with the fin between ;* thus the root ribs are curved to conform to the fin section. It is set at 0° incidence, and any further longitudinal control that is necessary is obtained from the two trimming tabs of thin aluminium, such as obtained from a " Bond-fix " container.

The actual colour scheme adopted is usually decided by the individual builder, but my own model was finished all red with black lining. Wing, tail-plane and fin, red tissue and gloss doped. Fuselage given two coats of red cellulose lacquer and polished. Black lining was used around the cockpit cover and outlining wings, tail-plane and fin.

(*Reduced scale plans are on pages* 162–3.)

A realistic model of a Spitfire Model "in flight."



MONTHLY MEMORANDA

No. 2 of Series

By O. G. THETFORD

EQUIPMENT OF THE UNITED STATES AIR FORCES

Since the entry of the U.S.A. into the War there has been an insistent demand for information on the types of aircraft flown by the U.S. Army Air Forces and the Naval, Marine and Coast Guard air arms, especially by solid modellers anxious to exploit this new field of interest and these notes have been prepared to meet this need.

Before American equipment can be adequately discussed it is necessary to understand the designation systems used by both the Army and the Navy, although in the latter service the policy of naming aircraft has recently come to the fore and "mark" numbers are appended in the British fashion where modified versions of the same basic type appear. In the Army the basic "missions" (purpose) for which the aircraft are employed are indicated by initial letters as follows:—P—Single-seat Pursuit; PB—Two-seat Pursuit; FM—Multi-seat Fighter; A—Attack Bombardment; B—Bombardment; O—Observation; F—Photographic; C—Cargo; P.T. Primary Trainer; AT—Advanced Trainer; BT—Basic Trainer; BC—Basic Combat and G—Autogiro. The prefix "X" indicates experimental or prototype and "Y" a type built in limited quantities for Service Trials. When the type goes into full production the prefix is deleted.

The standard pursuit aeroplanes in the Army at present are of the Curtis P–40B, P–40C, P–40D and P–40E type (British Tomahawk) and are in service in hundreds Many squadrons have the Republic P–43 (similar to Lancer supplied to China recently) of which deliveries are now completed.

New types now going into service in quantity include the Lockheed P–38E (British Lightning), Bell P–39B (British Airacobra I) and Curtiss P–40F (British Goshawk). Now in large-scale production but not actually in service are the North American P–51 (British Mustang) and the Republic P–47B (British Thunderbolt). The long-range fighter is still undeveloped in the U.S.A. but a squadron of Bell YFM–1 (née Airacuda) tricycle fighters are used tentatively. Attack squadrons are equipped almost exclusively with Douglas A–20A and A–20C aeroplanes (British Boston III) whereas bombardment units fly a wide selection of types ranging from the medium-size North American B–25 and Martin B–26B (British Marauder) tricycles to the four-motor Boeing B–17C, B–17E and B–17F (British Fortress) and Consolidated B–24D (British Liberator). Obsolescent Douglas B–18As (Canadian Digby) and B–23s are still in use but fast going out of service. The standard observation type is the North American O–47B, but recently several light observation types have been delivered, among which are the Stinson O–49 (British Vigilant), Ryan O–51 and Bellanca O–50. Taylorcraft, Aeronca and Piper lightplanes are on Service Trials and have the designations YO–57, YO–58 and YO–59 respectively. A new observation type in the heavier category, the Curtiss O–52 high-wing monoplane, is in production and will replace the O–47B. Converted transports are used for cargo duties, although more recently this classification has also embraced the troop-carrying machines. The Beech Model 18 is the C–45, the Electra the XC–35 or C–40B and the new Curtiss Wright transport (British St. Louis) the C–55.

Primary training includes both biplanes and monoplanes, and now being delivered in hundreds are Fairchild PT–19s, (Type M–62 as used by Royal Norwegian Air Force in Canada), Ryan PT–20As and PT–21s of recent origin and the Stearman PT–13 biplane of older design. Basic training is carried out on Vultee BT–13 and North American BT–9B (British Harvard I) and BT–14 (British Yale) aeroplanes and basic combat by the closely-related Vultee BC–3 and North American BC–1A (British Harvard II). Standard twin-motor advanced trainers are the Beech AT–7 and Cessna AT–8 (Canadian Crane) types.

New Types in the Middle East.

First deliveries of the new Curtiss Kittihawk fighter which has been developed from the well-tried Tomahawk have gone to the Middle East where they have proved to be an instant success. Bomber squadrons have also been reinforced with American types. An Australian squadron is flying Boston III medium day bombers and units of the South African Air Force the single-motor Northrop Nomad, previously the U.S. Army A–17A. All these machines have two shades of brown camouflage on the upper surfaces and are azure blue underneath. Fighters usually have the underside of the port wing painted black and a red, white and blue cockade outlined in yellow is carried beneath the tip. (This practice is now discontinued in this country, of course.)

Replacements for Bomber Command.

Squadron markings familiar on Whitleys and Wellingtons are now to be seen on many of the new generation of four-motor giants. The unit which became famous in the film "Target for To-night," Wellington squadron "OJ," now flies Stirlings and these code letters are painted ahead of the cockade on the fuselage in greyish-blue. Manchesters carrying the code squadron letters "OF" have replaced Whitleys in one squadron and another ex-Whitley squadron now operate Halifax IIs carrying the markings "ZA" ahead of the cockade on the fuselage.

Minor Markings Change.

The position of the serial number on certain types of heavy night bombers, notably the Wellington. On the rear fuselage it is now painted just above the tailplane root with the first letter level with the leading edge of the tailplane on the port side and vice-versa. Formerly the number was painted ahead of the tailplane.

Presentation Spitfires.

In addition to their normal day fighter markings the following Spitfire Vs presented by the Motor Car Industry of Great Britain carry their names on the fuselage sides in small block capitals just beneath the cockpit:—Austin Motor Co—"Lord Austin"; Brown Bros.—"The Dominant Factor"; Champion Sparking Plugs Co.—"Champion"; Dunlop Rubber Co.—"Pericles"; E. R. Foden, Ltd.—"Sun Works"; Ford Motor Co.—"Go To It"; Joseph Lucas, Ltd.—"King of the Air"; Motor Agents' Association—"M.A.A."; Motor Factors Association — "The Gay Gordon"; Lord Nuffield — "Nuffield"; Nuffield Organisation—"W.R.M."; Jack Olding & Co. Ltd.—"The Cat"; Rootes Group—"William E. Rootes," "Rootes Shadow" and "Rootes Snipe"; Scottish Motor Trade Association—"Caledonia"; S. Smith & Sons—"Smithfire"; Society of Motor Manufacturers and Traders—"S.M.M.T."; Vauxhall and Bedford Dealers—"Wyvem I"; Vauxhall Motors Ltd.—"Wyvem II" and Various Members of the Motor Industry—"H. G. Starley."

FIGHTING AIRCRAFT OF THE PRESENT WAR — XV

By H. J. COOPER

THE REID AND SIGRIST TRAINER— 'THE SNARGASHER'

THE Reid and Sigrist Trainer, of which there is only one in existence, has unofficially been named "The Snargasher." No one knows why; but probably, like the old "Blimp" of the last War, and the ungainly form of bowling called a "yorker," there is no other name it could be called.

This three-seat two-motor trainer was produced in the Spring of 1939 and designed for the purpose of introducing the technique of twin-motor flying to single-motor pilots.

It is a very small monoplane with a span of just over thirty-six feet and differs completely from any other design produced in this country, though it bears a strong resemblance to the Polish P.Z.L. Wilk fighter and Wyzel trainer two-motor monoplanes, the latter of which is even smaller than the Reid. Both of these types have retractable wheels, whereas the English 'plane has a fixed undercarriage.

The Snargasher is of all-wood construction, the low-mid wing being built on a single swept-back main spar, with a secondary spar to which are attached the flaps and ailerons. The covering is of plywood panels. The ailerons and flaps are metal-framed and covered with fabric. They are set on a slightly lower level than the wing itself.

The fuselage is of a simple wooden construction of oval section, and is covered entirely with plywood. The cantilever tail unit is of wooden construction and covered with fabric.

The crew of three is housed in a spacious covered cabin. Accommodation is for a pilot, a radio-operator and a rear gunner/observer. The cover of the front portion slides back under the fixed centre cover after dropping slightly from its original position. The rear cover tips forward in the manner of that of the Miles Master. A movable machine-gun mounting is provided in the rear cockpit.

When the Reid first appeared it had faired legs and wore spats, but it is now in use at one of the Flying Schools of the R.A.F. Training Command and the fairings have been removed because it has been found that they often become clogged when operating from soft aerodromes. That is why so many Magisters, Mentors and Proctors and others are often seen flying spatless. Their removal is inclined to spoil the appearance of the 'plane (the Vega-Gull looks much more "private-ownerish" when wearing spats), but in military aircraft good looks are of no consideration.

When the Snargasher was first built it was coloured yellow, with a black deck around the cockpits and nose and black chevrons on the motor nacelles and spats. The registration letters G-AEOD were painted in black in the usual positions on fuselage and wings. The manner in which they were painted raises an interesting question regarding the possible deletion of the letter D (or O) from the system of civilian aircraft registration. Usually, as in this case, the two letters are painted with hardly any discrimination between them. Another case was the old Desoutter registered OY-DOD, which was flown in the 1934 Mildenhall-Melbourne race. To read the letters correctly when the 'plane was in the air was just impossible. The letter Q was deleted from the list some thirteen or fourteen years ago to avoid confusion with O, but it would have been more prudent if the D or O had been deleted.

The Snargasher at present is camouflaged on the sides and upper surfaces with green and brown, and is the usual instructional chrome underneath. The 'plane is still on the Civil Aircraft Register and carries its original number in small black letters on each side of the fuselage and below the wings. Roundels are painted on the wings (red and blue above; red, white and blue underneath), and on the fuselage surrounded by yellow. The fins bear red, white and blue vertical stripes on each side.

SPECIFICATION:

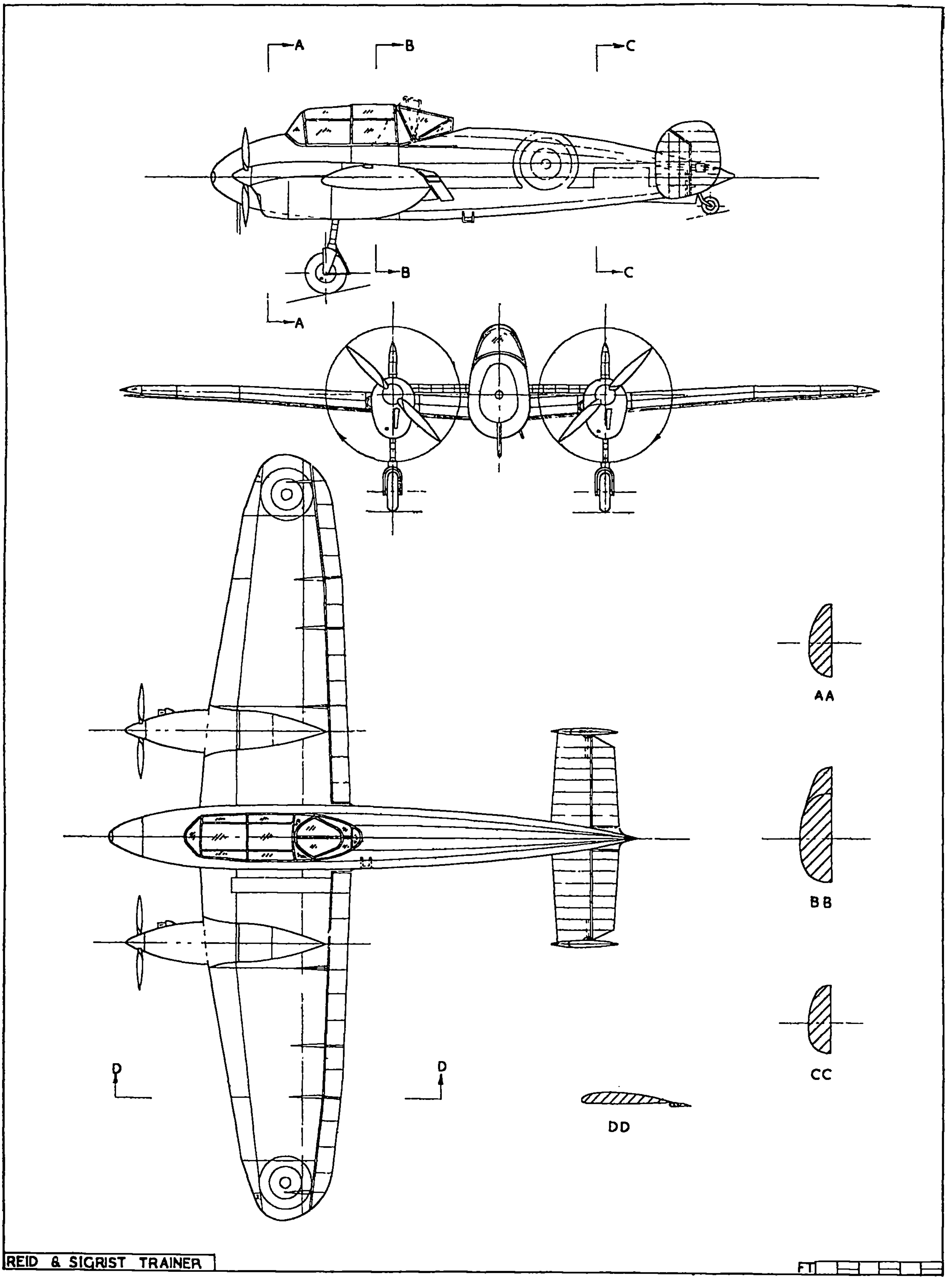
Two D.H. Gipsy-Six II six-cylinder inverted in-line air-cooled motors, normal output (each) 185 h.p.; maximum output, 205 h.p.

Performance.
- Maximum speed: 205 m.p.h. at sea level.
- Cruising speed: 190 m.p.h. at 6,000 ft. on ¾ power.
- Stalling speed: 65 m.p.h. (fully loaded).
- Initial climb: 1,330 ft./min.
- Service ceiling: 18,000 ft.
- Absolute ceiling: 20,000 ft.
- Duration: 4¼ hrs. at 190 m.p.h.
- Range: 800 miles at 190 m.p.h.

Weights.
- Tare: 3,000 lb.
- Loaded: 4,900 lb.

Dimensions.
- Span: 36 ft. 4 in.
- Length: 25 ft. 4 in.
- Height: 8 ft. 11 in.
- Wing area: 212 sq. ft.

Next month: The Bücker Jungmeister and the Gotha Go 149 Trainers.



REID & SIGRIST TRAINER

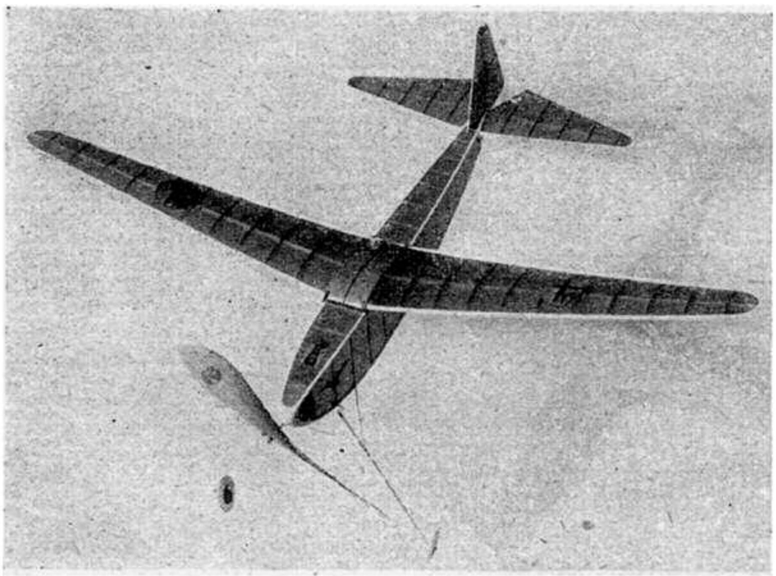
CHAMPION of CHAMPIONS

1st Place Winner

EDINBURGH MODEL EXHIBITION

(OPEN TO ALL GREAT BRITAIN)

VERON "EAGLE"



VERON KITS ARE SUPER KITS

KITS CONTAIN: FULL-SIZE PLAN. CUT-OUT RIB AND FORMER. SPARS READY CUT WITH DIHEDRAL SCIENTIFICALLY INCORPORATED. RUBBER MOTOR. DOPES. CEMENTS. FINISHED PROPELLER SHAFT. SHAPED WHEELS. GENUINE JAP TISSUE. PROPELLER BLOCK, ETC.

A SUPER KIT AT LOW COST 18/4 Plus 7d. post.

Read what Mr. W. A. Hogg (Builder of Winning Model) writes :—

(Manager, Frank Royle, 54, South Clerk Street, Edinburgh and Hon. Sec. Edinburgh Model Flying Club.)

Dear Sirs, *7th January, 1942.*

As a modeller for many years, I feel it a duty to write you this letter of appreciation for marketing such a fine kit as the Veron "Eagle."

I have built dozens of kits, but I have still to find one that can come up to the standard of the "Eagle" for simplicity of building, performance, etc.

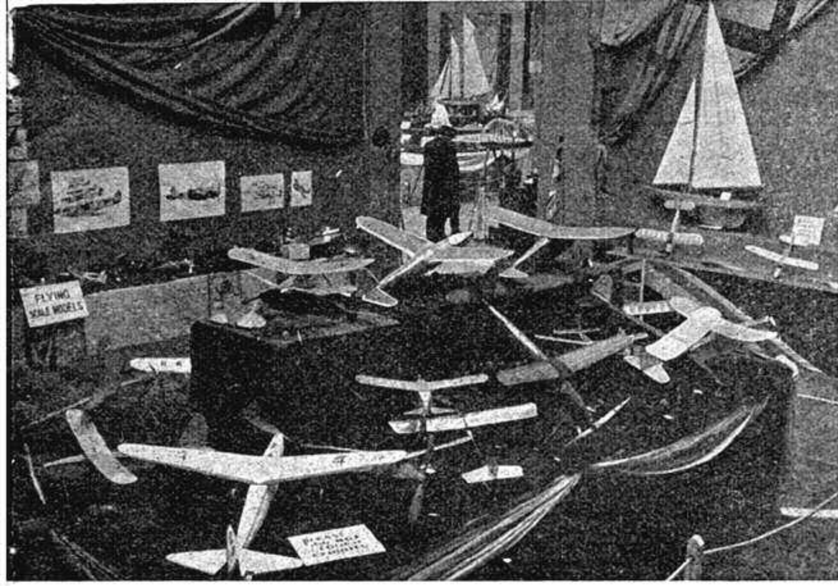
I have won numerous contests with my "Eagle" and I enclose herewith a catalogue showing its latest success in one of the largest exhibitions ever held in this country. Winner of the 1st prize cup in the duration class of over 100 competitors,

Wishing your firm all success.

Yours faithfully,
W. A. Hogg, Hon. Sec. E.M.F.C.

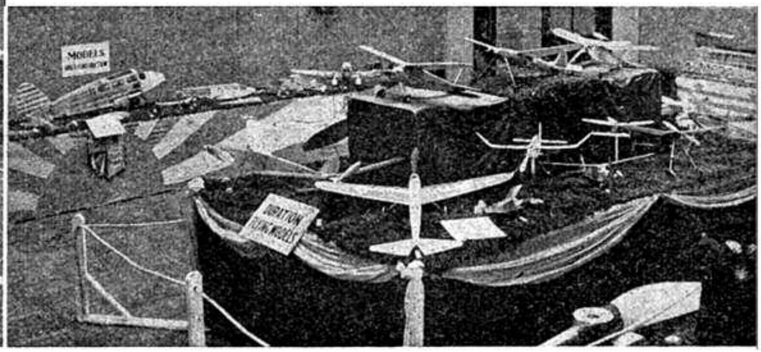
MODEL AIRCRAFT STORES (BOURNEMOUTH) LTD

127b HANKINSON ROAD, BOURNEMOUTH **Phone: WINTON 1922**



CLUB NEWS

By "CLUBMAN"



ALAS, my identity has evidently been discovered ! ! At least, one would think so on reading the definition of 'Clubman' in the latest issue of "Wings" (Halstead M.A.C.). To quote, the Clubman is "*a mystical tyrant on whose mercy all British Clubs have to throw themselves monthly. His name has now replaced that of the bogeyman with aero-modellists' children.*" Such indeed is fame ! But it is a good job they haven't also discovered my address as well as my characteristics, otherwise this magazine would be looking for a new contributor to muck about with your monthly reports. (Not a bad idea at that. Ed.)

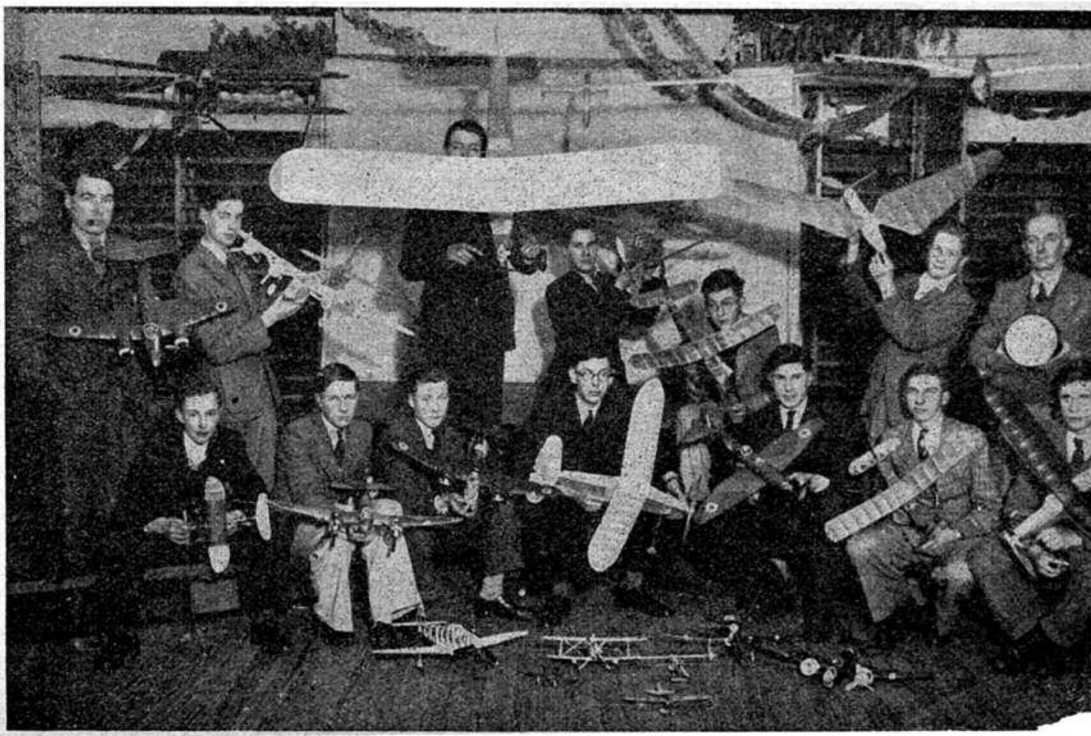
Owing to extreme pressure of space, which is becoming increasingly stringent, we are unable to print in full the report of the annual general meeting of the S.M.A.E. All Clubs, however, will receive this in its entirety in the next issue of the Journal, and now that more copies of this publication are available through the Society, it is possible that individual copies may be obtained through the new Journal Editor, Mr. A. A. Courtney, 9, Buckler Road, Summertown, Oxford. (Please note, however, that any communications to him (or any other S.M.A.E. official) should in all cases be accompanied by return postage. In these days of increased postal rates it becomes necessary for miscellaneous enquiries to carry this proviso, otherwise incidental expenses would soar beyond reasonable limits.)

A brief résumé of the meeting will not be out of place here, however, and the first item that strikes my eye is, somewhat naturally, the Balance Sheet. In spite of decreased income, mainly brought about through reductions in affiliation fees, competition fees, etc., the balance carried forward is increased by practically 10 per cent. This is very encouraging, particularly in view of the fact that affiliation fees are down by practically 25 per cent. and competition entry fees down by approximately one-third. These figures will give you a clear indication of the wise economy exercised by the Council during the past year, by which (in spite of reduced income) they have been able to bring forward an enhanced credit balance. Much good work has been put in during the past season, and there is no doubt that the Society is now steadily improving its position, and entrenching against the expected post-war expansion that we all hope will come about.

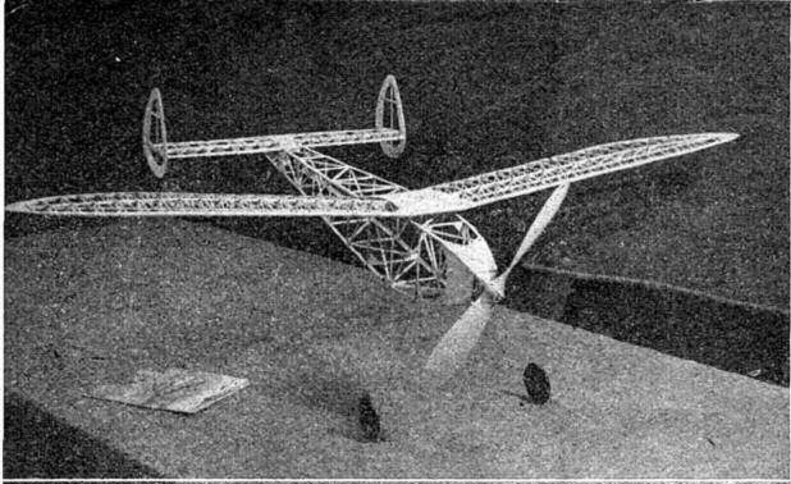
The question of instituting a Wakefield Fund was raised, and it must have been a surprise to most of the delegates present to find that a fund is already in existence in the Society's funds. If any Club, therefore, is anxious to subscribe towards the first post-war competition, this can be done without hesitation on their part, and all contributions should be forwarded to the Treasurer when convenient.

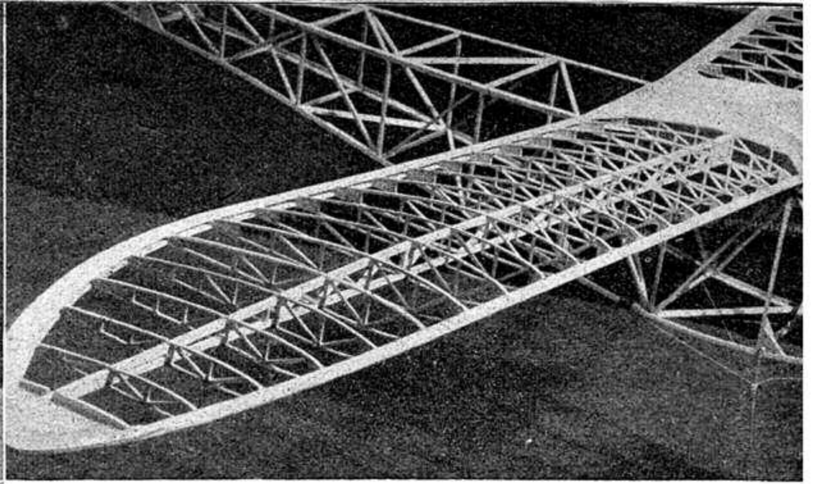
I am pleased to note that Mr. J. C. (Silver Voice) Smith has been elected a Fellow of the Society, and I am sure all my readers will join me in congratulating him on this appointment. This appreciation is long overdue, but, of course, the Constitution only allows the creation of a certain number of Fellows in any one year.

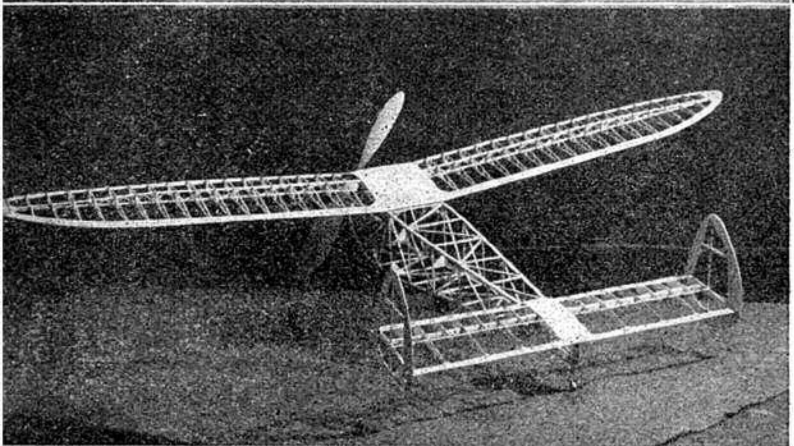
In his report as Competition Secretary, Mr. Smith brought out a number of pertinent points which I think are well worth enlarging on in this preamble. I do not know the exact number of affiliated clubs at the present date, but I gauge this to be well over the 100 mark, and it is certainly a surprise to find that the eight de-centralised contests arranged attracted entries from only 36 of these clubs. This is disappointing, particularly in view of the everlasting agitation for something to be done, and I do feel that a very large majority of clubs do not take anywhere near the advantage of their affiliation that they could do. Of the 36 clubs who did make some sort of an effort, only two groups entered for the whole of the competition programme, whilst 8 competed in one event only. The above figures become even more astounding when you realise that, out of the many thousands of aeromodellers in this country, only 499 entries were received for these 8 events, many individuals of course, entering over and over again. *The average entry per club was only* 3.84 *members*, which I venture to say is a very poor state of affairs.

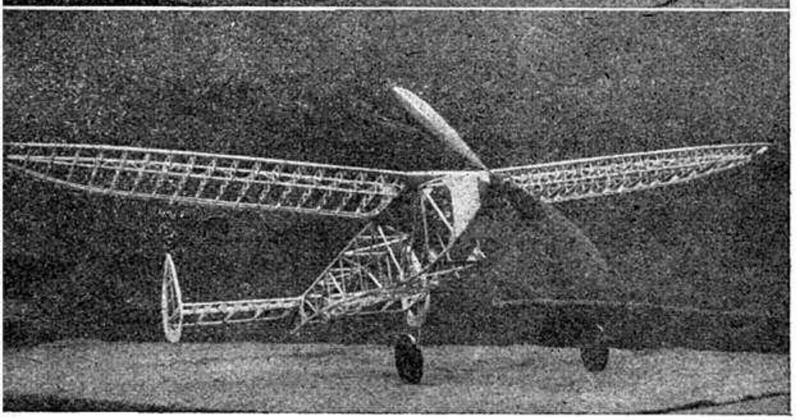


The Youth Centre wing of the Eastbourne M.F.C. at their Xmas festivities. Note the outsize in "stop-watches" held by Mr. Towner. (No, he does not carry this slung round his neck in the usual manner ! !)









This interesting model of 64 in. span was designed and built by Messrs. Hogan and Nelson of the Bristol & West M.A.C. An enormous amount of detail work is incorporated, particularly in the wings, and makes this model an outstanding example of fine workmanship. The only weak point appears to be the wire undercarriage, which hardly seems appropriate on a model of this size. (Note copy of the Aeromodeller for comparison.)

It does not say much for the state of aeromodelling in this country when the main support for the National events comes from one or two groups, and in the long run from a mere handful of enthusiasts. However, it is no use grousing over what happened last year, but I do feel it is up to all affiliated clubs to pull their socks up this season and get down to competition work with a more intensive spirit.

The Ashton Club are to be congratulated on carrying off the "Plugge Cup," also the "Thurston Individual Cup." N. Hayes was the winner of this honour, followed by A. T. Taylor, of Bushy Park, and S. Carter of Bristol. Special congratulations are also due to Miss D. Humphrey, of Bushy Park, and Mr. A. A. Courtney, of Oxford, who have now dealt with the "Women's Cup" and the "Gamage Cup" respectively for two years in succession.

The competition dates for 1942 are as follows :—

1.	The Gamage Cup	May 17th.
2.	The National Cup	June 7th.
3.	The Weston Cup	June 21st.
4.	The Pilcher Cup	July 5th.
5.	The Flight Cup	July 12th.
6.	The Gutteridge Trophy ..	July 26th.
7.	The M.E. Cup	August 9th.
8.	The K. & M.A.A. Cup ..	August 23rd.
9.	The Women's Challenge Cup	September 6th.
10.	The Thurston Glider Cup ..	September 20th.

Full details and rules will be published shortly but I understand that more attention is being given to gliding this year, and there is a strong possibility that an additional 'free for all' contest on Gamage Cup lines will be introduced.

There is a slight amendment to be made regarding the stolen model reported in last month's issue. I am now informed that the model was a "Lockheed P.38 (Lightning)" and not a "Hudson" as reported. Sorry for the mistake, but the onus is on the reportee and not the reporter ! !

And so on to this month's reports . . .

Our heading photographs this month were taken at the Exhibition staged by the EDINBURGH M.F.C. in conjunction with the local A.F.S. A most ambitious programme was fixed up, and the resulting support exceeded all expectations. Altogether over 600 models were on show, and over 45,000 people visited the hall during the one week. Best of all, the Benevolent Fund was boosted by over £1,000 as a result of these efforts, and my full marks go to this club for a very fine effort.

On the advice of the club officials, the competitions were thrown open to all comers, and I am sure this gesture will both enhance the reputation and enlarge the membership. Secretary W. A. Hogg had a proper field day, winning 5 places in the six classes staged. The Edinburgh members took the lion's share of prizes, and naturally feel mighty pleased with their efforts.

Another event staged in aid of the Comforts Fund was a one day affair, R.T.P. flying being held at different times during the day. H. Wardel carried off the honours on this occasion, and £40 was raised for the deserving charity.

A quotation from the report will give some of you food for thought :

"*My reasons for giving this Report is to show how the Clubs are helping various charities and at the same time attempting to educate the general public on the uses of Model Aerodynamics.*

I might state that in consequence of our numerous efforts the local Town Council granted us a very large handicraft room in one of the school buildings for the use of the Club. This was granted to us over a year ago at the very moderate rent of 1/9 weekly.

I am rather surprised when I read my 'Aeromodeller' and find so many clubs having difficulty in finding accommodation. I feel sure that if club secretaries approached their local council authorities about their difficulty in finding club rooms owing to lack of finance, etc., they would be surprised at the sympathetic treatment they would receive. So all clubs without rooms take note !"

Speaking of Exhibitions, did you hear of the dear old lady, evidently somewhat shortsighted, who was seen to stretch out and lift up a card from the far side of a table. Adjusting her glasses, she peered closely—and then put it back in a hurry. The card bore the words in large black letters "DO NOT TOUCH." Nuff said !

The LUTON and D.M.A.S. had a 'reet good do' at their annual presentation of trophies, the lucky (or clever) winners being:

A. Poulton	President's Trophy and Holton Cup.
E. C. W. Clark	Lutonian Cup.
R. Hinks	Brown Trophy.
R. Brown	Faunch Glider Cup.
A. J. Groom	Clarke Scale Trophy.
R. Jones	Novices Trophy.

Ft./O. Waller has been elected Vice-President—the fee being two gallons of beer per month . . . perhaps!

The PERTH (A.T.C.) M.A.C. is not limited to A.T.C. only, and others are welcomed to the membership. V. Stoddart won the December duration contest with a time of 40 secs., he also holding the scale R.T.P. club record with a time of 20 secs., the model being an Me 109E. W. Gordon holds the duration R.T.P. figure at 38 secs.

R.T.P. times are somewhat higher in the PENN M.A.C., I. Hough holding the record with 1:11, only slightly below the outdoor figure held by D. Newman (1:33). 'Gas' models are popular with this club, one member having just successfully test glided his 6 footer 'Wasp' powered. As long as it stops at test *gliding* we won't say owt!!

Fred Gray of the BLACKHEATH M.F.C. is hard at work on a 52-inch span scale 'Whitley,' in which he proposes to use three rubber motors, with gears, and flexible drive to the props. G. Temple (our glider contributor?) is busy experimenting with a tail-less type glider of 70-inch. span. The tapered wing is well swept back, and has a root chord of 10 inches, with tip chord 7 inches. The glide is slow and quite flat, but slight instability requires curing.

Mr. G. E. Taylor, of 28 Ward St., Penistone, nr. Sheffield, has a well-built 'Flying Minutes' for sale. He has built over 50 models to date, so the workmanship should be good. Those interested please write him direct.

Though the BEVERLEY and D.M.A.C. are rather slack at the moment, first news is given of their annual Rally, which will be held on June 7th this year.

The A.G.M. of the HARROW M.A.C. indicated a promising year, and cups were presented to the following: N. Gregory (Major Cup), W. J. Prescott (Pinora Cup). F. Howarth won the 'Best Flight of the Year' Cup with a flight of over 6 minutes.

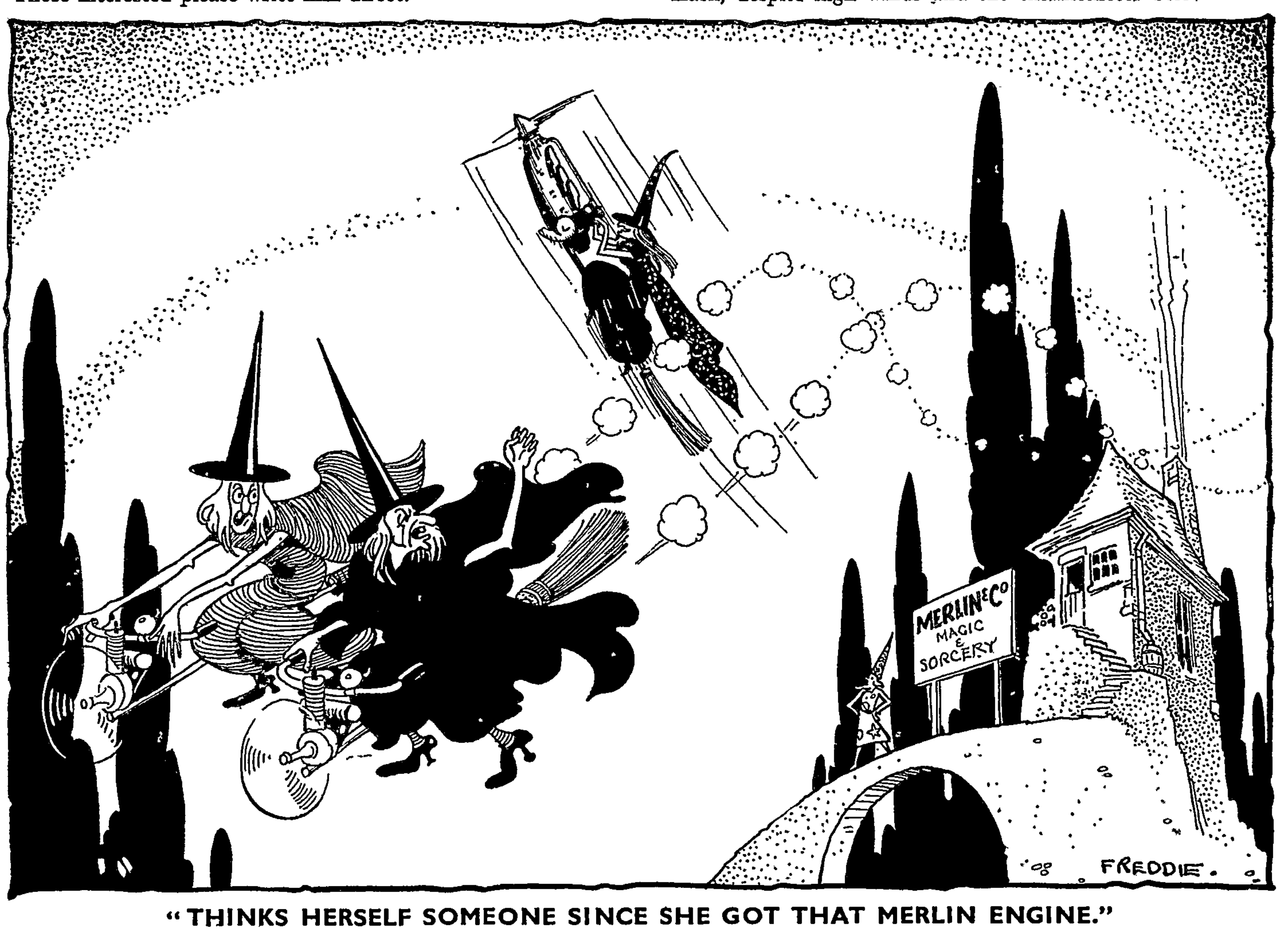
The HALSTEAD (Essex) and D.M.A.C. have secured a room for indoor flying, and members are now sitting up and taking notice of this class of aeromodelling. Owing to the pending shortage of rubber, many weird and wonderful ideas are being tried out, and one ingenious blighter had equipped his model with the innards of a golf ball!

Another 'sales item' comes from D. Coldwell, of 27, Redcar Rd., Sheffield 10, who has some 1937, '38 and '39 Aeromodellers for disposal, also copies of Model Airplane News dating back to 1935. All are in good condition, and may be secured for the cost of postage.

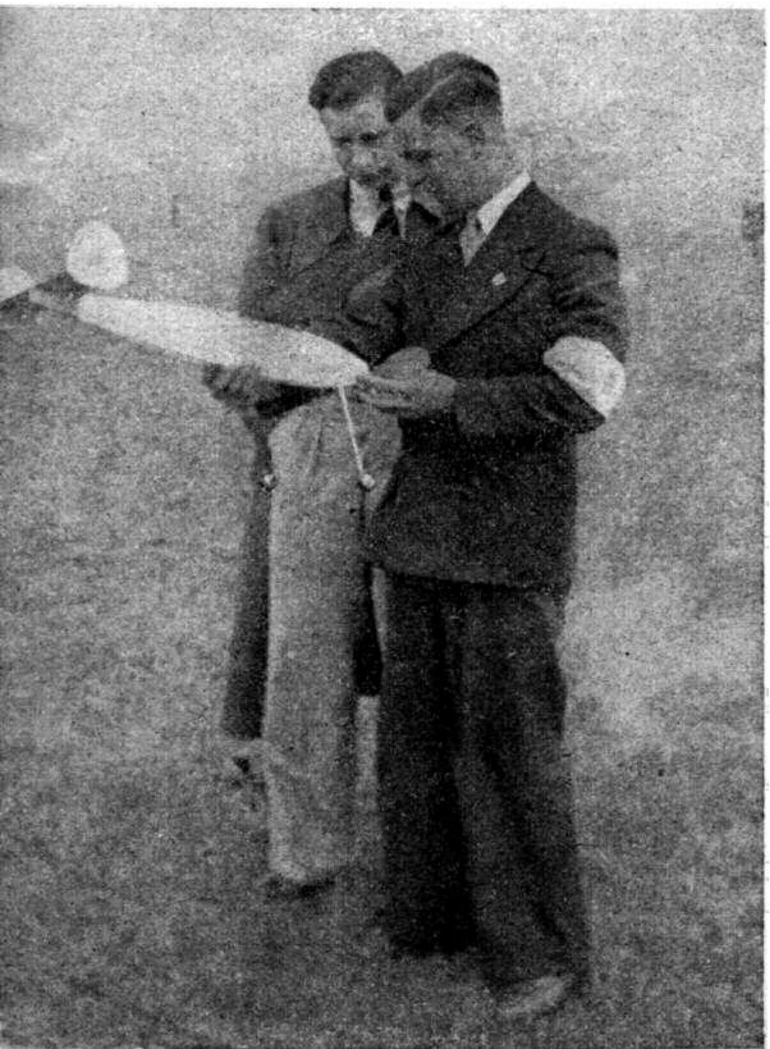
Membership of the LEICESTER M.A.C. is now past the 80 mark, but unattached aeromodellers are still welcomed. One member is busy on a super-super streamliner, while another is designing a 3 to 4 ft. span Autogiro. (What happened to that rotor plane illustrated some months ago? Don't tell me it never flew!!)

The STREATHAM AEROMODELLERS have come out of their winter R.T.P. quarters (a nice warm bakehouse!) and are already setting up promising outdoor times. Two new records have been established, J. James—a promising junior—clocking 53 secs. with a tail-less glider, and R. Rock setting up 54 secs. with a catapult launch glider.

Although the weather has, of course, considerably damped flying in most parts, the BURY and D.M.A.C. has braved the elements, and consistently put up times of over the minute mark, despite high winds and the thermometer below zero!



"THINKS HERSELF SOMEONE SINCE SHE GOT THAT MERLIN ENGINE."



(Shades of H.G. patrols ! ! !) This club would be pleased to hear from neighbouring clubs with a view to fixing up inter-club meetings this season.

Another fine exhibition effort was that of the BRENTWOOD SCHOOL M.A.C., who staged a two-day stunt during the local Warship Week. Over 200 models attracted a goodly trickle of people, and a good sum was raised in consequence. Much interest was shown in continuous R.T.P. flying, and the membership has benefited as a result, over 50 members now being on the books.

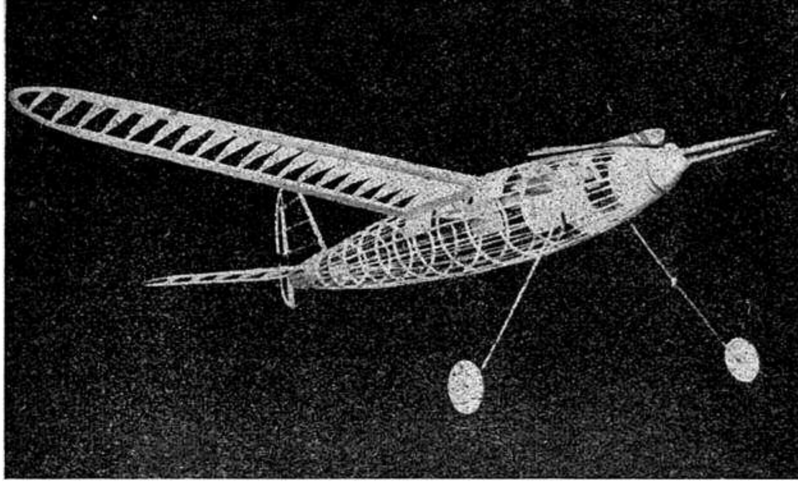
In calm, misty weather, and with snow all around—no, they didn't rope in Good King Wenceslas as a timekeeper—the HEYWOOD M.A.C. held an outdoor contest on the 8th February, C. Hall winning with three very consistent flights of 1:18, 1:15 and 1:10 R.O.G. G. Whitlam and C. Watson scrapped for second place, the former succeeding by .7 seconds, his average being 44 seconds.

The CHELMSFORD M.A.C. has tried R.T.P. work, and a good turn out took place at the second meeting—juniors in particular being present in force. G. Foden set up best time in the Senior section with a time of 51 secs., D. T. Wyatt placing second with 34 secs. The Junior class went to D. Michael with 33 secs., second being R. King, 21 secs. The bright spot of the month was an exhibition staged in aid of the local Warship Week, 1/72 scale models being especially prominent.

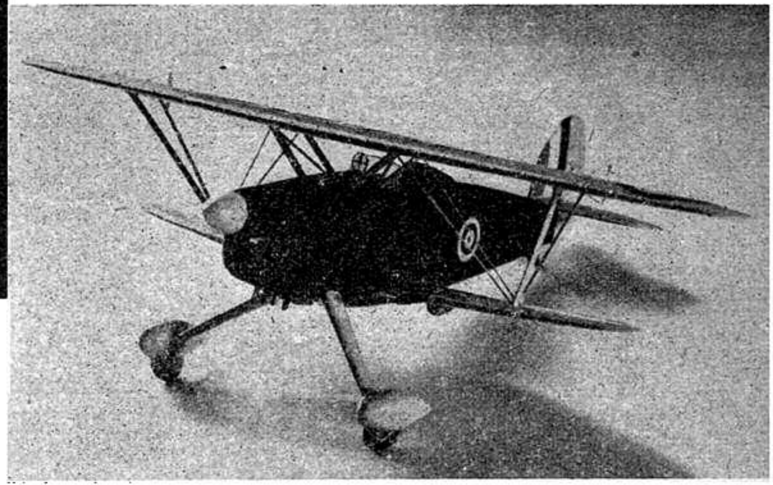
The eagerly awaited exhibition held by the STEWARTON M.A.C. suffered some bad fortune, being asked not to make it a public show in view of the fact that the local authorities are holding their own affair later on. However, nothing daunted, the Stewarton boys got down to it, and made a fine display off their own bat—the average age of the committee is only 15—and altogether over 70 models were on view. One lad had the pleasure of showing his Science master around, and lectured

N. Hayes (Ashton & D.M.A.C.) the 1941 Individual Champion, discusses his "Ikon" model. Hayes scored outstanding successes with almost every type of model employed during the series.

Right: A flying scale "Grumman F.F.1." built by Ivor Wallis of the Edgware M.A.C.



Above: A well constructed "Coplands Wakefield" by F. G. Brown of 48 Connaught Rd., Aldershot. This model is for sale, and intending purchasers should get in touch direct.



Right: A free-lance design by D. M. Roberts of Hounslow. This is one of the slickest looking biplanes we have seen for a long time, and shows beautiful workmanship.

him at length on torque, lift and drag, etc. The Lecturer lectured!

Miss E. T. Spragg, of Suffolk House, Greyfriars, Gloucester, wishes to obtain copies of the October and November, 1940, issues, also those for March and September, 1941. Anyone who can oblige, please get in touch direct.

The GOLDEN WINGS M.F.C. are busy building large gliders, and W. Jones has already had much success in tests. An experimental 'Bowlus' type sailplane is showing good soaring tendencies, even under snowy conditions.

The ASHTON and D.M.A.C. have been lecturing their local Home Guard on aircraft recognition, and mutual benefit has resulted. Worse luck is the news that their flying field has fallen to 'Dig for Victory' campaigning, but this is not deterring them from their usual programme. It is suggested that the S.M.A.E. Decentralised contests are 'centralised' in areas, in other words, clubs in the same district could meet on each other's grounds according to arrangement, and should do much to foster co-operation. Also, a great easing of organising and easier control should result. I recommend this idea to all clubs, and shall be pleased to hear of results as the season progresses.

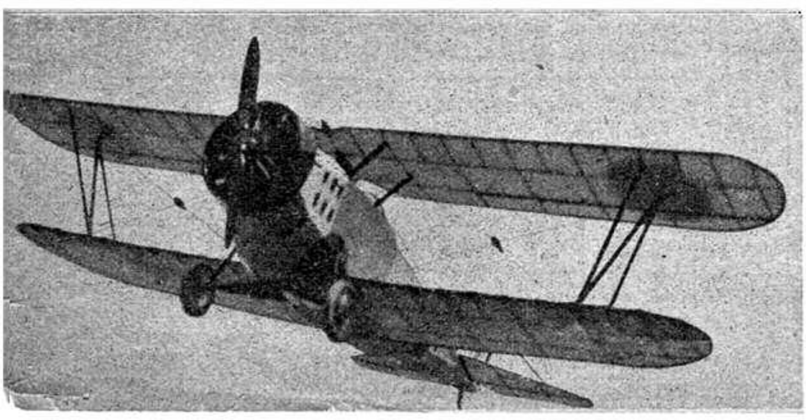
The BRISTOL and WEST M.A.C. have acquired a hall for indoor events, and are making good use of it. The chaps there are very 'gear-minded, and most of last season's prizes were won with models incorporating gears. Mr. Garnett has done some good work with I.1.P type models, while Mr. Hurley has established a new British record with a P.1.1.P of Wakefield specification. I hear rumours of a really hot low-wing Wakefield, with a 10-inch prop. driven through a 3½–1 ratio gear box, and employing 4 ounces of rubber. (Where do you get it fellers?)

A number of chaps are desirous of forming clubs, and would like the help and co-operation of others in their districts. To this end, I give herewith names and addresses of these enthusiasts, and would ask that all who are interested get in touch with them immediately.

E. Wallace, 115, Chestnut Grove, New Malden, Surrey.
Cpl. J. B. Milnes, 42, Kenilworth Rd., Monkseaton.
R. E. Watts, 8, Robartes Rd., Newquay.

And so to bed—or more likely to the workshop to make more bits and shavings, and cause more rows indoors when the stuff walks into the carpet!! However, I have yet to find anyone with a real argument against aeromodelling, and even irate mothers must admit that their lads have a hobby that keeps 'em interested and at home. (My wife always says I never am at home, and I can't always be at the clubroom! But I'm not answering that one.) Cheerio for now, and here's to the next time.

The Clubman.



New Club.

KIRKE WHITE LINCOLN M.A.C. (Formerly Lincoln M.A.C.).
D. Lee, 18, Claremont St., Monks Rd., Lincoln.

Secretarial Change.

SALE AERONAUTICAL SOCIETY.
G. Barnes, 61, Clough Avenue, Woodheys, Sale, Ches.