model AERONAUTICS

EDITED BY
BILL DEAN and RON WARRING

11 PLANS INCL. KORDA'S POWERHOUSE • SPEED, STUNT & FREE FLIGHT WINNERS OF 1948 ALL HERTS RALLY • C/L NIEUPORT • F.A.I. RUBBER & GLIDER DESIGNS

• MILLS 2·4 & ·75 CUTAWAYS • AMERICAN RADIO CONTROL
POWER MODEL STRUCTURES • AEROBATIC AEROFOILS
AND OTHER FEATURES

AN Ian Allan PRODUCTION

PRICE **2/6**

BY THE EDITORS

WITH something of a sigh of relief we finally fitted in the eleventh plan into *Model Aeronautics* and believe that, in doing so, we have established something of a record. The trouble is we find all of the models so attractive that we feel like building most of them ourselves! The most popular design so far has been the Jersey Javelin—hundreds of plans being sold. We have seen dozens of these flying lately, so look out for the Javelin at the contests. And we reckon that Norman Marcus's Firecracker in this issue will be equally popular! Not to mention the two versions of Korda's Powerhouse, which is one of the hottest free flight contest designs to come out of the U.S.A.

In case you have not heard of Herb Owbridge before—he is one of the "gen-men" of America's radio control modellers. Dick Shumacher is his partner—and Dick, you may remember, made the last American Wakefield team as well. These two have really got something with "**rudevator**" and that is the type of control we are going to use—when and if . . . . . Rudevator, incidentally, is provisionally patented and there is a very good chance that these units will be available commercially in this country. Write in to your editors, if you are interested. But digest Herb's article first.

For rubber contests to F.A.I. specification we have always admired Bill Geddie's Tiercel and we reckon on seeing a lot of them around in the near future. Properly trimmed, this job is going to be hard to beat. The glide is really something to get excited about and since the S.M.A.E. have gone all "F.A.I.-conscious" in their competitions this year, this proven design is tailor-made for the job.

The greatest variety in design is undoubtedly in the control line field and we often wonder where some of the present trends are going to end up. So to try and satisfy everyone (we know it cannot be done!), we have included a couple of speed and stunt winners designed around popular motors, an attractive flying scale Nieuport by a firm specialising in scale control-liners and a selection of flying wing stunters. Take your choice. They are all from the top of the list.

Finally, may we say thanks all round. Especially to all you readers who have written us, given us your opinions on the *Model Aviation* series and let us know what you want in future publications.

MODEL AERONAUTICS

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Cover photo by James W. McCandless shows free flight competitors at the 2nd Plymouth International Model Plane Contest, Detroit, Mich., U.S.A.

Published by

Ian Allan Ltd

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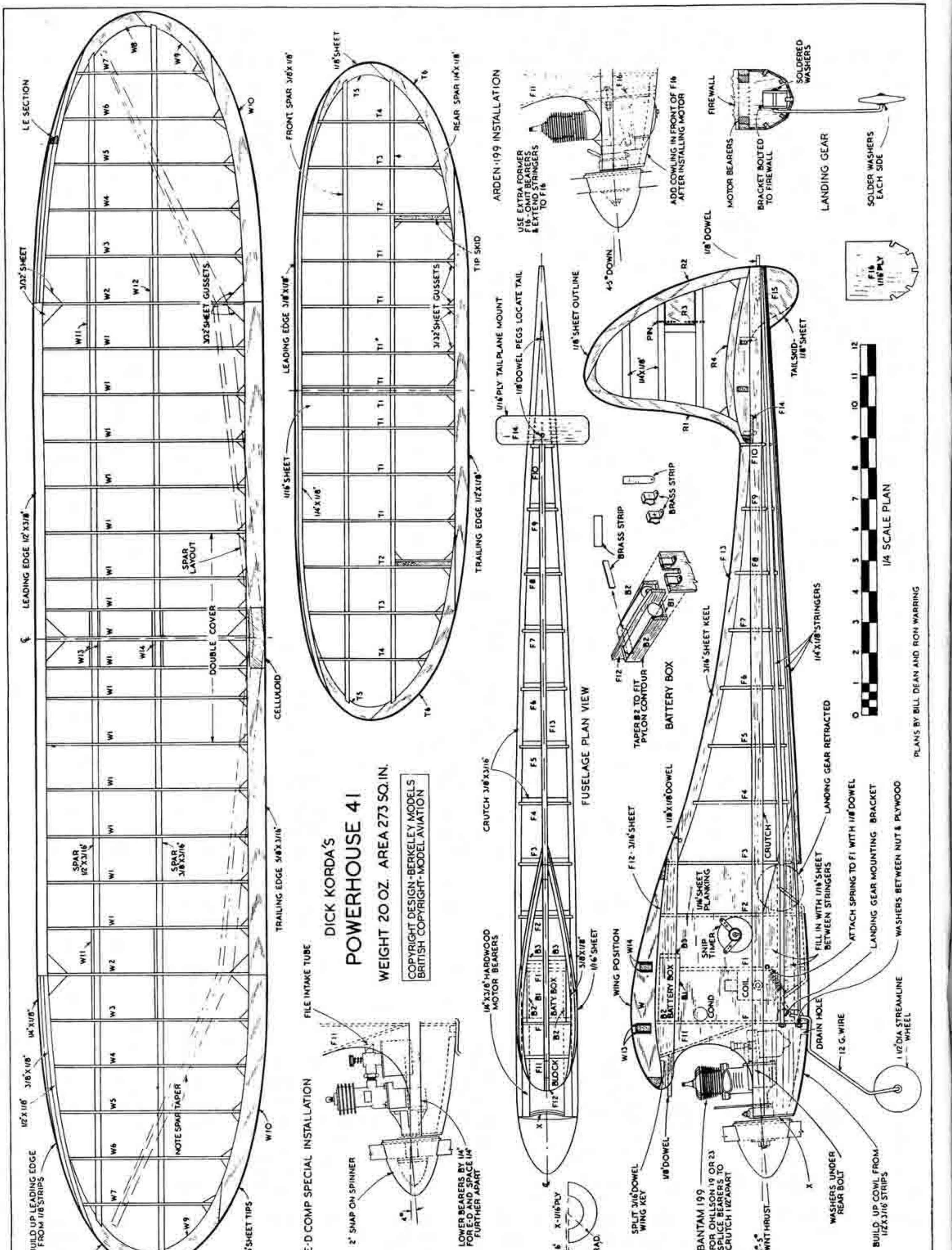
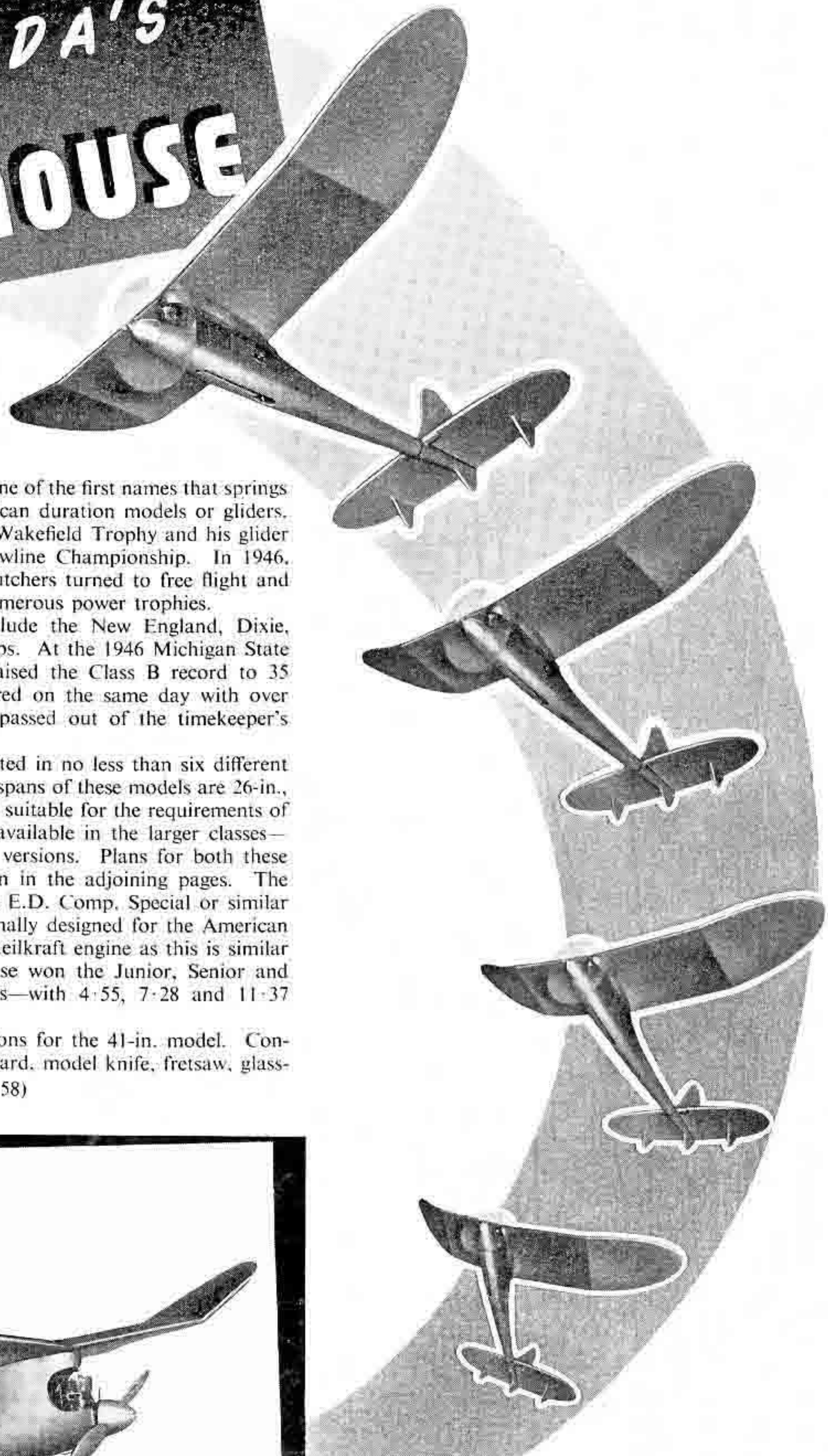


FULL SIZE PLANS AVAILABLE FROM IAN ALLAN LTD.

DICK KORDA'S Powerhouse



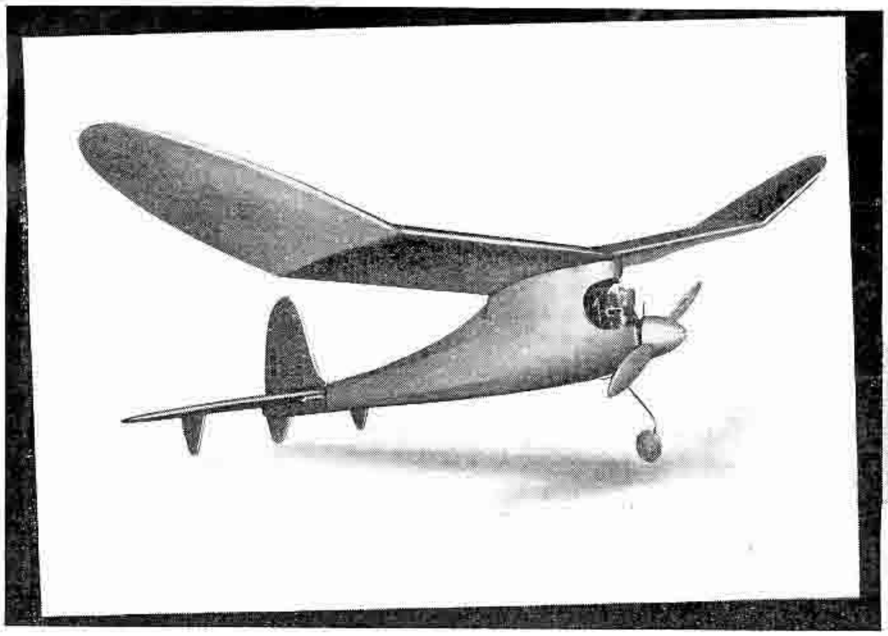
FOR many years Dick Korda has been one of the first names that springs to mind when the talk turns to American duration models or gliders. In 1939 Dick won the much coveted Wakefield Trophy and his glider successes include the U.S.A. Nationals Towline Championship. In 1946, the star member of the Cleveland Balsa Butchers turned to free flight and the Wakefield Cup was soon flanked by numerous power trophies.

The many wins of the Powerhouse include the New England, Dixie, Middle Atlantic and Western Championships. At the 1946 Michigan State Meet, Korda's de Long 30 Powerhouse raised the Class B record to 35 minutes 44 seconds. This flight was bettered on the same day with over 50 minutes, but unfortunately the model passed out of the timekeeper's sight after only 21 minutes.

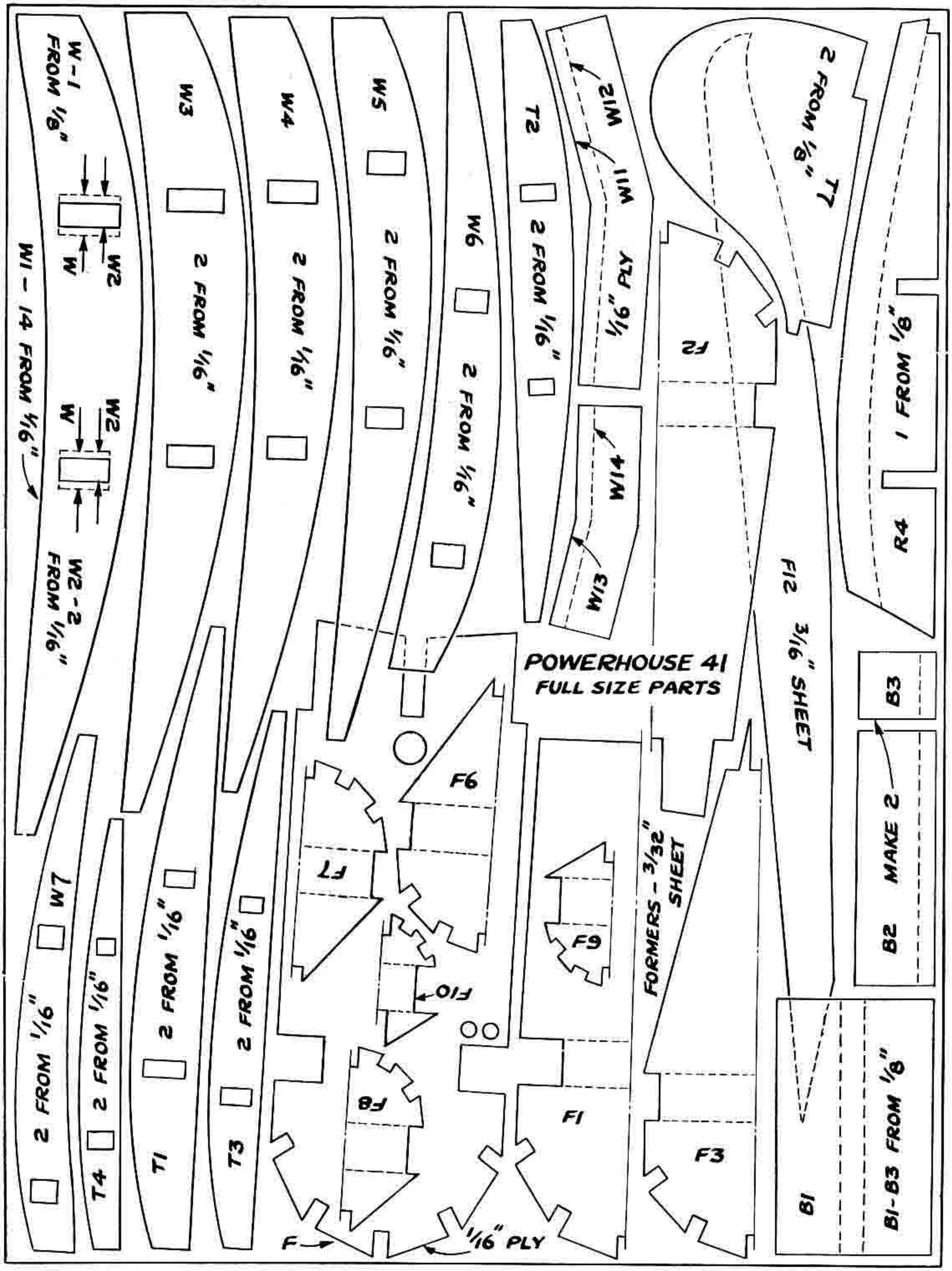
In America the Powerhouse design is kitted in no less than six different sizes—for the various A.M.A. classes. The spans of these models are 26-in., 33-in., 36-in., 41-in., 56-in. and 64-in. Most suitable for the requirements of British modellers—with few good engines available in the larger classes—are the 33-in. CO_2 and the 41-in. Bantam versions. Plans for both these models and FULL SIZE PARTS are given in the adjoining pages. The 41-in. model is particularly suitable for the E.D. Comp. Special or similar 2 c.c. diesels. The 33-in. version was originally designed for the American Herkimer CO_2. We have substituted the Keilkraft engine as this is similar in size. Incidentally, the 33-in. Powerhouse won the Junior, Senior and Open CO_2 contests at the 1948 Nationals—with 4·55, 7·28 and 11·37 respectively.

We shall start off with building instructions for the 41-in. model. Construction will require a 30-in. long work board, model knife, fretsaw, glass-

(*Turn to page* 58)



Plans for 33″ version overleaf


POWERHOUSE 41
FULL SIZE PARTS
W-1 FROM 1/8"
W
W2
W1 - 14 FROM 1/16"
W2-2 FROM 1/16"
W3
2 FROM 1/16"
W4
2 FROM 1/16"
W5
2 FROM 1/16"
W6
2 FROM 1/16"
T2
2 FROM 1/16"
W12
W11
1/16" PLY
W14
W13
2 FROM 1/8" T7
F2
1 FROM 1/8"
R4
F12 3/16" SHEET
B3
MAKE 2
B2
B1
B1-B3 FROM 1/8"
F6
F7
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F10
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F1
F3
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F
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W7
2 FROM 1/16"
T4
2 FROM 1/16"
T1
2 FROM 1/16"
T3
2 FROM 1/16"

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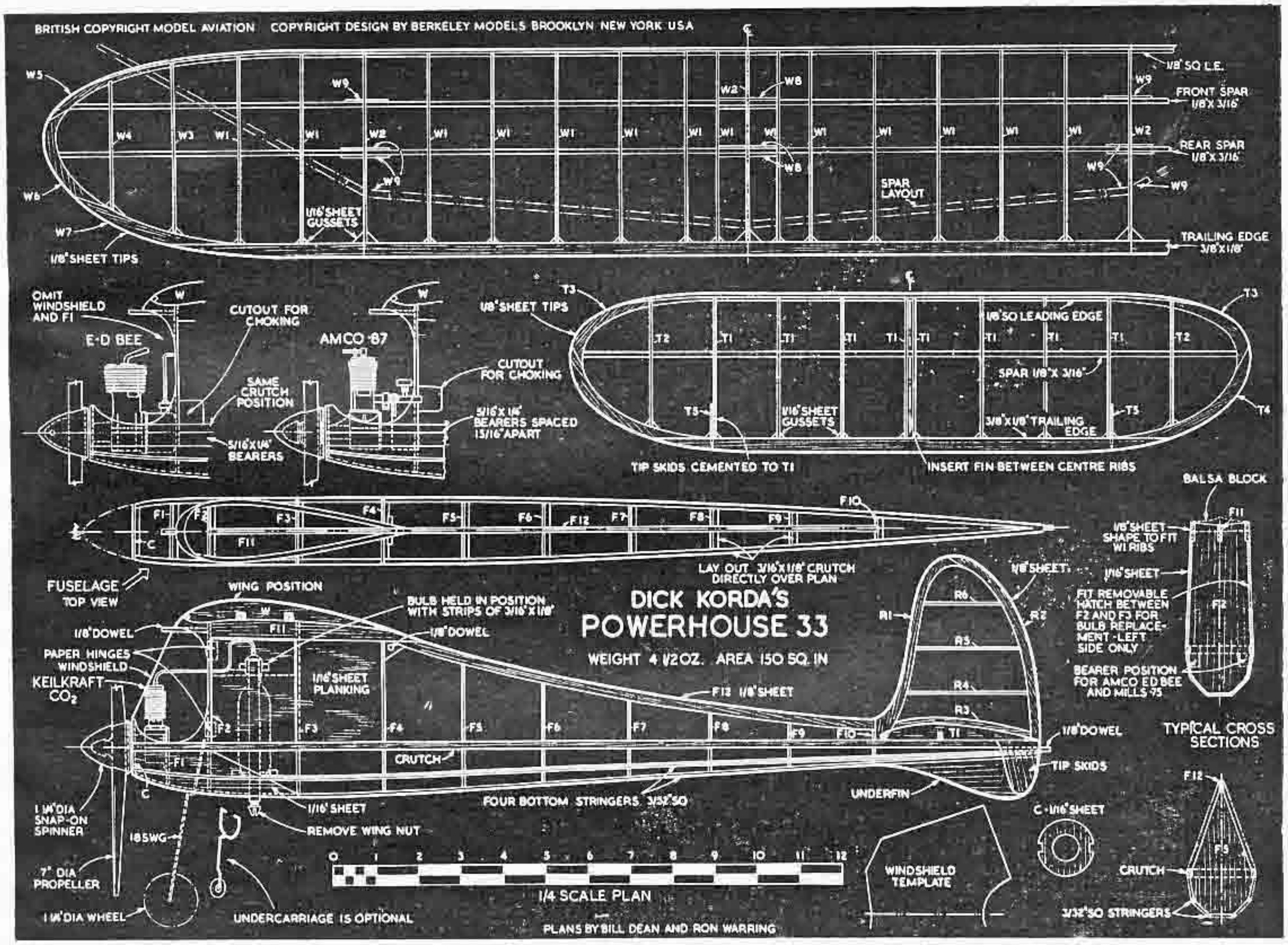

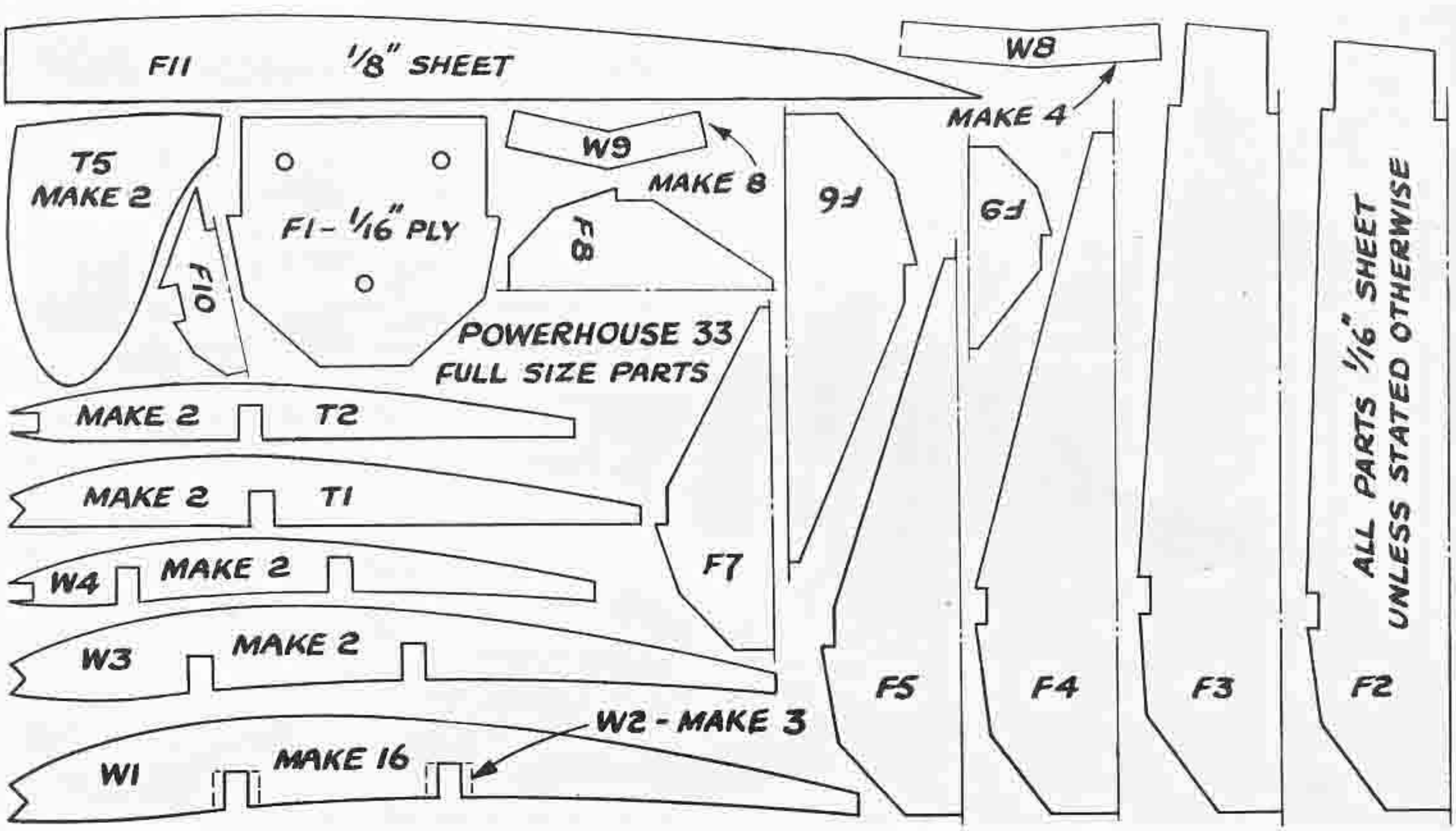

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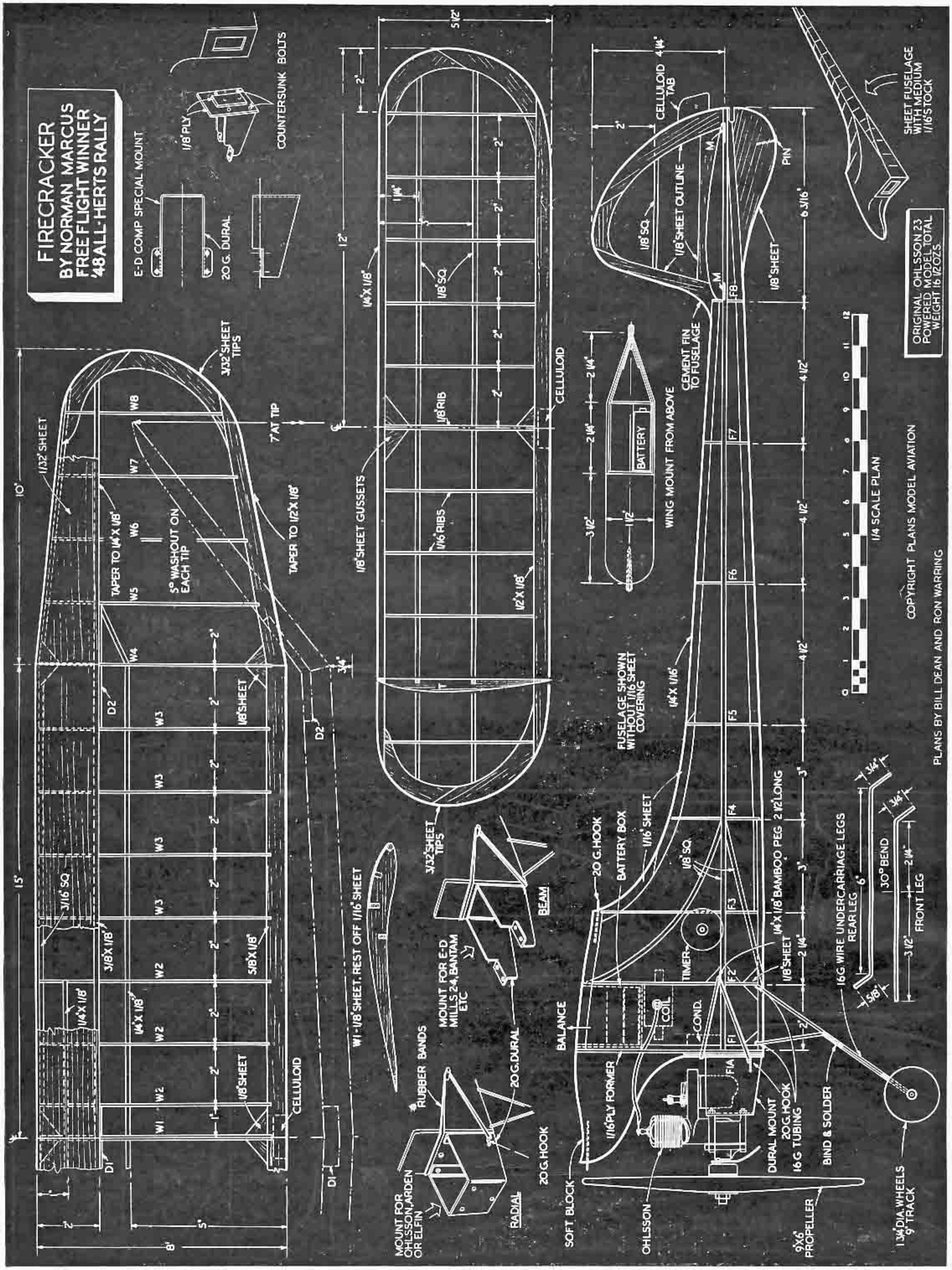


Firecracker

1948 All Herts Rally

FREE FLIGHT POWER

By Norman Marcus

CROYDON CLUB

MY first power model was on Bowden lines—weight 38 ounces and powered by a Majesco "45"—and had just about the opposite flight performance to that which I required! After that, three completely different experimental models were made in 1947, all powered by the Mills 1·3. Spans ranged from 32, 38 and 42-in. The last one of the series was the most successful and placed fourth in the S.M.A.E. ratio contest in May 1948, being lost 0.0.S on that day.

This in turn inspired me to build a similar job for an Ohlsson 23 which I had just run in. The main features thought necessary were a large wing area to give a good glide, long tail moment to lessen stalling after the motor cut, a double leg undercarriage of reasonable track to give a straight take off and light weight allied to reasonably strong construction. All of these features have been incorporated in "Firecracker" and have been justified many times, as the model takes off dead straight, never stalls more than twice when the power cuts and has a very good glide.

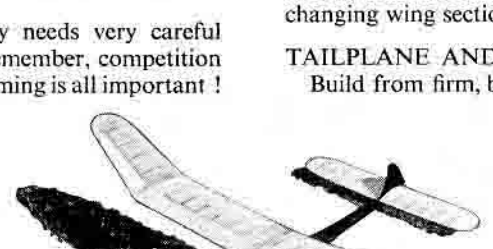
First competition outing for the "Firecracker" was the International Power Contest in August (1948). First flight was 365 seconds on a 11-second motor run, the model circling about 200 feet up for some five minutes in a mild thermal. The second flight was poor—a 4·9 ratio—due to the motor refusing to four-stroke. The last flight produced a 8·9 : 1 ratio and "Firecracker" ended up in first place.

Subsequently the model was re-trimmed and now has an average performance of 12 : 1 ratio. With this new trim, "Firecracker" placed first at the All Herts Rally, third at the West London Rally and first in the Croydon club power contest in October.

The basic design is sound. It only needs very careful trimming to bring out the best. But, remember, competition is very keen in free flight power and trimming is all important!

CONSTRUCTION

All the fuselage formers are cut from firm balsa sheet. Select two firm even-grained lengths of $\frac{1}{8}$-sq., and on these, mark off positions of formers measured from the tail. Cement these together at tail with a small angle between them. Cement F5 and F1 in place and allow to set.



Glue rest of formers in place and complete outline of fuselage—steam $\frac{1}{8}$-sq. at back of pylon, to shape before fixing. Stick block balsa (L.E. of pylon) to $\frac{1}{16}$-ply former, which is fixed to the skeleton fuselage—use "Durofix" for this. Durofix the 16-g. U/C tubes in place. Add ignition accessories (if used) in their respective places—the timer will project slightly beyond the other side of fuselage. Cement hooks, bamboo, and tail platforms in place.

SHEETING PROCEDURE

(i) Sheet underneath of diamond shape first and trim.
(ii) Sheet top of diamond and trim to shape.
(iii) Sheet T.E. of pylon. Two pieces each side (grain parallel to centre line).
(iv) Sheet sides and bottom of pylon. Add under fin.
(v) Sand slightly and give two coats of clear dope—sand very lightly. Cement fin in place.
(vi) Give whole of fuselage (not upper fin) *one* coat of coloured dope (or dope coloured tissue on) and rub over faintly with flour-paper. Brush on fuel proofer if required.

The fuselage may appear slightly complicated, but in actual fact it is quite easy to build and when finished looks very neat.

UNDERCARRIAGE

Bend the pieces of wire to shape. Plug into fuselage and bind and solder as indicated. Solder wheels in position.

WING

This follows normal methods of construction. The wash-out on the tips came naturally on the original wing: the changing wing section accounting for this.

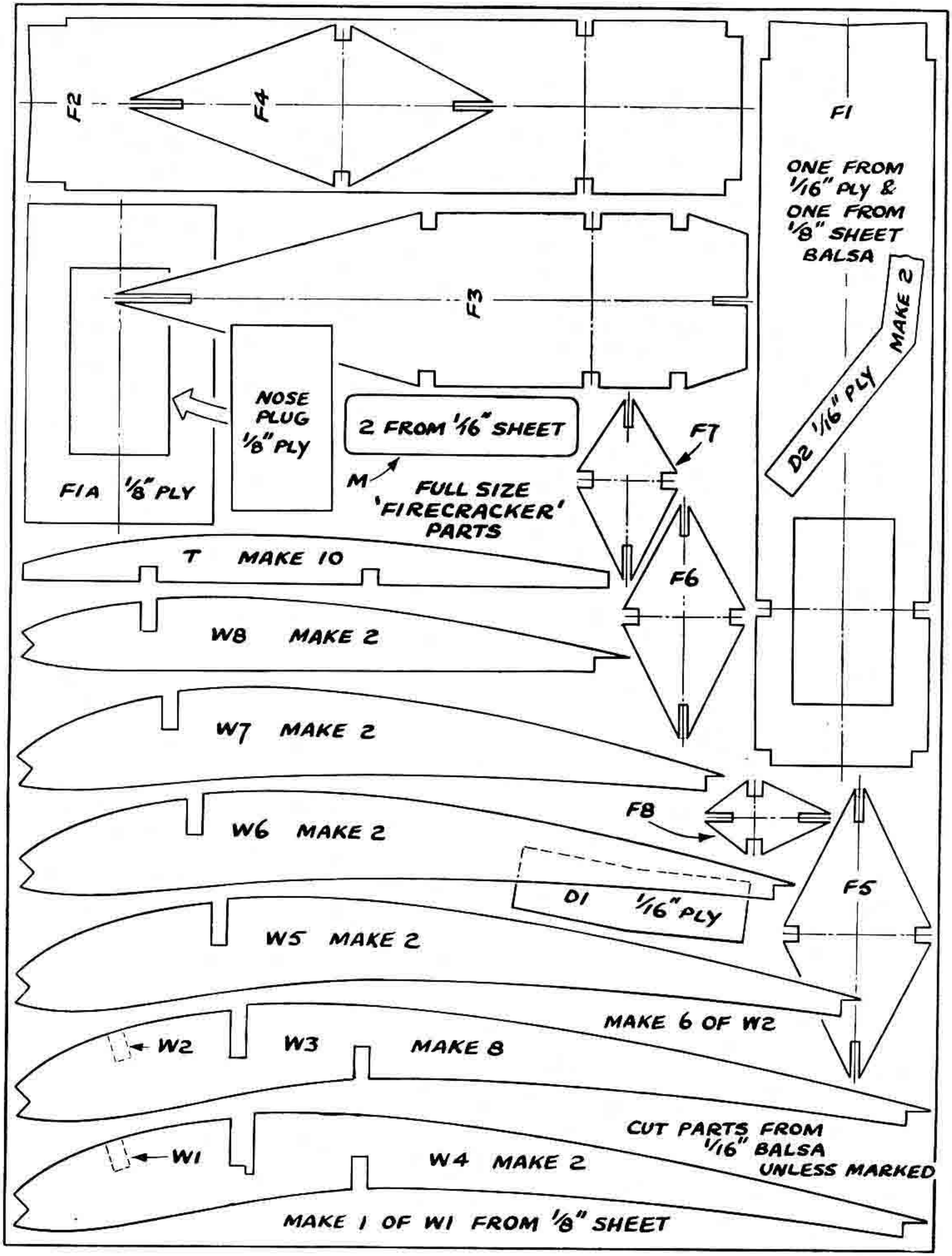
TAILPLANE AND FIN

Build from firm, but light wood. Trace fin and tail outlines on to $\frac{1}{8}$-in. and $\frac{3}{16}$-in. sheet respectively.

On the original, pendulum controlled rudder was used, with no apparent effect. Hence this has been left off the model.

MOTOR

An Ohlsson 23 with spark ignition (*Turn to page* 60)


F2
F4
F1
ONE FROM 1/16" PLY & ONE FROM 1/8" SHEET BALSA
D2 1/16" PLY MAKE 2
F3
NOSE PLUG 1/8" PLY
2 FROM 1/16" SHEET
F7
M
FULL SIZE 'FIRECRACKER' PARTS
F1A 1/8" PLY
T MAKE 10
F6
W8 MAKE 2
W7 MAKE 2
W6 MAKE 2
F8
D1 1/16" PLY
F5
W5 MAKE 2
MAKE 6 OF W2
W2
W3 MAKE 8
CUT PARTS FROM 1/16" BALSA UNLESS MARKED
W1
W4 MAKE 2
MAKE 1 OF W1 FROM 1/8" SHEET

USE THOSE *Plans*

By Calhoun Smith

ENLARGING MODEL PLANS IS SIMPLE IF YOU GET STARTED ON THE RIGHT LINES. HERE ARE EXPERT TIPS BY A WELL-KNOWN AMERICAN DESIGNER

WHETHER you build rubber, glider or power models, you have probably encountered model aviation's greatest stumbling block somewhere along the way. It usually goes like this :

Looking through the pages of a model magazine or book, you suddenly come across THE model. The size is just right and will suit that new engine you bought the other day. Then comes the let down—how to get those plans out of the magazine and on to paper in the correct size for working on. At this point you may decide to pass up that dream design—unless you already have draughting experience.

Of course, full size plans are often available, but the high cost is a disadvantage to many modellers. Kits are fine, but there are plenty of interesting models that never get kitted. So why not enlarge those plans and build THE model.

A complete course in aeronautical draughtsmanship is not the purpose of this article, but if you can hold a pencil and do simple arithmetic, you can certainly enlarge model plans up to working size. These notes will also be useful if you ever decide to draw up an original design for kit or magazine purposes.

Ribs and formers are hardest to scale up accurately and photostatic enlargements are a good idea. However, the cost is prohibitive for large scale reproductions. Shrinkage of the photostat paper will distort the drawing, but this is negligible on small enlargements (12-in. by 9-in. maximum). Use of a pantograph is ruled out as this expensive equipment is inaccessible to most modellers. Cheaper wooden pantographs are obtainable, but their use is not recommended as they are not very accurate and considerable practice is required before even passable results can be obtained. Let's face it—the best method for getting those plans on to the workbench is to completely redraw them full size by scaling them up.

You will have to equip yourself with some tools of the trade before you start this drawing board duel : Several hard pencils (3H or 4H) ; a 12-in. ruler (with $\frac{1}{16}$-in. divisions) ; and a good straightedge about three feet long. A dead straight strip of pine (2-in. by $\frac{1}{4}$-in.) may be substituted for this latter item.

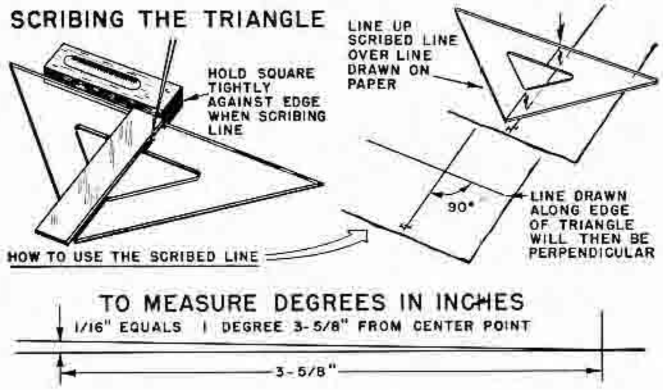
A small plastic french curve is very handy for drawing small curves such as wing ribs and tip outlines, but if you can do a fair job of free-hand line work you may be able to get along without one. Get a small plastic protractor. You won't use it very much but it is useful for laying out angles of incidence and the like. If you do not care to purchase a protractor, here is a simple rule to remember for laying out angles in degrees : One degree equals $\frac{1}{16}$-in. at $3\frac{5}{8}$-in. away from the centre point (see sketch below).

Next on the list is a plastic triangle. Get a 45° angle type—the 10 to 12-in. size is good for this kind of work. A very helpful trick that can be done with the triangle eliminates the need for a T-square for drawing lines at right-angles to each other, and is reasonably accurate. Simply scribe a line from the long edge through the top angle of the triangle. Care should be taken when doing this because the accuracy of your subsequent drawing depends a lot on this scribed line.

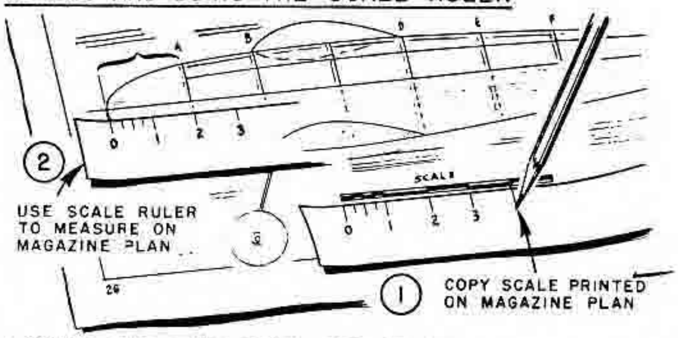
Use a carpenter's square, held tightly against the long edge of the triangle, and scribe the line deeply with a scriber or bradawl. Smear ink over the line, let it dry—then rub off the surplus. To use the triangle for drawing right-angle lines, simply line up the scribed line on the triangle over a drawn line and draw the needed perpendicular along the long edge of the triangle. More of this later.

Drawing paper is the next requirement. A roll of white shelf paper or even the back of a length of smooth wallpaper can be used. Inexpensive draftsman's layout paper can be purchased at artists' and draftsmen's supply stores. Widths up to 36 inches and rolls up to 20 yards are generally available. Thin tissue or tracing paper is not essential but will prove helpful. A 9-in. by 12-in. pad is suitable for average requirements. Last of all, don't forget a good eraser. Get a fairly soft type to avoid tearing the paper.

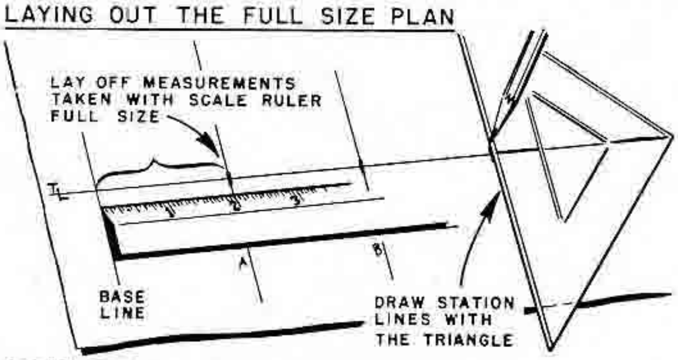
Nearly all magazine plans will include notes as to the scale size used. Probably a scale of inches will be drawn on the



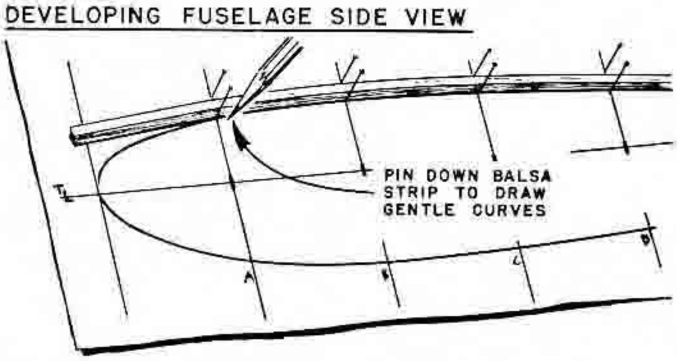
MAKING AND USING THE SCALE RULER



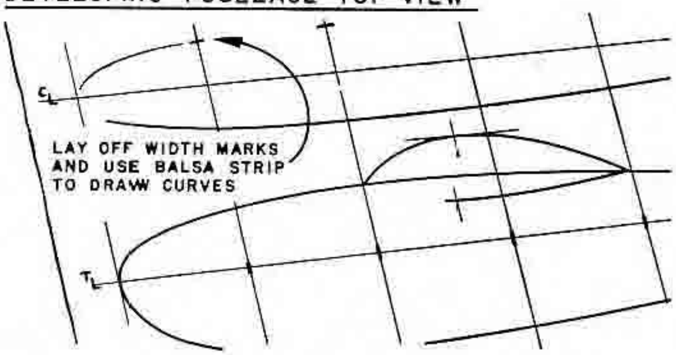
LAYING OUT THE FULL SIZE PLAN



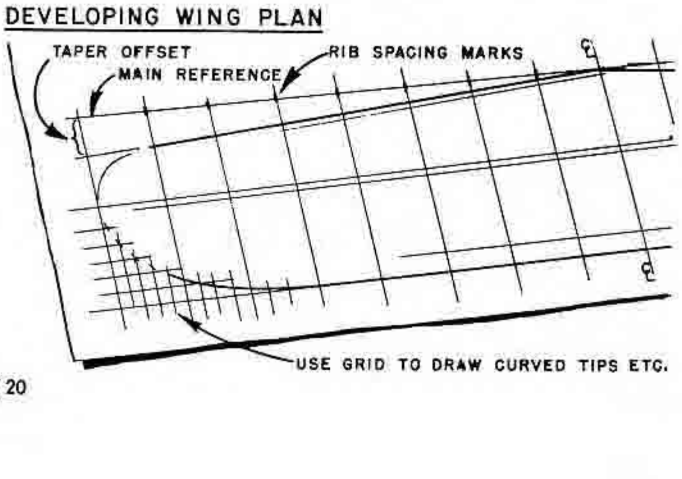
DEVELOPING FUSELAGE SIDE VIEW



DEVELOPING FUSELAGE TOP VIEW



DEVELOPING WING PLAN



plan. The main dimensions are often included and these can be read off directly without any trouble. The first step will be to make a miniature ruler the same scale size as the plans. If the plan has a scale printed on it, simply lay a piece of paper along it and transfer the divisions to the paper. Usually the scale will be only six or eight inches long, so repeat the process on your miniature ruler until you have one long enough to suit the model size.

Now all you need do, to find out the distance from the front of the model to the firewall, is to measure it—with your scale ruler. Most magazine plans are sized in even divisions of an inch, so if the scale is $\frac{1}{8}$-in. or $\frac{1}{4}$-in. or $\frac{1}{2}$-in. you can use a regular ruler for measuring. For instance, one inch on the plan of a $\frac{1}{2}$-in. scale drawing can be measured by $\frac{1}{2}$-in. lines on a regular ruler. Each $\frac{1}{2}$-in. becomes 1 in. on your full size plans. It will be necessary to look sharply at your ruler divisions and count carefully to avoid mistakes. Are you confused already?

But let's get back to the miniature ruler. Measure the overall length of the model on the magazine plan with your miniature ruler. This will tell you the size paper needed to lay out the full-size plan, measured in regular inches. Lay the paper down on a smooth table top or drawing board and draw a long horizontal line across the paper with the straight-edge. This line will be the main fuselage reference line and will correspond to the thrust line or other longitudinal reference on the magazine plan.

Now, near the left end of the horizontal line draw a line with the scribed triangle at right angles to the horizontal line. This will serve as the base line from which to lay out all fore and aft dimensions and will also mark the front end of the fuselage side view.

Carry on, using the miniature ruler to measure on the magazine plan and marking the indicated dimension in regular inches on your full-size plan. Starting at the front end of the fuselage, measure the distance to the engine former or first cross member. On the full-size drawing, mark this dimension on the horizontal line. Then, using the scribe mark on the triangle, draw a line through the mark across the horizontal line.

This process is repeated for each station or former, back to the tail. Wing and undercarriage position can be drawn by measuring from the front base line and up and down from the horizontal reference line. Vertical dimensions of the fuselage stations are measured from the horizontal reference and marked on the vertical station lines.

Now that the vertical dimensions are all marked off on the station lines, these marks can be connected to complete the fuselage outline. Where long gentle curves are involved, a strip of $\frac{3}{16}$-in. square or smaller balsa can be pinned down along the marks and the curve drawn against the edge of the strip.

More abrupt curves such as cowlings or rudders can be enlarged with a fair degree of accuracy by using the grid method. Magazine plans often have a grid around these parts. You will have to duplicate this grid in full size on your full-size plan, then spot the points where the curve crosses the grid on the magazine plan and transfer these spots to the corresponding grid line on the full-size plan. This is best done by eye and the accuracy of your work will depend on how well you can estimate the fraction of the grid unit, where the curve crosses.

To develop the top view of the fuselage, you need to continue the station lines above the fuselage and draw a centre line parallel to the horizontal reference line. Scale off the fuselage widths at the stations on the plan and mark the corresponding dimension on the full-size top view.

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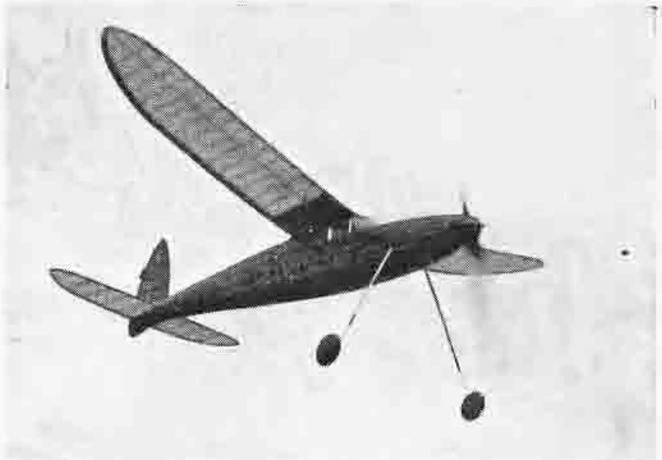
Corporal Ernest Nill took this shot of a mid-air collision, with his Graflex—at an American meet.



One of the prettiest Wakefields we have yet seen—the ARISTOCRAT. Photo by designer Edwin Stoffel.

Another Stoffel action shot. Dick Vahey of the Regents Park M.F.C. gets his MASTERPLANE away.

ACTION!

ACTION SHOTS LIKE THESE ARE ALWAYS INTERESTING—LOAD UP WITH SUPER XX AND KEEP YOUR CAMERA AT THE READY

"Taxi" Brookes semi-scale snapped just after take off from Fairlop at '48 Bowden. Note the "pilot."

Don Sweeny of Gardena, California, about to launch his THERMIC 72". Photo by Bob Hanford.

"Little Mike"

By Pat Lidgard

GETTING tired of merely being a spectator while my husband had all the fun of flying models, I finally induced Ed to work out a design for a sport plane which I could build and fly myself. Little Mike is the result.

Since I had built only a few models, the design was of necessity simple, utilising the minimum number of parts so as to be easy to build. Ed's finished plans were in the form of patterns, in which each part could be seen in its completed size and shape.

Sheet balsa is mainly used in the construction of Little Mike. This is a good idea with small models on account of the high strength to weight ratio and general durability. Building time is just two evenings. The original performs equally well indoors and outdoors—having over three hundred flights to its credit to date.

If this model appeals to you, lets get started by working on the fuselage. First cut out the two fuselage sides from $\frac{1}{32}$-in. (medium) sheet. Then cut the formers from sheet as specified on the plan. Bend the undercarriage to shape from 22-gauge piano wire and cement it to the main former C. Cement formers A and D between the fuselage sides and allow them to dry thoroughly before carrying on.

While these parts are drying, cut out the two halves of the wing from hard $\frac{1}{32}$-in. sheet (or medium $\frac{1}{16}$-in.) and the tail-surfaces from $\frac{1}{32}$-in. sheet (medium). Sand these parts smooth and round off the corners.

Now go back to the fuselage and separate the two fuselage sides enough to insert former C and cement it in place. The fuselage is completed by cementing $\frac{1}{16}$-in. strip crosswise in the slots already cut in the fuselage sides. When these are dry, trim flush with the sides.

Cement former B to the roughly-shaped nose block. Drill the block with a $\frac{1}{16}$-in. drill or pierce with a length of wire (neutral settings). Cement the male portion of a $\frac{1}{4}$-in. press stud at each end of the hole—to serve as bearings. When the cement has set, insert the block into the front of the fuselage. Hold the block in place and gradually trim it down to the shape shown on the opposite page.

The airscrew is carved from a block of medium balsa as shown. Lay out the length of the block in $1\frac{1}{2}$-in. portions and then draw the pattern on the sides (heavy lines on plan). Drill or pierce before starting to carve. Use a small thin-bladed knife for carving. Finish off to a smooth surface with fine glasspaper. Cement a press stud to the rear face of the airscrew as a bearing.

Bend the shaft from a piece of 22-gauge wire—starting from the front winding loop. Cement into the airscrew, slip three small washers on to the shaft, followed by the noseblock. Complete the assembly by bending the loop to which the rubber is attached.

The wing panels can be formed to an airfoil shape by dampening the upper camber with water and the lower camber with dope. Be careful not to moisten the area $\frac{1}{4}$-in. back from the L.E. and $\frac{3}{4}$-in. forward from the T.E. When the dope has dried to a point where it is no longer wet to the touch, the wing panel can be shaped by hand to the desired curvature. Experiment with this method on a piece of scrap wood first.

When the curve has been obtained in both wing panels, they should be cemented together so that both tips are raised $1\frac{1}{2}$-in. Allow this joint to dry thoroughly before moving from the building board. The tail assembly is attached to the fuselage after the rudder has been cemented to the tailplane. The under rudder can now be cemented to the underside of the elevator and both the fuselage sides. Fill in the small wedge-shaped openings with scrap pieces of $\frac{1}{32}$-in. balsa. Cement the wing permanently in place on top of the fuselage. When dry, a thin sheet of cellophane may be cemented to the fuselage—to form the windshield.

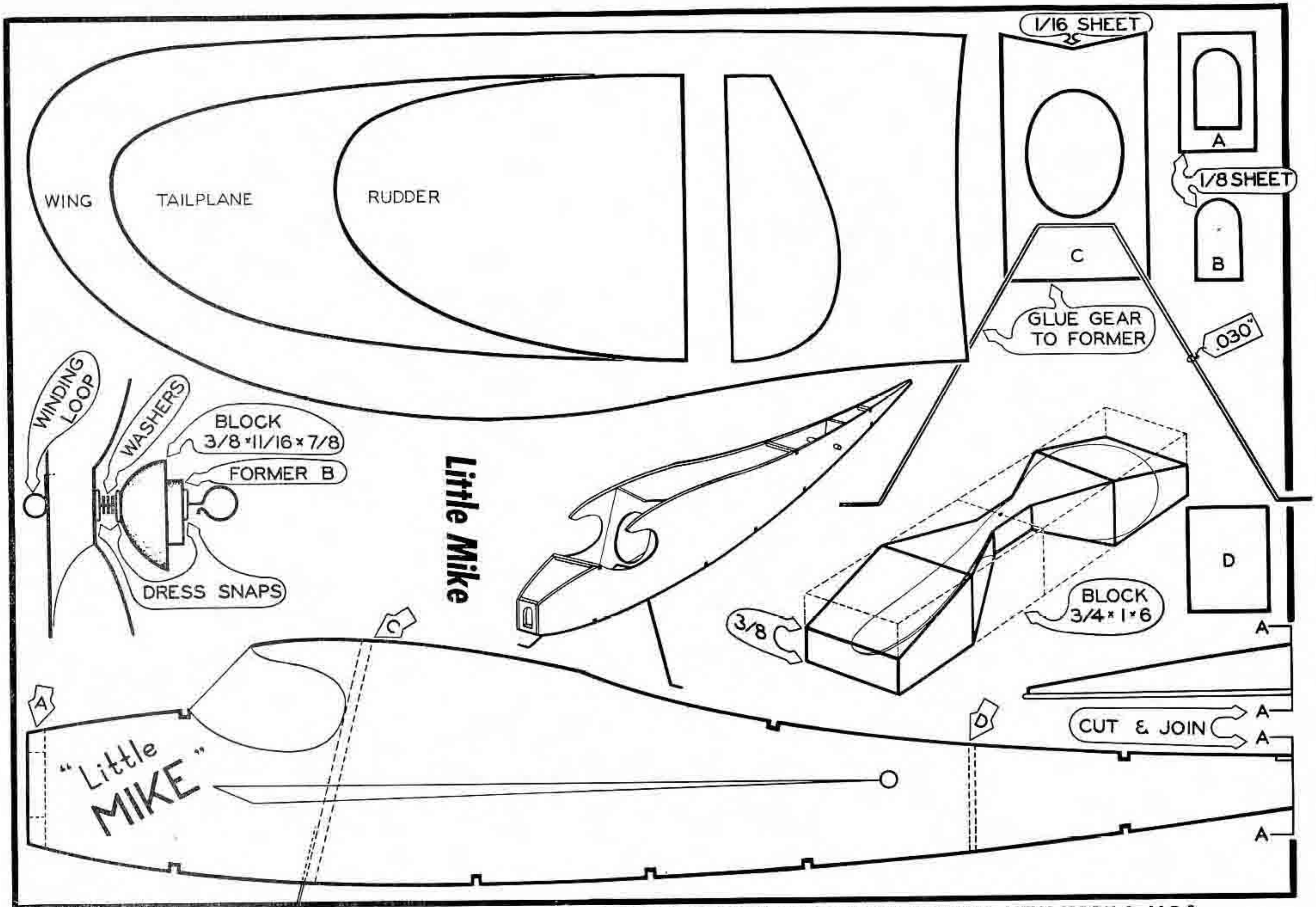
Cover the top and bottom of the fuselage with tissue. Tighten with water—then give two coats of dope. The wheels ($\frac{3}{4}$-in. dia.) may be any type available at your local dealers. Hold the wheels in place with dabs of cement on the ends of the undercarriage wire. The durability of the model will be improved by spraying lightly with very thin coloured dope.

FLYING

Four or six strands of $\frac{1}{8}$-in. rubber is adequate. Your motor will last longer and take more turns if it is well lubricated.

Before flying the model, check to make sure that the flying surfaces are correctly aligned and unwarped. Also see that the airscrew shaft is parallel to the centre line of the fuselage. Before using power, glide the model from shoulder height. If it stalls, add a little weight to the nose. If it dives, add a very small amount of weight to the tail.

(*Turn to page* 59)



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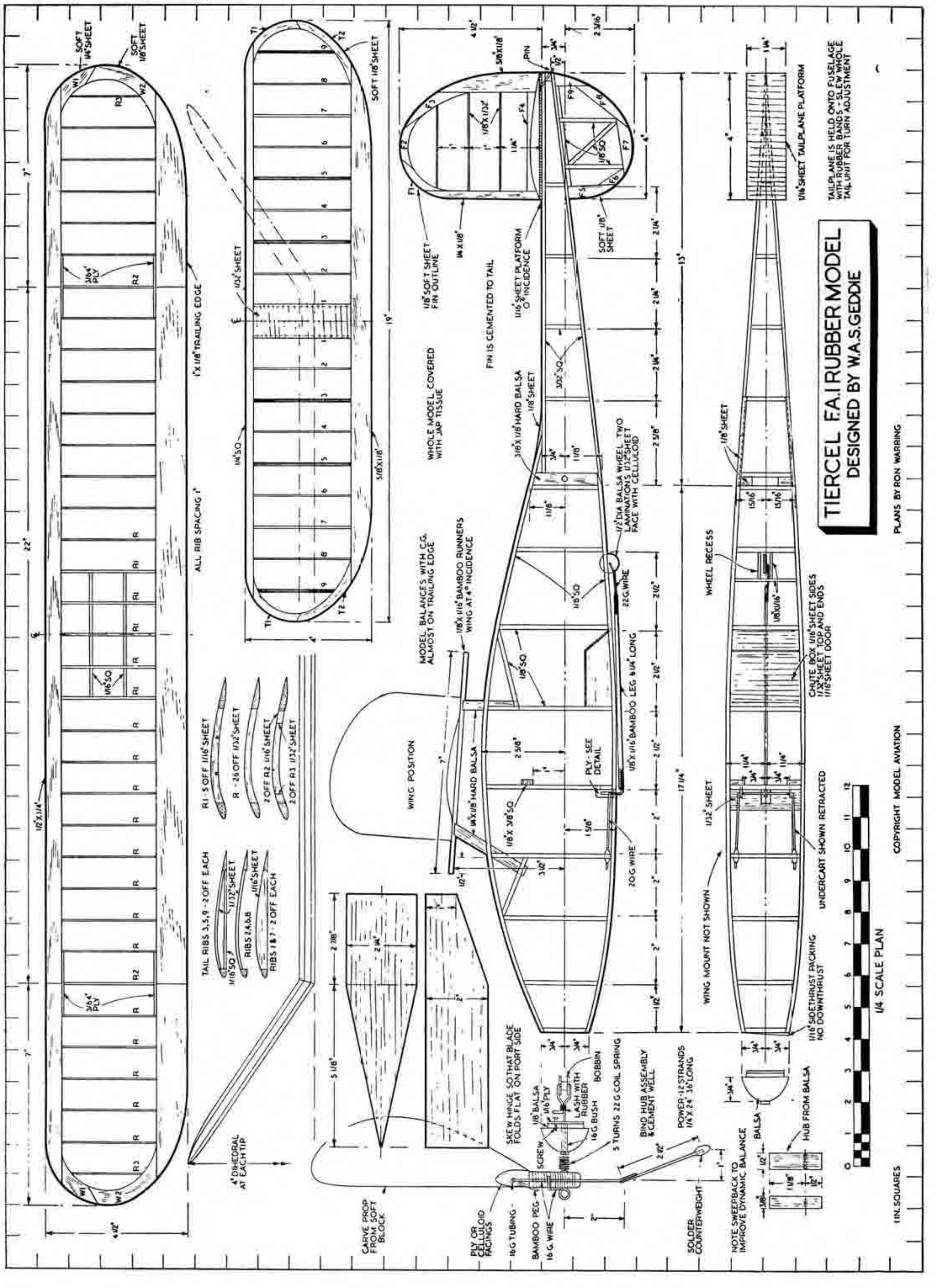


Tiercel

By W. A. S. Geddie

Retracting Undercarriage Rubber Design to F.A.I. Specifications

TIERCEL is an F.A.I. contest rubber model—with a difference. It is purely and simply a functional design, incorporating such "ultra-lightweight" features as high parasol wing and long fuselage with rear rubber peg well forward, large single-bladed propeller and Marquardt wing section. Yet the lines of the whole model have a definite appeal, the peculiar hump-backed fuselage being particularly pleasing in appearance.

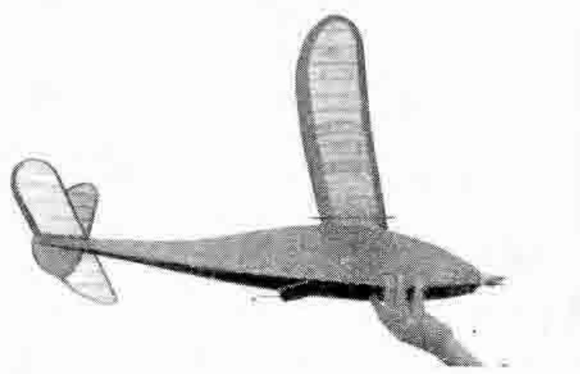
Tiercel is also probably the most flown-away model. The original model built in early 1945 is still airworthy, despite the fact that it has made many hundreds of flights and has been entered in dozens of contests. In all it has been lost on fly-ways no less than *fourteen* times—returned on each occasion to continue its hard-worked life. Possibly the best example of its sturdy construction is given by the fact that on one occasion it spent *four months* in a potato field before being discovered. It was then still in a fit condition to be flown in a contest again a few days later with no repairs or replacements other than the rubber motor. And, of course, it flew away again in that contest! Tiercel also has the unique record of having flown in three consecutive Gamage Cup events—1945-6-7—and flying away in each. A dethermaliser is now fitted as standard—and complete fly-aways are now less frequent!

A second version of Tiercel, with a smaller area wing and tailplane, won the 1945 Flight Cup—this model being lost completely on its last flight. The original Tiercel won the Brentford and Chiswick open rubber event the same year, and also put up the best flight of the day, and also placed fourth in the Model Engineer Cup. It has been placing high in S.M.A.E. rubber competitions ever since.

Bill Geddie's Tiercel has also been one of the mainstays of the Zombies London Cup teams, forming the "rubber" part of their strongest team alongside Ron Warring's Wakefields. This team reached the semi-finals in 1946 and the finals in 1947.

Although the lines—and one or two of the gadgets—are unconventional, construction is fairly orthodox. The fuselage is built as a normal slabsider, with two side frames joined by horizontal spacers. The longerons and spacers aft of the rear rubber position are of light $\frac{3}{32}$-square stock, which is scarf jointed to the main longerons and care must be taken to line these up accurately when laying down the two sides. Apart from this the remainder of the fuselage structure is quite straightforward. It is advisable to use card templates—or similar jigging—in assembling the sides, to ensure accurate line up.

The retractable undercarriage is a novel feature which has proved thoroughly practicable. This is well detailed on the drawings. With the undercarriage "down" and bearing the weight of the model, the upper extensions of the wire pivot are locked by the strip of $\frac{3}{8}$-in. $\frac{1}{8}$-in. balsa cemented across



the fuselage. As soon as the model is airborne and the weight is removed from the undercarriage, the whole unit drops down roughly ½-in. in the slots, when the wire arms come free of the stops and the counterweights fall forward to retract the leg. The leg folds up flat against the underside of the fuselage with the wheel partly inside a small slot in the fuselage.

At a later stage a two-wheel undercarriage was used. The same single leg was employed, with simply a Y-shaped wire extension bound to the lower end, each leg of the wire carrying a small diameter wheel. Track was such that, with undercarriage retracted, each wheel rested alongside the side of the fuselage. This twin-wheel undercarriage gave slightly better ground stability for take-off in poor conditions.

The propeller is unusual in having both large pitch and large blade area. The maximum width of the blade is 3⅛ inches. Powered by twelve strands of ¼-in. by $\frac{1}{24}$-in. rubber, maximum power run is roughly 65 seconds, the model climbing virtually to the last turn. The propeller assembly employs a normal type coil spring between the propeller and noseblock to stop the shaft when power has run out and allow the blade to fold flat against the port side of the fuselage. The hinge is slightly skewed to make the blade lie absolutely flat and reduce head resistance to a minimum. Folding propellers which do not fold absolutely flat against the sides of the fuselage have a tendency to affect directional stability in gliding flight.

Sparless wing construction fits in very well with the Marquardt section used, fairly light wood being employed for the leading and trailing edge spars in order to reduce weight. All ribs are cut from quarter-grained $\frac{1}{32}$-in. sheet, with the exception of the centre section ribs, which are of $\frac{1}{16}$-in. sheet. The centre section is double covered with Jap tissue for additional strength.

Sparless construction is also used for the tailplane, with a minimum of full ribs and closely spaced top and skeleton ribs to preserve the aerofoil shape and at the same time give the lightest structure possible. The fin is also quite orthodox and pegs into, or cements directly on to, the tailplane. For turn adjustment the whole tail unit is slewed slightly. For further non-critical turn adjustment the wing can also be slewed slightly, although this should not be necessary.

Tiercel balances just in front of the trailing edge of the wing when, with the rigging angles shown, it has a glide comparable with that of any contest glider or sailplane. Under power it is best flown fairly straight, the slow revving propeller and lifting tailplane preventing stalling. No downthrust at all should be necessary, the model having an extremely good stall recovery. A generous amount of sidethrust can be used to give a wide right hand turn under power. No spiral instability troubles have shown up.

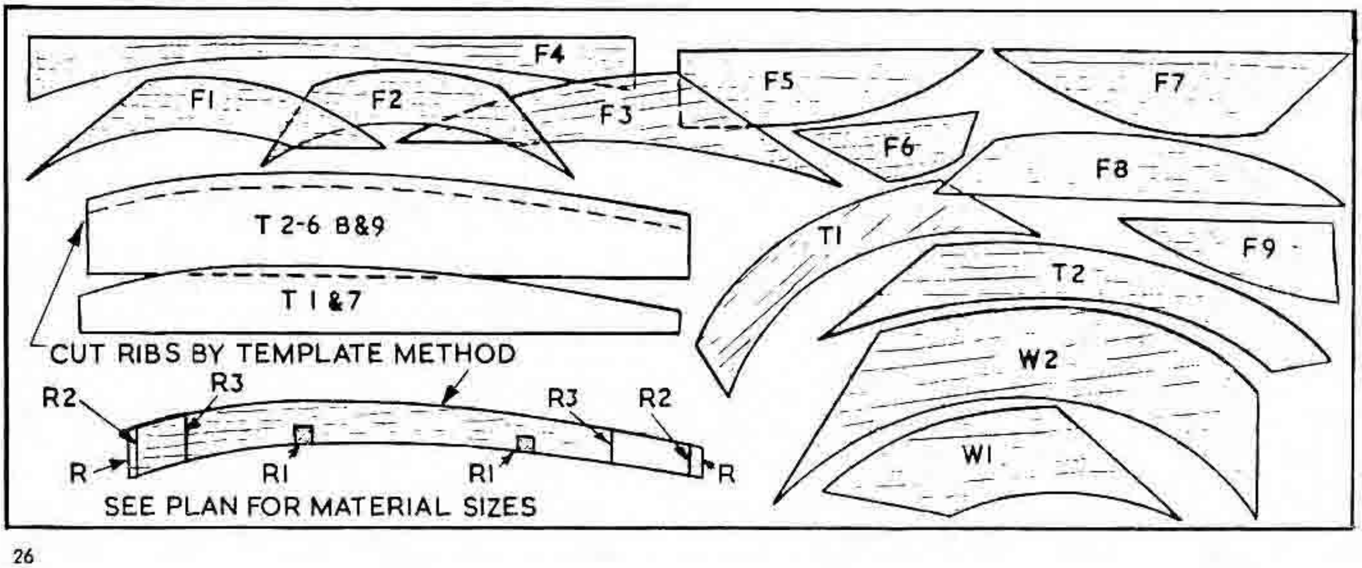
Turn adjustment on the climb is, of course, obtained with a combination of sidethrust and rudder offset. To obtain rudder offset the whole tail unit is slewed, but this should be held to a minimum. A near straight glide is as good as any. In thermals, a circle will then develop naturally.

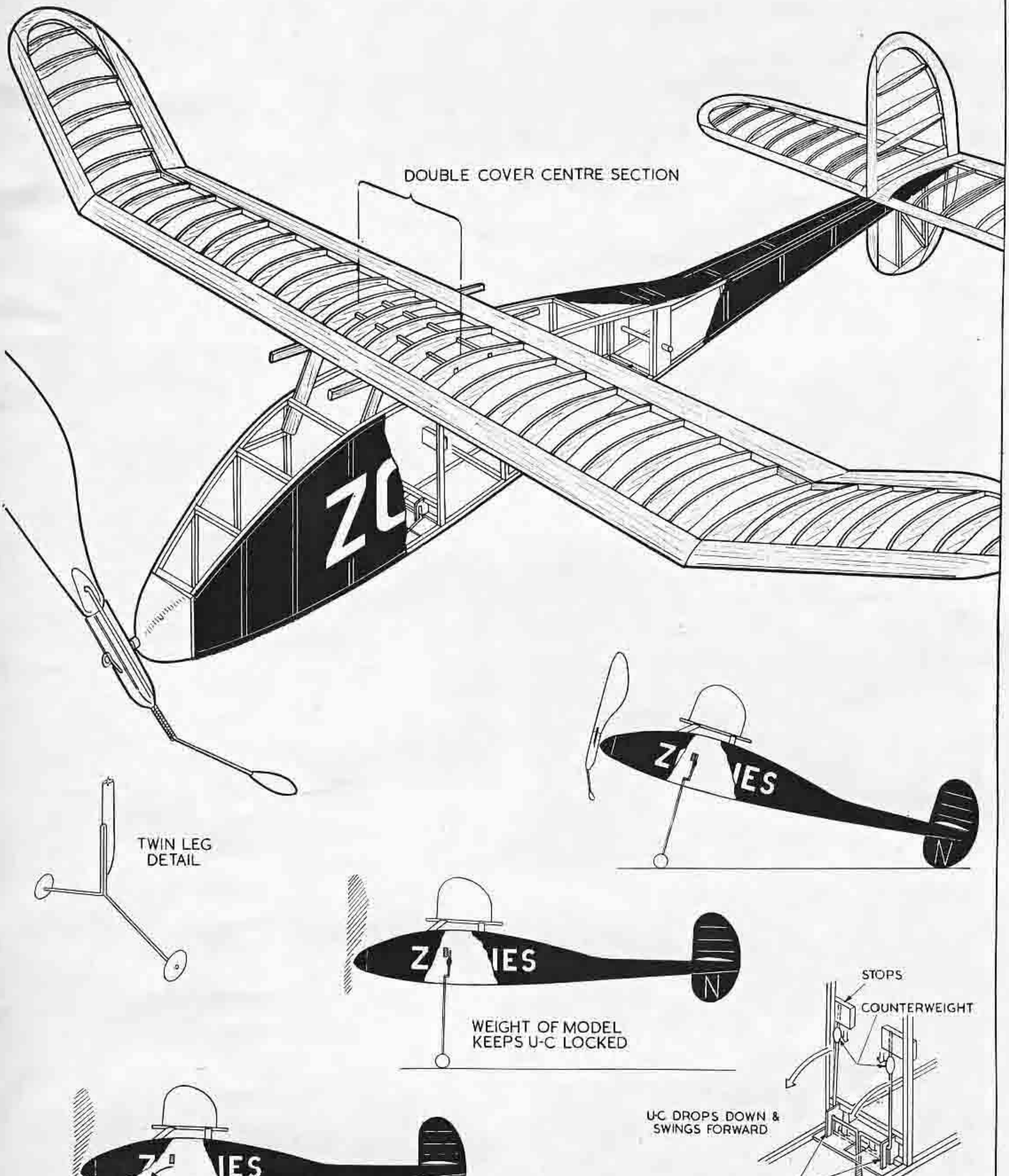
The retractable undercarriage should give no trouble, once adjusted correctly. Twin wheels are recommended for rise-off-ground work, these being accommodated on a simple V axle bound to the end of the bamboo leg. The undercarriage is gravity operated once the model has risen sufficiently for the unit to drop down in the carrying slots in the fuselage. One peculiarity is that should the model assume a near vertical attitude in flight, the undercarriage will come down again, retracting once more, of course, as soon as level flight is resumed.

A parachute-type dethermaliser is now standard, operated by the conventional fuse. The 'chute is purely circular and 10 inches in diameter. Eight shroud lines of cotton are used, spaced equally around the circumference, and these lines are tied in two bunches of four before being finally brought together and tied. This eliminated the need of a spacer and makes untangling the shroud lines easier. Parachute material is thin silk.

We rate this model extremely high, both as regards design features and consistent performance. Although the original design is now some four years old we feel that this model is still an excellent contest design and, with the increasing emphasis on F.A.I. specifications, have no hesitation in recommending Tiercel to readers as embracing the best features of the high-parasol, folding-propeller rubber model.

THE EDITORS.




DOUBLE COVER CENTRE SECTION
ZC
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KEEPS U-C LOCKED
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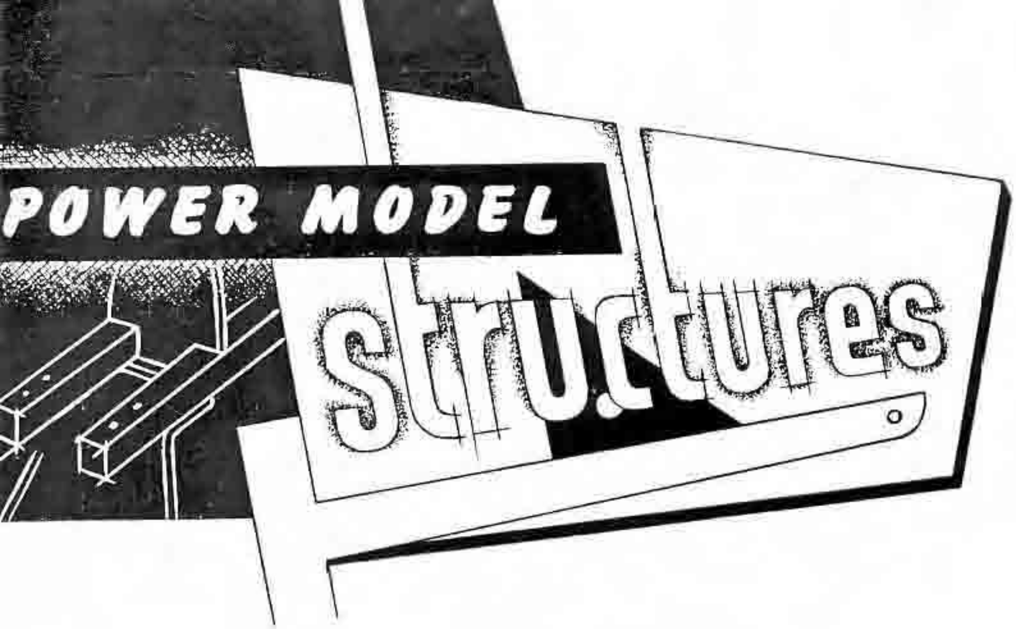


By Bill Dean

HELPFUL HINTS ON TYPES OF CONSTRUCTION BY KEILKRAFT'S DESIGNER

KIT designing has kept the writer extremely interested in power model structural developments and building methods. Naturally, many outstanding contributions to structural design have originated from the U.S.A.—home of the petrol model. However, several of the methods presented in this article have been developed or considerably improved in this country. We shall attempt to cover most of the important trends—both in control line and free flight.

FUSELAGES

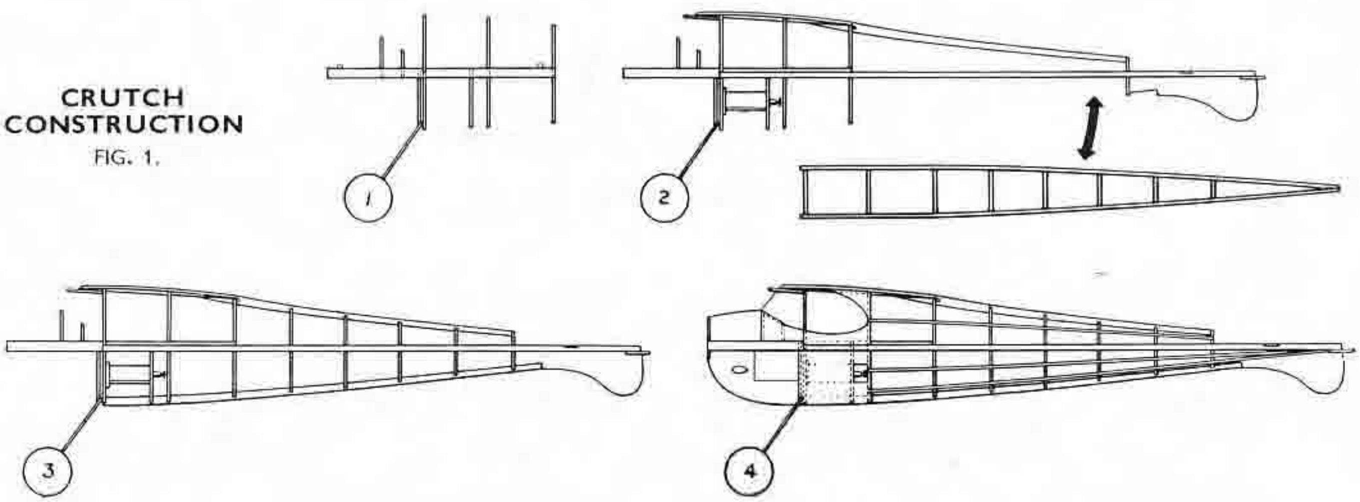
Probably the most accurate type of fuselage construction is the Crutch method. In this case, the crutch (usually on or near the centre line of the model) is first of all built flat on the plan—in the same manner as a fuselage side. The upper halves of the formers, followed by the upper stringers, being cemented in position while the crutch is still pinned down. A variation of this method—used in the Slicker and Southerner kits—is to keep the formers in one piece and fit them in front of the Spacers AFTER the crutch has been lifted from the plan. Square section wood should NOT be used for a crutch—make the cross sectional depth $1\frac{1}{2}$ times the width. Quite apart from the constructional advantages, rigging angle settings are easily checked using the crutch as a datum line. Fig. 1.

One of the most popular methods of cabin fuselage construction is still the simple slabsider, formers and stringers sometimes being added to the basic framework to give a streamlined section. However, a streamlined fuselage is best built up on the crutch system.

Slabsider or box fuselages present only two real constructional drawbacks. The first is the difficulty of producing two identical side frames—unless the longerons are of similar hardness. The sharper the longeron curves, the harder it becomes. The solution—originally developed for the Competitor kit—is to replace the sharply curved nose longerons with pieces of sheet cut to shape. Fuselage curves rear of the wing are usually gentle, and even different strength longerons will produce accurate side frames. Two kit designs using this method—the Bandit and the Outlaw—feature sheet at the nose and dead straight longerons rear of the wing for building simplicity. Use of " W " bracing helps to prevent side frames from twisting out of shape on assembly or after doping the covering. Fig. 2.

The second problem is that of joining the two side frames with the horizontal spacers. The usual procedure is to start with the two sets at the wing leading and trailing edge positions—and it is a ticklish job making sure that the joints are at 90° to the side frames. An easier way of initially joining the sides is by means of two sheet formers. Correct fuselage section is assured and after that it is a simple job to fit the remaining spacers.

Although both of the above methods are suitable for free flight and control line models, several new fuselage structures have been developed especially for controlled flight. The



CRUTCH CONSTRUCTION
FIG. 1.

first is the Hollow Log type—originated by Jim Walker for his famous Fireball design. As the name implies, the fuselage is carved from the solid—then hollowed out to a fairly thin wall. Now in use almost exclusively for speed controliners, we are unlikely to see Hollow Log fuselages widely used for kit purposes in this country on account of the large wastage of wood involved. However, the majority of original design speed models employ this fuselage construction, hardwood being favoured in preference to balsa. The usual method of building Hollow Log fuselages is to join two pieces of block along the centre line of the model, then turning (on a lathe) or carving to the outside shape. After completely finishing the outside surface, the two pieces are prised apart and the inside hollowed out with gouges. The engine, fuel tank and accessories are usually housed in the lower fuselage shell—and the wing, bellcrank and tailplane attached to the upper half.

A popular type of fuselage construction—in general use for control line trainers—consists of sheet sides cemented

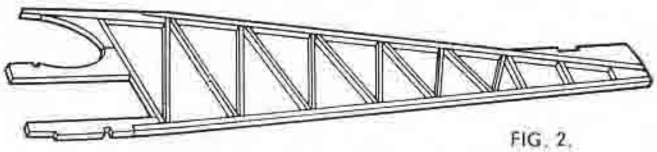


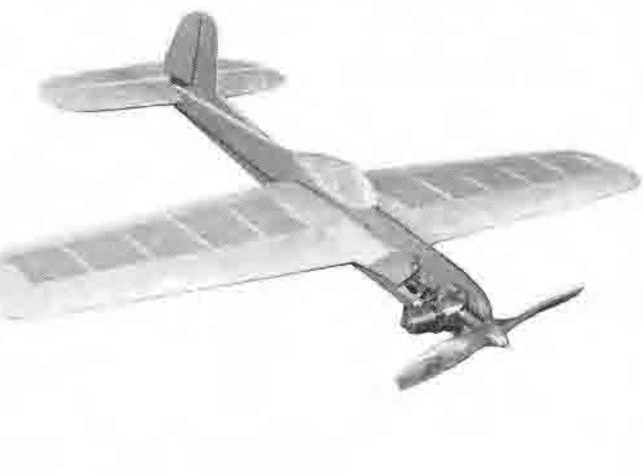
FIG. 2.

to sheet formers. The top of the formers are usually rounded, and planking added to give a more pleasing appearance. Engine bearers may be cemented directly to the fuselage sides. It is a good plan to anchor the bellcrank assembly to the engine bearers on a control line model—the bearers being the backbone of the fuselage structure.

The simplest and quickest way of building up a control line stunt or trainer fuselage, is by the Profile method. Profile fuselages may be built up in the same way as a fuselage frame—then covered in with sheet. Quicker still is the type made from thick (medium hard) sheet, with slots cut out to accommodate the bearers, wing, tailplane and bellcrank. We designed the Stuntmaster on this principle and found that for strength, a Profile fuselage has no equal.

Building procedure is simple—for this Mills-powered stunt design. Half-inch thick sheet, joined along the centre line, is employed. The undercarriage and bellcrank are first attached to the lower bearer. This assembly is then cemented to the lower profile sheet. The completed wing and tailplane are next cemented to the lower profile assembly. Then the upper profile sheet is cemented in place and the fin slotted in a vertical notch at the tail. After rounding off the edges of the fuselage, all that remains is to install the diesel, tank, pushrod, tailskid, etc. Side mounted engine

● Dolly version of the STUNTMASTER. Profile fuselage construction is detailed on right.



● 1949 version of the famous SLICKER (span 44") features crutch fuselage construction.

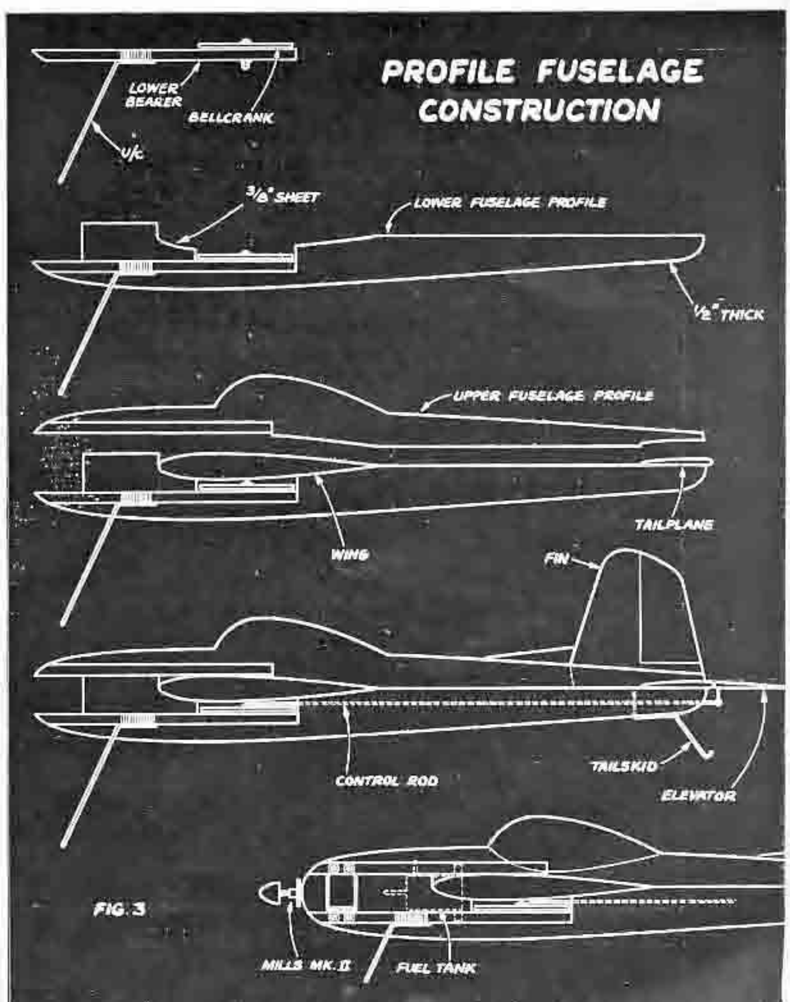
attachment comes naturally with a Profile fuselage—cylinder head preferably facing outwards. Fig. 3

UNDERCARRIAGES

Most free flight models feature a simple single leg fixed undercarriage. Except on ultra high-performance contest models, retracting undercarriages are usually more trouble than they are worth. In any case, whichever type is chosen, it should always be mounted on a plywood former or the actual engine bearers. "J" bolts are useful in attaching a wire undercarriage to a plywood former. The "Mercury" type, which pushes into a fibre box, is about the neatest detachable undercarriage that we have yet come across.

One of the most widespread methods of undercarriage attachment is to sandwich the wire between a ply former and another piece of ply, keeping the whole together with several wood screws. Direct attachment to the engine bearers—the Phantom type—is simple. Just bend the wire to shape and

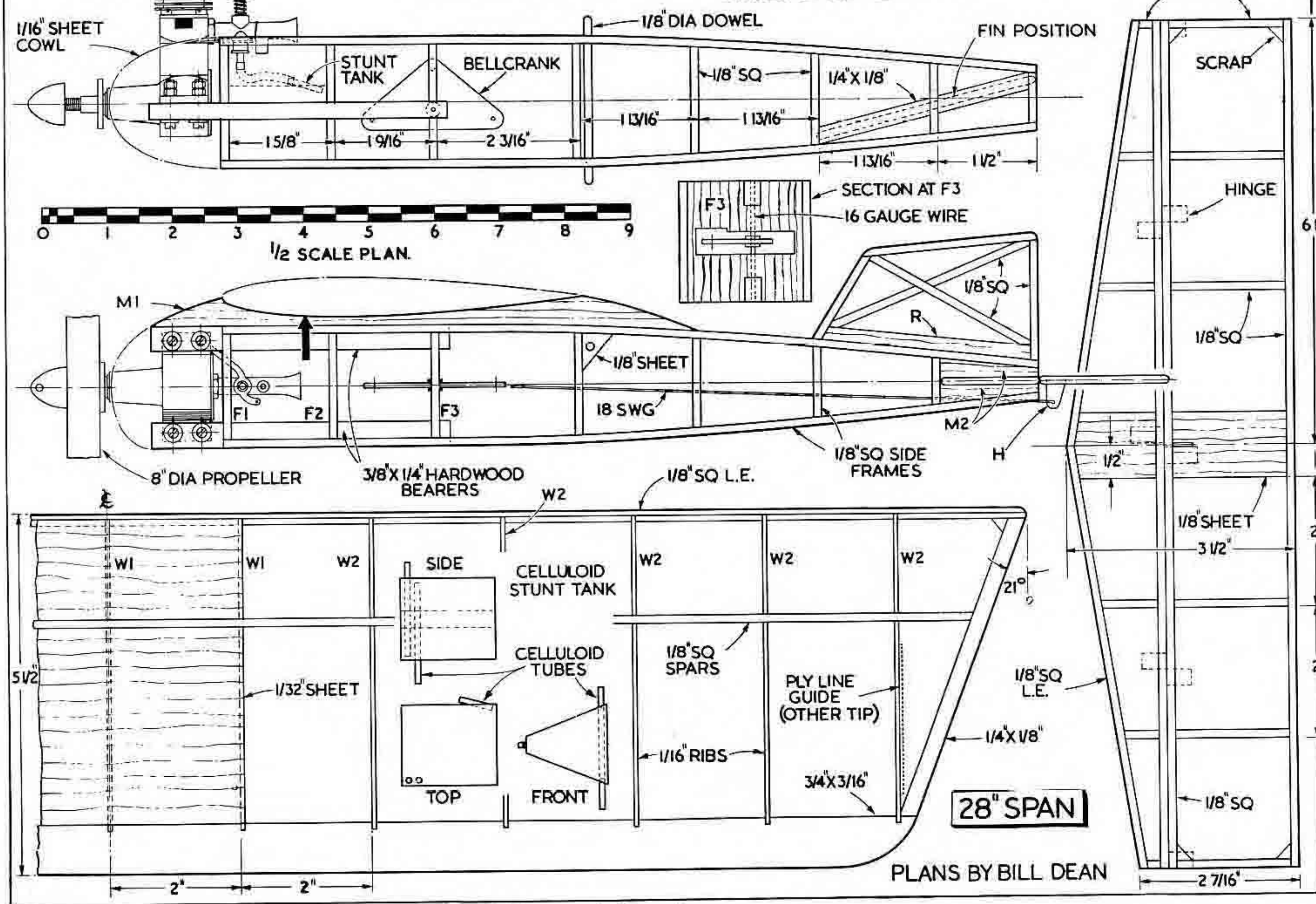
(Turn to page 53)



SMALL FRY

BY RON PRENTICE

WINNER OF THE 1948 ALL-HERTS RALLY STUNT EVENT



Plan 1/2 size

Small Fry

Winner 1948 All Herts Rally

OPEN STUNT

BY RON PRENTICE

SMALL FRY is simple to build and ideal for a first stunt model. The original won the stunt contest at the 1948 All Herts Rally at Radlett—proving once again that small British diesels can hold their own against larger American engines such as the Super Cyclone. I believe that it will do every stunt possible with a control line model. In any case, all the manoeuvres in the S.M.A.E. Stunt schedule have been successfully completed. Contests have also been won with a scaled up version powered by an Elfin 1·8.

This design is typical of the small box type stunt model popularised by the West Essex Club. To keep the wing loading low and cut down on drag, no undercarriage is fitted. After a little practice, hand-launching is as easy as the orthodox take off method. Although the model was designed in the first place for the Mills 1·3, any similar diesel may be used—such as the F. D. Bee, Foursome, Frog 160, etc. The C.G. position should NOT be further back than that shown on the plan. Using this design as a basis, different size models—to suit any engine you choose—may be drawn up.

The drawings on the opposite page are ½ size, so they must be enlarged to give a working plan. Full size ribs, formers and other parts are provided at the back of the book. If you want to save time, send off to the publishers for full size plans.

Construction is easy providing these notes and the plan are carefully followed. Cover the drawings with greaseproof paper to protect them from cement. The wing is detachable for easy transportation and the engine is side mounted to protect the cylinder head and ensure similar running characteristics in both upright and inverted flight.

FUSELAGE

Choose very hard ⅛-in. sq. balsa for the fuselage framework. Cut the wing and tailplane mounts (M1 and M2) from medium ⅛-in. sq. sheet. Build two sides flat on the plan in the usual way. When dry, lift up and insert the F1-F3 formers—followed by the crosspieces. Now glue the ⅜-in. by ¼-in. hardwood engine bearers in with Durofix. When dry, drill holes in the bearers to take a piece of 16-gauge piano wire (pivot point). Hold the control plate in position and push the wire through the bearers. Add the wing fixing peg behind the wing T.E.

WEDGE TANK

The stunt tank is detailed on the plan and built up from celluloid sheet—using cement to join the edges. Build this component carefully and check for leaks before installing it in the model. The tank is positioned between F1 and F2. The edge of the wedge should be on a level with the needle valve. THIS IS IMPORTANT.

TAILSURFACES

The tailsurfaces are built from ⅛-in. sq. balsa. The tailplane features a central brace of medium ⅛-in. sheet. The control horn (H) is cut from 1/16-in. ply and notched into the elevator. Cement the fin in position after it and the fuselage have been covered. Cut the hinges from linen tape.

WING

Cut the wing ribs from medium 1/16-in. sheet. Use hard ¼-in. sq. for the leading and trailing edges. The trailing edge is shaped to a triangular section before cementing in position. Start by attaching the ribs to the main spars—then follow with the leading and trailing edges. The centre section is covered with medium 1/16-in. sheet. Cement in the 1/32-in. ply line guide and add the ¼-in. by ⅛-in. wing tips.

COVERING

The entire model is covered with rag tissue and given two coats of full strength glider dope. Pin the flying surfaces down while the dope is drying—to avoid distortion.

FLYING

All up weight should not be more than 8¼ ounces—otherwise the model will be sluggish. The best propeller for this design is an 8-in. by 6-in. Truflo. Use 40-ft. lines and carry out the first test flights in fairly calm weather. When you become proficient, the model may be flown in the windiest conditions.

(Turn to page 65 for full size parts)

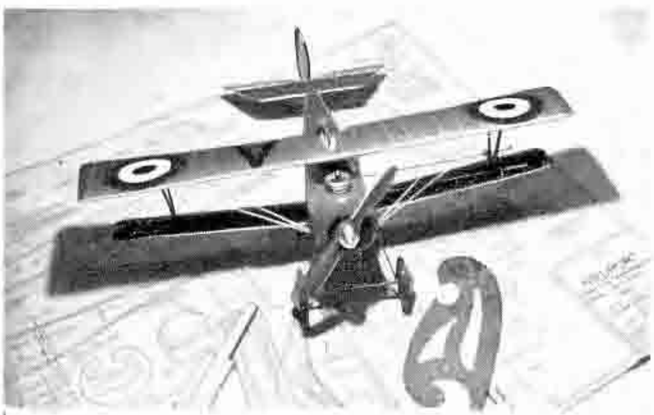
Nieuport

By R. D. Randerson

THE Nieuport Scout was one of the most famous fighting aeroplanes of the Great War, 1914-18, and in the hands of Billy Bishop, Werner Voss and others, the machine was a scourge to any hostile aircraft in any sector of the front.

This French machine became known in 1917 as the type 17.c. Scout, but before the year was out this model was improved upon and type XXIII was introduced.

In those days there was a continual struggle for faster speeds and greater armament, and already the Nieuport had stepped up its power from the 110 h.p. Le-Rhone to the 120 h.p. engine.



The armament was also improved and in addition to the single Vickers gun, mounted on the fuselage in front of the pilot, a Lewis gun was fitted on the top of the centre section so as to clear the propeller.

Further armament was provided experimentally by fitting rockets to the interplane struts and this was perhaps the first of the rocket projectiles now so common with strike aircraft.

When one constructs a scale model it may be because one has a liking for that particular aircraft or because it represents a machine that has featured in one's past and revives pleasant memories. Whatever the reason may be, it cannot be denied that the scale model is unique in its own sphere.

Flying scale models have in the past suffered unpopularity due to their relatively poor performance when compared with free flight contest models, but with the introduction of control line flying, the scale model is finding a place in the field of contest flying.

The Nieuport Scout did not feature in my past, indeed, it was a little before my time, but it does revive many pleasant

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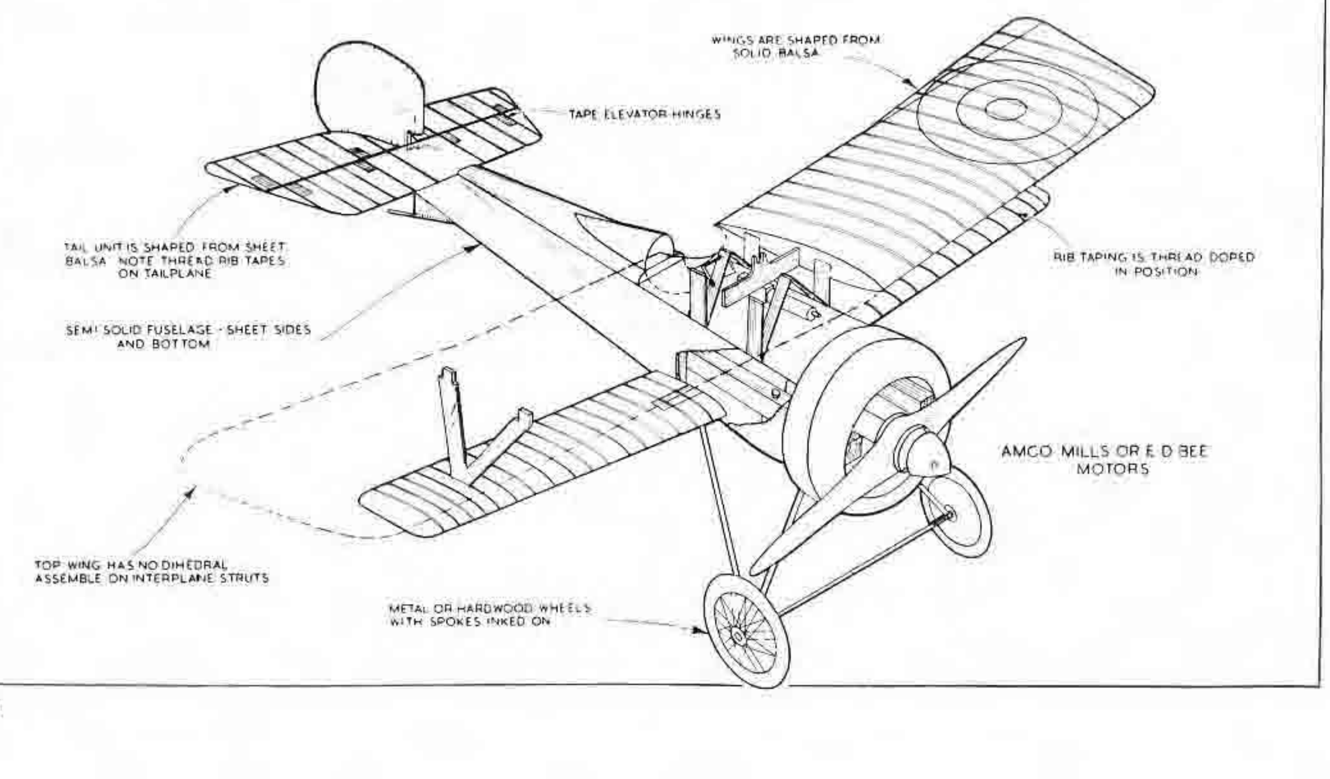
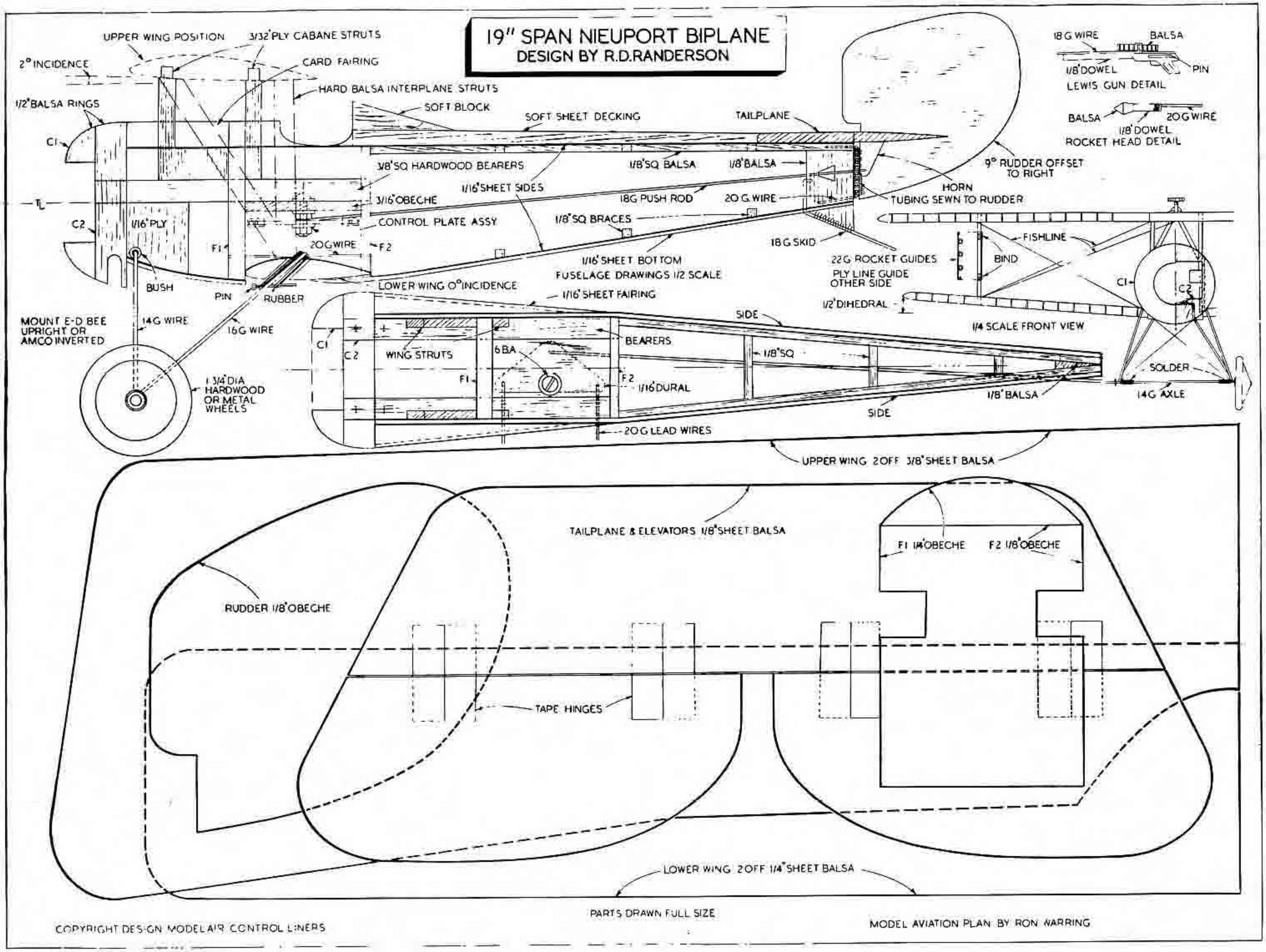
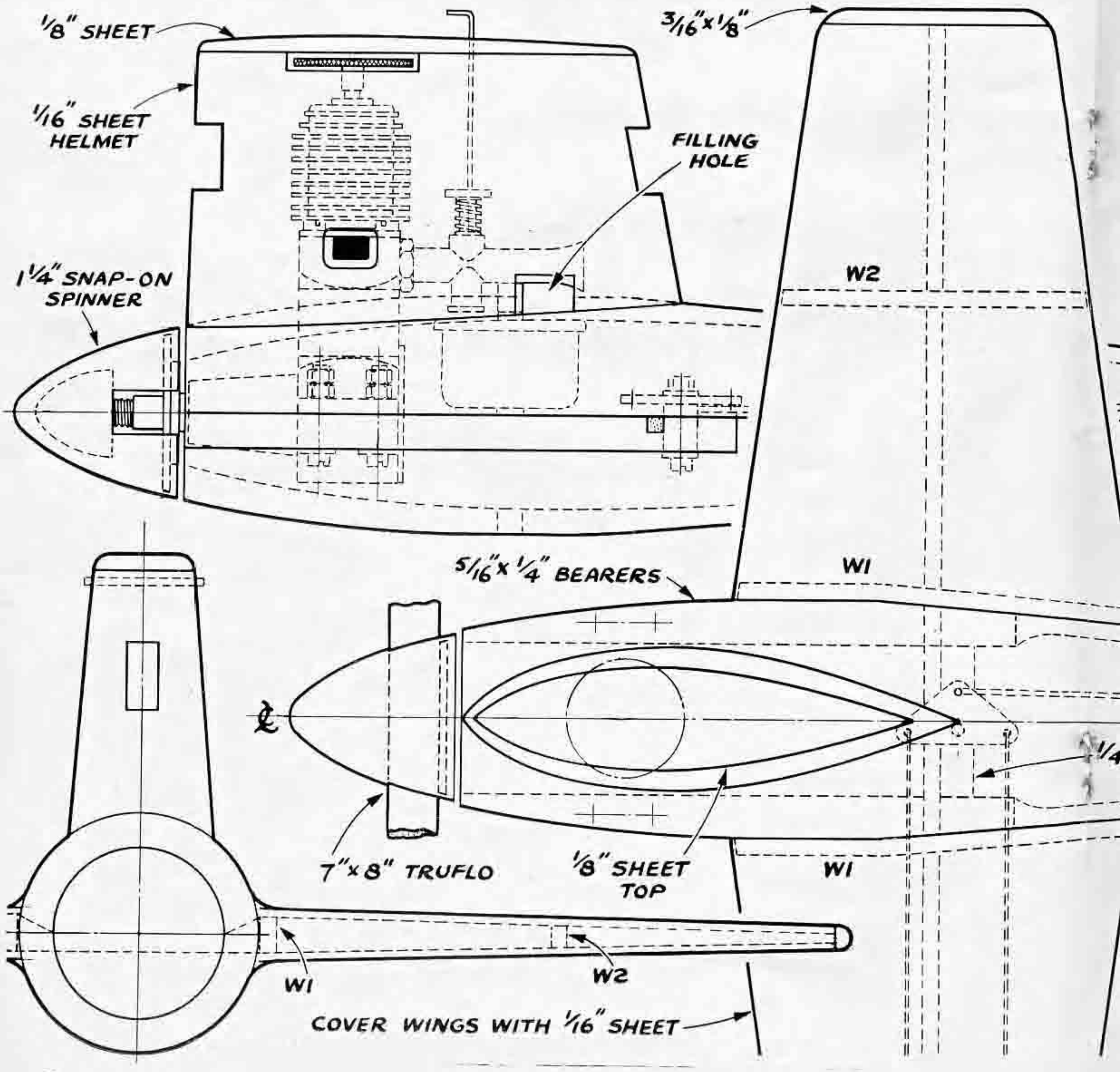



19" SPAN NIEUPORT BIPLANE
DESIGN BY R.D.RANDERSON
UPPER WING POSITION
3/32" PLY CABANE STRUTS
CARD FAIRING
2° INCIDENCE
HARD BALSA INTERPLANE STRUTS
1/2" BALSA RINGS
SOFT BLOCK
SOFT SHEET DECKING
TAILPLANE
C1
3/8" SQ HARDWOOD BEARERS
1/8" SQ BALSA
1/8" BALSA
1/16" SHEET SIDES
3/16" OBECHE
18G PUSH ROD
20 G. WIRE
HORN
TUBING SEWN TO RUDDER
9° RUDDER OFFSET TO RIGHT
C2
1/16" PLY
CONTROL PLATE ASSY
1/8" SQ BRACES
18 G SKID
F1
20G WIRE
F2
1/16" SHEET BOTTOM
FUSELAGE DRAWINGS 1/2 SCALE
22G ROCKET GUIDES
PLY LINE GUIDE OTHER SIDE
BUSH
PIN
RUBBER
LOWER WING 0° INCIDENCE
1/16" SHEET FAIRING
MOUNT E-D BEE UPRIGHT OR AMCO INVERTED
14G WIRE
16G WIRE
1 3/4" DIA HARDWOOD OR METAL WHEELS
SIDE
WING STRUTS
BEARERS
6BA
1/8" SQ
1/16" DURAL
1/8" BALSA
SIDE
20 G LEAD WIRES
18 G WIRE
BALSA
1/8" DOWEL
PIN
LEWIS GUN DETAIL
BALSA
20 G WIRE
1/8" DOWEL
ROCKET HEAD DETAIL
FISHLINE
BIND
1/2" DIHEDRAL
1/4 SCALE FRONT VIEW
SOLDER
14G AXLE
UPPER WING 2 OFF 3/8" SHEET BALSA
TAILPLANE & ELEVATORS 1/8" SHEET BALSA
F1 1/4" OBECHE
F2 1/8" OBECHE
RUDDER 1/8" OBECHE
TAPE HINGES
LOWER WING 2 OFF 1/4" SHEET BALSA
PARTS DRAWN FULL SIZE
COPYRIGHT DESIGN MODEL AIR CONTROL LINERS
MODEL AVIATION PLAN BY RON WARRING

BULLET

by Donald Dowell



FULL SIZE PLANS
of the 1948 All Herts Rally speed winner

DESIGNED especially for contest flying, the Bullet is capable of speeds of 70 to 80 m.p.h., when powered with the Mk. II Mills diesel. The original model won the Class 1 (up to 2 c.c.) Speed event at the 1948 All Herts Rally at 62·48 m.p.h. Best speed so far recorded by the writer's model is 85 m.p.h.

Construction is quite simple and the adjoining plans are drawn full size. No scaling up is necessary, so you can lay a sheet of greaseproof paper over the drawings and get to work right away.

FUSELAGE (1)

This is built on the hollow log principle—two pieces of block balsa (12-in. × 1¾-in. × ⅞-in.) being required. Lightly cement the blocks together along the centre line, mark on the top and side profiles, then fretsaw away the surplus wood. This will give a symmetrical block, which can be carved and sandpapered to a circular section as indicated on the plan. When completely finished externally, carefully split the two halves apart and hollow them out to make room for the engine and control components. The wall thickness is ⅛-in. behind the bearers, but increases towards the nose.

¼-in. deep recesses for the bearers are next cut in the lower shell. Bolt the diesel to the bearers and lock the bolts by soldering a strip of brass across each pair. Now cement the bearers in position and when dry, trim away the surplus on the outer edges. Give the inside of both shells several coats of clear dope for fuel protection.

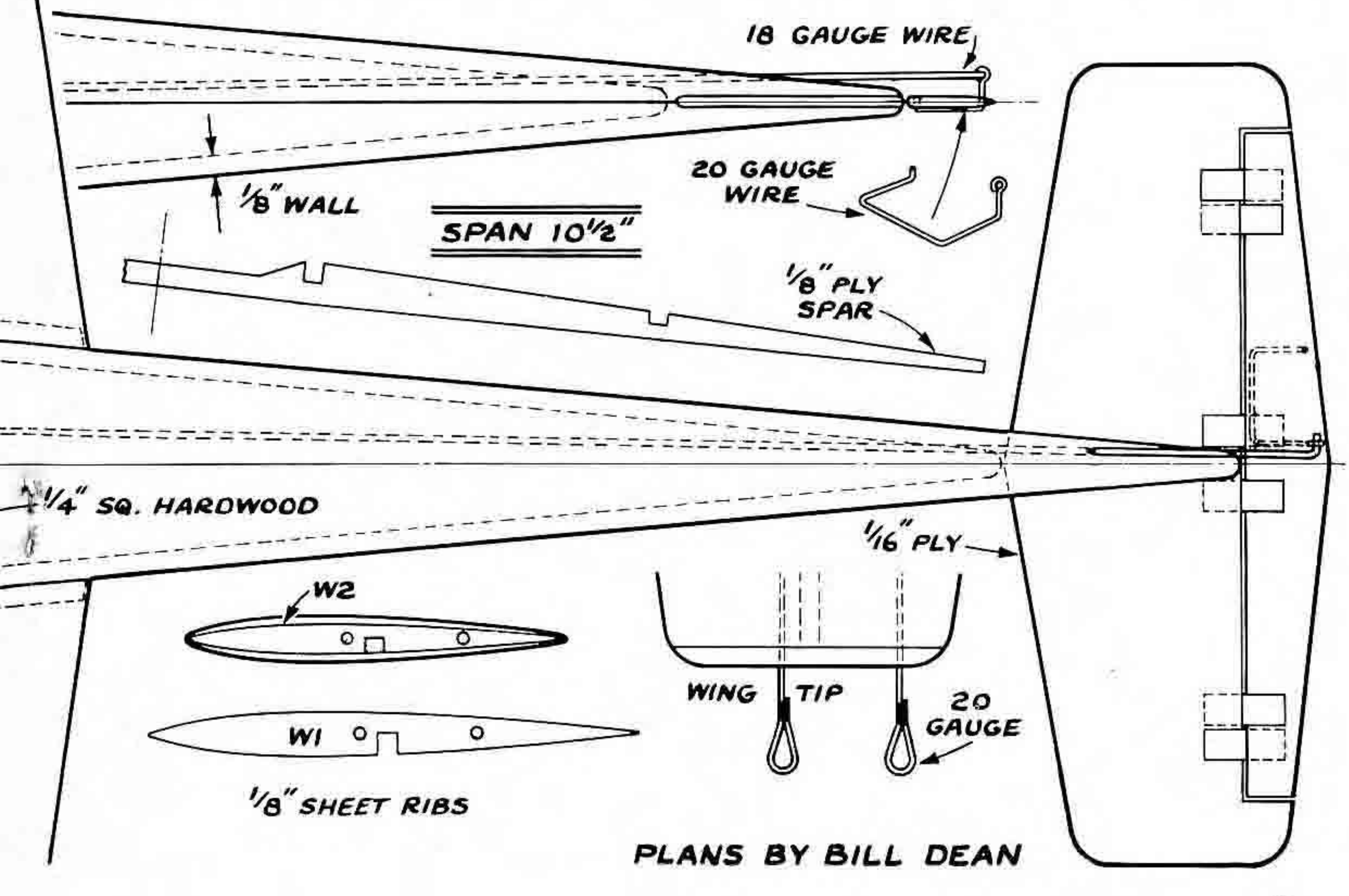
WINGS

Fretsaw the ⅛-in. ply spar to the pattern provided (trace the other half) and cut out the W1 and W2 ribs (holes for lead out wires in left wing only). Cement the ribs to the spar and crack the forward portions of the W1 ribs so that they follow the fuselage contour. Cut an ⅛-in. square slot in the bearers to receive the spar and see that the inner ribs line up correctly with the lower fuselage shell.

Bend the control wires to shape and insert in the left wing. Now cover the wings with medium 1/16-in. sheet—using pins and Scotch Tape to keep the leading and trailing edges together whilst the cement is drying. The tips are formed from two pieces of 3/16-in. × ¼-in. strip. The wing assembly is next dropped into place—the root ribs and spar being well cemented to the lower fuselage shell.

CONTROL ASSEMBLY AND TAILPLANE

The control assembly is conventional, with a 1/16-in. ply or aluminium bellcrank pivoted on an 8 B.A. bolt. Order of assembly is as follows: Insert bolt through 1 washer, ¼-in. square hardwood support, 2 washers, bellcrank, 1 washer. Keep the whole together with an 8 B.A. lock nut and finally glue the ¼-in. square support between the bearers immediately behind the wing spar. *(Turn to page 52)*



MILLS DIESEL 2·4 and ·75

TEST REPORT

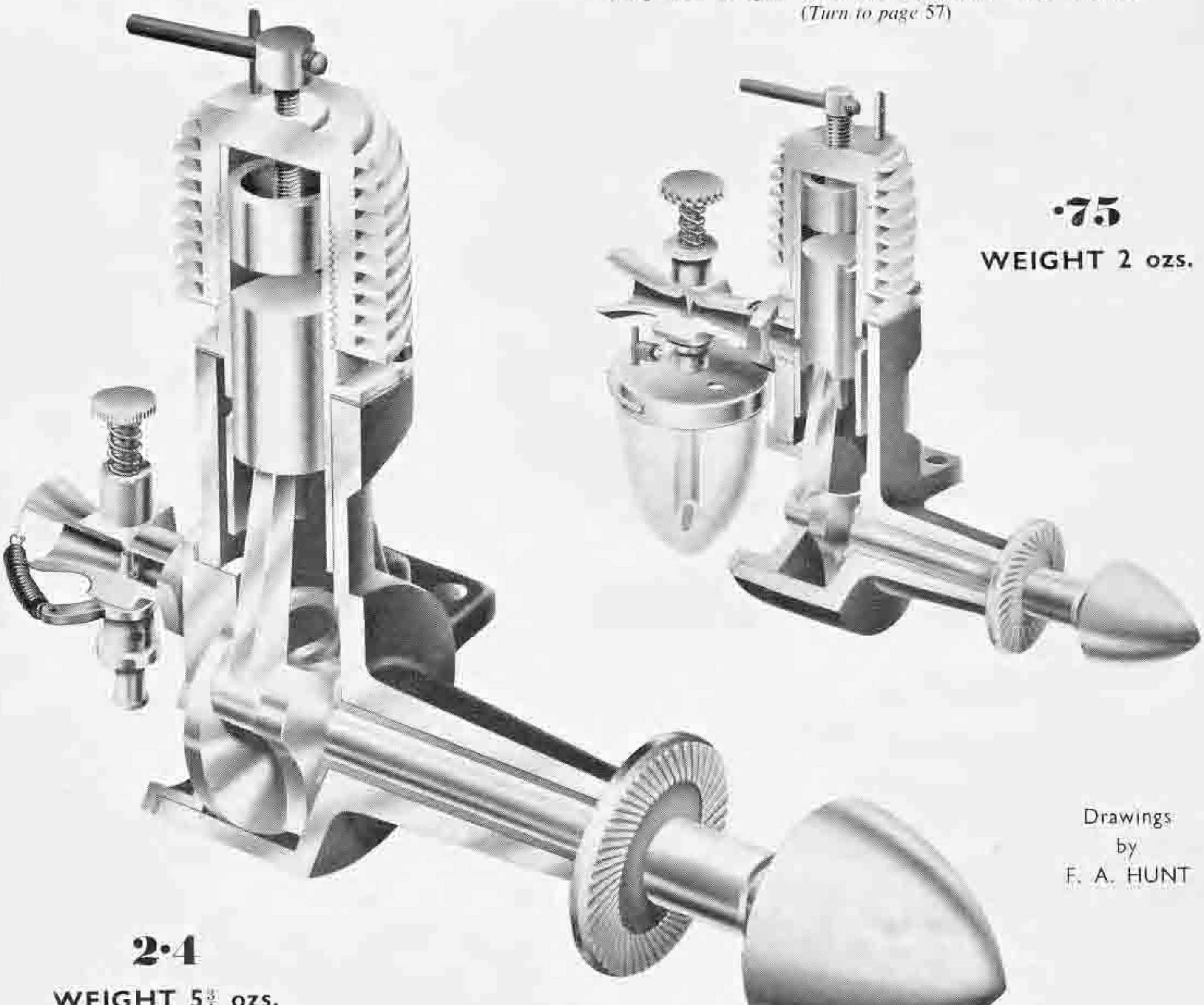
THE original Mills Mark I has become one of the "standard" British diesels, exemplifying good and reliable power output allied to an interior and exterior finish comparable with that of the best American miniature aero-motors. The same basic design has now been reproduced in two other capacities, the smaller motor (Mills ·75 c.c.) being a typical sports job catering for the "under 1 c.c." fans. The larger 2·4 Mills comes within the upper limit of the S.M.A.E. Speed Control Line, Class II, and the free flight, Class A, and hence has, presumably, been produced as a competition power unit. The smallest "standard" American motor coming in our Class II control line is the ·099 size (1·6 c.c.) and the larger capacity of the Mills should result in a marked improvement in power output over American contemporaries in the same class.

Construction of both the Mills ·75 and Mills 2·4 is similar. The larger motor has a disk rotary inlet valve and separate tank. The ·75 retains the familiar Mills side port induction.

Both crankcases are of magnesium, that of the ·75 being gravity die cast, and the 2·4 pressure die cast. The main bores of the crankcases are machined to a limit of ·0005 inches, no limit being permissible for out-of-roundness.

Main bearings are of phosphor bronze, that of the 2·4 being cast integral with the crankcase. The one-piece

(*Turn to page* 57)



·75

WEIGHT 2 ozs.

Drawings by F. A. HUNT

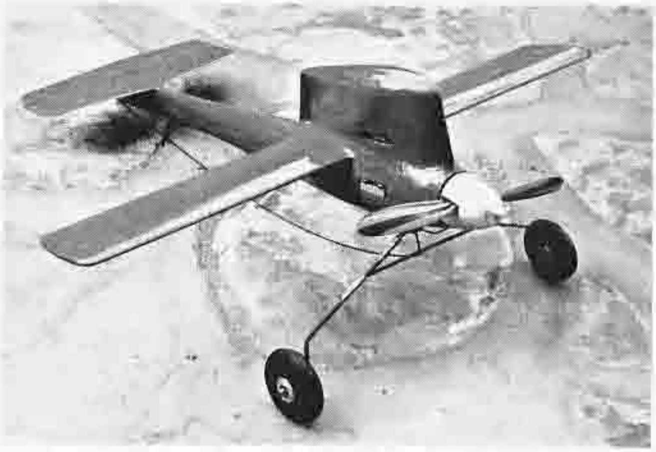
2·4

WEIGHT 5¾ ozs.

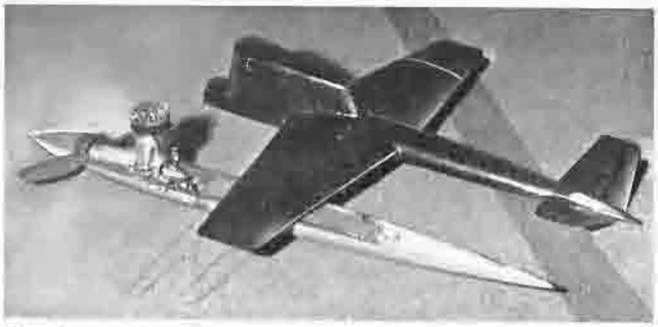
● Film star Hy Hazel takes a look at Cyril Shaw's graceful NEEDLENOSE. Model is 20" span, 24½" long and powered with a Fox 59. Hy is 25 years old, has a 25" waist, blue grey eyes and blond hair. Satisfied !

ACCENT ON SPEED

TYPICAL EXAMPLES OF THE LATEST TRENDS IN BRITISH AND AMERICAN SPEED DESIGN



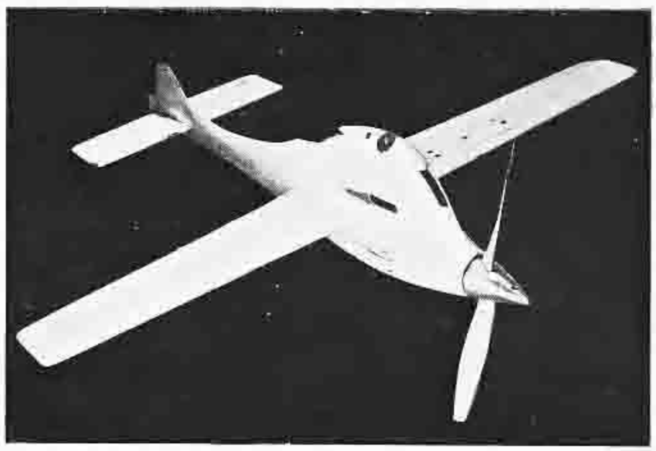
● Hornet powered model by H. A. Thomas of Little Rock, Arkansas, U.S.A. Speed fans will recognise the design as J. L. Sadler's LITTLE ROCKET. Best speed to date is 128 m.p.h.



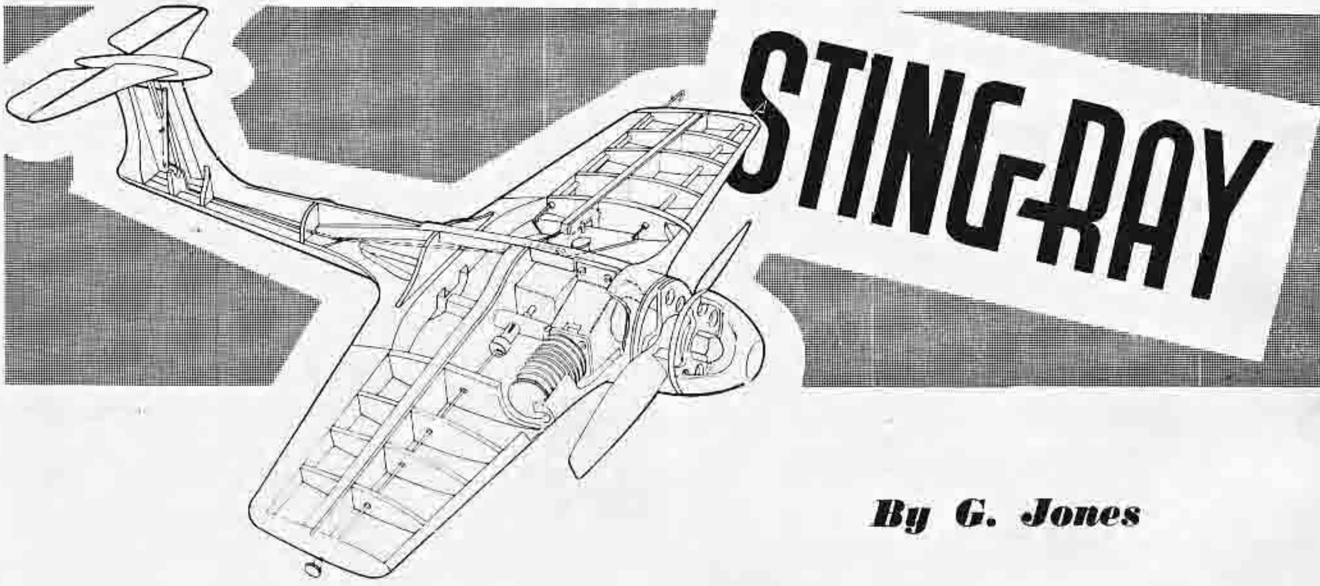
● Another Fox 59 model—this time with the lid off to show engine and tank installation. Similar to job in top picture except for square tips. Built by Wiz Pease.

● John Wood's latest version of his Nordec powered RACER design. This model won the 1948 Isle of Man Open Speed Trophy and the London Area S.M.A.E. Contest (109.75 m.p.h.).

● Two semi scale racers by Les MacBrayer (No. 3) and Keith Storey—of the Los Angeles FAST club. Motors are K & B Torpedo in No. 3 and McCoy 29 in No. 6.



● WHITE FAWN—a McCoy 29 design by Anthony Grish. Best contest win—Class B Open at the 1948 American Nationals with 137.93 m.p.h. Features 1½-in. long extension shaft.



STING-RAY

By G. Jones

Stingray is an "out of the rut" model which has many features to interest control line speed fans. It is essentially a practical design—the prototype being evolved by eye, step by step, without a plan, as the designer describes in this article. The 68-70 m.p.h. achieved with a Mills Mark I is pretty fast and ample confirmation of Mr. Jones's method of working. —THE EDITORS.

THE Stingray was built because I felt the usual modeller's urge to build something different, and, as I had got the idea of C/L pretty well pinned down and had already built five or six controliners including stunt, scale and the usual "knockabout" models, I felt something new was called for. Now I know that a sidewinder is nothing new, but the general aim was to cut the frontal area down to a minimum and still preserve a fairly decent appearance.

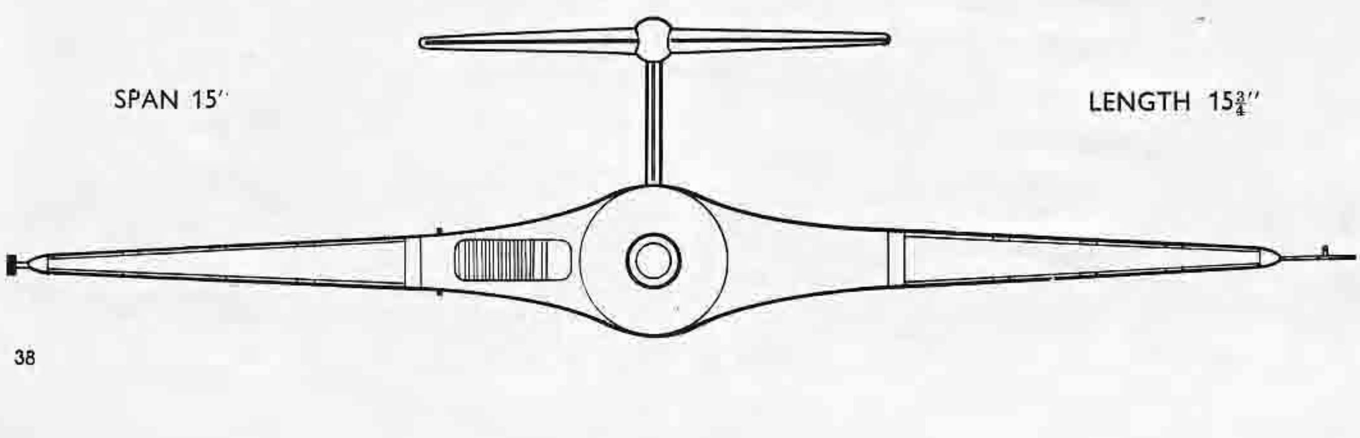
The model started life as two lengths of hardwood bearer bolted to a Mk. I Mills. As the model was to be a "sidewinder" the bottom bearer was in a position to take all the hard bumps and scraping, so it was decided to utilise a dolly take off. Now the idea started to form that this layout had possibilities as a speed design. As already stated, the engine was on its side so it was decided to enclose the cylinder head inside the mainplane. A former was cut from ply and with much cutting and sanding, made to fit between the bearers behind the engine.

An identical former was cut from balsa sheet and cemented into place also. This gave me something to cement the next of the bits to as I went along and showed me just how much the frontal area could be cut down. By judicious use of a rasp, this former was further reduced in size until, upon holding the framework and looking from the front, the former outline stood proud of the Mills outline by about one sixteenth. This cleaned up the front view and, after trimming the ends of this former until the required span was arrived at, I turned my attention to the side view.

The two rear ends of the bearer were now cut to the length required and chamfered so that they could be steamed and cemented at the ends. The next consideration was the rear half of the fuselage. For this I required something small in section, yet strong enough to take a fair amount of punishment when the model was set down roughly. I used two pieces of quarter square spruce which were cemented into place beneath the near end of the bearers. That was about all the weight I could afford back there as the engine was practically on the C.G., so I had to step carefully. The fin I decided should support the tailplane as this would get it well clear of the ground and also allow it undisturbed air in which to operate. The fin was then built and the control system installed. The activating wire was in one piece on the original model, necessitating numerous bends and kinks which were too complicated for everyday use and this was modified to the present lever system. The fuel tank was formed from shim brass and duly squeezed in at the back of the engine. The cooling air was to come through the spinner, so I turned one from hardwood and hollowed it out. Two circular disks the same size as the spinner were cut and placed one in front of the prop and one behind. The space between and around the prop was filled with plastic wood and, when set, six holes were drilled from back to front to

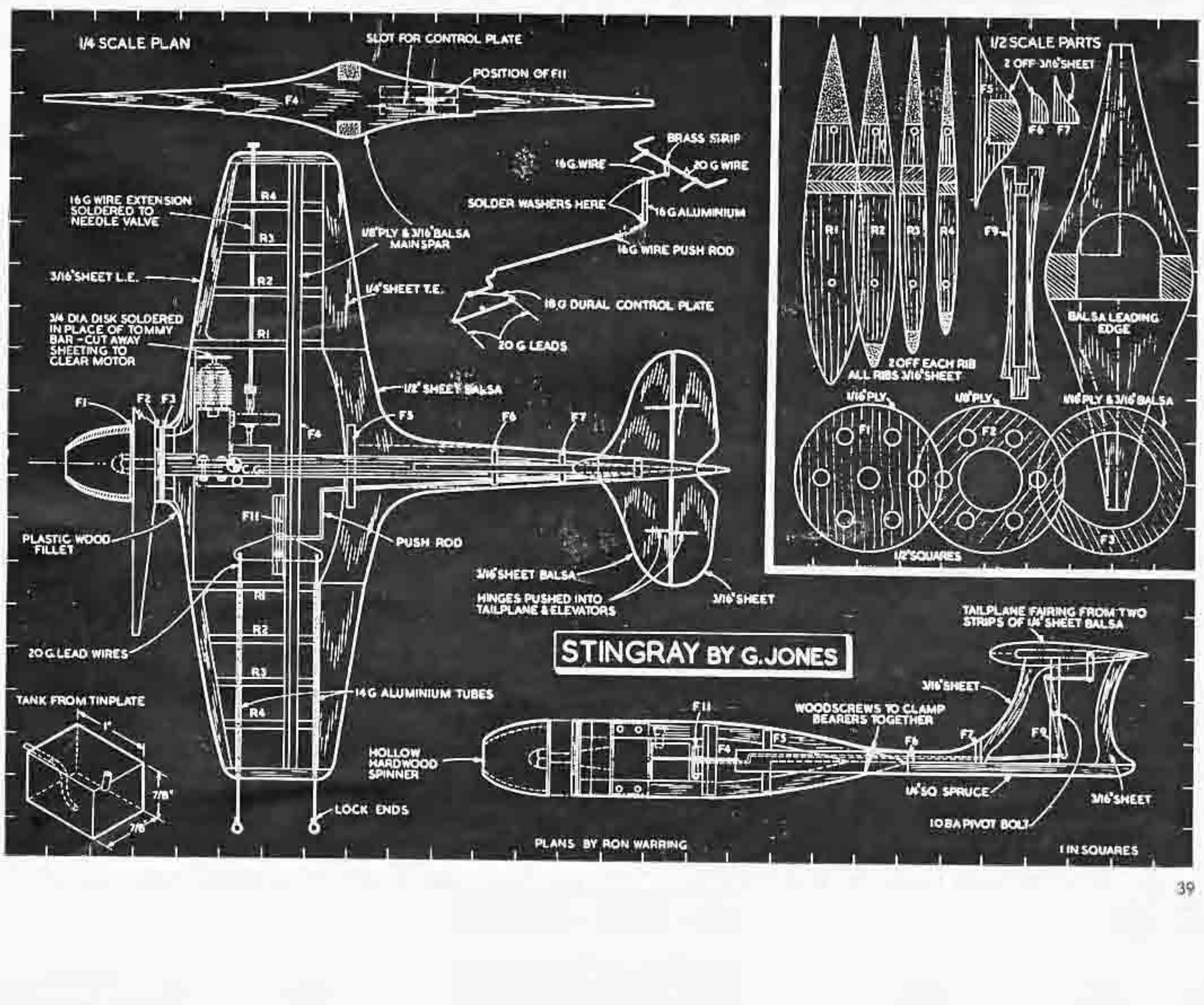
SPAN 15"

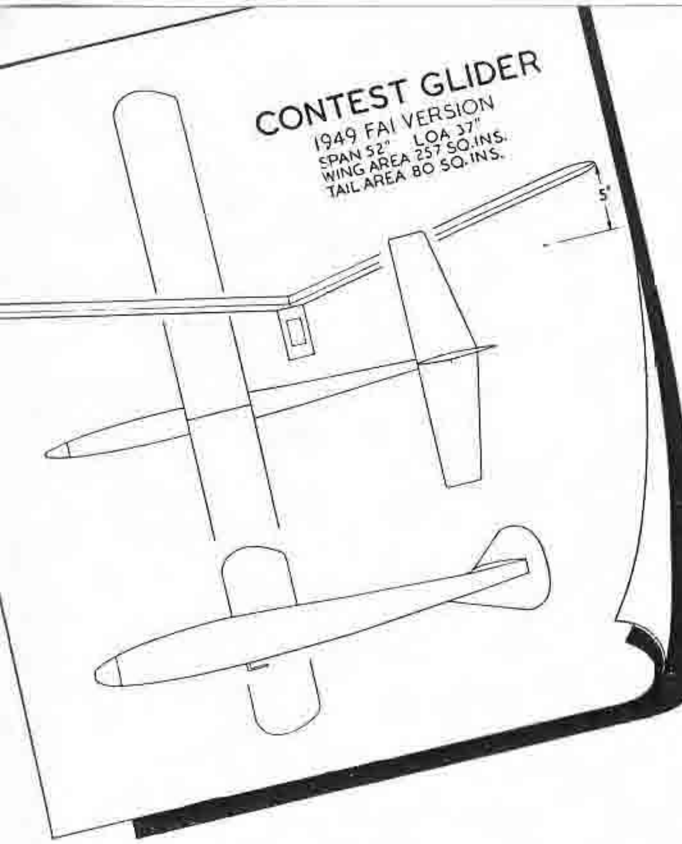
LENGTH $15\frac{3}{4}$"



allow for the passage of air. After bolting this backplate assembly in place the spinner was cemented on. The air for carburettion and cooling could then flow through the spinner front up the front of the crankcase and be vented through the wing at about fifty per cent of the chord. This is different from the final plan, but in the original model the fins were turned off the cylinder head and the engine was completely enclosed in the wing. Compression adjustment was a bit of a problem, but this was surmounted by utilising a brass disk in place of the usual compression rod. The needle valve was extended to the wing tip so making all controls readily accessible. A choking hole was unnecessary as it was thought (and proved correct) that if the needle was opened and the model held on its side, the fuel would flow into the intake by gravity alone. The difficult part being over, planking was commenced and, after a little more sanding the formers gave nice easy flowing lines and the model was completely covered. Grain filling was carried out with Glider dope.

The lines used for flying are 33 gauge and 33 and 40 ft. in length. The model becomes airborne after about half a lap. Besides being fast I found that wing overs were accomplished with ease and, by gradual application of up elevator it is possible to fly the Stingray at around 25-30 m.p.h. The top speed, using an 8 × 12 Tekniflo and a Mk. I Mills, is about 68-70 m.p.h. The dolly may slip a bit on take off and the cure for this is to bind the upper frame with adhesive tape. The prop is arranged so as to be horizontal just as the engine is coming on to the compression stroke. The wind generated by the motion of the plane will then hold the prop in the horizontal position for landing.



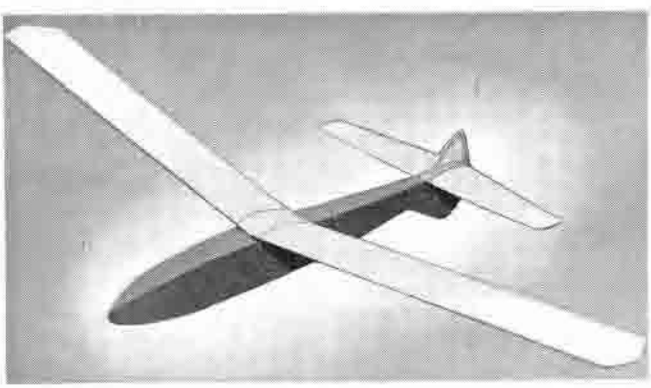


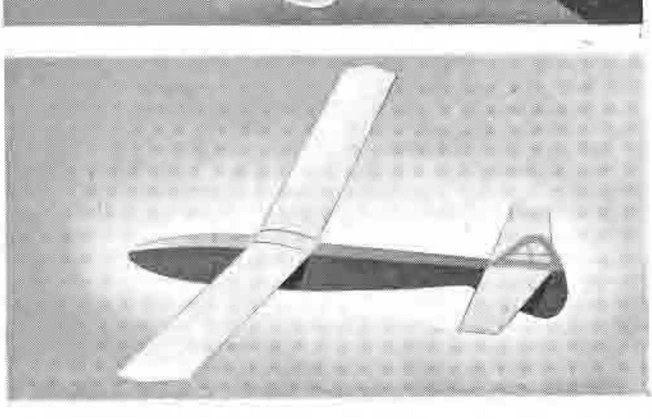
CONTEST GLIDER

1946
Eaton Bray (Open) † 1st
Thurston Cup * 3rd
1947
Surbiton Gala 2nd

By Ron Warring

STRAIGHTFORWARD CONSTRUCTION AND EXCEPTIONAL TOW-LINE STABILITY HAVE BEEN WORKED OUT TO THE LIMIT ON THIS DESIGN. BUILDING TIME IS ONLY 8-10 HOURS.





THE design of the original Contest Glider was very much influenced by the Bushey Park models which achieved such outstanding success, *circa* 1945-6. These models featured high aspect ratio parallel chord wings, slabsided fuselages and very light wing loadings. Still air duration from 300-ft. lines was consistently over the 4 minute mark. The original Bushey Park models, however, all suffered from the fact that they were not truly stable under tow and were very difficult to handle in any wind. Also they flew in straight lines, which is not the ideal for contest work.

The writer had, about that time, produced a small streamlined F.A.I. glider—the Wraith—which had really excellent towline stability under all conditions and models of this type were lost with monotonous regularity. The Wraith features crutch construction and was designed for quick building. Time to complete was roughly 10 hours and on two occasions a model was built on the Saturday and flown (and lost !) in a contest the following day.

The two lessons learnt at this stage were :

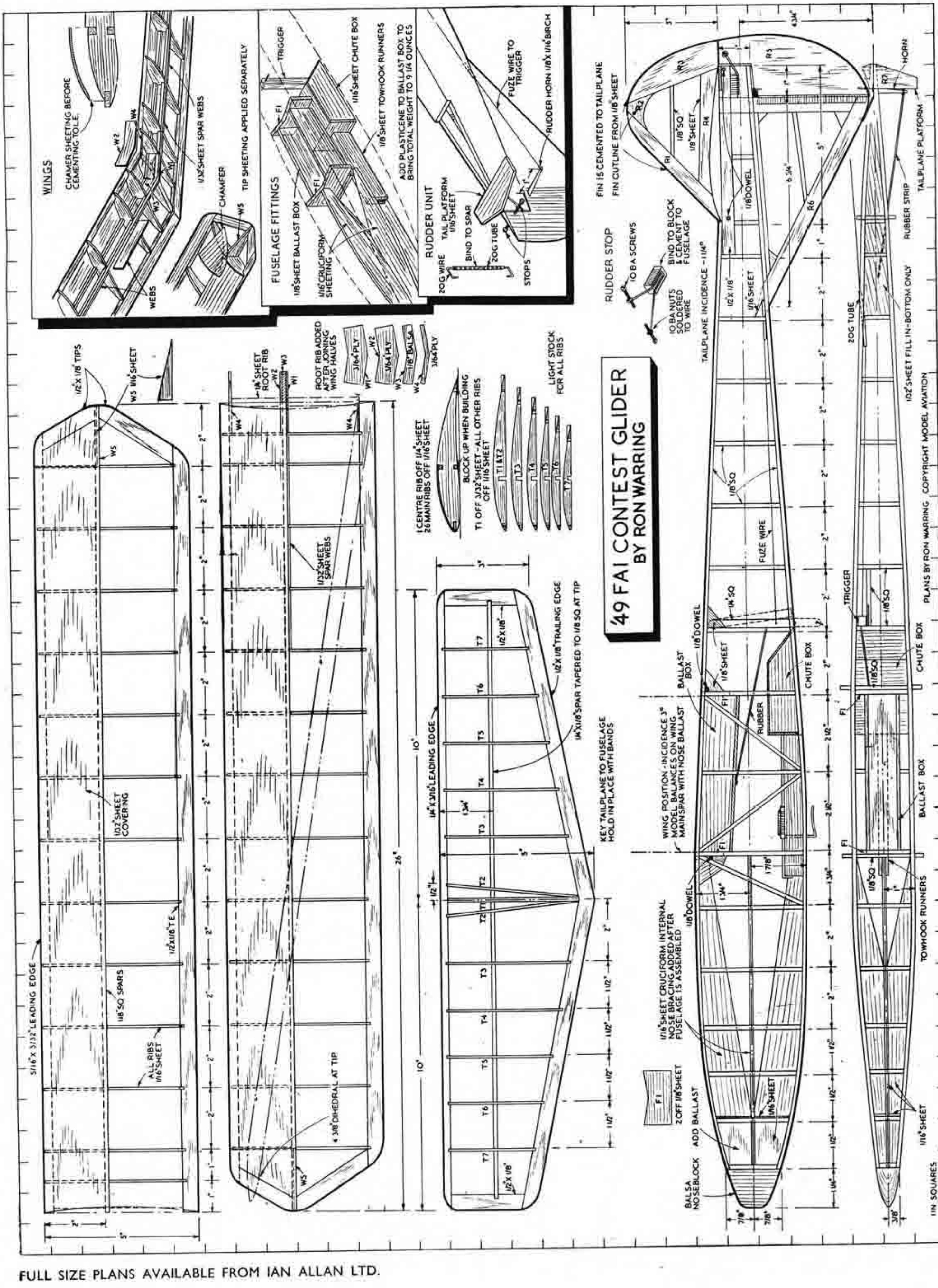
1. A contest glider must have exceptional towline stability under all conditions. Models which tow up perfectly well in calm are often unstable in wind.

2. Straight tow generally means a straight rudder setting. Hence some device was needed to offset the rudder or trim tab after release from the towline to give circling gliding flight. The alternative was to use a scheme since made popular by the Croydon club—offsetting the tow hooks to counteract offset rudder under tow. The latter method is not absolutely foolproof and demands considerable skill at times to prevent the model spinning on the line.

Other essential requirements are :

3. A dethermaliser is an absolute necessity.

4. To get maximum height under tow several alternative tow hook positions are necessary to meet varying conditions. With the tow hook too far forward it is impossible to get anything like the full height of the line. If excessively far forward it may be impossible to tow the model up at all in a dead calm. With correct tow hook positioning it is quite possible to tow up a large, heavy F.A.I. model to



FULL SIZE PLANS AVAILABLE FROM IAN ALLAN LTD.

almost the full height of the line in dead calm. But to achieve this, ample towline stability must be incorporated in the design. Some models are quite unstable under tow, even in dead calm, with the hook far enough back to get the required height.

The version of the Contest glider shown on the plan is essentially the 1946 model with several refinements to incorporate some more recent findings. The 1946 model never completed its full three flights in any one contest—being lost on the first or second flight in each case, despite the use of the dethermaliser. But it was a most reliable machine under all weather conditions.

Towline stability was achieved by means of a relatively long nose—the wings being in roughly "rubber model" position and underslung fin. The actual underslung fin area is relatively small and could be increased with beneficial results. It was found that under rough conditions additional outrigged fins could be used to advantage, preferably under the tailplane where they would be operating in relatively smooth air under tow. These, in fact, correspond to anti-spin fins as used on rubber models, but in this case are used for increasing directional stability under tow. Under calm conditions the upper fin could be removed entirely and give satisfactory towline stability on the rearmost hook. In fact, it is doubtful that the upper fin is of much use at all under towing conditions.

Correct disposition of side areas, allied to straight rigging, i.e. fin and rudder neutral, produced all the towline stability required. To give the required glide circle the writer devised a simple rudder-lock device which has since been widely adopted and it is referred to as "the gadget." Details are shown on the plan. Briefly, in this scheme, the rudder is hinged and tensioned against a neutral stop by means of a strip of $\frac{1}{16}$-in. square rubber. The other side of the rudder horn is connected to a trigger in the fuselage by means of a length of fuse wire, this trigger being tensioned forward by a rubber strip. In its most forward position the trigger pulls the rudder off neutral, the degree of offset being controlled by means of a suitable stop. The original model used, a 10 BA screw screwing into a 10 BA nut soldered to a length of wire cemented to the rear of the fuselage, permitting a range of adjustment.

If a length of $\frac{1}{4}$-in. square is inserted in the bottom of the fuselage between the lower end of the trigger and the fuselage frame, the pull on the rudder horn is released and the rubber band pulls the rudder back to the neutral position. This corresponds to the launching position. The $\frac{1}{4}$-in. square, known as the locking piece, is attached to the towline and is withdrawn when the towline releases. Thus, straight rudder for towing; the locking piece is withdrawn with the towline on release, allowing the rudder to move over to give circling gliding flight.

The system detailed is pretty well foolproof, provided the rudder is nicely hinged and the rubber tensions correctly adjusted. The device also allows the model to be trimmed to the very best possible trim for contest work. The model is originally adjusted for a slight stall in flight, when rudder offset is added until this stall just disappears. With such a trim, should the rudder device fail and the rudder remain in neutral for gliding flight, the resulting flight will be simply a series of very bad stalls. But with correct adjustment the

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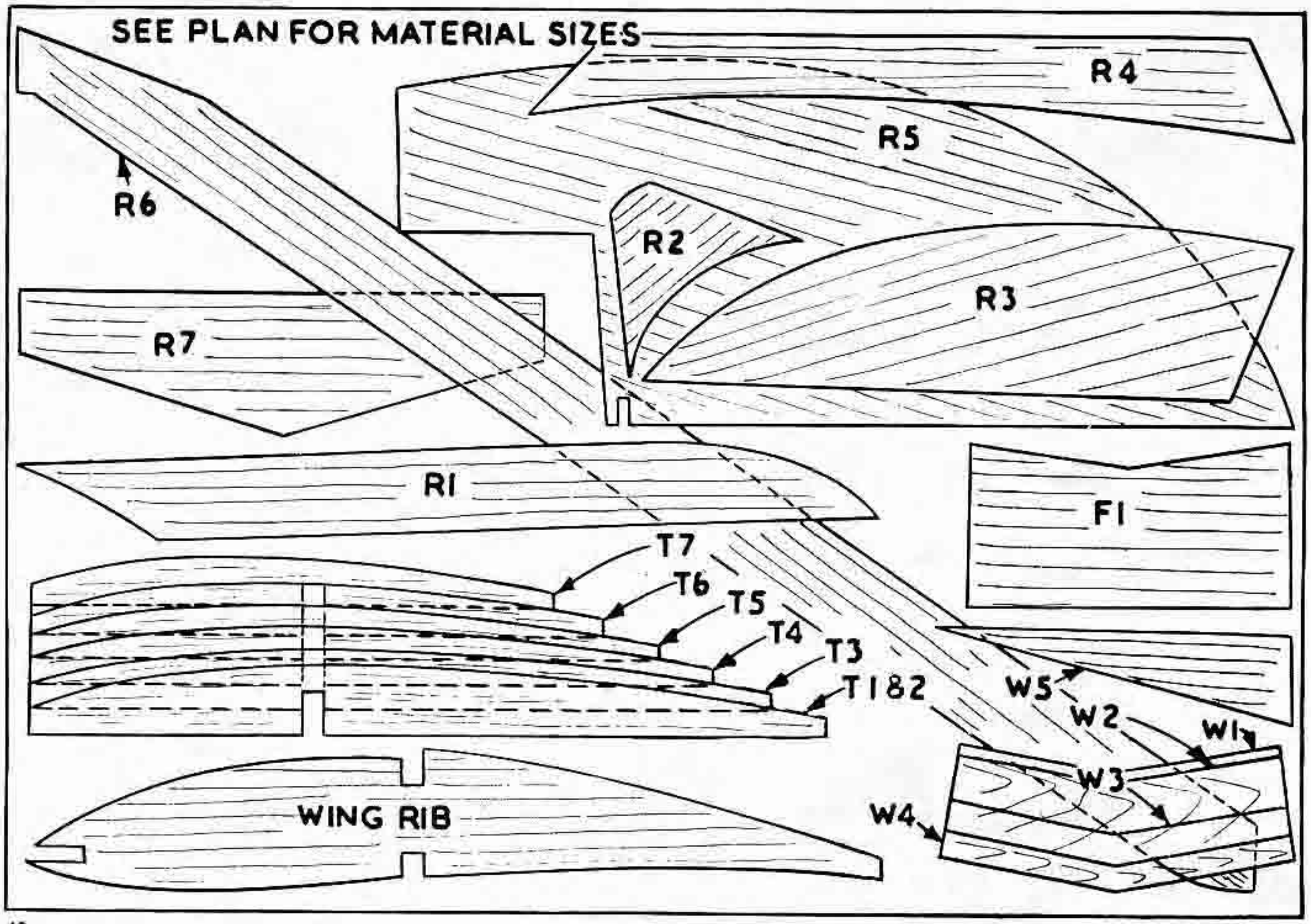

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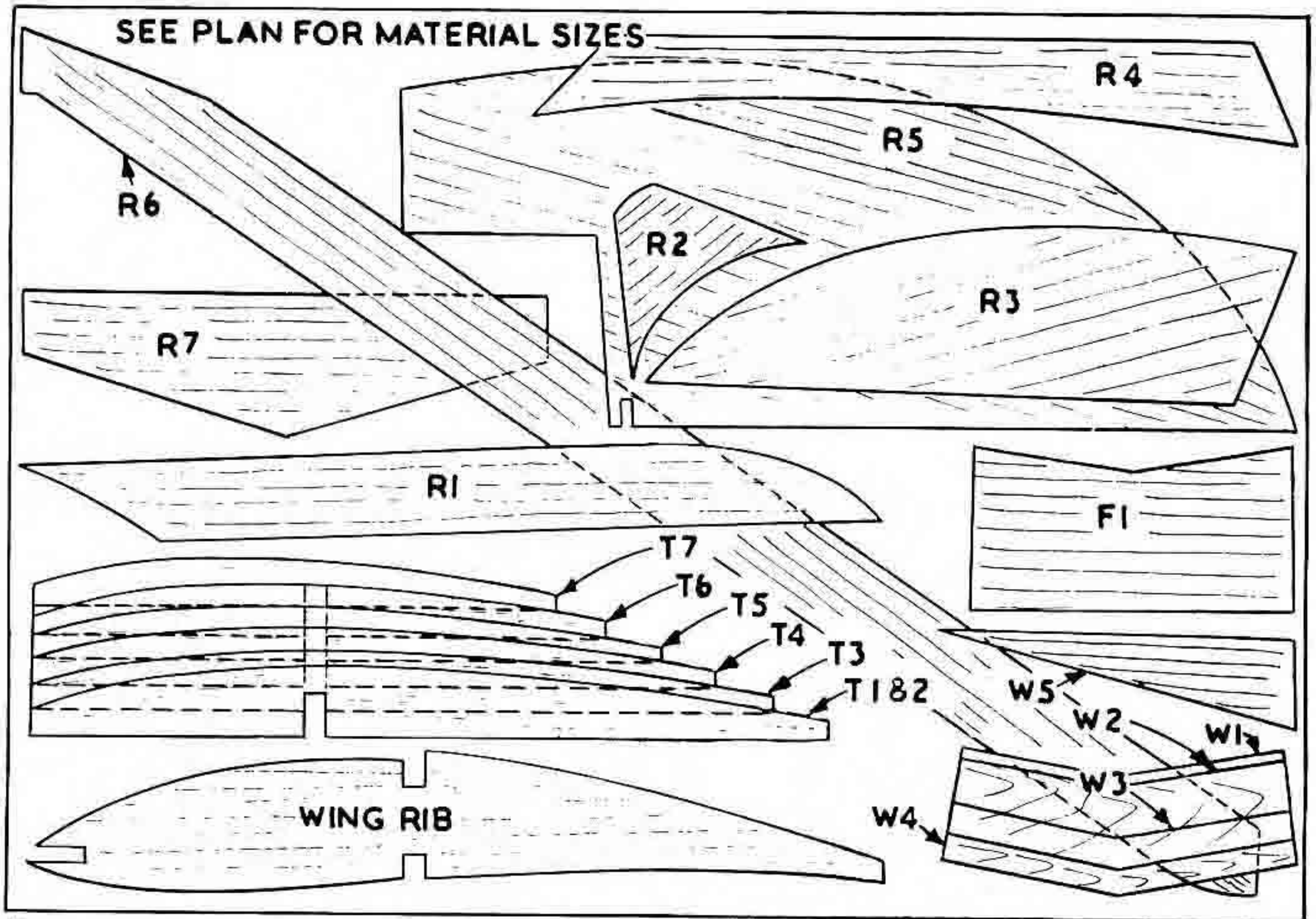
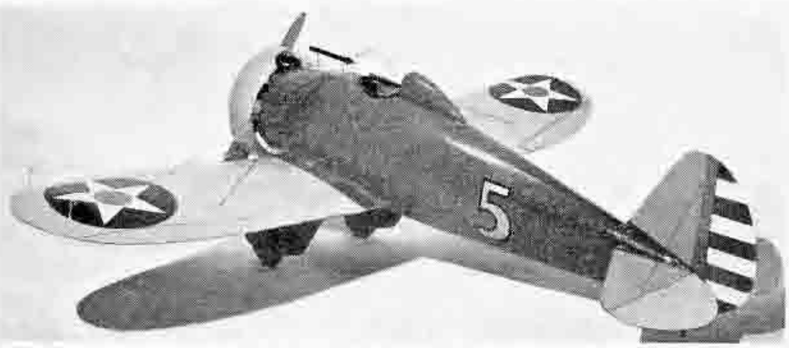


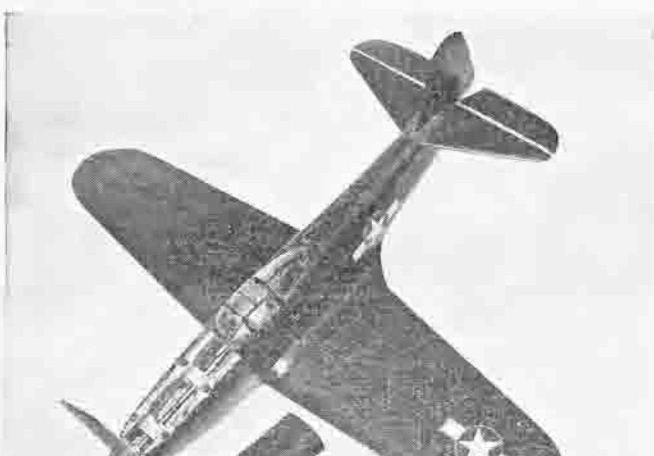
Harold Scriver of the Windy City Fliers (Chicago, U.S.A.) built this beautiful maroon and yellow STEARMAN TRAINER. The Forster 29 power plant is fitted with two-speed control for precision flying. Span is 32½".



Dick Struhl's Ohlsson powered (Gloplug) BOEING P-26a. Hollow log fuselage—built up wings—sheet tailplane. Span 28".

STARS AND STRIPES

Three outstanding control line replicas of well-known American aircraft. We should like to see more pictures of this quality—for publication in future model aviation books. Enlargements should be at least postcard size and printed on glossy paper.



Ken Symons 28" span AIRACOBRA features a long extension shaft to the Mk. II Mills 1.3 power plant.

Another view of the AIRACOBRA showing the motor position, air intake and landing skid. Good photos.

AEROBATIC AEROFOILS

FLIP-FLOP By RAY BORDEN

STUNT MODEL DESIGN IS CHANGING RADICALLY. IN 1949, TAIL MOMENT ARMS ARE VIRTUALLY DISAPPEARING

QUITE suddenly a whole host of flying wing control-liners have appeared, many of them with a stunt performance at least the equal of that of a conventional layout. The present American trend with stunt models is, in fact, to reduce the moment arm (i.e., the distance between the wing and the tail) to a very small figure. Harold de Bolt's new Stuntwagon is a typical example, where the moment arm as such has virtually disappeared—a huge wing being followed almost immediately by a conventional tail-plane and elevators. The flying wing model does the whole thing in one and hinges the elevators to the trailing edge of the wing !

The chief advantage of a short moment arm is, of course, that it reduces the turning radius of the model. A short moment arm job is far easier to stunt than a comparable long moment arm model, although its flight pattern may not appear so smooth. With such a model you can learn to perform all the stunt manoeuvres and then go on to smoothing them out.

Some of the first examples of flying wing control liners were sports jobs, pure and simple. Henry Cole produced a pretty conventional job some three years ago which could certainly not be called aerobatic, although it did show that models of this type were *fast*. Then someone tumbled to the obvious and simply drew a circle and said, " There's the plan of my new stunt model."

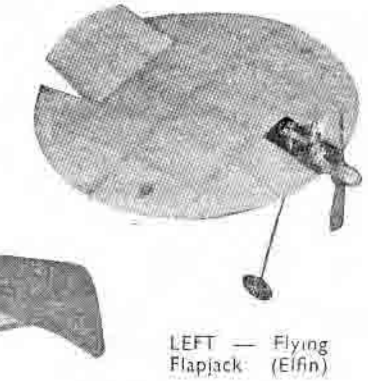
At present, all-wing control liners seem to be sharply divided into two classes. First there is the flying wing design which has been evolved the hard way—starting by making it look reasonably nice and then making it fly. Cole's original job comes in this category, with David Jackson's *Anita* a much developed model on similar lines but with a better performance. The Skyleada flying wing is another example of a " conventional " tailless layout, but this model is more properly a sport job.

The second school of thought are the followers of functional design, where appearance may get a look in occasionally, but is generally ignored. The main thing here is to produce a model which will do what is wanted, irrespective of the shapes and proportions this calls for.

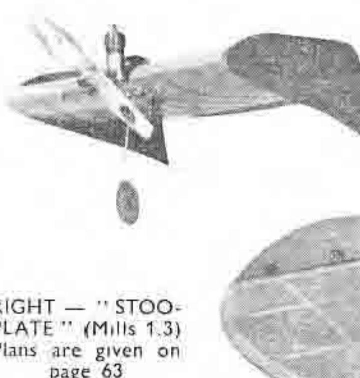
Undoubtedly, in this category, the circular flying wing must rate very high. A circle encloses the maximum area for a minimum of circumference and a good aerodynamic efficiency is assured. Stability problems appear relatively unimportant, apart from correct balance and location of pivot point, and the only remaining factor is then to determine the amount of elevator area required for aerobatic performance.

Proportions for this follow from plans of Len Stewart's highly successful " Stooplate " which is most certainly aerobatic, and typifies the good circular-wing layout. A commercial design—the Warneford " Flying Saucer " is again very similar. Stewart's design, it will be noted, employs a small fin with large offset to help maintain line stability. The Warneford design has no vertical surfaces.

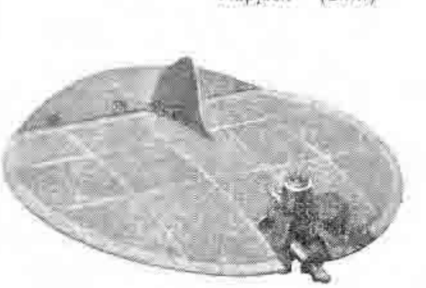
Again very similar in form is the Astral " Flying Flapjack " designed by F. G. Birden, only here a rectangular planform is used. Aerodynamic efficiency of this very low aspect ratio wing is no doubt increased by the large tip fins employed. Incidentally, low aspect ratio wings tend to have a high aerodynamic efficiency, even without endplates, induced drag being very much lower than standard theory would indicate. (*Turn to page 62*)



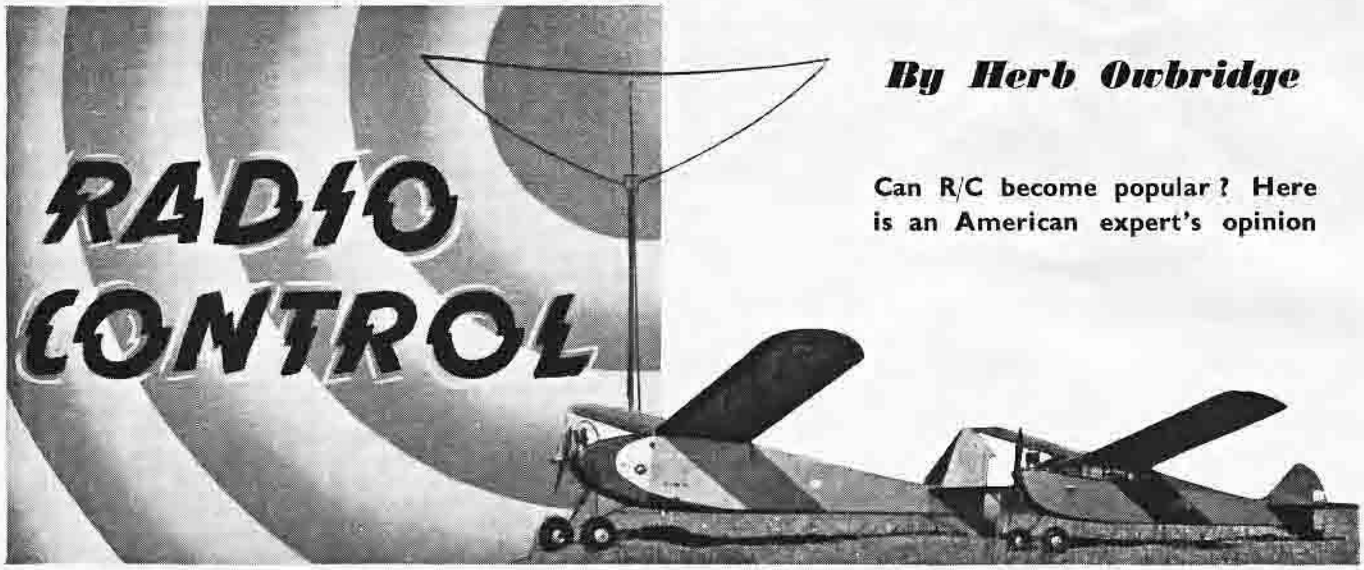
RIGHT — Flying Saucer (E.D. Comp. Special)



LEFT — Flying Flapjack (Elfin)



RIGHT — " STOOPLATE " (Mills 1.3) Plans are given on page 63



By Herb Owbridge

Can R/C become popular? Here is an American expert's opinion

THE first successful radio controlled flight of a model aircraft took place more than fifteen years ago. Until recently this accomplishment has been successfully repeated by only a comparative few. Today, with the recent introduction of ultra simple radio equipment, the numbers are gradually beginning to increase. Although not popular yet, the long expected trend has finally begun to show. By "popular" we mean at least half as many active modellers in the field as there are in the free flight field. Our question is not only *can* radio control become popular (which it most certainly will), but what are some of the detail requirements necessary to make it popular. Some of the more obvious of these requirements can be listed as follows :

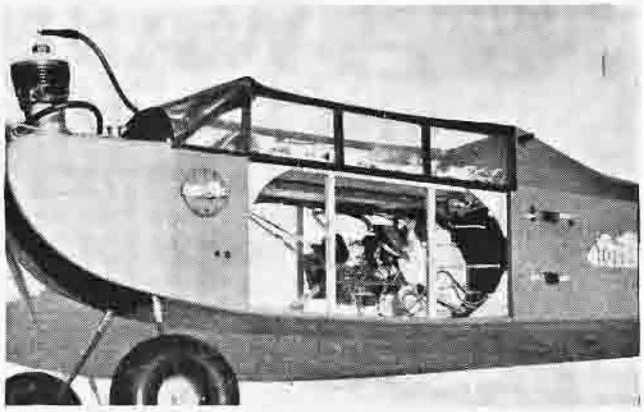
1. Licence free operation.
2. Minimum electrical knowledge.
3. Reasonable equipment cost.
4. Reasonable model size.
5. Reliability.
6. Sufficient control.

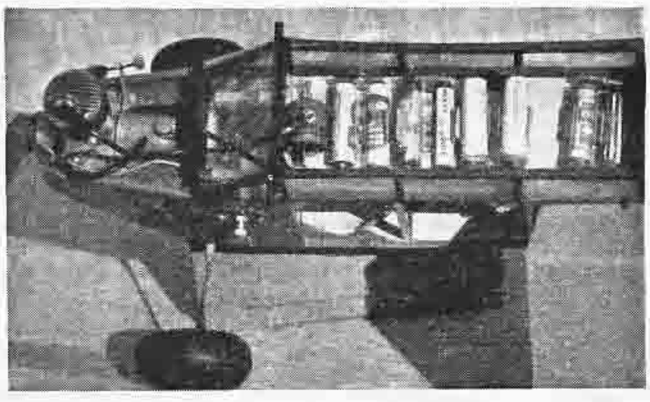
The first requirement is necessary to reduce the amount of effort that an individual must put forth in order to master a hobby of already sizeable proportions. Present radio permit requirements were made to control language communications. The rules and regulations governing this traffic are intricate to a degree far beyond that needed to regulate the ultra simple signals necessary to control a model. We cannot expect many modellers to find the time and energy to master an avocation of secondary importance merely to gain the permission to pursue an avocation which to them is of primary importance. In England, it is understood, this problem has been solved. In the United States, not so. We over here are still patiently waiting. When licence free equipment is made available, the radio control hobby cannot help but become popular just as soon as cost and knowledge requirements can be absorbed.

The electrical knowledge required for popular radio control must be held to a minimum. Model aircraft with radio control will always be primarily an aircraft hobby—not a radio hobby. It is mostly the modeller who wants radio control, not the radio amateur who wants a model aircraft. The electrical knowledge necessary to operate popular radio control equipment can be highly interesting to the model builder providing its scope is sufficiently small so as not to become a time-consuming burden and detract from the primary interests which centre around stability, manoeuvrability, flying skill and the like. Radio equipment available today comes much closer to this requirement than the complicated contraptions of the past.

The cost of popular radio equipment will always appear to

(*Turn to page* 48)





ABOVE RIGHT. Aerotrol installation in 5′ span design. K & B Torpedo engine.

BOTTOM RIGHT. Battery installation in same model. Watch for plans in M.A. Series.

RADIO CONTROL

(*Continued from page* 46)

be high. Insufficient production demand will never allow the prices of this equipment to compare with the prices of the more common radio merchandise. Since the goal is for ever smaller and lighter equipment for radio control, this fact will become even more noticeable in the future. There is one consolation. The three basic units for radio control (transmitter, receiver and control mechanism) are less subject to wear and damage than the engine and the model itself. Hence the investment in one set of radio equipment can (with reasonable maintenance) suffice for a whole career in radio controlled model aeronautics.

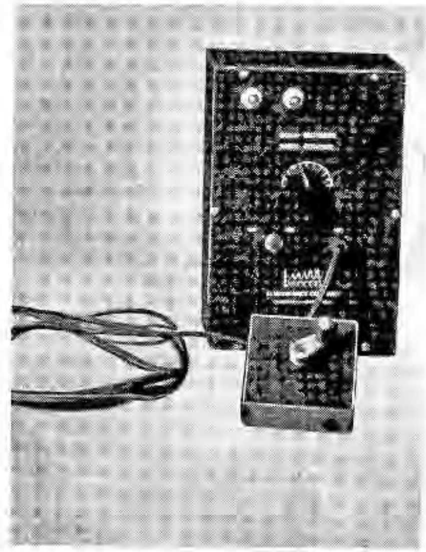
The model size required for popular radio control must be small enough not only for reasons of storage and transportation but also to fit the average budget. This requirement can be more than met with modern available equipment. Radio control can be " jammed " into a model of as little as three feet wing span. This is not advised however, and he who tries it will soon tire of it. Not only is the installation too marginal for reliability, but (and the majority will agree) as wing spans go too much below six feet, the model develops strong tendencies toward flit rather than flight. Radio controlled flight can be the most beautiful of outdoor model flying. Let's keep it that way.

Before radio control can become really popular it must at least show that it is capable of being reliable. This requirement has not been sufficiently met as yet but it at least shows promise. Overall reliability is meant. Not only the radio, but the engine, the aircraft, the control and all details of the installation. A reliable radio-controlled model would be one that could be flown six to twelve times on a Sunday and be ready for the same performance a week later without maintenance other than a general inspection and battery check. At present, it takes the most painstaking model builder to operate with this kind of reliability. Present equipment requires several pre-flight performance checks—any one of which if not done properly, can mean control failure in the air. This does not necessarily mean disaster, since, when such a failure occurs, the airplane simply (in most cases) joins the free flight class. But this can be very disconcerting to one who is priding himself on the fact that he has graduated from the free flight class. One logical way to increase reliability is to build a slightly larger model with more than the minimum necessary weight-carrying ability. Then install a little more than the minimum required battery weight and also build in the structure necessary to withstand the consecutive rough landings that are a part of radio-controlled operation. It is surprising how much time it has taken us to learn things as simple as that.

The " sufficient control " requirement means enough control to make the overall personal effort worth while. For several years the simple rubber band powered rudder escapement has been available. The radio requirements to operate it are extremely simple. It seems logical to surmise that at least part of the reason why this simple control has not become popular is because rudder alone has not been considered worth the effort. This point is logical only to a degree. Of all controls to be desired, rudder tops the list. It affords in itself the major part of control necessary to adequately manoeuvre a model airplane. This fact cannot be appreciated until one has flown a model and compared at first hand the extreme usefulness of rudder as compared to the other conventional controls—elevator and ailerons.

Next in importance comes either power control or elevator. Either one or the other is necessary for altitude control. Since a typical radio controlled flight will be of five to fifteen or more minutes in duration under power, it is obvious that altitude control is very nearly as important as directional control. After ten minutes of flying under power, a model can disappear vertically just as thoroughly as it can in a horizontal direction. For altitude control we favour power control for the following reasons :

1. The model *can* be spiralled down with rudder but this is a violent manoeuvre and not always effective. The model attains very high speed and the ground has been known not to stop coming up when it is supposed to. Even if it does, the recovery often puts the model back up to almost the altitude where the spiral was begun.



● Transmitter set with simple four-position switch. Synchronisation with model's response takes three seconds.

2. Elevator would be a good altitude control if it were proportional or semi-proportional or in other words trimable. A well-known U.S. Army target plane uses such a control. But proportional controls tend to run on the heavy side. A step control elevator is not satisfactory as an altitude control. Down elevator will increase the model's speed and upon release of the control, the model will simply zoom violently or may even loop, depending on how much kinetic energy was gained in the dive which must be absorbed in the recovery.

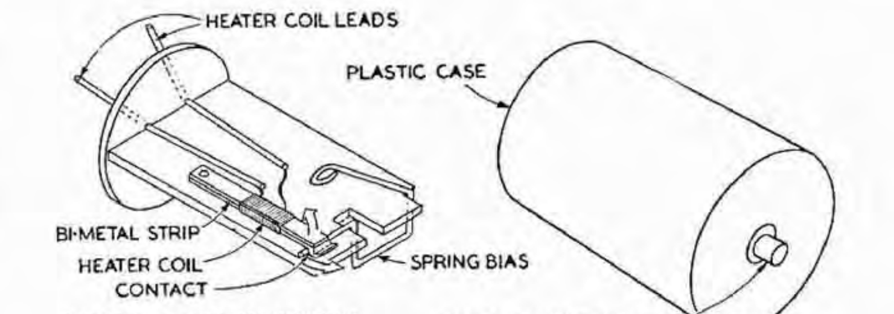
3. Power control, however, can be nearly automatic as an altitude control. Proportional power control is unnecessary. Step power control (slow and fast engine speed) is sufficient. At reduced engine speed, the model will level out at an absolute ceiling somewhere be-

tween 500 and 1,000 feet. We have seen it time and again. It is a law of nature, well understood and requires only the addition of an extra set of ignition timer points on the engine (and a little extra patience in finding the optimum fuel mixture for the two speeds).

So assuming our opinion is faultless (always a questionable assumption) and that power control is the most practical form of altitude control, this leaves elevator as the third most desirable control for use in executing the more violent manoeuvres (loops, rolls off the top, flick rolls, etc.) which require an air speed in excess of normal to begin.

Beyond elevator, we begin to deal with the controls that just don't pay their way. Ailerons are all but unnecessary. Landing flaps, retractable landing gear, wheel brakes, bomb bay doors? Brother, if you can load them aboard and still take off, they're all yours! But they'll never contribute to popular radio control and if you go stark raving mad, remember, we warned you.

So much for an attempt to predict the requirements it will take to make radio control popular in the future. Now, what equipment is available or will need to be available to fulfil these requirements? Two good transmitter-receiver combinations are available in the States. These are the "Aero-Trol" and the "Beacon Electronics" sets. Both operate on 52 megacycles. In considering the future of radio control this equipment must be considered temporary since it is not on a licence-free band. They are interesting however, if only to predict what is desirable in the future. Both receivers are long on simplicity but somewhat short on reliability. Their unreliability comes not from utter failure to operate but rather from the attention required to maintain them in proper adjustment. Without asking for any more sensitive performance in the future, we do ask for a receiver that will stay in adjustment not for hours, but for weeks. One that needs less checking, cross-checking and tinkering with to determine whether it is ready to fly, whether the tube is going out or whether it is just because we are out at the field too early in the morning and not quite awake yet. All respect is due to the boys who designed and produced these clever little receivers. Many of our troubles in the field have in no way been related to them. But if our receiver was under less suspicion, trouble-shooting time could be reduced considerably. The popular receiver of the future may well be a two tube rather than a single tube affair. The two tubes may prove worth while



THERMAL DELAY SWITCH

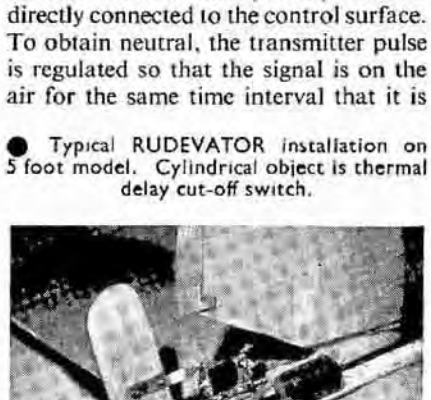
not only for the extra reliability but also they will be in a better form to cope with that ever looming problem on the horizon—separation.

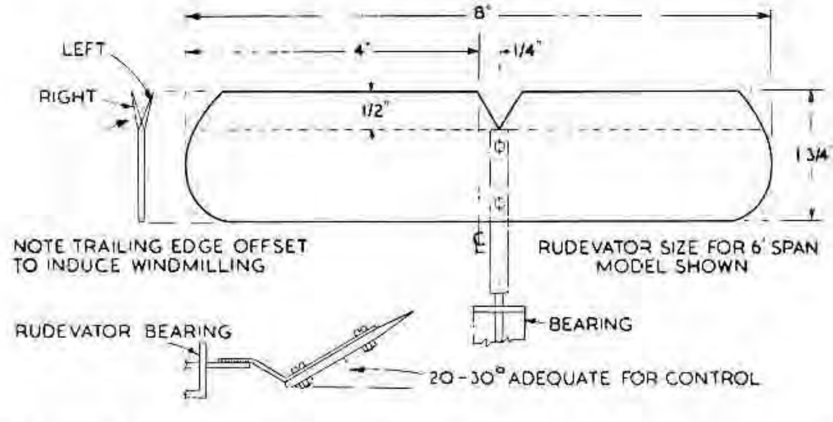
Finally, a word about the controls themselves. And rather than have it whispered to you by your best friend, let it be known that your author happens also to be the developer of Rudevator—that newcomer to the list of available control mechanisms. Now if this topic of discussion is going to seem biased, let it be so only to a fair degree by stating first off that like all controls, Rudevator too, is a compromise as we shall see. Four controls appear to be in line for future popularity. These are Jim Walker's "Pos-i-po," George Trammell's pulse length follower, Rudevator and the Nicholls-Cossor "Mercury" servo mechanism. The latter has not yet been seen by the author, so cannot be discussed, but from information received, appears to have enough of the necessary features to get in line with the rest. The old reliable rubber powered escapement is not included in the group since it should be well enough known not to need further discussion here.

Jim Walker's "Pos-i-po" is a rather ingenious cam and linkage mechanism weighing but a few ounces and driven by an electric motor. The mechanism gives rudder and elevator control in three steps of $\frac{1}{3}$, $\frac{2}{3}$ and full. Ailerons (although not usually used) can be connected up if desired. Two-speed engine control and engine cut-off are included. The mechanism is mounted on the shaft end of a motor and gear train and responds to the number of circular degrees that the motor shaft turns before it automatically reverses and returns to home. When the shaft returns to home (rotating the mechanism with it) the mechanism picks up the proper control linkage and moves it. For example, a shaft rotation of x degrees and return will pick up and move $\frac{1}{3}$ left rudder. A shaft rotation of $2x$ degrees will pick up and move (say) $\frac{1}{3}$ down elevator. A shaft rotation of $3x$ degrees will pick up and move (say) $\frac{2}{3}$ left rudder and so on. An ingenious system of locks and trips prevents a control from being moved from any position around the circle except that position where the shaft rotation stops and reverses for home. Since the motor is very nearly constant speed, a series of selectable signal lengths from the control box at the transmitter accomplishes the control selection in the airplane. This mechanism gives a very high degree of control and is beautiful to witness in flight. Probably the greatest drawback (or compromise) in this control is the fact that the control box (or signal length selector) on the ground is intricate and may be expensive. Also the mechanism in the airplane is a little too intricate to be repaired outside the factory. However, these factors must be weighed against the large amount of control obtained on a single carrier channel.

George Trammell's control consists (in simplest terms) of a very small bar magnet which slides in a smooth surface brass tube. A wire coil is wound outside the brass tube to form an electro magnet. A sensitive relay, following the pulses from the transmitter, alternately reverses the polarity of the electromagnetic field of the coil. The bar magnet follows this polarity and is directly connected to the control surface. To obtain neutral, the transmitter pulse is regulated so that the signal is on the air for the same time interval that it is

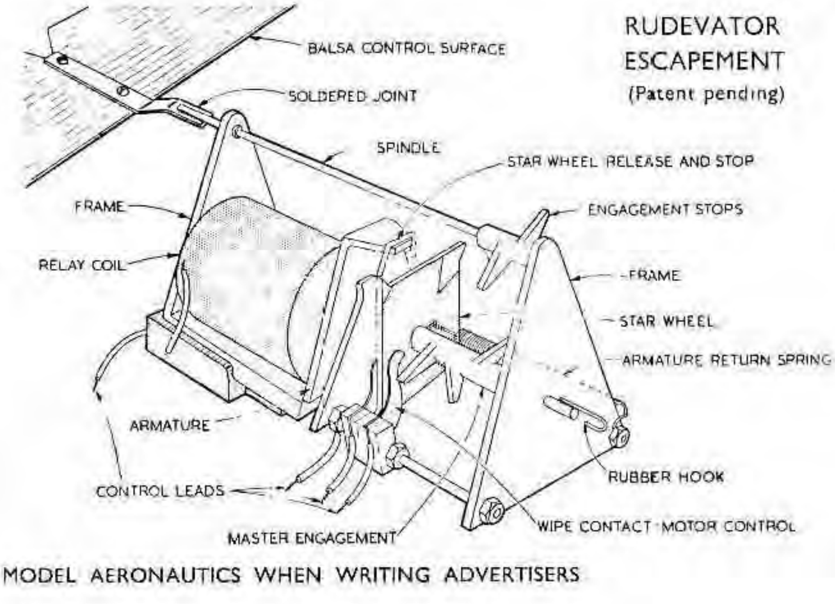
● Typical RUDEVATOR installation on 5 foot model. Cylindrical object is thermal delay cut-off switch.





off the air. To move a control, the signal is allowed to remain on the air for a longer time than it is held off the air in the given time interval. Hence the bar magnet moves longer and harder in one direction than in the reverse. Full control in one direction would be by steady signal—and in the opposite direction by no signal. On the ground, the control surface actually flutters violently at the signal pulse rate but in the air, the airstream damps out this flutter so that it is invisible. This control also produces some beautiful flying and comes very near to being a true proportional control. The compromises? Well, one carrier channel is needed per control in neutral, the servo batteries are still being used. But it could become popular.

Rudevator gives rudder and elevator in single-step form plus two-speed engine control and engine cut-off. This should be enough for a one-ounce mechanism. The cylindrical object in the photograph is a thermal time delay ignition circuit breaker used in conjunction with Rudevator to cut the engine and at the same time save the ignition batteries on the way down should the engine timer points stop in the closed position. The free rotating control surface (a piece of balsa propelled at a lazy rate by the slip stream) is the clever invention of one William Rhodes. When the control surface is rotating, all controls are in neutral since the ship simply cannot respond to such rapid changes. Free rotation takes place whenever the transmitter is off the air—hence neutral is very easy to find. The Rudevator mechanism is the good old reliable rubber-powered escapement type. But in this case, the rubber band drives nothing but the bearing friction of the escapement wheel shaft. On the escapement wheel shaft are four stops spaced 90 degrees from each other but each in a different plane. On the control surface shaft are four more stops stacked in planes that mate with the four stops on the escapement shaft. In neutral, all stops miss each other. With a steady signal on the air, the electromagnet will escape the escapement wheel shaft and allow one of the four stops to rest in the path of its mate on the control surface shaft. This will stop the control surface in some position (say up elevator) and produce con-



RUDEVATOR
ESCAPEMENT
(Patent pending)

trol. Upon removing the signal from the air, the electromagnet is relaxed, the stop is driven to a position of clearance by the rubber band (and the control surface rotational force) and control surface rotation resumes. Since this is a cyclic control, transmitter signals produce controls in the sequence of UP, RIGHT, DOWN and LEFT with a neutral between each. Unwanted controls are released quickly. The square control box consists merely of a four point rotary switch. No markings are provided. When the crank (we use a standard dial pointer now since we found there is no need for hurry) points to any corner, the signal is off the air and Rudevator is in neutral. Pointing to any side of the box, the signal is on the air and Rudevator is stopped in some control. The whole idea would be worthless if it were not for the fact that synchronization between the ground and ship is so simple. On the ground or in the air, we simply turn the signal on, observe the control surface position, rotate the control box to agree and turn the signal off. Since the escapement wheel turns clockwise, the control switch is always turned clockwise to retain synchronization. Two-speed engine control is handled by a wiper contact on the silver-plated escapement wheel which is in the retard ignition circuit. Full power is used in UP and NEUTRAL AFTER UP. Retarded power is used in all other positions. Another wiper contact on the escapement wheel supplies current to the thermal delay cut-off breaker only in the NEUTRAL AFTER DOWN position. A five-second dwell here will cut the engine. Several other simple adjustments are provided but this is getting long-winded. So there it is. Now, what are the compromises? First, although two aerodynamic controls are provided, they are the single step type. Second, the user must accept the rather unconventional rotary control surface. Although this is more fun to watch than not, there will be some who will object. However, so many other factors of consequence are in its favour that we have decided to stick with it in the future just to see what experience can make it do. It could easily become a popular control of the future.

Herb Owbridge and Dick Shumacher undoubtedly do get results, mainly because they have found out the answers the right, and only, way—by flying. Herb is the "electrics" of the partnership and Dick takes care of the model side. We are covering the latter pretty fully in the next issue of the Model Aviation *series by detailing two of the most successful models they have built and flown.* THE EDITORS

RUDEVATOR UNITS are now available in this country—Price $15
See announcement page 64.

USE THOSE PLANS

(Continued from page 20)

If the fuselage structure is of the crutch type, you need not bother to connect these top view outlines. You can simply lay your crutch wood along these marks when pinning down for building. If the top-view outline must be completed, simply use the balsa strip to get the needed curve, as was done on the fuselage side view.

Straight tapered portions of the model can be easily drawn by first continuing the tapered line on the plan through a reference line and then measuring both vertically and horizontally to find the line end position.

Enlarging the wing plan follows the same procedure used for developing the fuselage. Lay off a horizontal reference line to correspond to the spanwise dimension of the wing. This can be leading or trailing edge. Mark off rib spacing with the scribed triangle at right angles to this line. Draw spars in proper locations and develop tip curves, if any, by the grid system described previously. Straight taper shapes can be drawn by measuring line end positions from the horizontal reference line.

The best magazine plans present wing rib and fuselage bulkhead patterns full size. If such is the case with the particular model you are working on, very little drawing will be needed to get the patterns on to wood for cutting out. The patterns can be transferred directly to the wood by using carbon paper.

If you do not want to mark the magazine plan, or if the patterns are drawn superimposed over each other, the tracing paper comes into use. Trace individual patterns on to the tracing paper or, if good accuracy in the finished wood piece is desired, rubber-cement the tracing paper pattern on to the wood and then cut out the pattern and the wood at the same time.

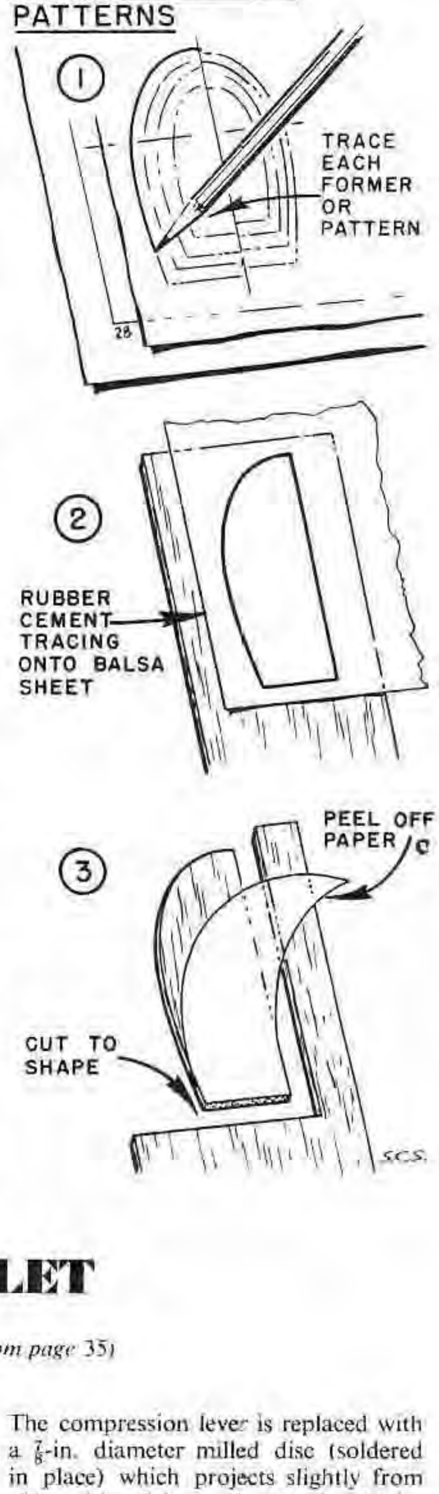
When using the rubber cement to do this job, spread a coat of cement on both the wood and paper and let dry separately. Then place the paper on the wood and press down. The two rubber cemented surfaces will stick very well, and when the piece is cut out the paper can be peeled off easily and the rubber cement remaining on the wood can be rubbed off with your finger.

If wing ribs or bulkheads are not presented full size, they can be enlarged by using the grid method or photostatic enlargement described earlier in the article.

Just a few tips in closing. First, a really straight straightedge for the long reference lines is a must. The right-angle line scribed on your triangle must be accurate. When using the triangle, be careful to line up this line directly over a drawn line on the paper. When marking off dimensions with the ruler, hold your head directly over the division you are marking, so that you can see your pencil exactly opposite the mark rather than to one side of it. Small errors in a series of dimensions along a fuselage mount up when you get to the tailskid. Keep those pencils sharp, work methodically and you will soon have that favourite model out of the magazine and into the air.

THIS ARTICLE APPEARS BY KIND PERMISSION OF "FLYING MODELS" 215 FOURTH AVENUE, NEW YORK, 3, U.S.A.

USING FULL SIZE PATTERNS



BULLET

(Continued from page 35)

Cut the tailplane from $\frac{1}{16}$-in. ply and taper the edges as indicated. The 20-gauge elevator horn is attached to the elevator by a linen patch (cemented in place underneath). The 18-gauge control rod is connected to the bellcrank and elevator horn—checking carefully that elevators and bellcrank are both set at neutral.

FUSELAGE (2)

In order to reduce frontal area, the engine fins should be filed until they fit inside the cowl drawn on the plan. The compression lever is replaced with a $\frac{7}{8}$-in. diameter milled disc (soldered in place) which projects slightly from either side of the cowl. Attach a $1\frac{3}{8}$-in. extension to the needle valve.

Check that the upper fuselage shell clears the engine and control components—then cement the two halves together. Join two pieces of $\frac{1}{16}$-in. sheet to obtain the required width for the cowl sides (grain vertical). Cut the sides to shape and curve them round the engine. Use pins and Scotch Tape to hold the ends together whilst the cement is setting. When dry, cut out the air intake and outlet holes—also slots for the compression disc and for fuelling. Dope the inner surfaces of the cowl and cement in place on the fuselage. Cap the top with a piece of ¼-in. sheet (see plan).

Fair in the angle between wings and fuselage with plastic wood and go over the entire model carefully with fine glasspaper. Give several coats of grain filler (try talcum powder mixed with dope) and rub down with fine glasspaper. Brush on six coats of clear dope, followed by two of coloured. Finish with a coat of clear glossy varnish.

FLYING

The diesel can be primed with a drop of fuel in the exhaust ports. The original model had an extension fitted from the venturi to the rear of the cowl but this is not essential.

It has been found quite practical to hand-launch the model and a take off dolly is only an unnecessary complication. Hand flights are perfectly safe if the following procedure is adopted. The assistant should hold the model at shoulder height and release after a short run. The operator gives full UP elevator as the model is released and must be ready to step back to keep the lines taut—levelling out as soon as the model is under way.

PHOTO CREDIT

"FLYING MODELS" *Cover*, 21 *(Top Lt. and Bot. Rt.)*, 37 *(Bot. Lt., Mid. Rt. and Top Rt.)*, 43 *(Mid. and Top.)*, 44 *(Top)*
BERKELEY MODELS ... 13, 58
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POWER MODEL STRUCTURES

(Continued from page 29)

bind to the bearers with strong thread spreading glue over the binding. A contribution to the structural strength of the fuselage is made by the wire crosspiece and consequently the use of plywood formers is made unnecessary.

Control line undercarriages present no special problems. In addition to the usual fixed type, the use of dolly and drop off undercarriages are becoming widespread—both on speed and stunt models. In our experience, the drop off type is the best for foolproof take-offs. To prevent the undersides of speed models from slowly rubbing away, due to belly landings, we recommend that a 1½-in. or 2-in. solid rubber wheel be fitted. The wheel need only project ¼-in. from the fuselage, so the increase in drag is negligible.

WINGS

Methods of free flight wing construction are too numerous to completely detail in a short article, so we shall confine ourselves to the most important—from both an aerodynamic and structural point of view.

When we started building models, some fifteen years ago, too little stress was made—in kits and magazines—of the importance of building all parts flat on the plan. Attaching ribs to a tip spar which projected up from the building board was tricky to say the least of it. With polyhedral wings, the most practical and accurate building procedure is as follows. First of all build the main spar flat on the plan. Then build each wing panel flat on the board, propping up the panels as they are completed. Fig. 4.

WING CONSTRUCTION

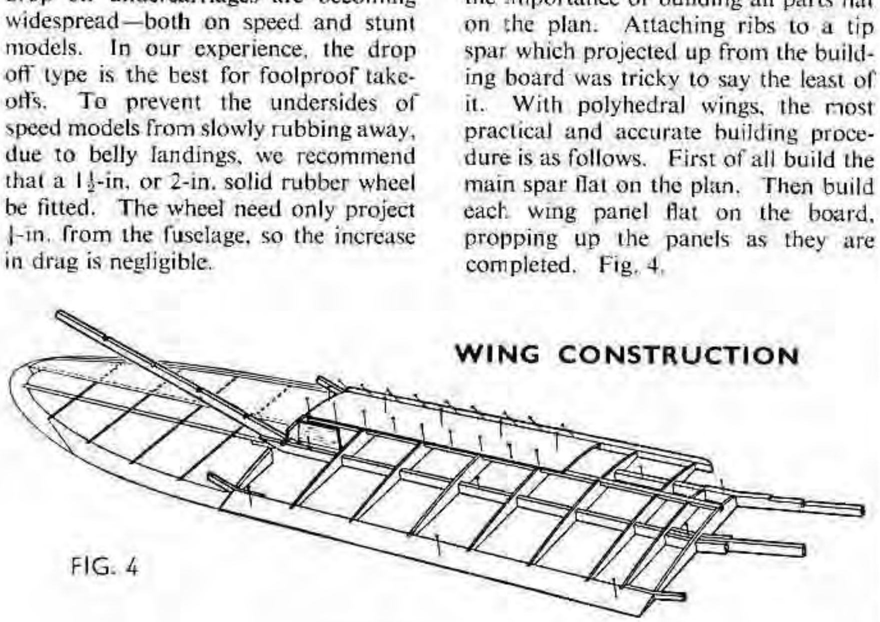


FIG. 4

Make trailing edges broad enough to resist warps. A sheeted leading edge has several advantages over the older method of closely spaced ribs. Sheeting gives a rigid structure of good warp-resisting qualities. Covering is made easier and a perfect airfoil section achieved.

● PIRATE—A simple cabin design featuring several of the methods described in this article.

The model designer has plenty of choice when it comes to choosing the spar layout for his wing. Some modellers swear by built-up box spars, while others follow Dick Korda's example, by using as many as eight small section spars. Henry Cole, well-known American designer, advocates the use of wide shallow spars. We ourselves favour one deep main spar set at 50% of the chord, plus a small square section upper spar at 30% back from the leading edge. The upper spar is little more than a stiffener for the leading edge sheeting—the two combining to resist any tendency for "elliptical dihedral" to develop in the doping stage.

Good wing construction depends on many small points—such as insetting ribs into the trailing edge; cap-stripping rib undercamber to provide plenty of area for covering attachment; the use of hard balsa or ply dihedral braces at the leading edge and trailing edge breaks. If a wing features a single spar, it should be notched into the UPPER edge of the rib to prevent warping and tissue sag between ribs. A double thickness wing rib in the centre of each panel is helpful in preventing the trailing edge from warping. Pins and cellulose tape are useful in wing construction—particularly for keeping parts in place on the plan and for attaching sheet covering.

Control line stunt wings are a little difficult to build on account of their symmetrical wing section. But even symmetrical wings can still be built on the plan—by blocking up the leading and trailing edges. The main spar should be positioned at the thickest part of the ribs, so that the spar may be pinned directly to the plan. On simple control line trainers, solid balsa wings are frequently used—being sanded to a thin Clark Y solid glider section. $\frac{3}{16}$-in. to $\frac{1}{4}$-in. thick sheet is suitable for a Mills 1·3 c.c. or an E.D. 2 c.c. powered model.

Wing tips are worthy of mention—balsa sheet being mainly used for these components nowadays. The strength of balsa tips depends largely on the location of the joints. An attempt to make a graceful curved tip from a couple of pieces of sheet will result in a weak structure. Use four or even five pieces of sheet, so that the grain follows round the curve. All joints should be at an acute angle to obtain quite a large cementing area. A sharp change in contour between the last rib and the tip may be avoided by gradually thinning the wing section over the last few ribs. A piece of sheet shaped to conform to the front tip profile (and cemented on top on the main spar) makes a neater and more efficient covering job.

Tapered wings with blunt "Mustang" tips are becoming popular with both free flight and control line modellers. These tips are simple to make. Just cement VERY SOFT block to the tip ribs, carving and sanding to shape afterwards.

● PHANTOM—Well-known C.L trainer. All sheet construction is popular with this type of model.

TAIL SURFACES

Tailplane construction is basically the same as for wings—being simplified by the lack of dihedral. Unless an upper spar is fitted, the shrinking action of the dope on the covering will almost certainly cause an upward "bow." If your model is large enough to feature a sheet-covered wing leading edge, the tailplane should be treated in a similar manner. To prevent a sharply curved L.E. from distorting the framework of a tailplane, use two narrow leading edge strips—cementing the second to the first (in position on the plan). Sharply curved wing tip leading edges may also be built up in the same way.

With the exception of ultra lightweight stunt models, control line tail surfaces are usually cut from balsa sheet. The tailplane and elevator should always be carved and sanded to shape in one piece—cutting apart along the hinge line on completion. Incidentally, covering sheet parts with tissue, boosts up the strength by at least 50%. Metal elevator hinges are best, but too tedious to make and fit for the average modeller. The conventional fabric hinges work well on all controliners—usually outlasting the life of the model.

Flat fins, with the leading and trailing edges streamlined, are satisfactory for all except the largest models. Best way of attaching the fin (and tip fins) is to sandwich it between two of the tailplane ribs. Thicker tailplane ribs should be featured for this purpose. The fin may be a push fit or cemented permanently in position—after covering the tailplane.

To sum up—complete as much building as possible flat on the plan. Make full use of building pins. Always choose your materials carefully—especially for highly-stressed components such as spars and longerons.

" Clapworthy's determined to get that record or bust."

(*Continued from page* 32)

memories in the shape of tales my father told of those stirring days of castor oil and screaming wires.

Three prototypes were constructed before the final model was decided upon, but I would point out that in the light of present knowledge, the first model was quite successful as a model but unfortunately it was too " hot " for my inexperienced hand. This model was fitted with an E.D. Comp. Special and had a wing span of $20\frac{1}{2}$-inches.

The first difficulty was getting the engine to start and continue running with a scale 7-in. diameter propeller. Eventually this difficulty was overcome by fitting a flywheel in the shape of a rotary engine immediately behind a propeller. Although this solved the engine problem it was all too apparent that the model was then nose heavy and quite impossible to make a " take-off." Further modifications enabled the model to take the air, but only to end its brief career on its first lap.

A second prototype of similar size was then constructed for the Mills Mk. I engine. This proved very successful and I was so confident that after the first two laps I put the model into a loop which it performed in a very realistic manner.

On the second flight the same manoeuvre was attempted and on this occasion the engine stopped when the model was inverted, resulting in a complete " write-off." A *post mortem* revealed a slack contra-piston and the need for another model.

A third model was started upon from the same drawing but it was all too evident that the model was being spoilt from a scale point of view by the amount of " pot " sticking up and protruding through the centre-section, although to invert the engine made starting difficult due to the axle fouling the compression lever.

The final model was entirely redesigned, simplifying construction and decreasing the all-up weight. The span was reduced to 19 inches and the E.D. (Bee) was chosen as the power unit. This was undoubtedly the best combination and the model proved very successful. It must be borne in mind that the manoeuvres are limited and it is not recommended to try such manoeuvres as bunts and vertical " S " turns.

The fitting of a stunt tank is essential for stunt work and this should be fitted into the cockpit and " dressed " as a pilot, the filler cap protruding through the pilot's shoulder.

FUSELAGE

This should be assembled by gluing

the engine bearers to F1 and F2 and squaring up with the control platform which should be cemented under the bearers between the formers. The lower wings should next be cemented into position, care being taken to ensure that the correct dihedral is maintained, also note that the incidence should be zero. A slot should be cut in the lower wings for the undercarriage struts to pass through. The control plate should next be assembled and fitted with the control rods. The elevator end of the rod should be left unbent until the empenage is fitted.

If the Amco engine is to be installed the stunt tank should next be fitted on to the front face of F1. The side can now be cemented to the front end assembly, care being taken to see that the top edges of the sides are horizontal and square to each other.

Cement the fuselage bottoms to the under side of the lower wings and with the tail block complete with tail skid, bring the bottom and sides together and cement. Place three pieces of $\frac{1}{8}$-in. square balsa across the fuselage at the bottom to strengthen. Cement $\frac{1}{8}$-in. square balsa along the top inside edges of the fuselage and brace across as shown on the drawing.

The tail plane and elevators should next be prepared. The elevators are connected by a piece of 20-gauge piano wire. This unit may be cemented to the fuselage when the correct length of control rod has been found. Do not allow more than 70° total movement of the elevators or this will cause the surfaces to stall, resulting in ineffective control.

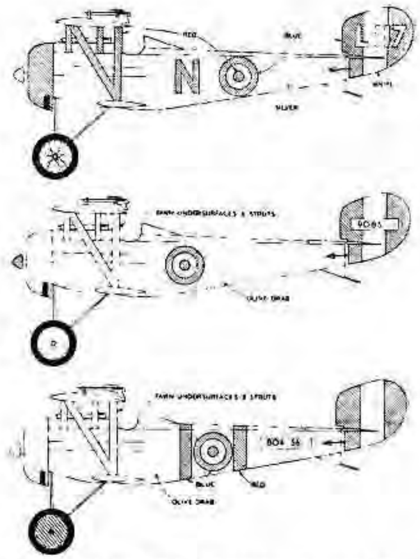
The rudder should next be prepared and it will be seen from the plan that this is hinged to the tail block and that the rudder has a control horn or king-post on its starboard side. This should be connected by 22 SWG wire to a small block cemented inside the fuselage about 2-in. from the rear end. The length of this wire will determine the angle of rudder which may be altered to suit individual requirements. The device also assists in the true scale appearance.

The rear portion of the fuselage can now be completed by cementing the top piece into position and sanding to a gentle curve.

WINGS

The upper wings have no dihedral angle but have a built-in incidence of 2°. A slot should be cut in the upper wings for the wing brace which also forms the Lewis gun front support.

Glue the interplane struts together and also glue the cabane struts to the



● 3 NIEUPORT MARKING SCHEMES.

fuselage. When firmly set, cement the top wing into position. Check the rigging angles carefully as this is very important.

The rigging must pass through the wings and wrap at least once around the top and bottom of each strut. At the bottom front, a rubber band may be used to maintain tension in the rigging but if this is not done the line or wire must pass around the front undercarriage legs.

UNDERCARRIAGE

This is built up from three separate pieces of wire. The front struts are of 16 SWG, the rear struts of 18 SWG and the axle of 16 SWG or 14 SWG piano wire. All three pieces should be bound with thin wire and soldered. The front attachment points should be glued to the fuselage and when firmly set the undercarriage unit fitted into position. Next fit the rubber bands for the shock absorbent and it is stressed that no play should be allowed. The rubber should be quite tight and only allow a little movement.

The engine can next be installed. Finally, fit the nose cowl, side and top decking (manilla card) into position.

FLYING

The model should be test flown on 20-ft. to 25-ft. lines and when satisfied with its performance longer lines may be used (depending on the weather) and stunt manoeuvres may be attempted.

MILLS 2·4 AND ·75

(*Continued from page* 36)

crankshafts are turned from nickel steel, ground and polished before being let into the bearings by a hone. The manufacturers have carried out extensive tests on the strength of the 2·4 crankshaft, which will take a bending moment of 500 lbs. in., when the deflection is still under $\frac{1}{4}$ degree. The shaft will resist a bending moment of 250 lbs. in. with no distortion whatsoever. This gives an adequate safety factor with any type of airscrew, ensuring that in a crash landing the airscrew will break long before the shaft will bend.

Under torsional tests, the shaft was loaded up to a torque of 650 lbs. in. without failure. This represents a load of over $\frac{3}{4}$-ton on the crankpin, which was not affected or damaged in any respect.

The cylinders of both motors are of chrome - molybdenum steel with a nitrided case and are honed to a tolerance of ·0001 in. The case has a diamond hardness figure of 830 and, after final honing, a surface finish figure of 2·4 mu.-in. Diamond hardness figure of the crankshaft case is 852.

The pistons are lapped to a tolerance of ·0001 in. and married with the cylinder to give an annular gap ·000075 in. wide. This fit ensures excellent compression and excellent oil retention under operating conditions. Material specification of the pistons is not disclosed. ●

SPECIFICATIONS

	·75 *c.c.*	2·4 *c.c.*
Bore	·335	·500
Stroke	·516	·750
Stroke : bore ratio	1·54	1·50
Compression ratio	Max. 20 : 1	Max. 20 : 1
Weight	2 ozs.	$5\frac{1}{4}$ ozs.
Recommended Airscrew	8" × 4"	10" × 5"
Thrust	10 ozs.	32 ozs.
Mounting	Beam	Beam
Four fixing holes	6BA clearance	4BA clearance
Distance between hole centres :		
across	$1\frac{1}{8}$"	1·8"
in line	$\frac{3}{8}$"	$\frac{1}{2}$"

MATERIALS

	·75 *c.c.*	2·4 *c.c.*
Crankcase	Magnesium	Magnesium
Cylinder	Chrom/Molybdenum	Chrom/Molybdenum
Piston	Not disclosed	Not disclosed
Conrod	R.R.56	R.R.56
Crankshaft	Nickel steel	Nickel steel
Bearing	Phosphor-bronze	Phosphor-bronze

"He's either doing 300 or flying two models."

● Dick Korda and his original POWERHOUSE 33—fitted with O.K. CO_2 motor.

POWERHOUSE

(*Continued from page* 13)

paper, steel pins, hand drill and a pair of half round nose pliers. The building instructions are intended to be used in close conjunction with the plan. Many small sheet gussets are used on the model to prevent warping—and should not be omitted on any account.

FUSELAGE

Lay out the two main "crutch" members on the top view of the fuselage, adding the $\frac{3}{8}$-in. × $\frac{1}{8}$-in cross braces. Use pins to hold this frame in position on the drawing. When dry, lift up from the plan and insert the fuselage formers (F-F11). Bolt the landing gear bracket in place with the landing gear already attached—or substitute a conventional two-wheel undercarriage if you usually fly from rough ground. If a conventional spark ignition engine is being used, this is the time to install the coil, condenser, timer and battery box. Note the position of these components on the plan. Now add the fuselage stringers.

In the case of a diesel version, omit the battery box and install an Elmic timer to operate the fuel cut out. The E.D. Comp. Special is shown on the drawing and the bearers are lowered and spaced wider apart than on the standard (Bantam) version.

Fill in between the bottom stringers with $\frac{1}{16}$-in. sheet balsa. Cut the slot for the retracting landing wheel. Add the $\frac{1}{8}$-in. × $\frac{5}{8}$-in. wing mounts and the wing blocks. Go over all joints with several coats of cement.

WING

First cut out the front and rear spars —tapering the tips in accordance with the layout. Slide all the W1 ribs on to the centre panel spars. Then add the ply dihedral keepers and the tapered tip spars. With all the ribs in position, add the leading and trailing edges. The outboard laminated L.E. is added last of all. Sand to the correct sections after the cement has dried.

TAIL SURFACES

Tailplane construction is also started by sliding the ribs on to the spars. The trailing edge and tips are next added, followed by the laminated leading edge. The final sanding of the leading edge should be carried out after the cement has set.

Cut the fin parts from $\frac{1}{8}$-in. sheet and install the small movable tab. Cover both the tailplane and fin before joining them together. Slit the covering between the T1 ribs to take the fin.

COVERING

The original models were covered with Silkspan, given one coat of clear dope and several of coloured. High visibility colours were used—such as red, orange and yellow.

Silkspan is not available in this country, so any of the power model coverings available should be used. Go over the model with fine sandpaper to start with. Cover the curved surfaces with small pieces of paper. The rudder, tailplane and wing panels can be covered with one piece to each side (except the tips). Three coats of clear dope followed by three of coloured are recommended. Confine the coloured dope to the fuselage and fin. Be sure to put your name and address on the model.

FLYING

Dick Korda used the Arden 19, Bantam 19 and the Ohlsson 19 in his original models. The largest recommended powerplant is the Ohlsson 23. Note that 4-5 of downthrust is featured. High pitch 8-in. diameter airscrews were used on the record flights—but experiment until you find the best suited to your own model.

Balance point should be on the rear spar. Hold the wing and tailplane in place with heavy rubber bands. Set the airscrew so that it will stop horizontally—to avoid breakages on landing. Use the rudder tab to correct any excessive turning tendencies. Spinning tendencies are usually traced to warped flying surfaces.

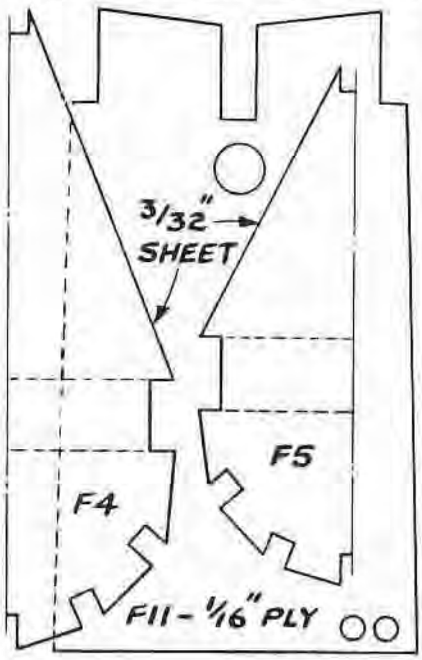
POWERHOUSE 33—CO_2 VERSION

Construction of the CO_2 Powerhouse is very similar to that of the larger model—so we shall only detail the differences in powerplant installation. Follow the plan carefully and no difficulties should arise.

The standard model needs no undercarriage, although one may, of course, be fitted for contest work. Mount the CO_2 engine on F1 and support the CO_2 bulb with a frame of $\frac{1}{16}$-in × $\frac{1}{8}$-in. strips. Insert a hinged door between F2 and F3—for access to the CO_2 bulb. Remove the wing head nut to save weight and use a screwdriver to screw up the piercing needle of the bulb holder. Cover the front with celluloid to form a windshield.

The E.D. Bee, Amco ·87 or Mills ·75 are all suitable for this design and installation for the first two diesels has

POWERHOUSE 41 PARTS



been detailed on the plan. Add $\frac{5}{16}$-in. × $\frac{1}{4}$-in. hardwood bearers immediately underneath the crutch—spaced $\frac{15}{16}$-in. apart (all three engines). No fuel cut out is provided in the Bee, but the Amco or Mills should be linked up to a diesel timer (positioned between F2 and F3). A fixed twin leg undercarriage is best for these diesel versions. The C.G. will be further forward than the CO_2 model, but this can be counteracted by a little negative incidence on the tailplane.

Here are a few tips for CO_2 engine operation. Do not allow the bulb to "pour" the liquid into the cylinder—hold the model in a nose up attitude when starting. Keep the bulbs warm for extra power—but do not actually heat them as this is DANGEROUS. Korda used an 8-in. × 4-in. airscrew on his original model. (C.G. $1\frac{1}{2}$-in. forward of T.E.) ●

LITTLE MIKE

(*Continued from page 22*)

After a smooth glide has been obtained, wind the airscrew up about 50 turns and launch the model in level flight at shoulder level. Add a small amount of right turn to the rudder so that the model makes a circle of about 30 feet in diameter. Increase the number of turns progressively, making slight adjustments in balance and rudder turn, to eliminate undesirable stalls, dives and spins.

When maximum turns are approached, it may be found that the model tends to stall slightly. If this occurs, add $\frac{1}{32}$-in. packing between the top front of the fuselage and the nose block to incline the thrust line downwards. A good quality motor, well lubricated, will take about 300 turns.

Here's hoping that Little Mike will give you many pleasant hours flying. ●

FIRECRACKER

(Continued from page 17)

was used on the original. This year I shall be using the same motor with glow plug ignition. Any 3-4 c.c. spark-ignition or 2-3 c.c. diesel motor will provide ample power for this model. Installation details for the E.D and Elfin are shown on the plan, together with the Ohlsson mount. Propeller pitch should be standardised at 6 inches, using a diameter best suited to the particular motor used.

KNOCK-OFF MOUNTING

Cut out back plate and plug from $\frac{1}{8}$-in. ply and rivet (or nut and bolt) together.

Tailor the dural mounting to suit the engine you use and arrange for approximately $\frac{1}{4}$-in. airscrew clearance from the pylon. Use 20-gauge dural for radial mounting and 18-gauge dural for beam mounting. To bend dural—cut sheet to required shape, rub toilet soap on the surface, heat over gas until soap goes brown-black and immediately dip sheet in cold water. Now bend sheet to desired shape with all corners radiused off. When bent to shape, repeat heat treatment above—this will prevent the dural from cracking when bent. Leave 24 hours to harden.

COVERING

The wing, tailplane and fin are covered with Jap tissue. Water spray all surfaces and then apply clear dope. The wings should have three coats, the tailplane two and the fin one coat.

FLYING

Trim for a flat glide, the model turning in about 100-ft. diameter circles. Test for power flight on 10 sec. motor

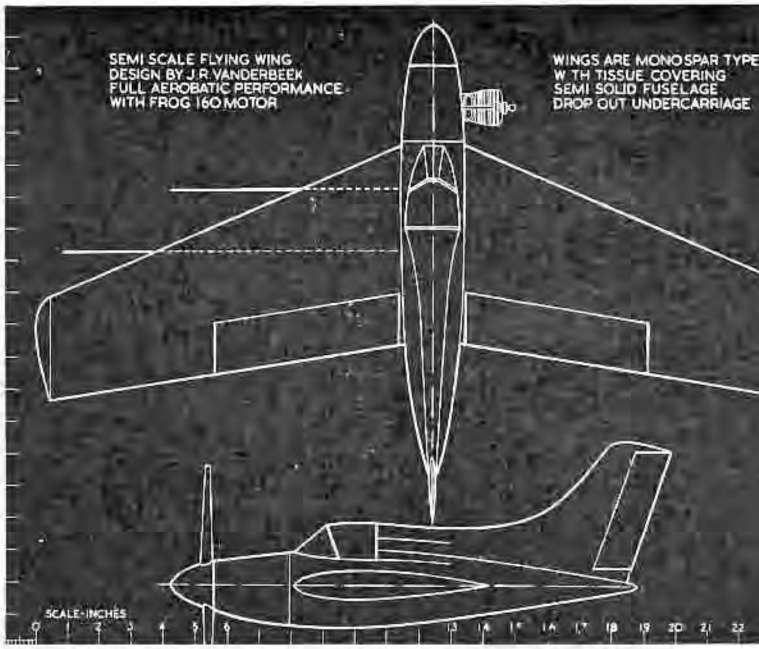
"This is the worst one we've had up there yet."

runs, gradually increasing revs. as correct trim is obtained. Looping cannot be cured by down thrust, but by careful adjustments of warps, turn and wing and tail incidences, it can be practically eliminated.

The dethermaliser parachute is of 12-in. diameter, and is fitted to the extreme end of the fuselage. It is advisable to set it for all flights made during the daytime.

WEIGHTS	ozs.
Fuselage and fin	2·59
U/C with wheels	0·78
Knock-off mount	1·28
Engine (Ohlsson 23)	5·24
Propeller	0·54
Ignition hook-up	2·74
Flight batteries (3 of ½ pen cells in parallel, i.e., 1½ volts)	1·65
Wing (covered and doped)	2·02
Tailplane (covered and doped)	0·47
Total weight	17·31

Weight with glow plug engine or diesel (with timer*) should be 13-14 ozs. (*Fit timer between F2 and F3.)



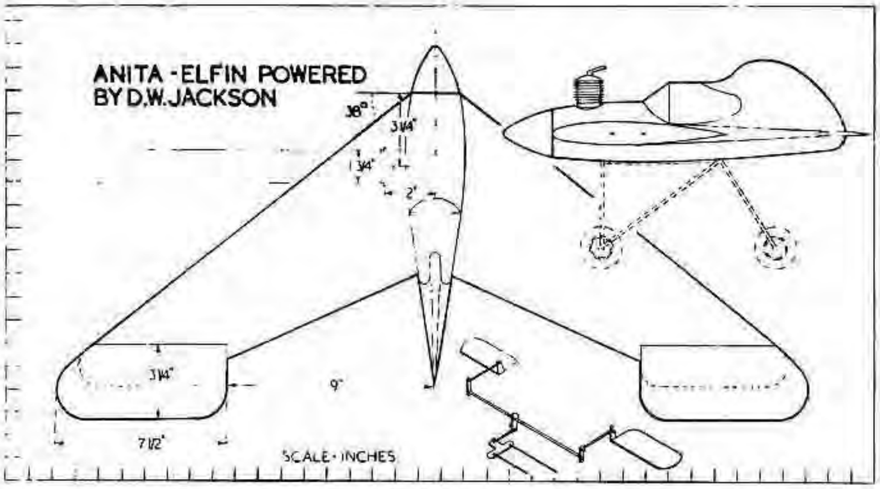
AEROBATIC AEROFOILS

(*Continued from page* 44)

The extreme simplicity of layouts such as these will undoubtedly appeal. A one-piece elevator can be used, coupled to the control plate in the conventional manner. Provided the elevator area is not excessive, controls are not too sensitive and yet response to control movement is positive and rapid. Stable aerofoils are, of course, used—simple symmetrical sections being much favoured.

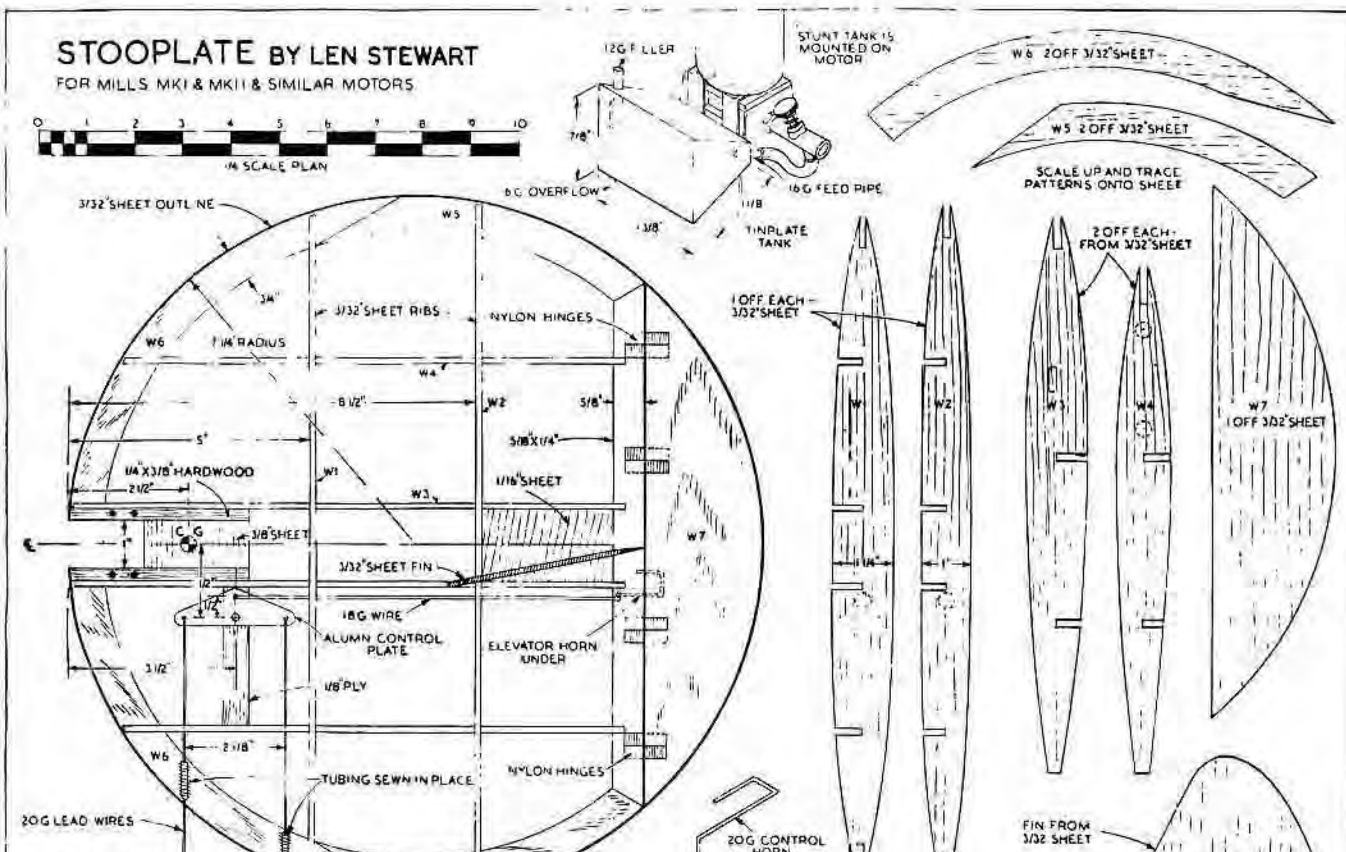
The American design—Flip Flop by Ray Borden—is again virtually a rectangular flying wing with an extension carrying the elevators. The addition of a definite fuselage and attention to the lines has produced a model which has, really, a semi-scale appearance. As a stunt model, powered by a Drone diesel, it has proved extremely successful. Dave Slagle, on the other hand, in producing a "pterodactyl" stunt model did little more than sweep back the tips of the wings of a conventional stunt job and still retain the orthodox tailplane and elevators. Slagle's design is not a flying wing model in the true sense of the term.

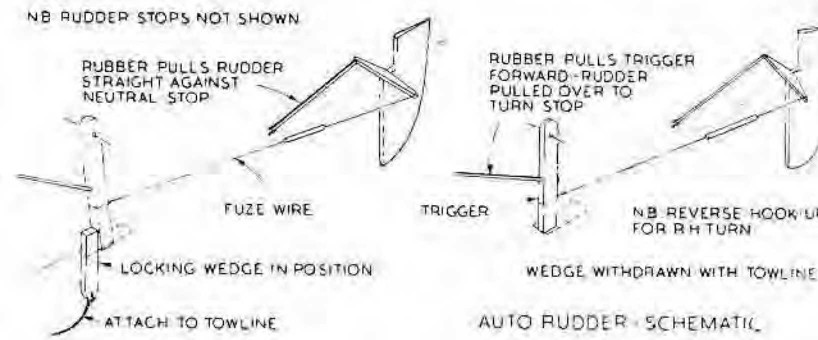
All of these flying wing jobs fly much faster than orthodox machines with the same power unit, although compared with a specialised *speed* design in the same category their performance is inferior. It is, indeed, this inherent high speed flight which has led to development troubles on many flying wing stunt



models. Departures from the simple functional design, where, for example, split elevators are called for, have complicated mechanical linkage and lead to other control difficulties—so that it is much more difficult to produce a semi-scale flying wing stunt model than a simple "flying saucer," both to have a comparable performance.

Manoeuvres with a flying wing stunter are often carried out so rapidly that observers are at a loss to follow exactly what has happened—a point which may confuse judges in contests! But on the whole they afford two distinct lines of approach for stunt fans. On the one hand is the simple "flying saucer" which can really stunt well and teach the pilot a lot about stunt flying. On the other hand there is the possibility of producing a scale or scale-appearance flying wing model with a full stunt performance, calling for ingenuity in construction and detail design, for those modellers who prefer such "tricky" problems. ●





AUTO RUDDER - SCHEMATIC

CONTEST GLIDER

(*Continued from page* 42)

possibility of failure is very small indeed. Even if the locking piece sticks, it can be pulled out by a gentle tug on the line. The line joining the locking piece to the towline should be stronger than the towline itself, so that the latter will always fail first.

The original Contest Glider was 5-ft. wing span and of very light overall weight. Still air flight time from 300-ft. of line was consistently around the 5 minute mark, but it was a good weather model. In high winds, the wings would flex and twist under tow and hence a stronger wing was built for the F.A.I. version of the design.

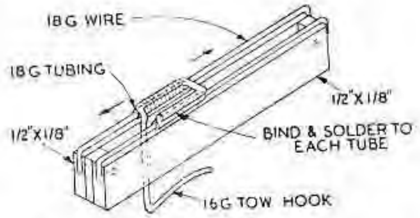
Since the original model was so light, wing area was reduced on the F.A.I. version to reduce the amount of ballast to be carried. Span was now 48 inches and the wing further strengthened by sheet covering the leading edge back to the top mainspar. All of these wings, incidentally, used a very thin, laminar-flow section, which has since been abandoned. The latest version detailed on the plan has a standard RAF 32 section.

To bring up to F.A.I. loading, ballast was carried under the wings, this being preferable to building a heavier airframe throughout. In fact, it has been found that provided the airframe is reasonably strong, the lighter it can be made the better, additional weight being added in the form of ballast amidships, i.e. immediately under the wings. This minimises inertia forces which may affect stability—particularly under tow.

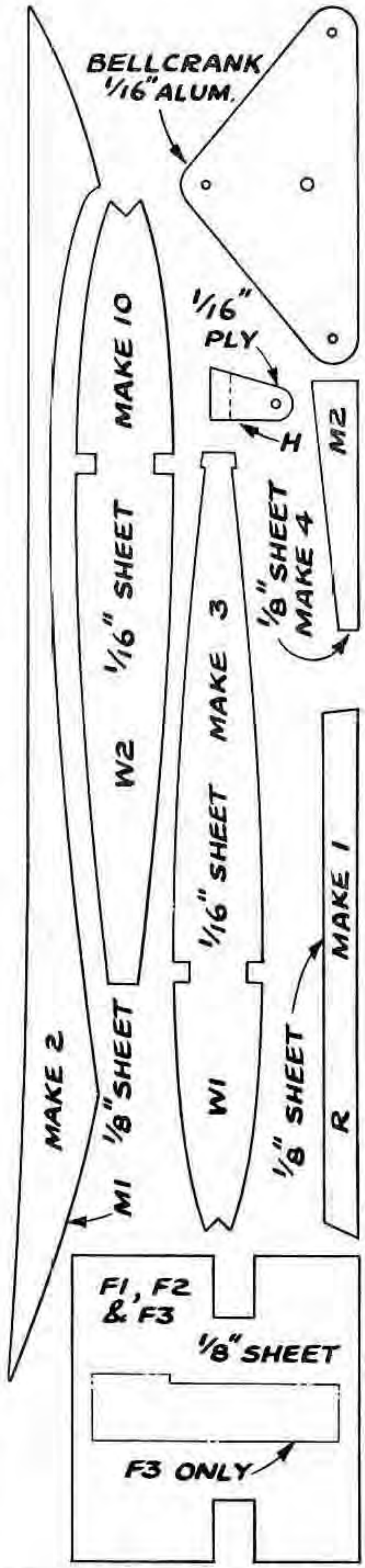
The other new feature to be incorporated is an adjustable tow hook, which has been thoroughly proven on a large-scale Wraith (6-ft. span), this

"If only we could get that power into the size of a walnut."

particular model being used as a "guinea-pig" for testing various devices. A single adjustable tow hook allows the hook to be adjusted for the best possible position for any conditions. It is readily possible, on the large Wraith, for example, to bring the model right overhead and release immediately above utilising the full length of the towline. To achieve this consistently, practice is needed in setting the tow hook position and also the lightest possible line should be employed.



All constructional features are detailed on the plan, the airframe being strictly conventional. The only unorthodox feature is the use of $\frac{1}{16}$-in. sheet bracing inside the nose to strengthen the nose section against stalled landings. Under optimum contest trim, all gliders of this type should have a tendency to stall slightly when approaching the ground. ●



"SMALL FRY" PARTS

MEET THE DESIGNERS

W. A. S. GEDDIE

built solids from 1933-36, then rubber duration until call up in 1940. Served in the Royal Engineers, being invalided out in 1944. Started modelling again with rubber and glider types. Now concentrates mainly on Wakefields, with free flight power as a secondary interest. Belonged to Bromley M.A.C. 1937-46. Member of Zombies club since inception in 1946—now club secretary. Has a brother—Duncan—who is also a modeller and goes in for HATS. Is 28 years old and single. Profession : Quantity Surveyor.

DICK KORDA

is 33 years old and one of the best known of American designers. Won Wakefield Trophy in 1939—his winning design still being popular in this country and the U.S.A. Established himself as a free flight expert with his Powerhouse in 1946. Started off with a ready built R.O.G. stick model at the tender age of 5. Built his first flying model at 12 and has had cement on his fingertips ever since. Has been a member of the Cleveland Balsa Butchers for many years. Other interests are fishing and deer hunting. Married, has two children aged 5 and 10.

NORMAN MARCUS

is just 19 years old. Took up serious modelling in 1944—on joining the Croydon club. Engineering student at Kingston (with Roy Yeabsley). Has won contests in nearly all classes. Won the S.M.A.E. Individual Championship in 1946. Favourite type of model is lightweight rubber. Has a definite dislike for Wakefields. Considers that high-powered free flight models require most trimming skill.

R. D. RANDERSON

has built scale models for the last 12 years—but has yet to try a free flight model. Became interested in power designs when he met P.E. Norman at R.A.F. Halton in 1945. Started building scale controliners in 1947 and founded "Modelair Control Liners" in January, 1948. Served in the R.A.F. for eight years (from 1937)—logging over 1,000 hours as a flight engineer. Collects 1914-18 diaries and autobiographies of famous airmen.

Look out for these other 1949 Publications in this 2/6 Series.
MODEL AVIATION PLANBOOK (Mid August)
1950 MODEL PLANES ANNUAL (Early November)