Full Size Plan feature

Sopwith Triplane

A truly international 45" span electric model, designed in the UK by Peter Rake, with test models built by Robert Hoffman in the USA and Rodd Perrin in Australia

Of all the fighter aircraft produced during WW1, the Sopwith Triplane possibly had more effect on fighter design than any other type.

Although her service career was relatively short-lived, and despite only being produced in quite small numbers, virtually every other combatant nation was sufficiently impressed with the little Sopwith to produce triplanes of their own. However, apart from the most famous of them all, the Fokker Dr1, virtually all the others disappeared into rapid obscurity. Considering what monstrosities many of them were, that is not necessarily a bad thing.

The model

As usual with my designs, this isn't intended as an exact scale copy of the full-size aircraft. It is an easy-to-build scale model of the type that you are likely to see at your local flying field most Sunday mornings, very representative of the original, and capable of being well detailed, but not 100% scale.

In order to avoid the problem of assembling three wings, complete with ailerons on each wing, every time you fly her, she has been designed as a one-piece model. That is not to say that, with minor alterations, she couldn't be built to disassemble, just that it's an awful lot of bother on a model that will fit easily into most family cars in one piece.

Also, like many of my models, she is intended to take advantage of economy power plants and just seven or eight-cell battery packs. As drawn, the intended motor would be one of the 'hotter' 600 types mated to either a Graupner or Master Airscrew offset gearbox and retained using

1: Have a sandwich! Basic wing rib blanks, clamped together between ply templates on a pair of long threaded rods, ready for sanding to shape.

2: After sanding - the wing rib sandwich. Note that spar slots have been cut in the underside.

shell clamps. However, that isn't to say that other motor and battery combinations can't be used in the model. Just to prove the point, while Rodd has fitted his model with a 4:1 geared ND10 motor and 10 x 3000 mAh NiMHs, Robert's model flies extremely well on more or less the combination I had in mind - a Graupner Speed 600 (No. 6309), a Master Airscrew 2.5:1 gearbox and eight CP2400 Ni-Cads.

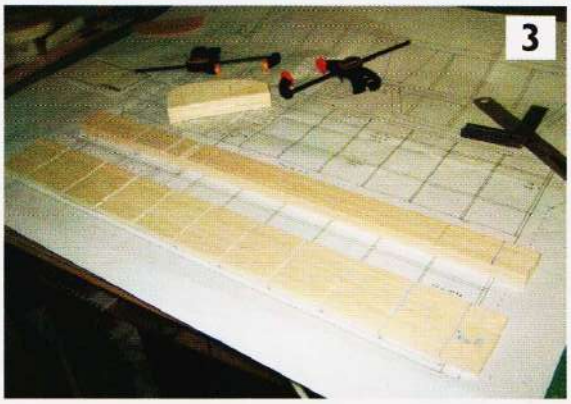
Wings

Before starting assembly, study the fuselage plan and familiarise yourself with the different way each wing is fitted to the model. The top wing, which is built and joined to the centre-section with ply dihedral braces is the one that sets the dihedral for all three wings. The outer centre-section ribs are cut to seat accurately onto the ends of the ply centre-section struts.

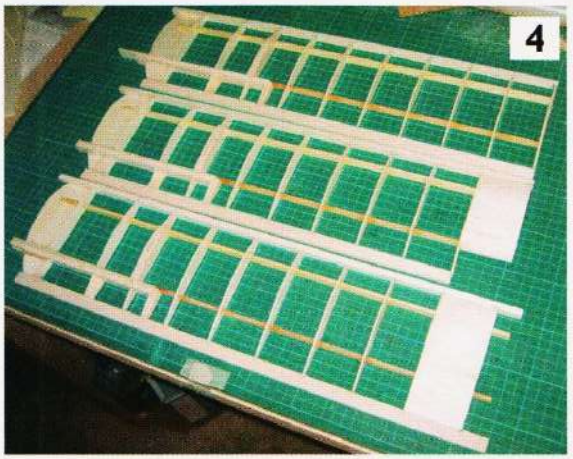
The middle wings, which have the 1/4"x 1/2" balsa extensions, have their root ribs slotted to fit accurately over the 1/4" square balsa strip fitted to the centre-section strut, and also have the two inboard ribs of each panel trimmed back to allow for the top sheeting to be fitted.

The root bay ribs for the bottom wing panels are also trimmed for sheeting, but these wings rely on the 3/16" locating dowels to ensure that they go on at the correct incidence angle. In addition to these points, all ribs inboard of the aileron servos will require the hole for the aileron servo extension leads to pass through.

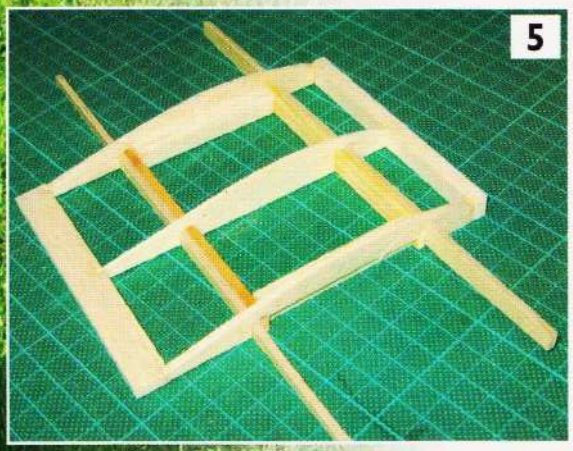
The final task, before you reach for the glue, involves the interplane strut ribs. Once again, use



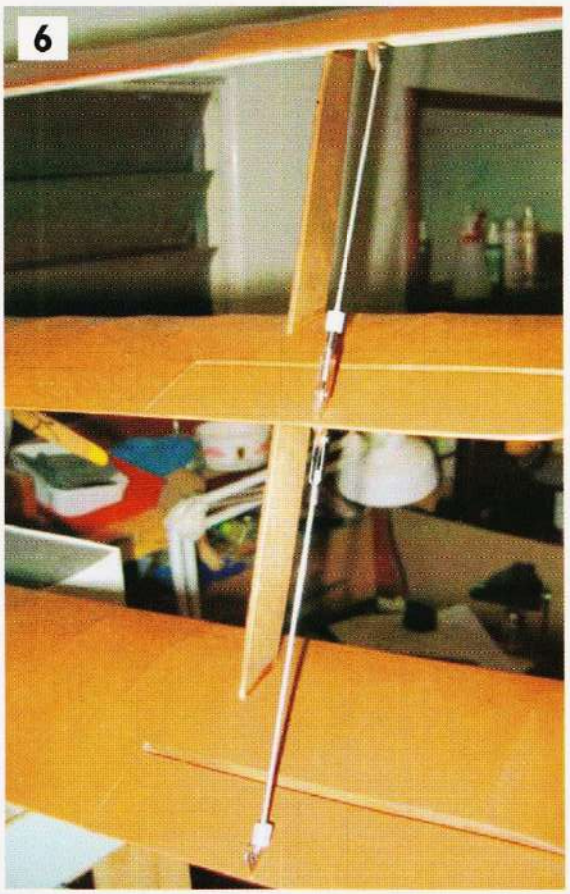
3: A full set of wing spars, both front and rear, knotched to take the wing ribs, egg-crate fashion.



4: A full set of wing panels for the port (left) side. All are essentially the same. Ailerons are built integral with the wing panels, and are separated after trimming and sanding.

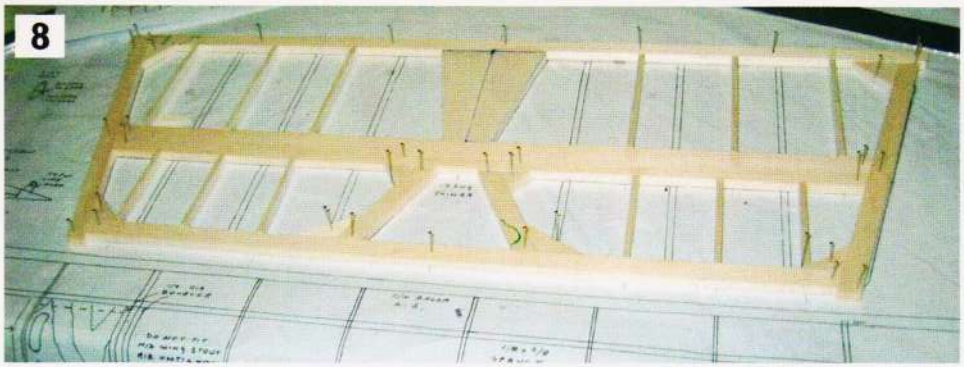


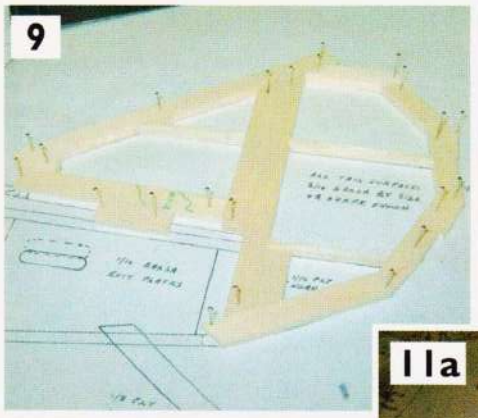
5: Ply dihedral braces are built into the top wing centre-section. Only the top wing has a centre-section.

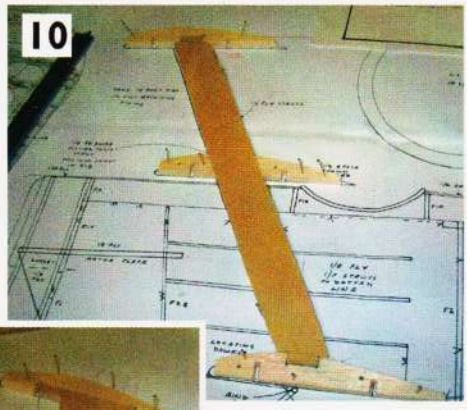


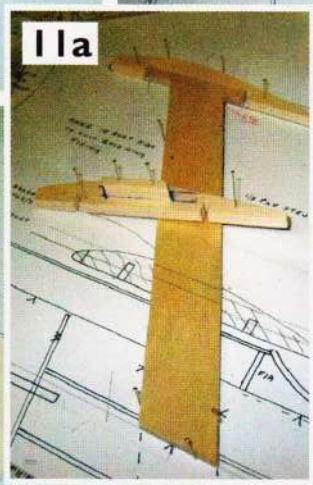
6: Interplane struts pass right through the middle wing. As an aid to simplification, the strut ribs are not fitted to the wing until the initial assembly stage.Note of the way in which the ailerons on each side are linked.

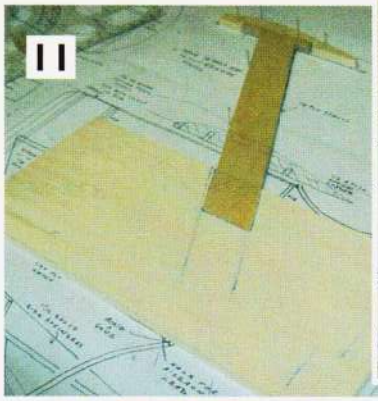
7: Two aileron servos are used - one in each lower wing panel and linked to the aileron on the wing underside. Servo is hidden by removable ply panel.







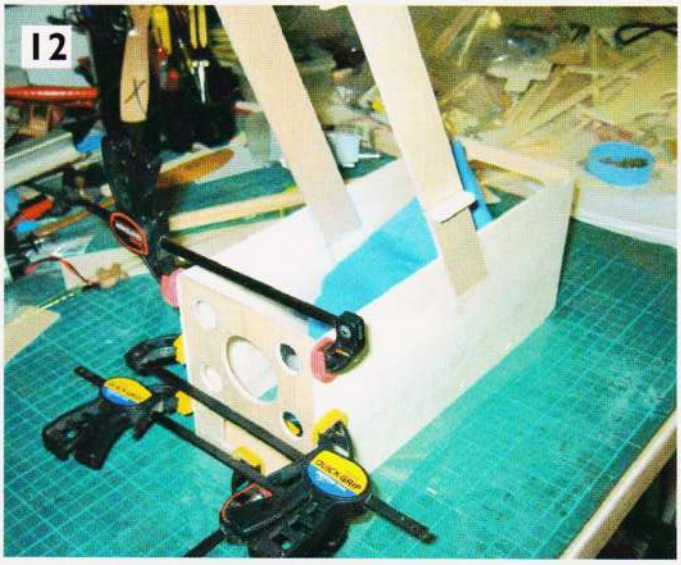




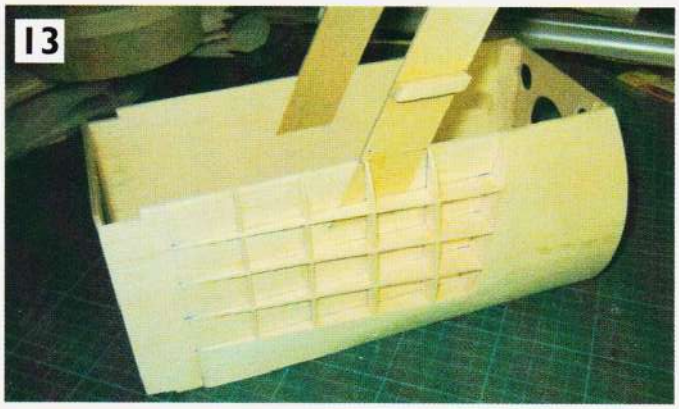
8 & 9: Absolutely nothing complicated about the tail surfaces.

10: A vital stage to get absolutely correct. Interplane strut and related ribs are set up over the plan to get the strut cut-outs exactly right.

11& 11a: Centre-section struts are let into the sheet fuselage sides; the block at the bottom of the strut and the tongue at the top aid wing alignment during the assembly stage.



12: Once the centre section struts are set into the basic sheet fuselage sides, the basic front fuselage box is assembled. Clamps help set it all in place.



13: The front fuselage assembly taken a stage further. With the side-fairings now in place, it is ready for mating to the fusegae rear unit, built sepatately.

the fuselage side-view to determine exactly where and how much, the rib should be cut away to take the struts. In the case of top and bottom wings, this simply means small notches which are then faced both sides with the doublers. However, since the interplane strut passes right through the middle wing panels, they will require the entire strut area to be removed. Assemble these rib/doubler assemblies over the side-view, then add the opposite doubler.

Right, we have all the ribs prepared, the spars cut to length, notched to clear the tip and tapered, and the other wing components to hand. NOW you can reach for the glue and begin some serious wing building.

Pin down the leading-edge, trailing-edge and wing tip, gluing as required, then pin down the spars, gluing them to the wing tips. Now trim the ribs for the ailerons and glue the ribs in place. Lean the root ribs in slightly to allow for dihedral, but ensure that all other ribs are upright, the only exception being the middle wing strut ribs which are not fitted until later. Glue the aileron area false trailing-edge to the spar, pin in place, but only glue to the tip, the aileron leading-edge and fit the aileron ribs and horn plate (bottom wing only). Allow to dry thoroughly, and then sheet the root bay of the middle and bottom wing panels. Add the 1/4"x 1/2" balsa pieces to the ends of the middle wings, and trim and sand to shape. Separate the ailerons and trim and sand the leading edges as shown on the plan.

Add the hardwood rails to the servo bay of the bottom wing panels so that once the servo hatch is screwed in place it will be flush with the lower surface of the wing. Any scrap hardwood will do, just so long as you have something to screw to. It is a good idea to fit the aileron servo leads now too, they are much more difficult to fit if your wing is covered. However, the aileron horns and link horns are better fitted after covering the wings.

Centre section

This really is very simple; build it over the plan, building in the ply braces as you proceed. Add the pieces of 1/4" x 3/8" balsa inside the 1/8" ribs, and allow to dry. Trim and sand the centre-section to shape and then join the top wing panels to it. Cut brace slots in the ribs and glue the panels snugly to the centre-section. Pin them down at the wing roots, but pack up the tips as indicated before allowing to dry.

There you have it - effectively, three pairs of wings built.

Tail surfaces

Since by now you probably feel you deserve a rest, we'll move on to what has to be the easiest part of the entire model - the tail surfaces. However, before starting construction, a few notes. The horn positions shown on the plan are for a model using balsa and wire pushrods and are not the scale positions. Should you wish to save a little weight and end up with a more accurate model, move them to the correct locations and use a closed-loop control system. Naturally, for this method, double-ended horns that pass right through the control surface will be required.

Right, that decided, let's bash some more-balsa. Build the tail surfaces over the plan, using 3/16" balsa as indicated on the plan. Allow to dry, round off the edges and sand overall. Join the elevators using the 12 s.w.g. wire (3/32" music wire), ensuring that both elevators are level and straight. Once again, horns are added after covering.

Fuselage

Okay, rest over! Now it's time to move on to the area of the model that is likely to take asl

long to complete as the rest of it put together. Yes, it's time to make something to fit those wings and tail surfaces to - the fuselage.

In keeping with my usual practice, the fuselage is built as two separate box structures, the front, sheet sided one and the rear, built-up one. Once at basic box stage, the two assemblies are joined over the plan and then have all deckings and stringers added. This system is nothing like as strange as it at first sounds, because it is the surest way I know of to obtain a straight, square fuselage. The slight deviation from scale is a small price to pay for a model that flies better.

Rear box

Build two side frames, one on top of the other, but separated by some thin polythene sheeting to prevent them becoming one double thickness frame. Allow to dry completely, and the join them over the plan with the cross-braces. Note the way the tail is cracked in and joined; make sure it is also securely glued because free-flight tails are no use to anyone. The tailplane seat pieces and the tailskid plate are designed to help reinforce this area, and are in fact the next pieces to be added. The sheet fill pieces in the rear side panels are only really required if you are using pushrod linkages - for closed-loop controls, they may, if you desire, be omitted.

Front box

The first task here is to edge-to-edge join some 1/8" balsa sheet to provide the required width balsa for the side panels. Then mark out the sides, noting that they are cut around the centre-section struts and should also have the locating dowel and servo lead positions marked at this stage. Cut out two identical side panels, and prepare yourself for an extended fuselage building session. The centre-section struts should be accurately glued into the two sides, and the middle wing locating blocks added while you can still use the plan as a guide. It is vitally important that these pieces are accurate, and almost impossible to do after the sides have been joined with the formers.

Next, mark in all former positions and the position of the motor plate before using those formers and motor plate to join the sides. It cannot be over stressed how important it is to ensure that the assembly is straight and square. If it isn't, your centre-section struts won't align correctly, which means you'll have problems when it comes to fitting the wings to your model. Add the undercarriage plates and the ply motor plate gussets, allow to dry and then join the front and rear basic box structures. Make this assembly over the plan as an aid to producing a straight and square fuselage.

Deckings, etc.

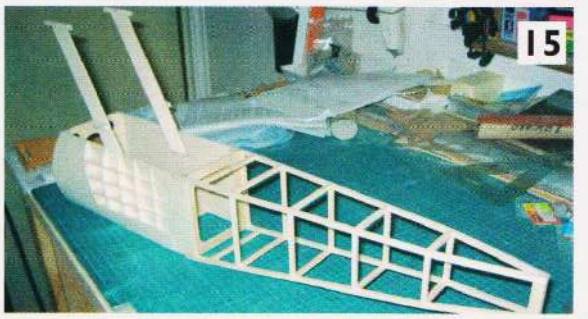
Glue in place all decking and stringer formers, including the piece of 3/16" strip between the tailplane seat pieces, and then glue in place the top 1/16" sheeting and the stringers. Follow that with the side stringers and the 1/16" side sheeting, noting the way it is cut away round the bottom wing position. This task is made slightly easier by ignoring that fact initially and using the bottom wing panels to mark out the area to be trimmed after the sheet is firmly glued in place. The side stringers are nothing more technical than triangles of 1/16" balsa, cut to match the depth of side sheeting where they fit, but with the bottom one trimmed by the thickness of the side sheet which is glued over it.

Note that Rodd also added extra side formers to the nose of his model to achieve that showing-through-the-fabric effect so prominent on this aircraft. Glue in place the bottom surface fill pieces and your fuselage is ready to trim off the excess longeron and tail seat pieces before sanding overall. Bind the undercarriage wires firmly in place, bind and solder them to the axle and then glue the thread bindings. Alternatively, the undercarriage may be retained with small saddle clamps. Robert and Rodd both used this method which, as it turned out, was no bad thing (see flying notes).

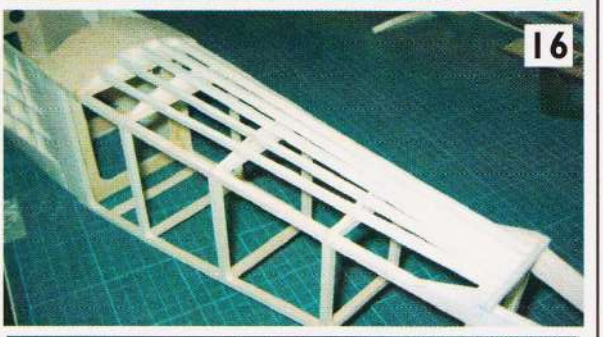
Cowl

As you can see from the plan, you have another choice to make - a scale-length cowl or a slightly over-length cowl to help with balancing the model. The choice is entirely up to you, both are made in exactly the same manner. As far as I'm aware, both builders chose the scale-length cowl.

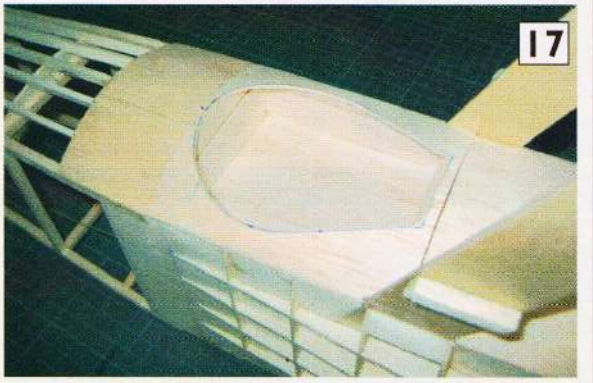
14: The basic box structure of the rear fuselage, built from 1/4" square balsa.



15: Now it looks a bit more like a fuselage - the rear and front section mated.

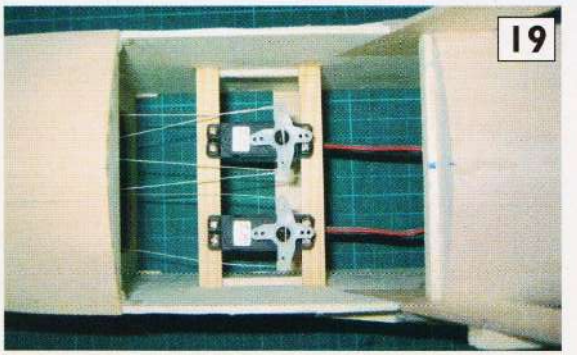


16: Top decking now in place, with stringered fuselage rear deck. Nose the fairing shape up to the front of the tailplane seat to reproduce the scale shape.

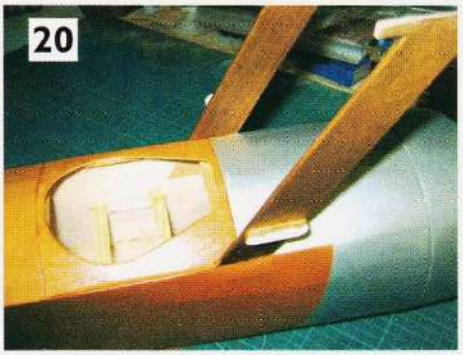


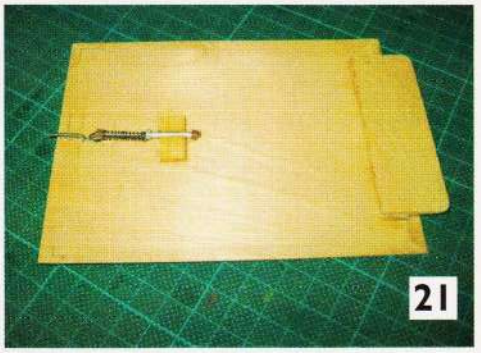
17: The cockpit area with sheet 'floor' in place on which to mount a pilot bust.

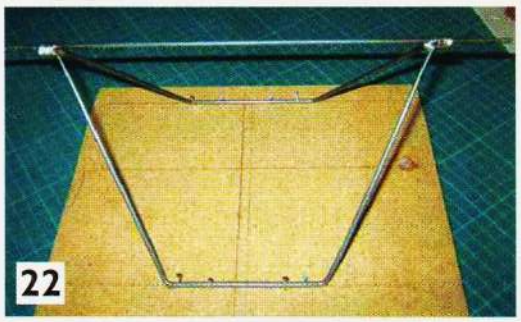
18: Detail of the rear fuselage showing how control runs for a scale-like closed loop link to the servos should be fitted.



19: View inside the fuselage before addition of the sheeting at the cockpit, showing the installation of the ruddder and elevator servos - in this case set up with closed-loop control links.



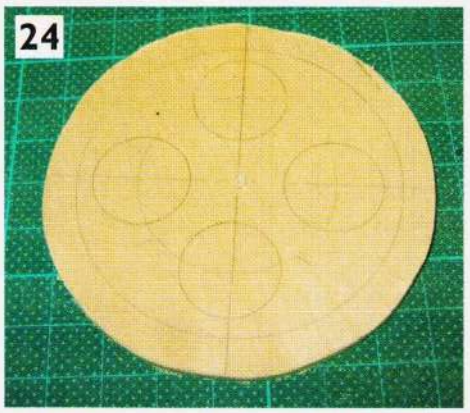


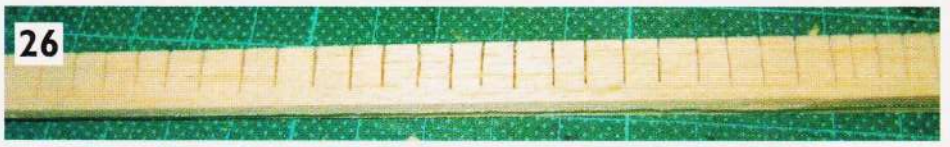


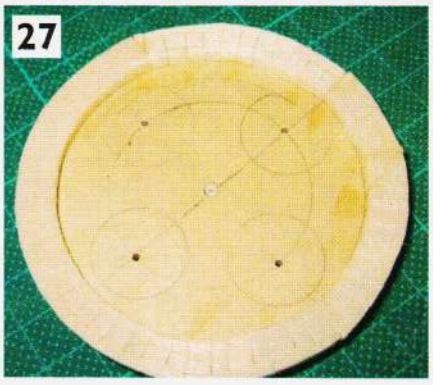
20: The completed fuselage, showing the centre section struts and the key on which the centre wing panels rest to set position and incidence angle.

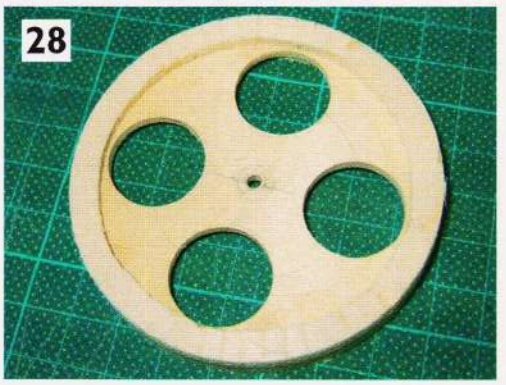
21: Access panel for the fuselage underside.

22: This simple, marked out jig is a great aid in accurately constructing the wire undercarriage.









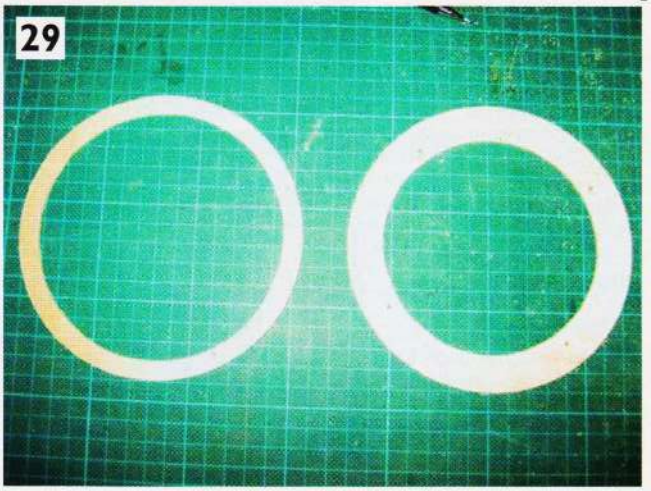
24: Rough-cut plywood main wheel disk, with lightening holes and rim positions marked out.

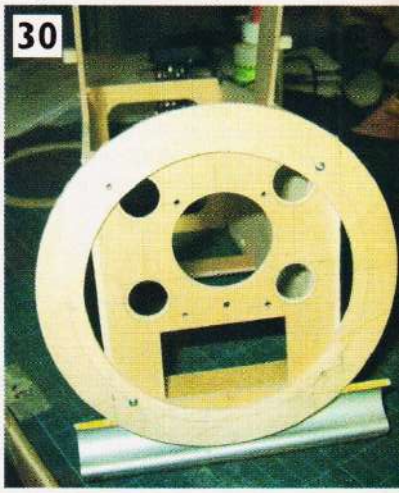
25: The Rough-cut disks are spun up in an electric drill for sanding the edges to perfectly round.

26: Wheel rims are from balsa strip, slotted as shown here to allow the strips to be eased round the edges of the plywood disk. A good overnight soaking may well help.

27: The balsa rim in place on the plywood disk.

28: Lightening holes cut into the ply centre disk.





Wrap a strip of 1/32" ply around one former C2, gluing with cyano as you proceed. Once all the way round, don't trim off any excess until the second C2 has been fitted. Glue the ends of the ply and reinforce all the glue joints with a bead of white glue on the inside.

Laminate the C1 parts and then glue them to the front of the assembly. Once dry, trim and sand the cowl to shape before proceeding to fill, sand, seal, sand, prime, sand and finally paint your cowl. The cowl may be either glued in place, or made removable, whichever you prefer. Retaining the cowl with small, rare earth magnets, while using small lengths of cocktail stick as locating pegs, works well.

Covering and finishing

Once again, the test builders chose different methods of arriving at a similar end product. Robert covered his model with *Polyspan*, shrunk, doped and painted, while Rodd used a film covering called *Ozcover*, keyed and painted. Although both methods worked out okay, Rodd did have more trouble with the painting stage. Painting film can work, but is not without its hazards, especially if any masking is involved. Whichever system you choose, do make sure that you keep the tail end of the model light. Too heavy a covering material, or too much paint, in this area can cause major problems when you try to balance the model. Note how Rodd had to fit some of his batteries in the cowl to get his model to balance...

Assembly

Start with a trial assembly before the middle wing panels are covered, but after that the sequence will be just the same for the final assembly.

Fit the top wing onto the ends of the centre-section struts, ensuring that it seats accurately. Feed the interplane struts through the middle wing strut ribs, and use the fuselage side view to ensure they are aligned correctly before gluing them in place. Plug into position the bottom and middle wing panels on one side of the model and position, but DO NOT GLUE the strut rib/interplane strut in the wing. Lightly tack glue the strut ends into their locations on the top and bottom wings, and then align the strut rib accurately into the middle wing before gluing it securely in place. Repeat the procedure for the opposite side, and then lightly sand the strut ribs before covering the middle wing panels.

Doing it this way ensures that not only are the strut ribs at the correct angle in the middle wings to prevent the struts bowing, but also that the wing is at the correct incidence at both centre-section and interplane strut positions. For the final assembly, simply glue the top and bottom wings securely in place and glue the interplane struts into them, also gluing the middle wing onto its

locating block on the centre-section strut. Since you will need time to align things accurately, a slow setting (30-minute) epoxy is the ideal adhesive for this operation. Use this assembly as a guide when gluing the tail surfaces in place.

Installation

Motor installation is simple. Mount it with shell clamps, ensuring that it is totally upright and that the shaft is on the thrust line. The receiver and ESC should be mounted to the sheet fuselage sides with servo tape, whilst the elevator and rudder servos are screwed to hardwood rails across the fuselage. The aileron servos should be screwed to short hardwood blocks, which are then securely glued to the servo hatches with the output arms protruding centrally through the slot. Alternatively, the servos can be glued directly to the hatches using cyano.

The only technical part of the operation is installion of the aileron link wires. These must be accurately shaped to length, with a 'Z'-bend in each end. Secure all the ailerons at neutral and then slip a link horn onto each end of the link wire. Fit the link horns to the ailerons (middle and bottom wing), check that they are still at neutral., and glue the horns. Fit the remaining link wire to the middle wing link horn, slip on the other link horn and glue it into the top aileron.

By making top and bottom link horns slightly over-length, you can use that length to ensure that the ailerons all align - either by making up for a slightly short link wire, or by passing it through the wing and trimming off any excess once it has been glued. Now, because it's a one-piece model, the ailerons can't but act in unison and there is no fear of fitting the wrong link wire to the wrong ailerons. Any trim changes will affect all ailerons equally. The one point that has come to light is that the link wires must run as a straight line from bottom aileron to top aileron. Anything less will cause binding.

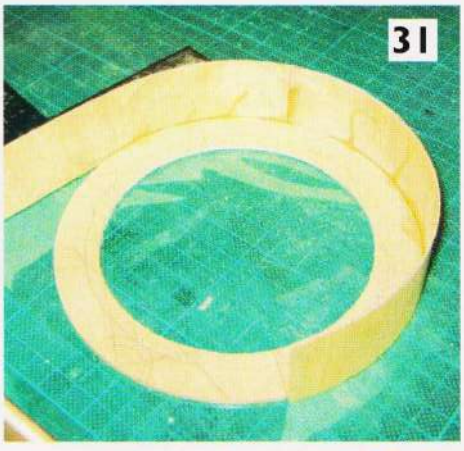
Specification

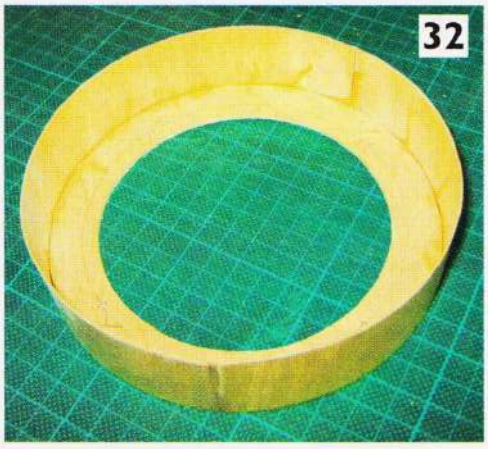
Name:	Sopwith Triplane
Type:	Near-scale electric R/C
Designed by:	Peter Rake
Wing span:	45" (1145 mm)
Motor:	Speed 600 geared 2.5:1
Battery pack:	8 x 2400 NiCads or equivalent
Control functions:	4-ch. - rud./elev./ail./throt.
Construction:	Built-up balsa/ply
Covering:	Polyspan/Ozcover on prototypes

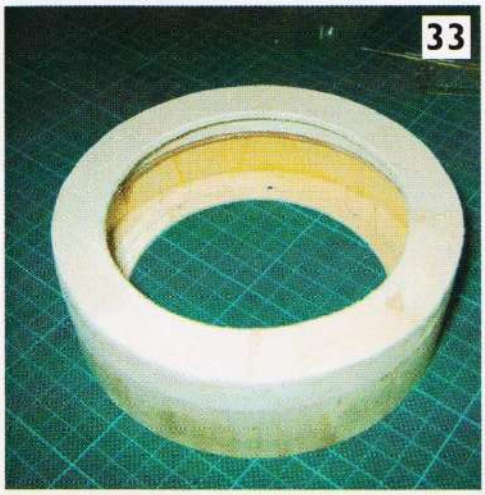
Flying

Robert was the first to have his model ready for test flights and promptly discovered something of a problem. With the wheels in the scale position, they are almost directly below the balance point, making take off and landing extremely difficult to get right. Consequently, as soon as power is applied, the model tends to nose over. Similarly, during landings, as soon as the wheels touch, the drag causes a nose-over too. It didn't cause any damage, but made her a bit unpleasant during these two criticall stages of flight. Since the model flew extremely well with the balance point as shown, the solution was to move the wheels forward to a slightly non-scale position.

Robert made up several new sets of undercarriage, each with the wheels pro-







29: Plywood front and rear formers for the engine cowl. The wide one on the right is the rear position one.

30: Cowl rear former trial fitted to the fuselage front assembly. There are four retainer points for the cowl.

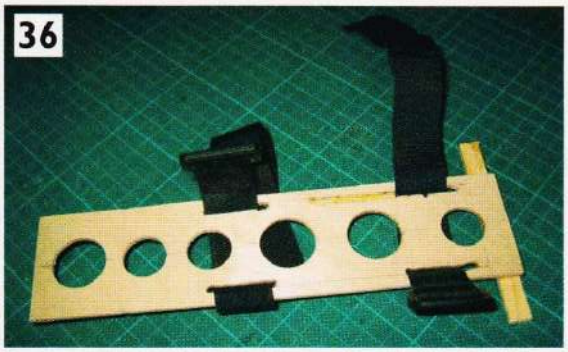
31 & 32: The basic engine cowl starts with a plywood strip, wrapped around the front and rear formers.

33: Second stage of cowl construction is to add laminations of balsa forward of the front plywood former, ready for final shaping

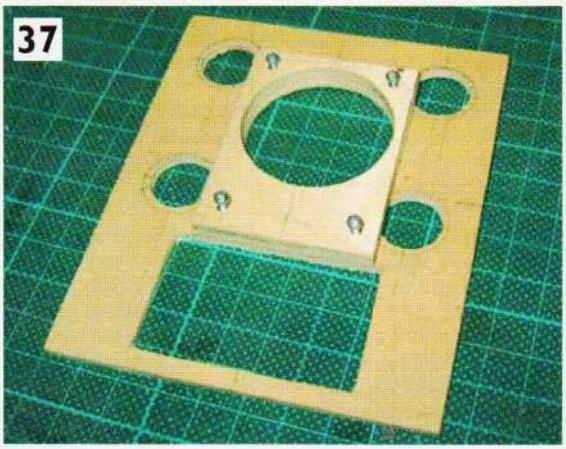
34: The completely shaped cowl, also showing the fuselage nose section.

35: ND10 motor, geared 4:1 and run with 10 cells.

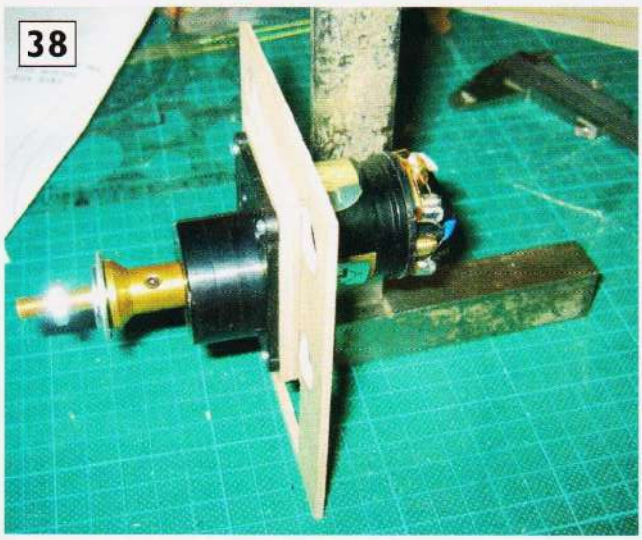
36: Battery installation tray showing the retainer straps. The tray slides into the fuselage through the opening in the fuselage front former that also retains the engine cowl.



37: The motor mounting plate is secured to the front fuselage former by for bolts - one at each corner.



38: The motor, bolted to the plywood mounting plate, ready for installation in the fuselage.



gressively further forward, until he was happy with the result. Rodd, who had received his plan after Robert and builds a little slower, went for the modified undercarriage from the outset.

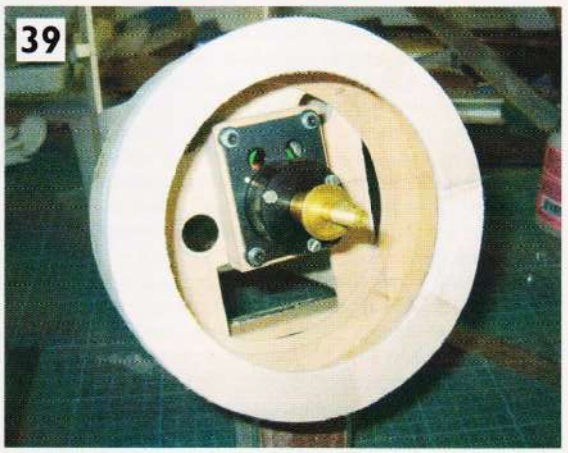
Now, with the only problem solved, Robert is very happy with his Tripehound. Tracking during take-off is good, resulting in a nice straight run with take off after about 35-40 feet. The model flies very smoothly, turns can be executed without the need for rudder/aileron mixing, and she is not at all difficult to fly. In fact, Robert says that, in his opinion, she flies just like a trainer - just looks a lot more impressive in the air than any trainer. He has flown her in winds of 10 m.p.h., with gusts up to 15 m.p.h. and she handled it well. No problem at all, in fact.

As regards take-off and landing, the secret is to hold her tail down until she's moving, but remember to let the elevator input off again as soon as she is. Otherwise, with all that wing and relatively low wing loading, (even Rodd's slightly heavier model only carries 14.25 oz./sq. ft.), the model is likely to leap into the air before flying speed has been achieved. With this type of model, it is essential that it be allowed to pick up speed before easing her off the ground.

For landing, keep a little power on to help with the roll-out after she has touched down. On one practise flight, Robert did six take-off and landing runs, with some loops in between. Five of the six landings were perfect, the sixth, on which he forgot to keep the motor ticking over, resulted in a nose-over. So, you have been warned!

Rodd has since flown his Tripehound and although only flown once at this point, he says that she tracks straight and has plenty of power with ten cells on board. Just like Robert, he is very happy with the model and promises to fit a pilot, gun and undercarriage fairings, as well as adding those missing underwing markings. ■

39: The motor, on its mounting plate, bolted into position on the fuselage front former. Note the opening below the motor, through which the battery pack passes, on its mounting tray.



40: The nose of the Sopwith Triplane is typical of WW1 rotary engined aircraft - very short. Achieving the correct balance point can thus be a problem and mounting a couple of the cells of the power pack right inside the cowl is about as far forward as it is possible to go to help drag the balance to the right place.

41: Getting ready for action! The one-piece model can fit easily into the back of almost any car.

42: Detail of the radio installation compartment and the undercarriage mounting.