54in. wingspan sports aerobatic model for 0.40cu.in. motors and 4 function R/C

Hawk

by Dave Crawford

HAVING decided to build a new aerobatic model all that was required was the shape and size.

Skipping through magazines I found myself pointed in the direction of the *Hawker Siddley Hawk* as a basis. Smart new shape, deep fuselage, especially up front for 'knife edge' flying and swept wing for speed with stability. My only concern was that the rudder (all top side) would push the tail down when used.

In practice the swept back hinge corrects this and the rudder action remains true and powerful. Although only based on the *Hawk* the final model certainly looks the part in the air.

My original version has a foam core wing and tailplane but built up units are shown on the plan. My own feelings are that foam core wings are truer and quieter (no sound-box effect) but you pays your money etc., etc. The wing itself has pronounced sweepback and no washout. Its profile however is 15 per cent thick at the root and 17½ per cent at the tip, in addition, wing fences are fitted as per the full size Hawk. The end result is a wing which is very stable at low speed. How much of this is due to the wing and how much due to the fences I don't know, but I am not about to alter it so take my advice and fit the fences.

The model was originally designed and flown with a plain bearing *O.S.35* and was more than adequate for the Sunday flier.

However, in the end I succumbed and fitted my *HP.40*, with this motor the *Hawk* can climb on 'knife edge' and will climb straight at about 45 degrees continually after lift off.

After initial tests the model was handed to several seasoned club members for evaluation. The result was requests for six copies of the plans in the same week. Can't say better than that, next season could give a new meaning to the phrase 'A clash of colours.'

Construction

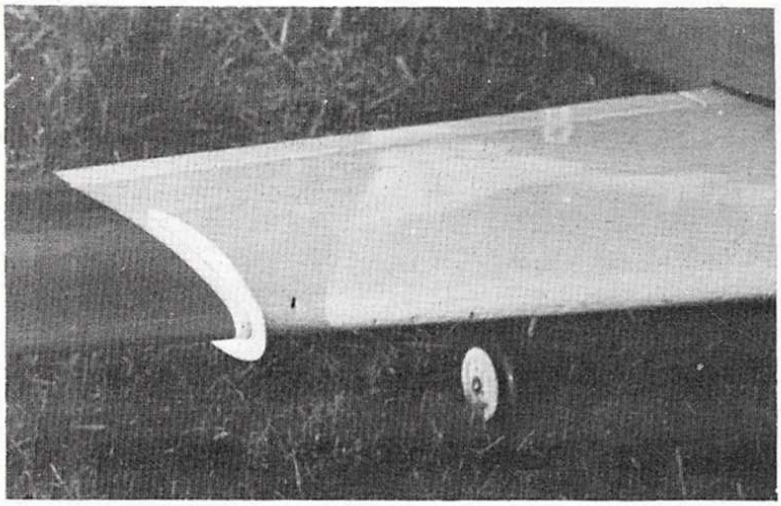
Wings

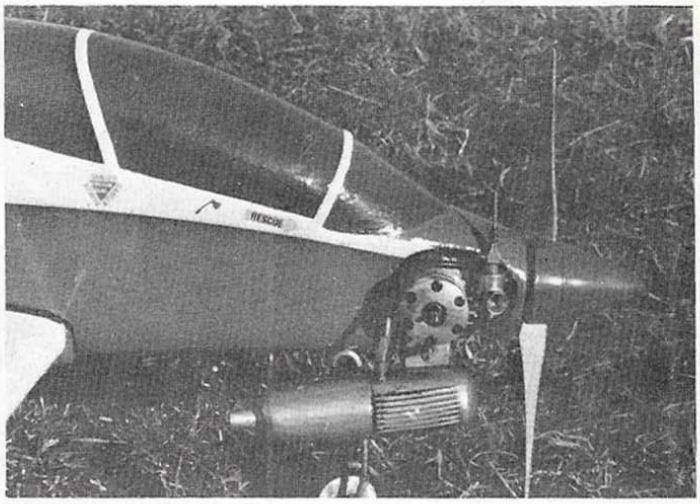
Cut out the root and tip ribs, add the intermediate blanks and carve to shape.

Before building add 1/16in. ply stiffeners to the root ribs at the leading edge on the tip rib side. This is to support the wing dowel. At the same time add 1/16in. ply stiffener to the ribs supporting the U/C blocks. Take rib eight and trace its outline adding 1/16in. top and bottom for sheeting plus a leading edge radius. This is the inside profile of the wing fences. Cut two of these from 1/16in. ply and put to one side.

Both wing panels are built upside down. Pin the front spar to the board and glue the root and tip ribs in place using blocks to keep them level and vertical. Next add the leading and trailing edges. When dry add the rest of the ribs, ensuring they are upside down. The bottom spars can be added followed by the 1/16in. cross grained balsa web between the front spars. Next add the U/C bearers and fit flush with the ribs. A ¾in. fillet is fitted between the leading edge and the root rib to support the wing dowel. The underside can now be sheeted. The wing can then be removed from the board and the top rear spar fitted. Cross grained 1/16in. balsa sheet can now be added to rib seven. This side of the wing can now be sheeted along with all cap strips and tip blocks.

When both panels are complete the root ribs are grooved to take the ⅜in. dia dowel. Both panels are then epoxied together. Stiffening sheets of 1/32in. ply are glued to the lower wing surface between the rear spar and the trailing edge for the wing bolts. An aileron servo box can now be cut out to suit. The centre section T.E. is cut from 1½in. T.E. stock as are the ailerons. These T.E. pieces are then fitted incorporating the aileron torque rods. The wing joint is now reinforced with glass fibre bandage and resin.





Above left: large wing fences contribute to the excellent low speed handling of *Hawk*. Above right: *HP40* fitted to author's prototype provided sparkling performance.

Tail plane

This is built in two halves and is quite simple. Make the ribs as per the wing. Now lay the L.E. and T.E. over the plan on ½in. thick blocks, fit all ribs not forgetting the root rib anhedral angle, this side is now sheeted. When dry remove from the board and sheet the other side, both panels are then epoxied together. Cut out the elevator panels and carve these to shape.

Aileron type torque rods are fitted to operate the separate elevators.

The fin and rudder are cut and shaped from ⅜in. medium sheet.

Fuselage

Note both sides differ in length by the amount of side thrust at F.2. Therefore fuselage lengths are marked from the top view.

Start by splicing ⅛in. sheets to obtain correct lower fuselage length (F2-F8) this panel is butt joined to another ⅛in. sheet making sure of correct off-set (F2-F7) see note at F7. Now add a short length of ⅛in. sheet to achieve required depth over cockpit area. When dry cut fuselage shape out and add 1/32in. ply doubler using a contact adhesive. Mark all bulkhead positions on the sides and add all triangle stock, saw-cutting to achieve curve over cockpit. Cut out all bulkheads. Bring both sides together by using F3 and F5. Epoxy these in position ensuring correct alignment. When set bring sides together and add F8 followed by F6 and F7.

Now epoxy F2 in position maintaining required side and downthrust. The remaining bulkheads can now be fitted along with the top and bottom sheeting. Mark the motor mount centre line positions onto F2 from the plan. Next position the mount and drill the bolt holes, throttle, snake and fuel lines. Do not forget the nose leg position when drilling these last holes. The fuel tank should be positioned to the same side as the cylinder head within the fuselage. The reason for this is that in knife edge flight with the cylinder head uppermost the motor will run lean after some ten seconds. This is reduced by positioning the tank as above.

Fit the mount (Slec used on original) and motor. Then using the spinner as a guide, add fuselage sides around motor. When dry remove motor and mount and add triangle stock to corners as per the plan.

The fuselage can now be carved to shape. The tailplane seat is also built up and the tailplane glued in position. When the adhesive has set build up the fuselage above the tail. The bottom sheeting is now removed to give access to the necessary areas.

Radio installation

The positions shown are approximately correct though I always assemble the aircraft complete and rest it on the balance point. The servo's battery and receiver are then hung on the fuselage with Selotape, to determine the best positions.

Finish

R.A.F. Training colour scheme was selected using red/white *Solarfilm*. The cockpit area was painted metalic blue and the engine bay red as was the supersonic spinner. The painted areas, all fuselage *Solarfilm* joints and decals were then fuelproofed using *Tufkote*.

Flying

Set up the control throws as per the plan. Double check the control orientation and the centre of gravity.

Take off requires just a touch of rudder and when the speed has built up a little up elevator will lift the *Hawk* into the air. The ailerons are positive, even at low speed, as is the rudder — so take it easy at first.

Rolls are fast. Spins both upright and inverted require 'hands off' recovery. My own record is 37 turns and recovery dead stick. Landings are floaty but can be fast with this small model. Stretching out landings will find the *Hawk* nose high and sinking slowly to earth with the elevator finally held full up. On a calm day the model has demonstrated circuits on closed throttle (electric tached at 4,000 r.p.m.) with good aileron response, though no pylon turns were attempted. At the other end of the scale knife edge circuits of the field are also possible.

The tailplane, although anhedral, has shown no odd effect on the handling.

Well, I think everyone raves about their own creation, but others who have flown the *Hawk* rave more than I do, so give it a go — you won't be disappointed.

Right: the modernistic lines of the Hawk reflect many trends seen in current R/C aerobatic competition models making this model a natural for a possible .40 aerobatic class.