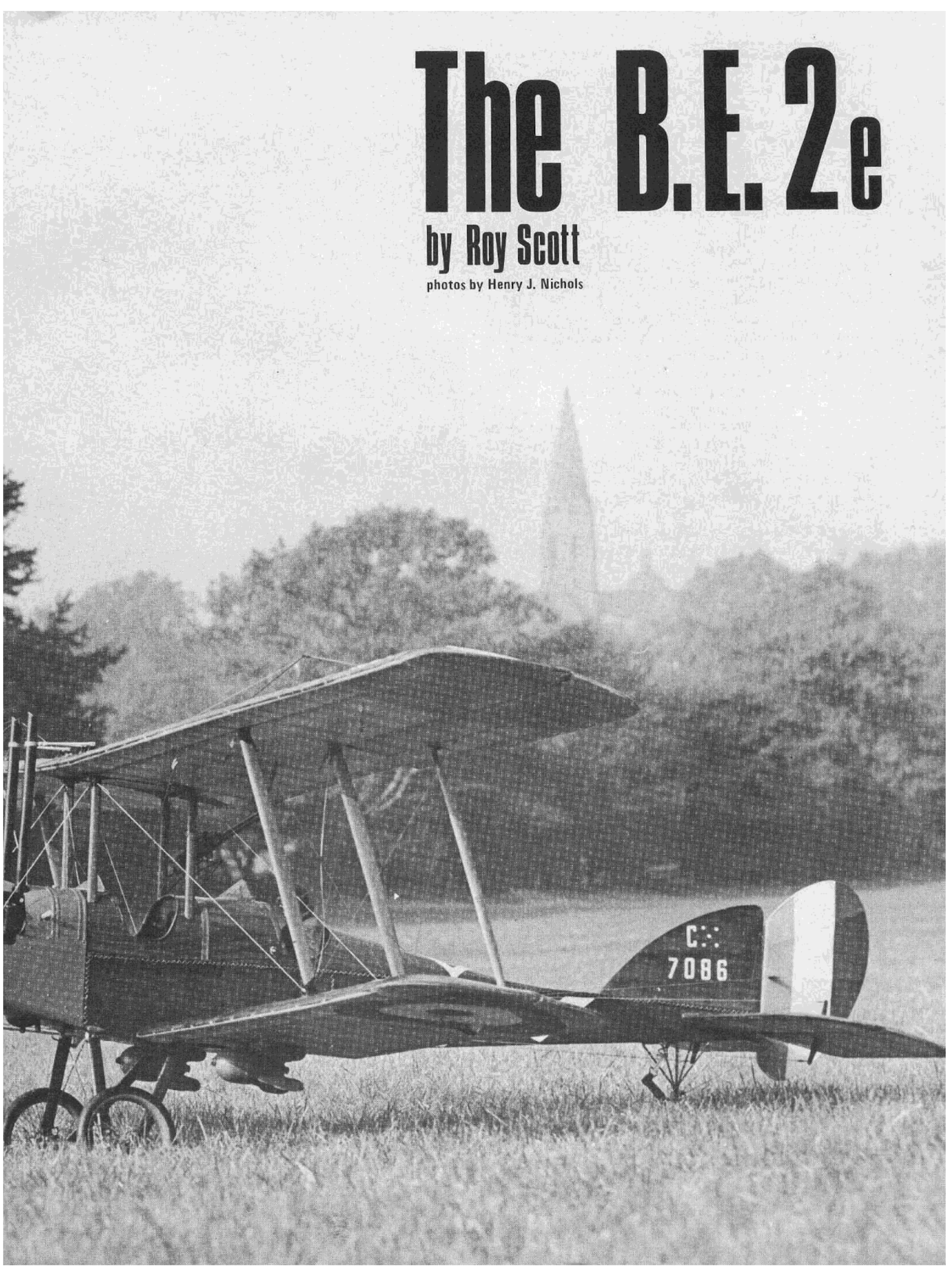
The B.E.2e

by Roy Scott

photos by Henry J. Nichols



The B.E.2e tempted me for many reasons. One reason in particular was that if ever an aeroplane looked "out of the past," this one did. It brought home to me the pioneer spirit of aviation during the First World War. Wood, fabric and whistling wire, the high cabanes, big wings and two Stevenson's rockets for a motor!

Having designed and built numerous other scale subjects, each having a comparable scale speed to the full size, I had yet to design one that would run the batteries out for the time taken to do a circuit of the field. So there's the second reason. Slow flight.

Thirdly . . . gimmicks! I liked the idea of the exhaust stacks and also bombs of a size that can be seen to drop, and very few World War I planes can boast that at 2" to the foot!

Lastly, I wanted other people to enjoy scale flying without months of hard work, at the end of which they end up with something only an expert could fly.

So there we are. Three good reasons for the B.E.2e: World War I, slow flight and **you** – Mr. Modeler.

Build it as per the plan and I assure you it will fly itself – certainly time enough to put the transmitter on the ground, fumble for a cigarette, light it, smoke a few puffs, pick up the transmitter and look to find the model flying in the same position as before. This has been done with the B.E. many times, believe me. *(But only into wind!! – Ed.)*

Now to work.

Read the plans well and get acquainted with the general layout of things. Next the details. Here you may find you will get a better picture of them from other parts of the drawing, i.e. elevator horn shown on the side view. To the right and down on the plan will show you what this arrangement looks like.

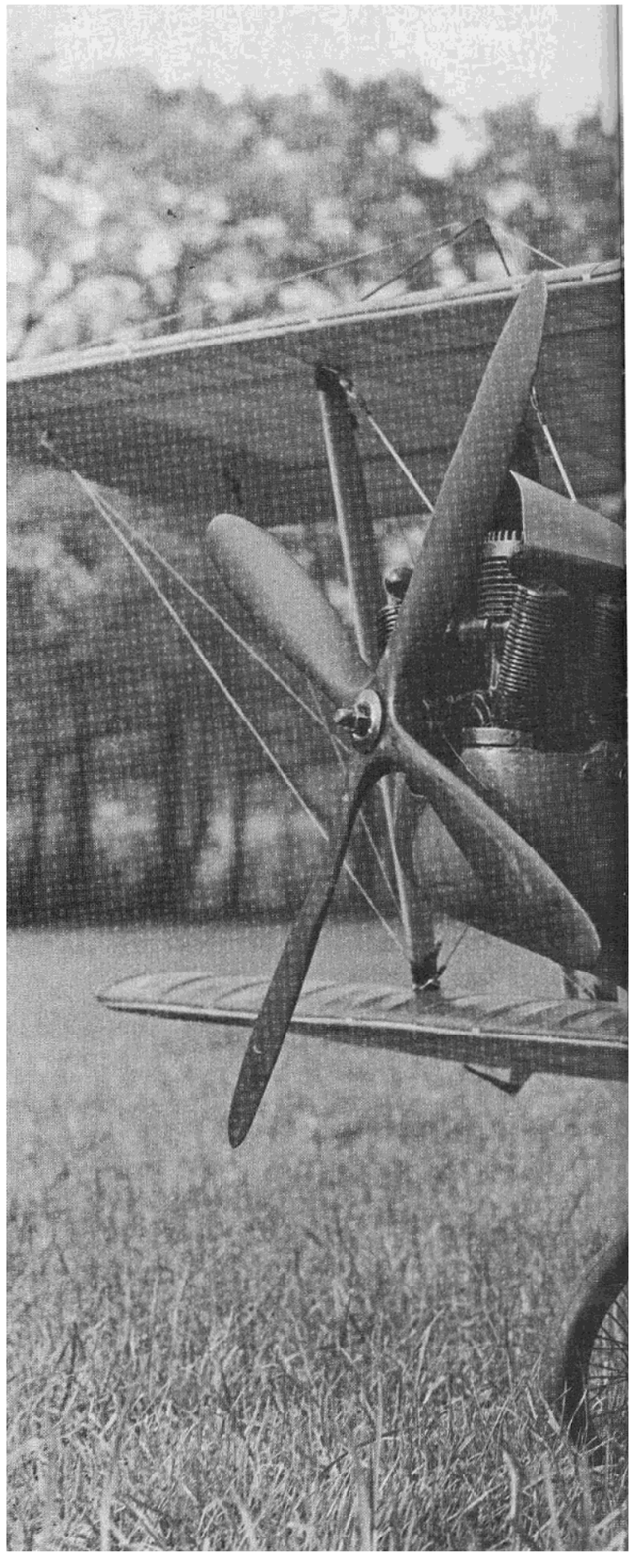
Now you haven't got a kit so let's make one and keep all the parts tagged in a box so as to find them when you want them.

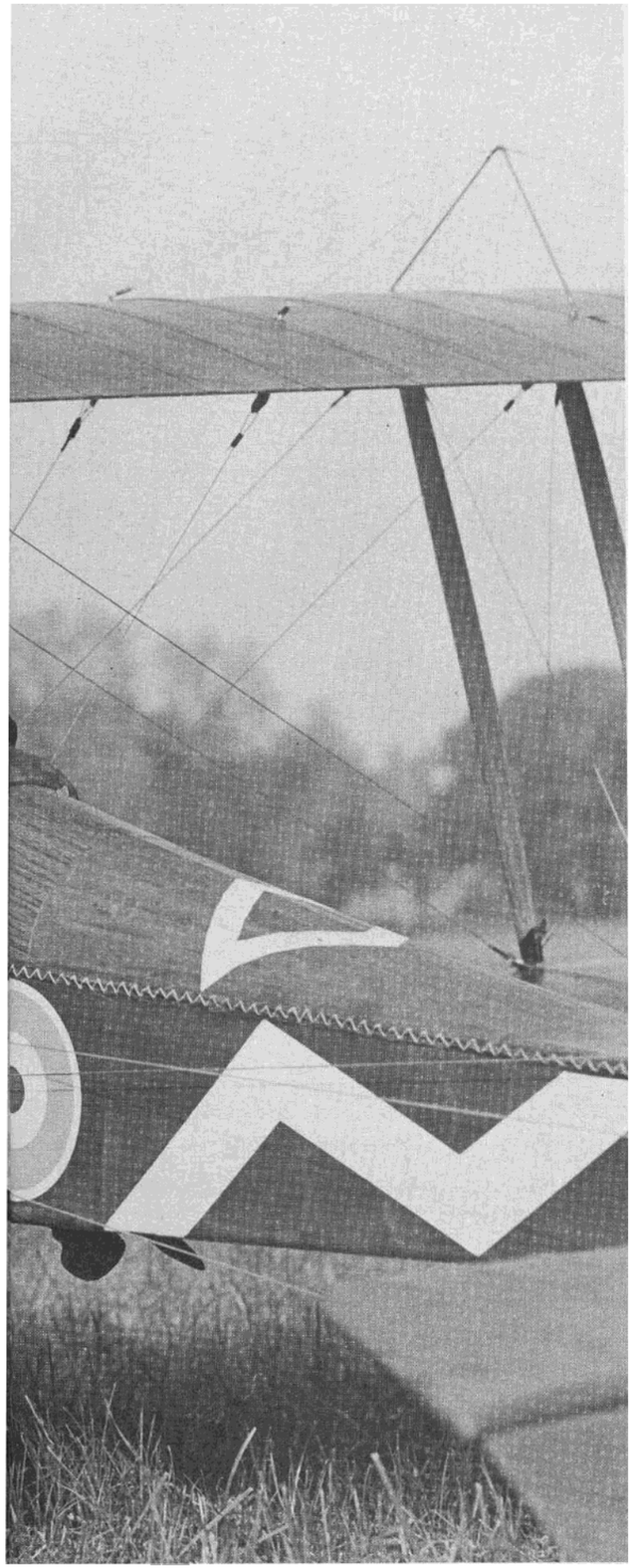
Let's start with the wire jobs. You will notice from the sketch the front cabanes (8SWG gauge wire) runs full length to include the undercarriage. These are joined with a brass tube sleeve, sweat soldered into position. Don't add any of the top wires to this yet. The undercarriage spreader bars are one length of wire (12 SWG). Rigging brace shown on top view of fuselage, 2 wires and brass sleeve. The top wings have 2 jury struts and 4 rigging wires on the outer panels. The lower wings have 2 8SWG dihedral braces and 2 small wire cranks at the bottoms of the aileron struts. The elevator control horn is made up from a commercial metal horn unit. The two copper outside horns are made up but **not** added until the assembly is installed into the fuselage.

Cut out all the wooden parts, ply first, except the 1/32" decking which is mentioned in the construction.

There are two ways of marking out your parts: Using carbon paper direct on to the wood or trace on to tracing paper cutting through this on to the wood. A mention here regarding the 1/32" ply ribs: These are for strength at the places shown and are a facing to the 1/8" balsa ribs. Achieve these by contact cementing 1/32" ply to 1/8" sheet, thereby cutting out ply faced balsa ribs to the number shown. There are plenty of ribs and a time saver here is by using a band saw. If you don't possess an invaluable item such as this, perhaps a friend may help. Failing this, cut one rib outline from 3/32" ply and use this as your template. When cutting the 1/16" ply doublers, note there are slots in them to accept the tongues of the formers.

The ply for the center section of the bottom wing:





The floor is 1/8" right to the four corners. 2 ply ribs: back end and wing fix dowel support. All other wood parts are self-explanatory by the plan.

All rigging wire is 35 lbs. test plastic coated steel fishing trace, obtainable from most angling stores. Its name is 'Steelon' (English name) and 5 reels of 25 ft. is the order. Also obtainable are lead or brass ferrules from the same store, about 3/8" long and 1/8" in diameter. Get 100 of these as you will need spares from time to time.

Covering material: For this we use lightweight nylon, and as we are not going to paint the colour scheme on (weight) we shall dye the nylon. Yes, dye it. Quite simple and it looks good, too. The dye to use is called Dylon (Rit). A nylon dye obtainable from most hardware stores, ironmongers or fabric store. Cut ample length for the undersides and likewise topsides. 1 small tin of Reindeer beige No. 22 is added to a galvanized bucket of hot water. Place in the length of underside nylon briskly and give it a good stir! Bring to the boil watching the colour for depth. Remove the length and run under the cold tap keeping the nylon on the move. Hang on to a line to dry. Now add to the same mix 2 tins of Coffee Brown No. 7 with just a tinge of black and a tinge of blue – a tinge, by the way, is about the amount one would take from a snuff box, (but if you have a big nose then 1/8th of a teaspoon will do!) and repeat as before.

Make up the horns from fibreglass sheet. This can be obtained from stores dealing in radio construction, etc., and comes in the guise of printed circuit board 1/16" thick. The copper can be peeled off quite easily.

Now, armed with the tools of the trade – knife, pins, plenty of white glue, cement, epoxy, soldering iron, saws, hammer, building board and flying goggles, we will cover the plan with a plastic drop sheet and commence construction.

The word glue means white glue; cement – balsa cement; and epoxy – 2 part adhesive.

FUSELAGE: Start by making two identical sides from ¼ sq. in. cross pieces. (Note that the 1/16th" ply doublers are outlined from the nose to the former 8 upright member and diagonally down to former 11 upright in heavy black lines, and must have the former cutouts made prior to gluing the ¼" strip and sheet side frames). Add formers 3, 5, 7. Add wing fix dowel plate, 3/16" cross sheet below rear cockpit. Square up and let this part set up on top view. Next, glue the front balsa block, and slide in former 1. Pull in the rear of the fuselage sides and glue the 2 ply end pieces. Run a rubber band on the rear end of the fuselage and glue the remaining ¼" cross pieces. Glue all ply parts to the rear end. Cement four 3/16" strips to the inside of each longeron as shown on the plan. Fix the cabanes with clips, nuts, and bolts. Drill fine holes through the 1/16" ply rear cabane seat and sew with strong thread and cement over. Add the top formers. Cement on the 3/16" x 1/8" back stringers. Glue the ½" sheet in place. Carve and sand the balsa rear side to shape. Mark out the tailplane section on each side and cut this area out – take care on this point. Now with stiff paper, about 15" x 15", place on top of cabanes. Mark for 4 holes, cut them, and slide this paper down over the formers, and down each side. Hold down with tape. Now press the paper around the front edge of former 2 and mark with pencil in 4 places where the paper meets the top edge of the two top longerons. The rear-most marks will fall on the ply join line shown on the plan. Remove the paper, draw lines between the marks, and cut 1/32" ply from this template. The reason this template was

not added to the plan was because no two models are the same and to be a fraction out can leave a large gap along the edge where the ply meets the longerons. This way we have a custom fit (I hope). Moisten the outside surface and slide the ply over the cabanes and glue in place. Hold into position till dry with cellotape. Now, with another piece of paper repeat the same procedure for the decking behind the rear cockpit. This you will see takes on a new angle, so the ply decking must be done in two parts. When marking this part out take care in marking out the join line to the first ply wrapping and a good job will ensue. Cut out the cockpit openings. Now bind and solder all the wires to the cabane tops. Solder copper or brass wing fix corner pieces, but don't drill the holes as yet. This is done when the top wing is finished but uncovered and positioned on top of the cabanes, by sliding the wing back on to the front catches and marking through the holes that would have been drilled and tapped to take the rear fixing bolts. Good thing you're reading this – think of the muddle you would be in!

Where were we? O, yes – the fuselage. Now comes the point of making a complete kit because now we need a piece of underside coloured nylon. Cover the underside with this and dope tight. Now you can drill small holes and sew on the tail skid assembly. Smear epoxy over the sewing. Rig the rear cabane wires by drilling a small hole in each 1/16" side doubler at the point shown. Tie a small nut, 2 BA, into the middle of the wire and push both ends through into the fuselage and then up through the decking to the cabane tops. Epoxy the nut in position. Shape up the front blocks and dope and cover the rest of the fuselage in topside colour nylon. Don't cover the top decking with nylon, just leave about ¼" all around its edge. Once the nylon job is completely finished and the last dope coat has dried out tight, obtain a yard of contact mahogany veneer and adhere this to the top decking and trim off to the decking lines. Don't worry about getting a perfectly straight line down the sides as this will be taken care of later in another stage. Fit the engine plate and the two side bolts used as rigging points, and run wires from these to cabane tops.

FIN: Very easy, this. Simply a 1/8" sheet outline with ¼" x 1/8" strips cemented on each side and shaped to the section of the tailplane.

TAIL: Build a flat structure on the plan using 3/16" material. Remove and add 1/8" x ¼" rib strips. Shape to outline.

WINGS: Slide all the ribs on to the spars and build up on the plan, (covered with plastic drop sheet), the four wing halves. Block up the tip ribs of the top wing 2½" and build the center section flat on the plan. The bottom wing center section is built on its own. Dihedral wires are added while building this up. The wires are inserted into each wing panel and epoxied. Don't forget the stand-off gap between the center section and the wings. Cut the aileron ribs back 3/8" clear of the rear spar, and face the aileron L.E. with 3/8" x 3/4" balsa and trim to shape. Next, cut above and below the rear spar, ¼" in and down to the spar. Glue a 3/8" x ¼" balsa strip to the top and bottom of the spar. Trim to shape. Tips are cut from 3/16" sheet. Moisten the top, turn over, and roll a broom handle or its like length-wise over the tip. With ample pressure it will bend and stay to the shape on the tip view shown on the plan. Glue into position. Epoxy the rigging point wires into position, as well as the jury strut tubes. This hard plastic tubing can be the outer tubing from control cables.

Epoxy 4 control horns into the top center section to accommodate the exhaust stack braces. They should stand proud ½" above the ribs. Epoxy the main strut attachment plates in position. Cut away sufficient to the front of the center section ribs and glue in the ¼" ply cabane catch. Drill out and tap (for ¼" round head gutter bolts) the ply center section – hold down, at points marked. Place the wing on the cabanes and mark through these holes onto the copper corner pieces and drill these marks through to ¼" diameter. Run on and smooth out cement to the undercamber of all ribs. Give two coats of clear dope to the framework and cover with underside colour first, bringing the top colour over and trimming around the edges.

A point about the stitching along the fuselage sides which will cover any jagged lines of the fabric. This is done on doped nylon. Let it dry then put through a sewing machine doing zig-zag stitch. Then trim within 1/8" each side of this zig-zag stitch and clear dope the resultant strip into position. Rib tapes are ¼" dyed nylon baby ribbon.

The silencer is made up with two flatened ½" aluminum tubes, a sheet aluminum expansion chamber and ½" aluminum stub tube, aluminum flux and solder was used for welding this altogether. A small length of silicon rubber tube joined this unit to a Merco marine exhaust extension. A 1/8" round elastic is used, wrapped around the axle ends of the undercarriage, as suspension. The tops of the rear undercarriage legs are held onto the lower wing center section ply base by means of 2 lugs and self-tapping screws.

The whole model was given a spray coat of clear matt polyurethene as fuel-proofing.

PROCEDURE FOR RIGGING:

1. Run ample lengths of approximately 3' Steelon trace from each cabane top (4 corners) and make these fixtures permanent by a loop and ferrule squashed tight.
2. Do the same thing at the rigging brace at the top of the undercarriage legs, and at the electrical tags on the lower wing center section. You will see in the rigging deployment sketch, the wires are marked "F" for permanent fixture and "B" for rubber band attachment. With both wings bolted into position, fit the outer plane struts into their location slots, top and bottom. Each strut should have ample lengths of tip wires run through the lower ends as shown in the sketch of the strut fixture.
3. Take a front cabane wire, place a ferrule onto it, run the end through the eye of a hook and back through the ferrule. Put the hook into the front lower strut tag and pull in a slight pressure on the wire – just enough to straighten it. Now slide the ferrule home, and pinch tight with pliers. Do same thing on the opposite wing. Now, here is an important part: eye the model from the front and look for warps in the wings. Now is the time to get them out. Taking the rear cabane wires and proceeding the same as per the front, you can add more pressure to lift out any warp. The front wire may go slack under this extra pressure, and to be able to keep an eye on the amount of warp you may be taking out, place a small weight on the outer panels of the bottom wire to keep the front wire taut. Pinch the rear ferrule shut when all is in order. Both wings, when looked at from the front, must be equal. You may find now that after removing the weights, slack will reappear in one or the other of the front wires. Don't worry as this is taken back out in the next step.

Take the front undercarriage point doubled-up wires, run on a ferrule, and re-run the wire ends back through the ferrule making a loop. Put two small rubber bands through this loop and onto a hook. Place the hook onto the top of the front strut tag and pull in half the stretch power of the bands. Slide up the ferrule and pinch shut. Same again to the other front wires and then the rear wires. Now run the inboard jury strut wires in the same manner. Now the outer wires. Take the rear wire from the front strut and the rear wire from the rear strut and join both in a ferrule, and attach by the rubber band method to rear jury strut rigging point. Do the same for the front wire taking the front wire front strut, then the front wire rear strut. Finally, take the last double flying wires from the point on top of the undercarriage leg and attach by the rubber band method to the inner front jury strut point. Do likewise from

the electrical tag to the rear jury strut point.

FLYING: Gun the motor and check any swing with just a dab of rudder – don't hold it on. A touch of up-elevator and neutralize. It's airborne! Now be prepared! You may need to push the nose down. Just a case of over-powering and because of this don't put down thrust in the motor, fly it as per the full size. (High motor you go up, low motor you come down). Now gain some height, using the rudder all the way. Don't touch the ailerons as this may cause slip. Ease back the power and take off the down-elevator you may be holding. At half power, trim out for level flight. That's it. Landings you will have no trouble with, as it lands on its own. Remember this is a model of a bomber, and as such, the only manoeuvres the full size did were evasive. Yours will loop and spin as did the prototypes – drop bombs and fly slowly – don't ask for more.

Have fun! □

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