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Parnall Elf

Jack's lovely 1/6 scale replica spans 61".

Veteran modeller Jack Elson's Shuttleworth Trophy-winning charmer

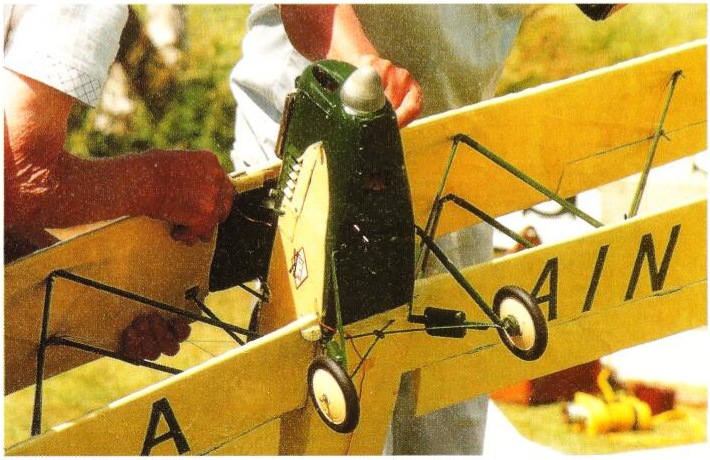
The Parnall Elf was one of Harold Bola's designs, a follow-up from his Parnall Scout, the Peto and Pixie and, of course, the Parnall Imp. I have always liked the design, and what I've seen of it flying it looks a very capable aeroplane with its Cirrus Hermes 111 power unit.

The staff at Old Warden were very helpful when I asked about taking photos and, of course, I acquired the scale drawings from the Argus Plans Dept (Plan No. 3026.) which includes three-view and a full description of the Elf, now housed in the Old Warden museum from which I copied the decor. So build, enjoy and don't bend it!

Let's start

Study the plan carefully and cover with some clear plastic sheet, making sure there are no wrinkles and that it lies flat; tucks and wrinkles distort measurements.

Start the fuselage by pinning sown the 1/4 square top logerons, then the bottom 1/4in square, gently bending this up to the front shape. Start from the rear with this and pin it down firmly as you go. Now fit the other verticals and diagonals until completed, then fill in the front end round the nose with 1/4 sheet. Now build another on top, making two identical sides. When these are set, unpin them and turn them over on your building board, placing them opposite each other top to top and cut out the 1/32 ply sheet side doublers, that fit from the engine bay to rear of cockpit on the dotted lines. This way you will not end up with two righthand sides; the 1/32 ply is on the outsides of the fuselage. To make a good joint rub a coat of white glue onto both sides



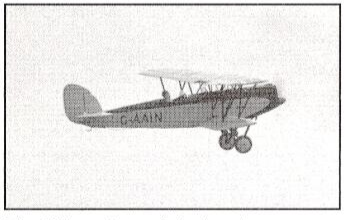
Running up the prototype's Saito 45 four-stroke at Scale Weekend '91.

Wings fold just like the real thing!

with your fingers, allow to almost dry then apply another thin coat and fasten down until really set.

Next fit the 1/8 ply inserts flush with the inside face. These take the wing hinges and centre section strut fixings, then leave all to set really thoroughly. You can now fit the fuselage formers starting from the front end and carefully draw in the end at the rear and fit the rudder sternpost. (If you picked your 1/4 square balsa strip carefully you should not have any banana shapes). It is safer at this stage to fit a 1/4 strip along the top centre from the nose to the tail – any that is not needed can be taken out after.

The tank bay and engine housing can now be fitted. Measure a piece of 1/4 ply to fit in the engine bay (it is best to first make a cardboard pattern) then fretsaw the ply for the engine. Drill out the engine bolt holes then glue the plate and your engine in between the side cheeks, reinforcing underneath with hard balsa (but first solder the heads of the engine bolts across with tin plate or thin wire; you may want to take out



The Elf is rock-steady in the air.

the engine sometime and this should stop your bolts turning.) Now mark and cut out of 1/4 ply the engine plate and its air intake holes. Glue this in place and, taking out the 1/4 square strip you fitted earlier, replace it with 1/8 ply shaped to fit from firewall to nose. Remove just enough to enable you to get a plug spanner through. Then sand to an oval shape at the top for the contour of the alloy engine cover.

While these are all setting nicely, make up the aileron crank from 10g wire. Cut or file some brass strip for the bellcrank, drill a centre hole to fit the rod and two holes to fit a pushrod clevis. The clevis fits 1/2in from the centre of the crank. Push the bellcrank along rod and solder in place, then fit into the fuselage along with the spacers so that there is no end to travel. Temporarily fit the 13 amp earthing plugs, one each end and secure with its own stud.

There comes a time when the radio has to be fitted and at this stage I built the tailplane and rudder. Sand them all up, fit hinges and cover; I used Solartex. Temporarily glue the tail surfaces in place, fit the servos to servo tray and fix permanently in position behind the tank floor and close up the partition.

The rudder is coupled by closed-loop using nylon fishing trace, elevator and engine by commercial snakes and clevises. Test to see that everything works nicely. I always fit my radio at this stage – it's much easier to get at.

Now make the undercarriage and fit. This is from 10g wire for the two main legs and 12g for the two centre spring wires. Bend the parts to shape, and make a groove in a piece of 3/4 x 1/2in hardwood for the rear legs and the top spring piece. Solder the two together and sew and epoxy into the groove. Now do the front leg and the bottom spring, fix the front, then draw altogether and silver solder. Don't forget the axles for the wheels; these are part of the rear main legs. Now fit the tail skid, and test to see if the whole thing stands level.

Next, build the top wing centre section, cutting the 1/8 ply base and six ribs (two CS1s and four W1s) from the same wood, saving two ribs for the bottom wings. Drill the ply base to take bolts from the centre section struts as close to the CS1 ribs as possible. You may find it more convenient to bolt this on before adding the CS1s themselves and the wing fixing. Then cut out the slot at the front of a pair of CS1 ribs for the wing tongue to pass through and glue one each side on the top edge of the base. Now glue a piece of 3/4 x 1/8 ply across vertically up to the back of the slot at the front of the base. This forms the rear section of the dihedral guide.

Also glue a piece of 1/8 across the back horizontally, leaving 1/2in short on each side, plus a similar piece across the whole width which makes the slot for the back hinge. Then fill up to the top at rear with balsa, to be sanded later. You now have a box without a lid. The centre section struts can now be made up by bending the threaded ends of the 6ba or similar bolts at

Jack and the prototype at Shuttleworth.

right angles, cutting off the heads and inserting and soldering into 3/8 brass tubing. Fitting to the fuselage is by pushing the threaded ends through the 1/8 ply bracing and screwing the nuts on really tight, either soldering or epoxying so that they stay put. With that done, all the top decking 1/16 sheeting can be completed. Cover the front cockpit area along with the rear one so that you have sheeting all the way along from the luggage hatch to the firewall. I used white glue for this and bound it all round the fuselage tight with thread and left it to set overnight.

The rear decking is stringered with 1/4 x1/8 strip let into the formers starting at the top centre and working outward. Sheet the one side of the luggage hatch up to the centre strip putting in a luggage floor and leaving the door until later. The door is made of 1/32 in ply, steamed to fit, with

plastic hinges and glued.

The whole fuselage can now be covered. I used heavyweight tissue for the top decking and the underside – I never seem to be able to get a really nice fit over stringers anyway with iron-on material. I used cream Solarspan for the rest of the model.

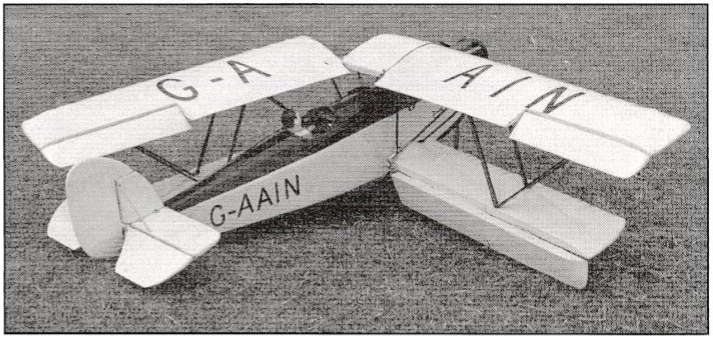
Engine cowling

Cut out the holes in C1 and the 1/4 ply C2 which backs it. Then fit the 1/8 ply top stay which notches into the firewall replacing the 1/4 square which supported it initially.

Cowlings

I used some soft aluminium for the cowling. You may need to aneal yours and, if so, cut the metal roughly to shape, rub some kitchen soap all over one side, then heat it on the cooker ring until the soap turns dark bran then immediately plunge the metal into cold water. This should do the trick!

You should now be able to bend it with your fingers, and when done to your satisfaction, cut out the two top air inlet scoops, form the scoops from lithoplate, and epoxy in place. Now put in the dummy



Plan shows wing hinge detail... if you dare!

the Brunswick green enamel.

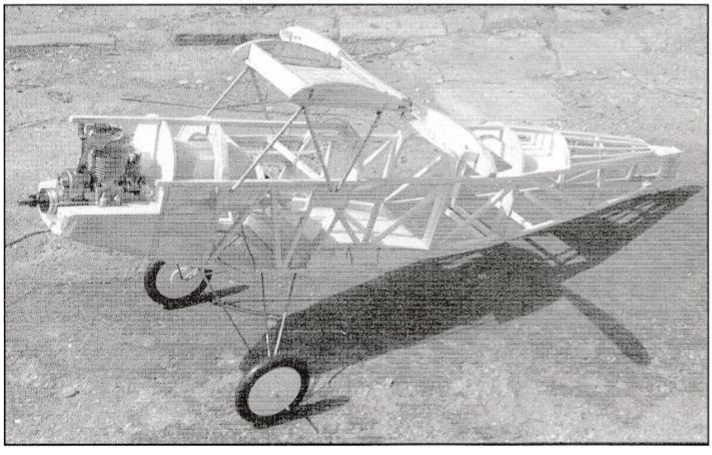
Top wing

First cut out all the wing ribs; there are twenty-eight for the top wings and twenty-six for the bottom, plus riblets. You did save those end ply ribs didn't you? Follow the plan and firmly pin down the 2in x 1/16in sheet leading edge, and pack up the front with 1/16 square strip, to give the upward curve at the front.

Now pin down the 1in wide x 1/16 trailing edge and fit cap strings of 1/16 x 1/4 between the two where each rib will go; cap strips are only used on the underside of the wing. Now lay the 1/4 square main spar half on the 1/16 sheet and half on the cap strips and fit all the ribs, leading edge (1/4 square) and the riblets. Cut off the tails ends of the ribs and fit the 3/4 x 1/8 spars to take the aileron rod and hinges. Slide the plastic hinges along the rod, the front all the way along the wing, the rear only as far as the aileron.

Now fit in the 3/4 soft balsa sheet for the ailerons. (I cut away where I could for lightness when all was finished). Mark where the three hinges go and fit them so there is no side play. Cut out the slots, epoxy in place and fill up the gaps, complete the wing by fitting the aluminium hinge at the rear of the No.1 ply ribs. Let this into the rib so that it is level with the rest and countersink for the screws.

Now fit the 1/8in x 1/2 alloy tongue at the front of the rib; this is just 1/8 x /1/2 bent at right angles and pushed through the

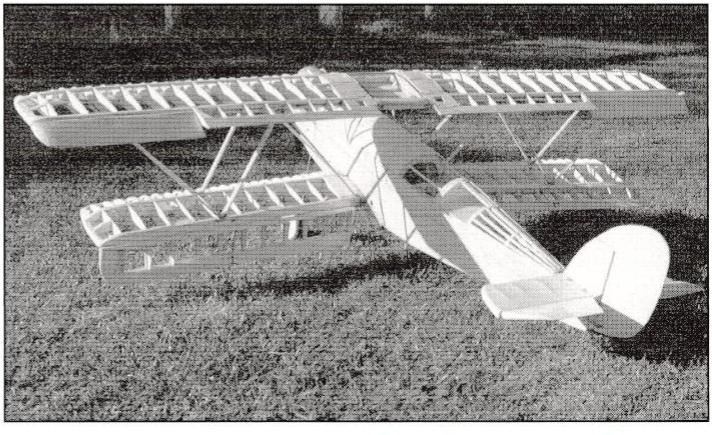


Bare bones of the matter; a useful shot for builders...

... as is this. Solarspan will soon cover this detail.

exhaust pipe. Now glue two pieces of 3/4 x 1/4 hardwood across each side, where the top cowl and side cheeks will meet. Then make the two sides cheeks from the same material as you did the top; these have eight louvres on the portside and five at the back half of the starboard side. I cut out the louvres by first marking them out, then used a fine drill that would take a fetsaw blade, and cut round three sides of each, then pushed them out from inside. The louvres supply adequate cooling for the engine. Now trim both sides and the top cowl to fit and secure with small crews.

We can now cover all the fuselage and fit the wheels, then make the hatch under the front directly between the legs of the undercarriage. Finish off by fitting the dummy oleos and giving the whole fuselage a couple of coats of 50/50 clear dope and thinners to make a nice smooth surface for



rib and bolted and glued to the main spar. When all is set, turn over and sheet as far as the second main rib to help with the covering. Leave the brass shim at the end of the aileron rod until coupling up the pushrod form the fuselage sides.

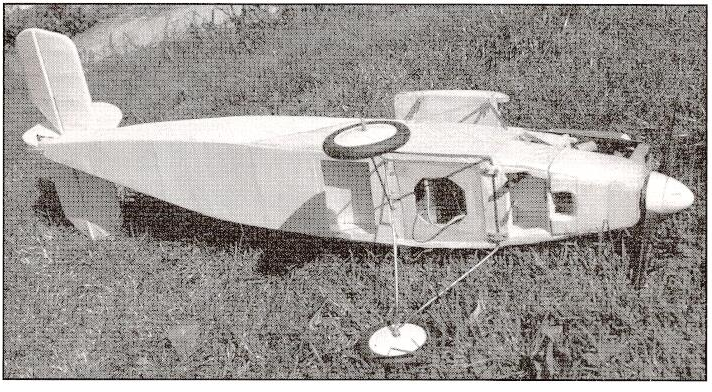
Bottom wing

Build this over the plan, as for the top wing, but note that the front 1/16 sheeting is a little wider than that for the top wing, also that the main rear spar goes the full length of the wing, but is only glued at each end. When this is set, remove from the board, turn it over and fit the two aluminium sheet hinges. These are made by cutting to size some thin sheet and bending it over a 6ba bolt using a good pair of flat nosed pliers. Crimp right up to the bolt so that the pliers have to slip off the bolt to make a tight fit around it. Then file out the slots to fit the alternate tongues and drill to take the screws for fitting; epoxy the screws before screwing in place.

Note where the 8ba screw goes for the wing struts and solder these to a piece of tinplate, before pushing though the spars and epoxying in place. Finish off by adding the wing tips and sanding down any rough bits plus all leading edges. The wing struts are a bit fiddly, but use the templates shown on the plan to help. Notice that there is a top and bottom template. Prop up the tail end of the plane so that the tailpane is at zero, fit the wings by their appropriate hinges and tongues, then, using the bottom template, secure this under the bottom wing tip and the other one directly on top but between the wings on the last outside rib. First fit the screwed brackets at the top of the outside struts, fit both outside ones. Then the inside one and the middle one last. When all this is done, fit the laystrate bracing wires.

While the wings are in the flying position make the ply box to fit tightly round the top wing tongues and finish off by covering the centre section with 1/16 sheet crossgrained. Cover with the same material as you did the rest of the model.

Saito 45 installation and wing centre-section detail in close-up.



Fuselage top and bottom was covered ultimately in heavyweight tissue.

As I said I used heavyweight tissue on top of the fuselage and the underside, but Solarspan for the wings, tail and both sides of the fuselage.

Flying

As for flying the model, the weather has been so rotten it has had only two flights as I write this, but there was absolutely no problem – in fact, the tail came up in about 20 yards and away she went, handling as if she had done 12 months flying. This was before the ailerons were properly sorted out.

A proud moment; Jack receives the Shuttleworth Trophy from RCM&E *editor Geoff Clarke.*