

Peter Plail's attempt to provide many a happy landing for his son's flights of fancy in this rocking aeroplane won him a fourth prize in this year's Design a Toy Competition

Happy Landings

THE idea for this style of aeroplane first came to me about 7 years ago as a swing for the children of a friend, but they moved away before I could commit it to wood and so the idea was filed away in one of the deeper recesses of my mind.

The arrival of my son two years ago brought the idea out of hiding, and although he was too young to benefit from the swing, I decided that I could build the plane as a rocker for him to use straight away, and then could convert it to a swing later.

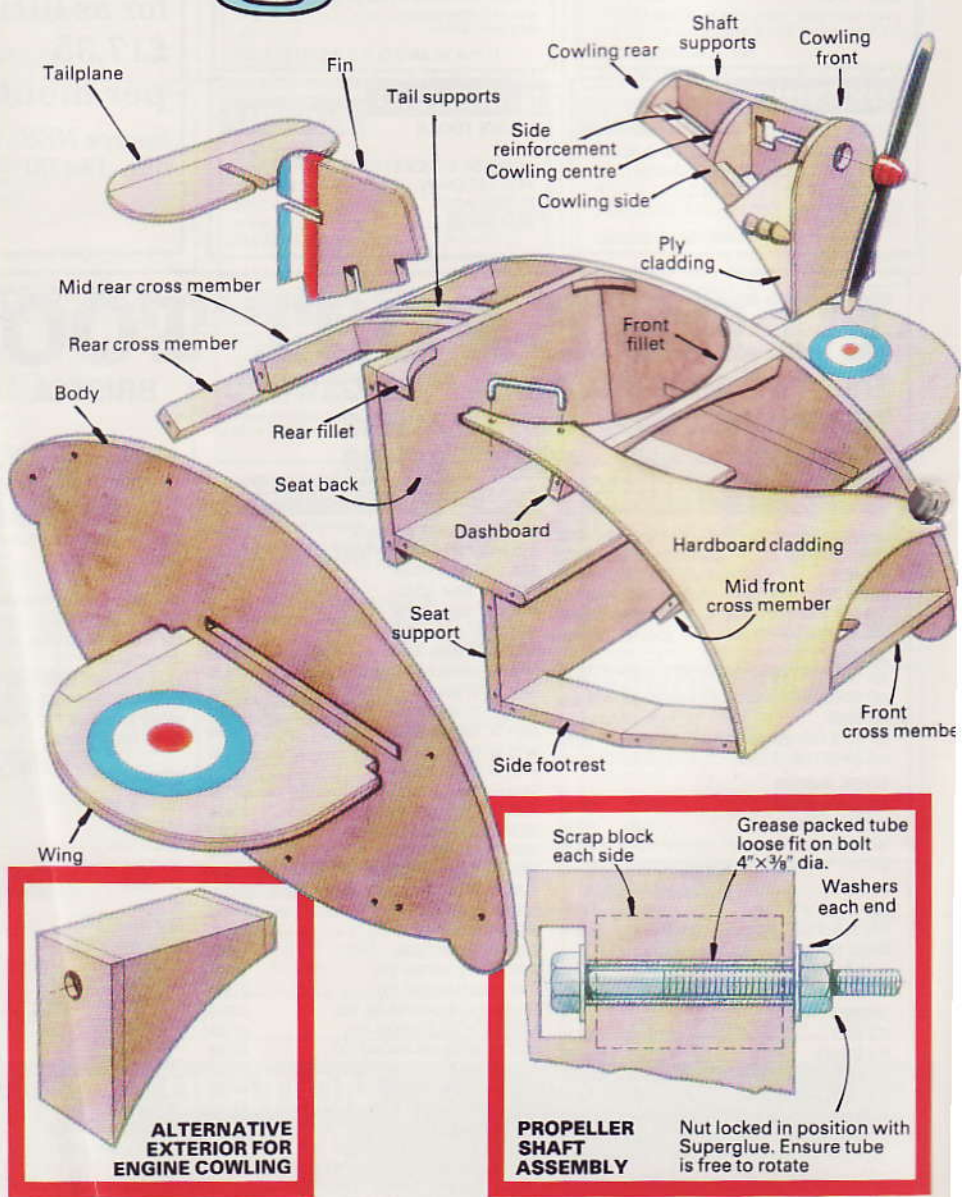
To date the plane has survived the ravages of both the weather (it has been outside continuously for two winters and summers), and numerous children from nine months to five years.

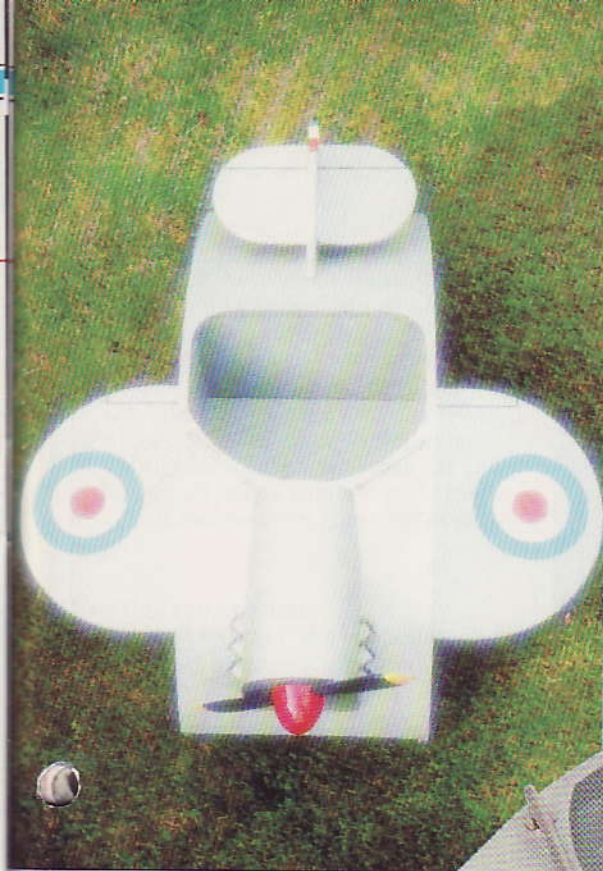
Materials

In the period during which the idea for the aeroplane had lain dormant, man-made boards had taken great strides. The original plan was to use birch ply, but although this is an admirable product it is prone to splintering on exposed edges – far from ideal for kids to use – and I suspect would not have weathered too well. The recent greater availability of medium density fibreboard (mdf) has for me revolutionised toy making. Its combination of strength, weather resistance, easy working and benign characteristics under abuse (it doesn't splinter or leave jagged edges when worn or broken) make it ideal for toys and children's furniture.

The entire rocking aeroplane is designed to be made from half an 8ft by 4ft sheet of 12mm mdf – in fact it

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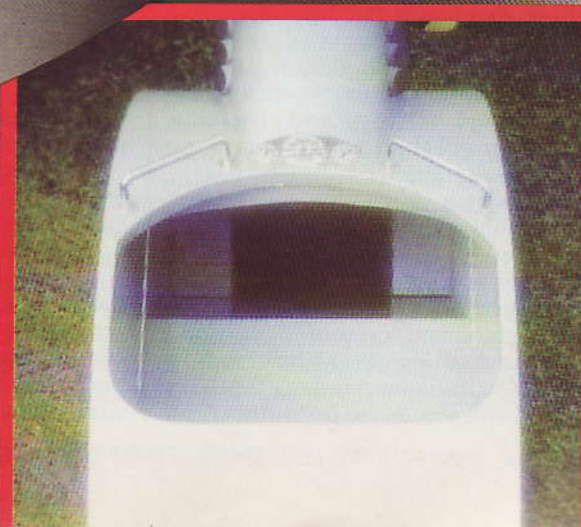




Although shown here in its rocking version, the aeroplane can easily be modified for use as a swing. An alternative bird version can be built by substituting bird wings and a suitable head and beak for the plane wings and engine cowling.



The body of the aeroplane is built up from the principal mdf components which are then covered with hardboard decking pinned in place.



can be made from two 4ft by 2ft sheets which makes transporting the wood a lot easier for the amateur. Exterior grade hardboard is used for the curved decking. Any waterproof wood glue may be used for construction, and twin-thread countersunk 1/4in. screws (preferably plated) are needed to ensure the rigidity of the body.

Enamel paints were used for finishing, with a final coat of satin finish varnish. The fittings are all easily available hardware.

No special tools are necessary. A jigsaw can be used for most of the cutting out. My own technique is to use the jigsaw to cut the parts roughly to size and use a bandsaw for the final cutting. This then only requires light sanding to produce a smooth accurate finish. A router is also useful for rounding off wings and tail components.

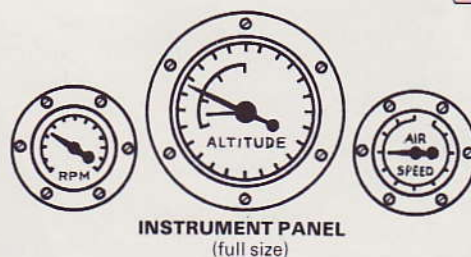
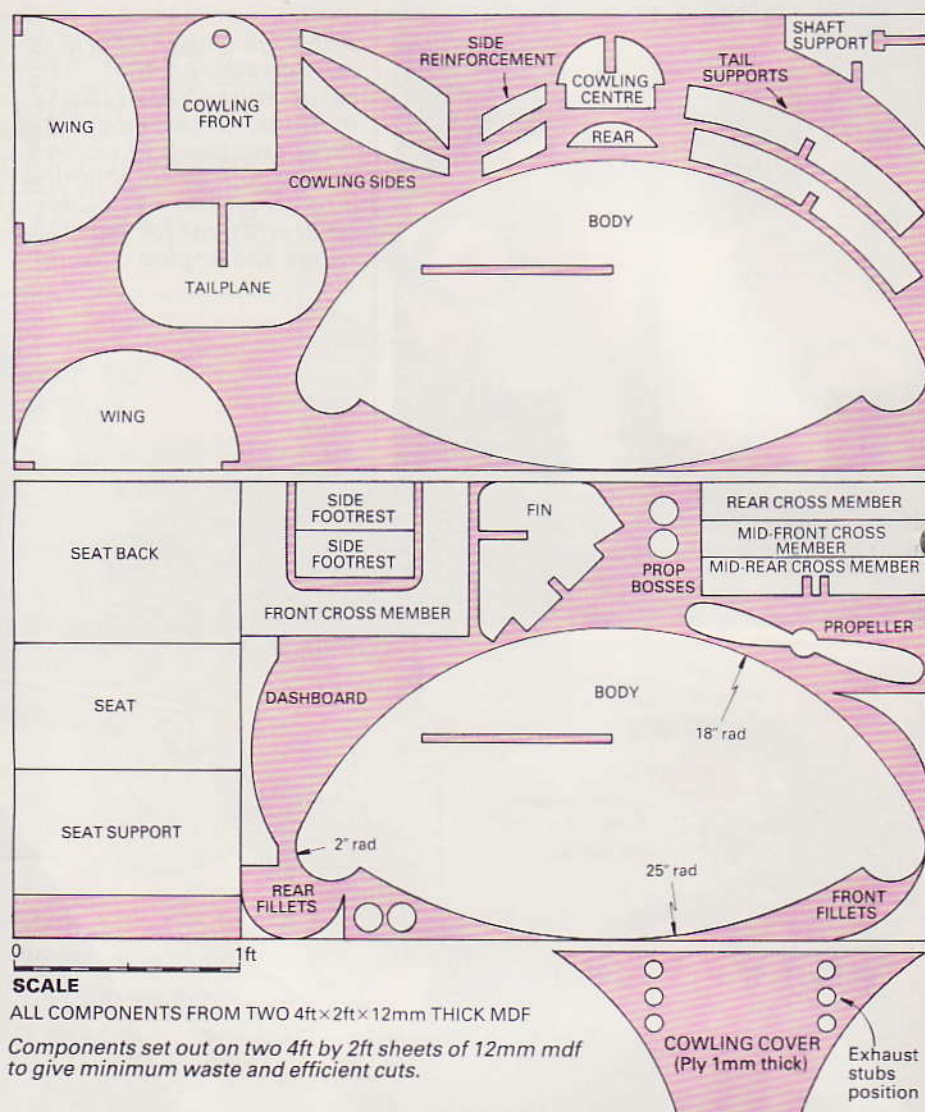
Body construction

I have been a keen aeromodeller since I was about 10 years old. I have always been impressed with the simplicity and rigidity of model aircraft construction, and have used the same approach with the rocking aeroplane, suitably scaled up. It has proved eminently suitable for the purpose.

First mark out and cut out all the components from 12mm mdf. It is important to ensure that the two body sides are identical in size and shape, so the smoothing of the curves should be performed with the two sides clamped together. All screw holes should be drilled and countersunk at this stage. It is also important to ensure that all the body cross members are identical in width and accurately square.

Take the two seatbase components and screw and glue them together. Mark the location of this seat sub-assembly and all other cross-members on the inside of each body side panel. Locate the seat against each side panel and then mark and drill screw holes in the sides of the seat. Screw the two sides and the seat together first without glue to test that the sides are perfectly aligned; straight edges placed across the body fore and aft will show up any winding, and simply rocking the body back and forth and observing the motion will confirm that there is no major misalignment.

When satisfied that all is square, disassemble and reassemble with glue and screws, re-checking for squareness. All other cross-members may now be offered up to the sides, drilled, glued and screwed in position. The fin support pieces can be glued and slotted into place and the footrests screwed and glued into position.



When complete, you can either fill the screw heads with a fine surface filler like Polyfilla, or leave exposed to add to the 'technical' feel of the aeroplane (if you choose the latter then you have to be more consistent with the countersinking depth).

The curved decking can now be fixed in position. It will help if the hardboard decking is persuaded to take on a curved shape before attempting to fix it to the body framework. This is quite simply achieved by cutting slightly oversize and then holding in as tight a curve as possible with a couple of loops of stout string for a day or so.

Glue and panel pin one end of the decking in position, and then clamp a batten securely over that end. Put a bead of glue on the framework and slowly work round the curve pinning the decking at both sides and on cross-members as you go. Space pins at 1 to 1 1/2 in. on the side panels and at 3 in. on the cross-members. Finally, clamp a batten over the other end. Turn the plane upside down and glue the mdf fillets in the cockpit corners. Leave to dry overnight.

When the glue is firmly set, release all the clamps, trim the hardboard flush with the sides and ends. Cut out the cockpit opening with a jigsaw or

padsaw. It is best to cut slightly undersize and enlarge and clean up the hole with, say, a rotary sander. Also cut out the slot for the fin, checking with the fin for a snug fit.

Sand the body inside and out, rubbing down any filler so that it is flush, and take care to put a slight radius on all edges where a child might knock its knees when climbing in and out.

Cowling construction

It is best to make the propeller shaft first. This is a simple construction of bolt, nut, washers and tubing. The sizes are not critical and many woodworkers will already have suitable items in the 'bits box'. Make sure that the assembly rotates freely when complete. Superglue, Araldite or thread locking compound will secure the nut. Fit the shaft into the central cowling frame piece and sandwich between two pieces of scrap mdf. Be generous with the glue, but be careful it does not get into the moving parts. Clamp and leave to dry.

Begin the cowling by dry-fitting the framework pieces. The bottom ends of the two of the cross-pieces need chamfers cutting; this is best done by trial and error, offering up the cowling to the body. When happy with the fit, glue the parts together.

With the curved cowling, make up a paper templet for the 1mm ply covering by wrapping it round the cowling, and then cut the ply slightly oversize. Glue and clamp the ply around the framework; I found that pinning was unnecessary. When the glue is dry, trim the ply flush with the framework and finish with abrasive paper.

With the other cowling, simply round off the corners of the cowling, with router or sander, and then smooth down overall.

At this stage you can fit exhaust stubs cut from lengths of dowelling and any other embellishments such as radiator grilles and simulated louvres and inspection panels.

Tail and wings

All exposed edges of the wings, fin and tailplane should be rounded off with router or sander. The fin and tailplane simply glue and slot together. A light sanding is all that is needed to prepare them for finishing due to the quality of finish of the mdf.

Propeller

As an aeromodeller of the old school, one of the delights of the past was carving propellers. I must confess that I enjoyed making the propeller

for this most of all. It is made entirely of mdf. The propeller blades were cut in one piece and then carved and sanded to the appropriate section, although for those less enthusiastic, they could simply have the edges rounded off.

The propeller boss was laminated from four circles of mdf and then turned to the correct profile. If you don't have a lathe then drill a central hole which is a tight fit for a piece of dowel and jam the length of dowel in the hole. Roughly carve and file the boss to shape, then put the dowel in an electric drill chuck and sand to the final shape on a sheet of sandpaper fixed to the bench.

Glue the boss onto the propeller blades and, when the glue is dry, contour the blades into the boss and drill a central hole part-way through to suit the propeller shaft. Do not fit the propeller onto the shaft at this stage.

Final assembly

Check that the wings fit securely into the slots in the body and that they do not protrude into the interior. Glue the wings in position. If the fit is tight enough they will not need additional pressure to keep them in position until the glue has dried. My experience of the last 18 months is that this simple glued mortice and tenon arrangement is quite sufficient to withstand the

weight of children jumping on and off the aeroplane.

The tail simply pushes into the slot in the rear body and is fixed with a little glue.

Mark the location of the cowling of the front of the body. Drill a couple of holes through the body decking and drill holes to match on the underside of the cowling. Apply glue to the mating face of the cowling and then fix in position from the underside with screws through the hole.

Fit the propeller to its shaft when all painting has been completed; a dab of Araldite will ensure that the propeller stays put.

Finishing

All end grain of the mdf and hardboard decking should be given one coat of sanding sealer which is rubbed down when dry. The entire model is then given a coat of white enamel undercoat inside and out (I used Joy enamels), rubbed down and all dust removed. I chose to spray the plane because I have found that brushing does not produce a satisfactory finish when using silver. If you don't have spray equipment, then I would suggest using a non-metallic colour or perhaps a camouflage scheme. Give the aeroplane two coats of silver enamel; this should give a satisfactory density of colour. The



inside is painted a mid-grey.

When the silver was dry, I masked out the roundels and fin flashes using stencils, masking tape and latex masking fluid, and painted the red, white and blue by hand. An alternative, if you don't fancy cutting circular stencils or painting circles freehand, would be to cut them from self-adhesive coloured film (available from model shops).

Panel lines can be ruled on with indelible black fibre tipped pens or you could use lining tape as I did. This is available from model and art shops in a variety of widths.

Once all the decoration is dry, a final coat or two of satin finish varnish protects against the weather and scuffing by little feet.

The final touch is to add appropriate instruments to the instrument panel. I have included a selection so you can copy them. Stick them in position and varnish them.

Variations on a theme

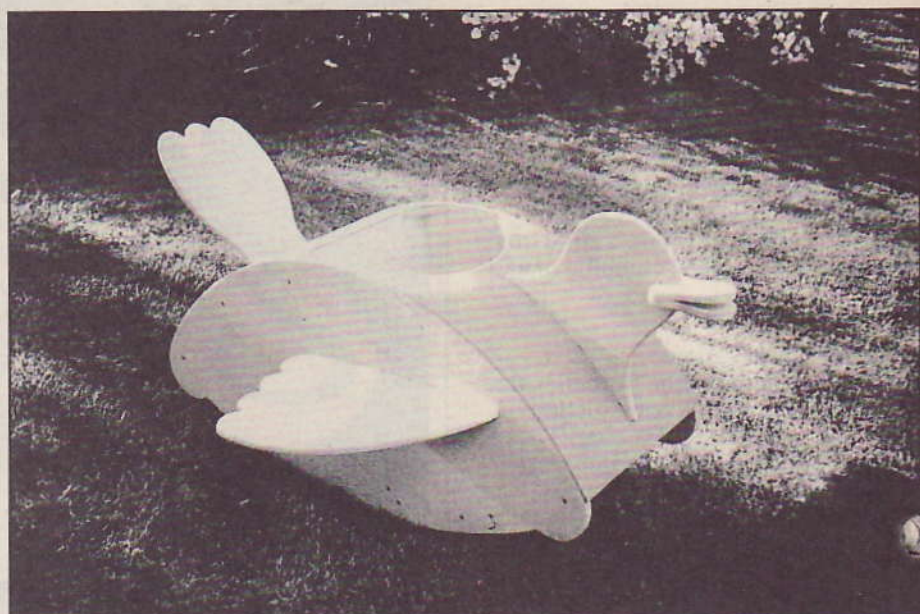
For those who have an objection to the war-like nature of an aeroplane, a simple variation which maintains the flying theme is a bird. Substitute bird wings for aeroplane wings, a head and beak for engine cowling, and a set of tail feathers for the fin and tailplane, and you have the opportunity to do a splendid paint job for the bird of your choice.

Swing conversion

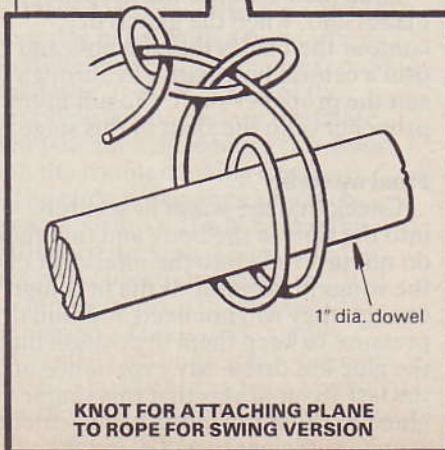
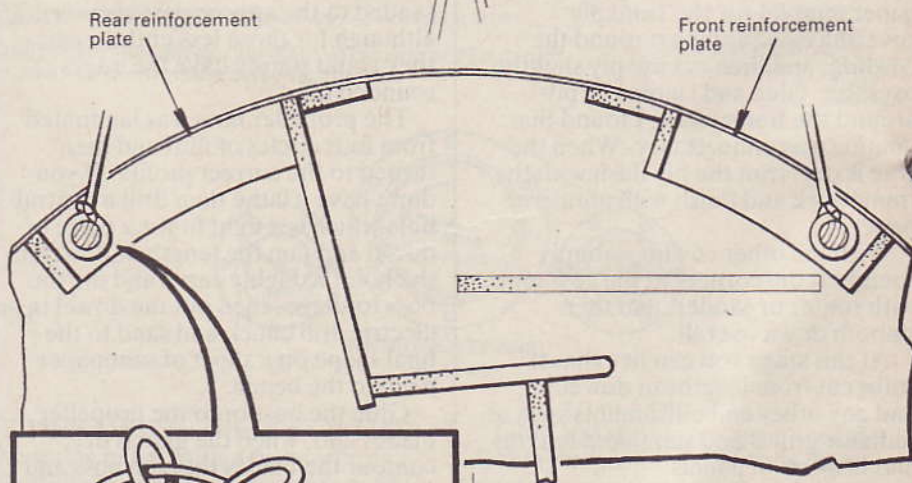
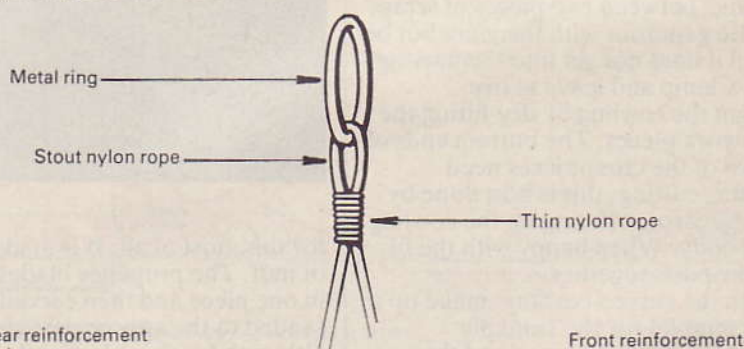
Conversion to a swing is very straightforward and entails gluing in reinforcement plates to the inside of the body, drilling four holes and then suspending from an appropriate frame or tree branch.

Cut out and glue four reinforcement plates (approximately 6in. by 3in.) in the positions indicated. When the glue is dry, drill $\frac{3}{4}$ in. holes through the centre of the reinforcement plates and round off the outside edges of the holes.

Select two lengths of stout nylon rope (approximately $\frac{3}{8}$ in. diameter) to suspend the aeroplane – washing line is not sufficiently strong so don't try to use it. Select a length to suit the height of the frame or branch. Ensure that there will be at least 6ft of rope above the plane to give a smooth swinging action and that the child will be able to touch the ground with his or her feet when sat in the plane. Thread a stout metal ring onto each rope and then pass the free ends of each rope through the holes into the interior (use one rope for each side). Tie each end of the rope to a length of 1in. dowel using what I am told by my former Boy



The bird version of the rocker for those who want a toy with gentler overtones.



KNOT FOR ATTACHING PLANE TO ROPE FOR SWING VERSION

Scout colleagues is a round turn and two half-hitches taking care to make the rope on each side the same length.

Hang the swing up from the metal rings (attached to appropriate hooks or screw eyes and shackles) and level the body of the plane. Secure the rings in position by binding the ropes just below the rings with thin nylon cord, and then thoroughly check that all fixings and knots are tight and that the swing is safe for your children to use and abuse.