

HELICOPTER

Things that move fascinate children — especially if they are realistic. This helicopter, with its rotor and tail rotor that spin around, will give hours of pleasure.

SKILL LEVEL 1-2

Materials

- 1 x 370 mm x 75 mm x 35 mm (14½ in x 3 in x 1½ in) piece pine
- 1 x 250 mm x 12 mm x 5 mm (10 in x ½ in x ¼ in) piece pine
- 2 x 225 mm x 10 mm (9 in x ¾ in) dowel rods
- 2 x 30 mm (1¼ in) No. 10 countersunk steel screws
- 4 x 15 mm (¾ in) No. 6 countersunk steel screws
- 1 x 15 mm (¾ in) No. 6 round-headed steel screw
- 1 x 10 mm (¾ in) No. 6 round-headed steel screw
- 2 x 10 mm (¾ in) electrical washers
- Sandpaper
- Wood glue
- Wood filler
- White universal undercoat
- Topcoat paint

Body

1. Enlarge diagram 1 to full size (280 mm [11 in] long), either freehand or on a photocopier and transfer on to the larger piece of pine by placing carbon paper under the enlarged diagram and following the outline with a pencil. Don't forget to draw in the cockpit at the same time.

2. Using a band saw, coping saw or jig saw, cut out the body; diagram 2 shows a top view of this piece. Follow this diagram and draw the shape of the cockpit and the tapering tail on to the wood.

DIAGRAM 1

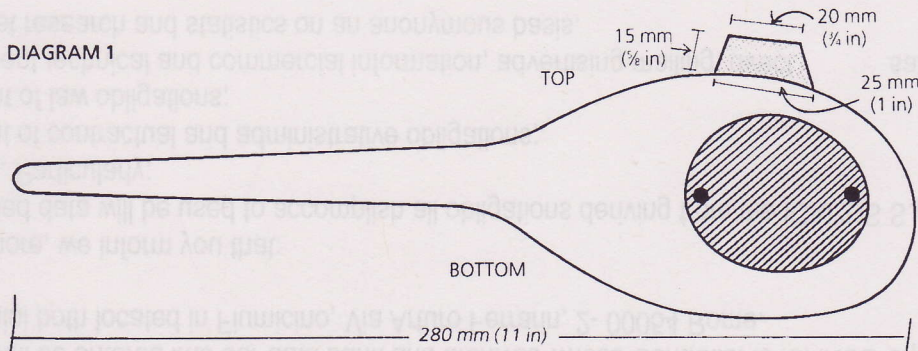
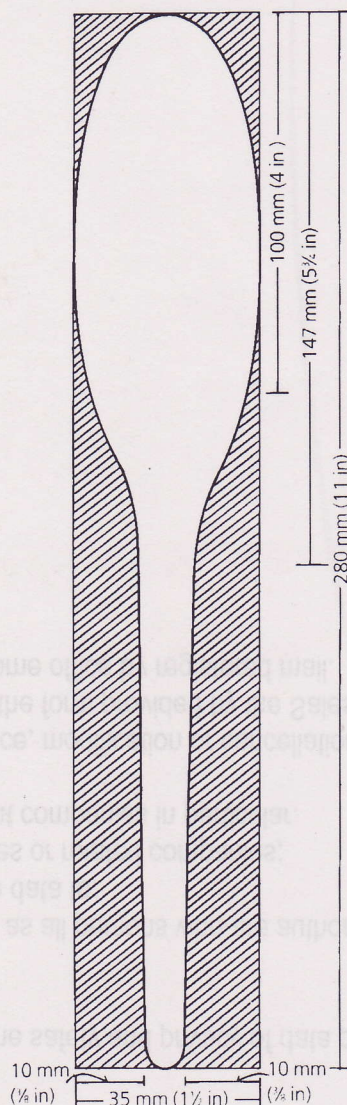


DIAGRAM 2

PLAN VIEW



3. Using the same saw, cut away the scrap indicated by hatching lines on diagram 2.

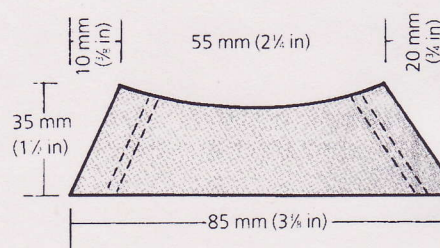
4. Drill two lead holes (represented by the black dots on diagram 1), then use a jig saw or a keyhole saw to cut out the hole for the cockpit. The lead holes will need to be a few millimetres larger than the width of the blade you will use.

5. Using a rasp and sandpaper, round all the edges and surfaces to make the body as realistic as possible (see photograph).

Undercarriage

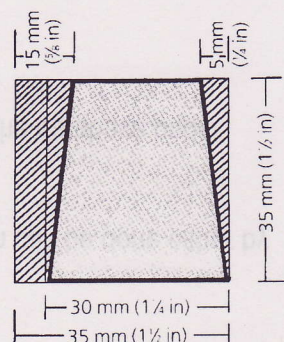
6. Cut a piece from the remainder of the pine following diagram 3. This can be traced on to the wood in the same way as the body. Ensure that the measurements are full size.

DIAGRAM 3



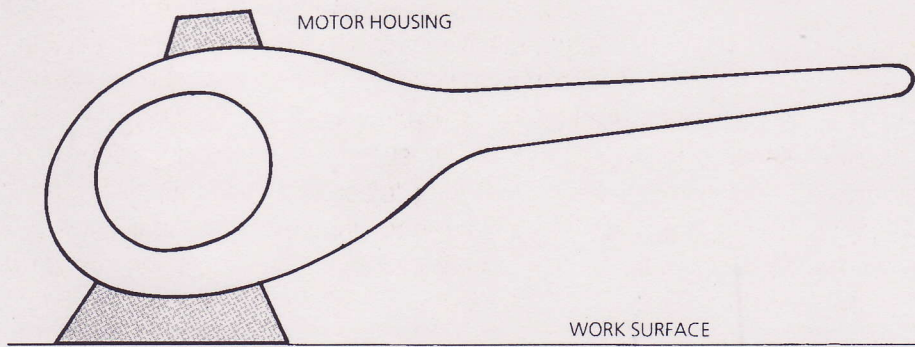
7. Draw the angles on both front and back (diagram 4), continue the lines along the top surface of the wood, and then plane away the scrap.

DIAGRAM 4



8. Hold this piece up against the bottom surface of the helicopter body and, using a rasp, shape the top surface of the undercarriage until the two pieces fit snug together. If you place the undercarriage on a flat surface, the tail of the helicopter should be angled away from the horizontal (diagram 5).

DIAGRAM 5



Main rotor blade

13. Cut a 180 mm (7 in) length from the thin — 5 mm ($\frac{1}{4}$ in) — piece of pine. Drill a 3 mm ($\frac{1}{8}$ in) hole right through the centre of the width and length of the rotor. This will be the axis on which the rotor spins, so it's important that this hole is dead centre. Using sandpaper, round off the ends and all the edges of this piece to make it look as realistic as possible. However, remember that this toy will be used by a child and if the rotor is too thin, it will break.

Tail rotor

14. Cut a 60 mm ($2\frac{1}{2}$ in) length from the remainder of the 5 mm ($\frac{1}{4}$ in) thick pine, and follow the same steps as for the main rotor blade, above.

Construction

We shall first assemble the helicopter 'dry', that is, without any glue, ensuring that everything fits together well. Remember, too, that before a screw can be screwed into place, a lead hole has to be drilled. For this you will need a drill bit that is the same width as the shank of the screw. The retaining hole must be the same depth as the distance the screw will protrude from the main hole.

15. Screw the undercarriage to the body (diagram 5).

16. Screw the skids to the undercarriage so that from the front it looks like diagram 8a and from the side it looks like diagram 8b.

DIAGRAM 8a

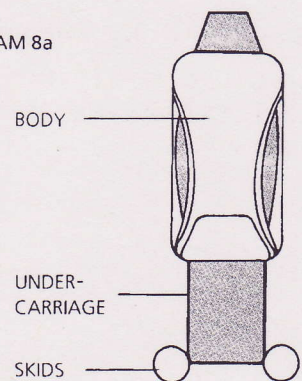
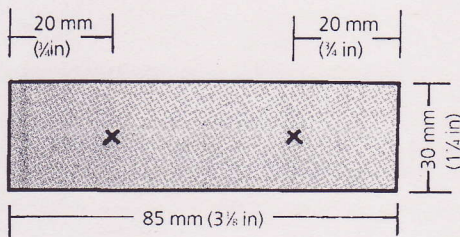
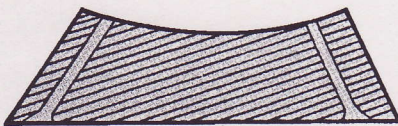


DIAGRAM 6a



9. Drill a 4 mm ($\frac{1}{8}$ in) hole at each end of the bottom of the undercarriage so that the angle of the hole follows the angle of the end of the undercarriage (diagram 3). Diagram 6a shows a view of the underside and diagram 6b is a cross section through the undercarriage. Countersink these holes on the underside to accommodate the head of a No. 10 screw.

DIAGRAM 6b

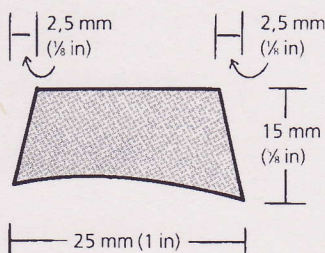


Skids

10. For the skids, cut two 125 mm (5 in) lengths from one of the dowels and round off the ends with sandpaper.

11. Clamp each skid to your work surface and drill two 3 mm ($\frac{1}{8}$ in) vertical holes in each, one 30 mm ($1\frac{1}{4}$ in) from one end and the other 50 mm (2 in) from the other end. Carefully countersink these holes on one side only to accommodate the head of a No. 6 screw.

DIAGRAM 7a



Motor housing

12. Cut the motor housing (diagram 7a) from a remaining piece of pine. The front view is given in diagram 7b. Using a rasp, file the longest surface of the motor housing concave, so that it fits on top of the body as in diagram 5, above.

DIAGRAM 7b

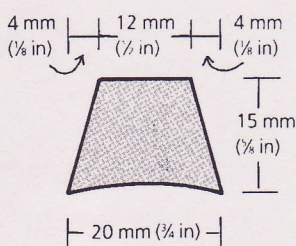
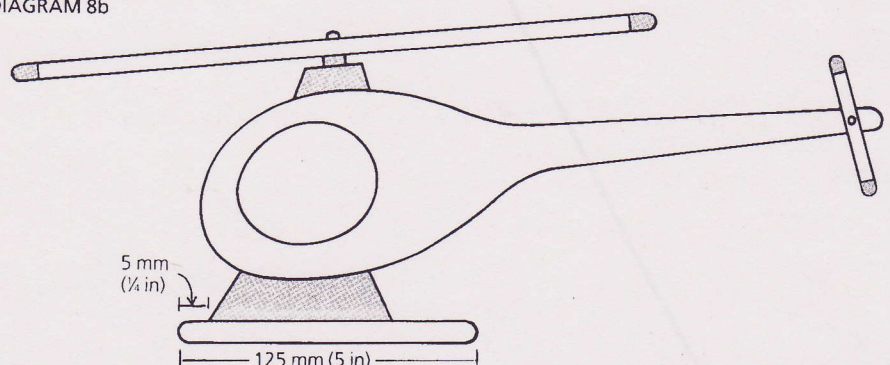


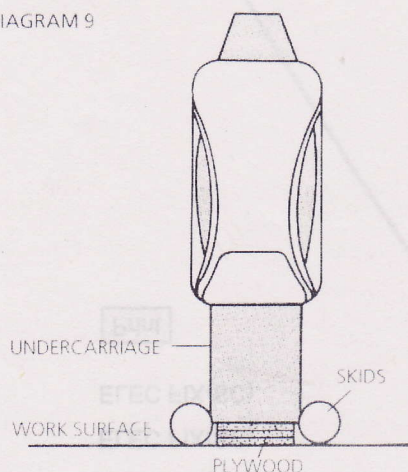
DIAGRAM 8b





The slight height of the undercarriage above the ground can be achieved by placing a thin piece of plywood on the work surface. The undercarriage will stand on this wood, while the skid will be on the work surface itself (diagram 9). Do not attach the plywood to the undercarriage — it is used simply to create height while fixing the skids. This will also mean that the screw holes will be angled slightly upwards, towards the undercarriage.

DIAGRAM 9



17. Screw the motor housing to the centre of the body so that its top surface leans slightly forward (diagram 8b).

18. Drill a 2 mm ($\frac{1}{16}$ in) lead hole into the dead centre of the top of the motor housing. With a washer between the housing and the rotor, screw the rotor into place so that it spins freely.

19. Carefully drill a 2 mm ($\frac{1}{16}$ in) lead hole 5 mm ($\frac{1}{4}$ in) from the end of the tail of the body, noting from the photograph which side to attach it to, and with a washer between it and the body, screw the tail rotor into position so that it spins freely.

20. When you're certain that everything fits perfectly, take the toy to pieces, give every part a final sanding to ensure a good finish and assemble the chopper using a thin layer of wood glue on each surface to be joined. Make sure that any surplus glue is wiped off with a damp cloth. Do not, at this stage, attach either of the rotors as this will make painting very difficult.

Painting and final construction

21. Give every surface a coat of universal white undercoat. (It may be a good idea to put a knotted string through the centre hole of each rotor so that they can be suspended while the paint dries. In the same way, you could screw a cup hook into the hole in the top of the motor housing so that it, too, can be suspended while the paint dries.) When the undercoat is thoroughly dry, rub down all parts gently with sandpaper to remove irregularities.

22. Apply the topcoat of your choice. You may find it necessary to apply two topcoats to achieve a really good finish. It might be a good idea to add some decoration at the end of the rotors (see photograph), but remember that each coat must be thoroughly dry before attempting to apply another over, or alongside it.

23. Finally, screw the main rotor back into position, making sure that it's tight enough not to wobble, while at the same time being free to spin smoothly. In the same way, screw the tail rotor into position.