We have designed this Dalek as an exercise for a well-equipped school, using the resources and facilities of several departments—woodwork, metalwork, art and so on. It could also be built at home—but only by someone with considerable 'do-it-yourself' experience.

You do not need to be a professional to build a Dalek, but you will need some basic skills, precision, common sense and, above all, enthusiasm! You will need the use of some machinery, such as a woodworking lathe and a band or jig-saw. Don't follow our instructions too slavishly; do not be afraid to improvise.

For clarity, we have divided the Dalek into five sections: 1 is the head—and this needs a full week to complete; 2 is the neck; 3 is the shoulders; 4 is the body; 5 is the base.

The head could adequately be made from reinforced papier mâché instead of the more complex fibreglass. If you do decide to use fibreglass, exercise extreme care in the process: barrier cream should always be used to protect your hands and the fibreglass should only be handled in a well-ventilated area. Fumes can be unpleasant and dangerous in a confined space. Note well, too, that the accelerator and catalyst used must not be mixed together. That could be dangerous.

To make sure that this Dalek design works, we asked the Technical Sixth Formers of Highbury Grove School, London N5, to produce a Dalek as a feasibility study. With help from their staff, they produced the magnificent black-and-orange specimen (below) in two weeks, at a cost of £12.

'We based our Dalek on these plans for size and shape, but substituted materials that were to hand or more easily obtainable,' says the school's Head of Technical Studies, Don Jackson. 'And with careful marking out, pieces like the neck disc can come from the unwanted centre of the top of the body, and the top of the body can in turn come from the unwanted centre of the baseboard.'

Highbury Grove also cut costs by scavenging aluminium from a scrapyard for £1, instead of paying more than double from a stockholder. Don Jackson’s verdict: 'A very worthwhile, enjoyable project. There is no process in construction that 12 and 13-year-olds could not do, with supervision.'

Finally, we wish you good luck!

These are the basic materials required to build a Dalek:

1 28 lb bag modelling clay
1 roll 500 mm bandage
1 sq yds hessian scrim
1 pint shellac
1 tin car wax polish
1 pint PVA release agent
2 oz accelerator
2 oz catalyst
3 strips of glass matt
2 lbs gelcoat resin
6 lbs layup resin
acetone
soap and water
1 tub barrier cream
2 sink plunger
4 car parking lights (for flashing lights on head)
6V 0·3 amp bulbs and holders
6 volt battery

1·5 mm ply 1 sheet 5 ft x 5 ft
6 mm ply 4 sheets 5 ft x 5 ft
9 mm ply 1 sheet 8 ft x 4 ft
15 mm ply 1 sheet 10 ft x 4 ft
12 mm wooden dowel
27 mm wooden dowel
2 wooden balls 95 mm diameter

24 polystyrene balls
6 ball bearings 6 mm
30 gauge fine aluminium mesh 275 mm x 1470 mm
24 gauge large aluminium mesh (2 strips) 655 mm x 180 mm aluminium
1425 mm x 150 mm and two strips 651 mm x 10 mm soft aluminium: 40 mm x 170 mm
36 mm aluminium or plastic tube 455 mm
40 mm aluminium or plastic tube 615 mm
3 mm steel rod 315 mm
15 mm rod 270 mm brass shim strip
ribbed rubber flooring foam strip
3 plastic rotating castors
1 in to 2 in diameter
perspex 2mm 80 mm x 80 mm
2 brass rings (internal diameter 28 mm, cut to 10 mm long)
screws, nuts, bolts, snap rivets, fast-drying enamel paint

Approximate total cost: £15
SECTION 1: HEAD

1 MAKING A FORMER
Take a suitable sheet of ply. Cut and shape to make a former. Using fibreglass, attach to 15 mm metal rod.

2 SHAPING THE CLAY
Build up soft clay on the base to approximate shape of the head. Pack the centre with paper or polystyrene to save clay. Spin the former round to scrape off the excess clay. Remove the former, leaving the rod in position.

3 MAKING THE MOULD
Cut plaster-bandage into strips of 500 x 800 mm each. Dip in water and lay over clay to 5 mm thickness. Allow 3 or 4 minutes to set. Next, mix plaster (see opposite for method). Then build up the mould thickness to 25 mm, reinforced with alternating layers of plaster and hessian scrim.

Press two wooden supports into outer layer of plaster while it is still wet. Bind with strips of hessian scrim. When dry, this makes a stand for the mould.

4 MIXING THE PLASTER
Fill a plastic bucket with 50-80 mm of water. Gently sprinkle in plaster until it forms a peak above the water line. Stir gently with hands. The mixture is ready when it does not run off the stick.

Allow mould one week in a warm place to set and dry. Then turn upside down and remove clay. Fill hole with plaster and smooth over edges.

5 MAKING THE FIBREGLASS DOME
Paint the inside of the mould with shellac and allow to dry. Apply three coats of wax car polish. Use a soft cloth or sponge, apply layer of release agent. Allow 2 or 3 minutes to dry.

Mix gel coat 1 gallon resin with accelerator, approximately 5% weight of the resin, and catalyst, approximately 5% of resin weight. But add accelerator and catalyst to gel coat separately. Do not mix them together. Paint on with brush. Allow to go hard.

Mix layup resin with accelerator and catalyst. Clean brush in acetone. Wash hands in soap and water. Apply strips of glass matt to the mould and paint with resin. Continue this layering process until approximately 4 mm thick, or 3 layers of glass. Use a paint brush to punch out all the trapped air bubbles from the matt fibres.

When fibreglass is hard enough to cut, trim off the ragged edges with a sharp knife. Then allow it to 'cure' fully for about 24 hours in a warm room. Finally, remove from mould.

6 MAKING THE ANTENNA
Stick 2 sheets of 15 mm ply together. Draw a 25 mm circle on it. Saw off corners till nearly round. Chisel, file and sand with glass paper to make a perfect circle (or use woodworking lathe if available).

7 MAKING THE
Cut a 2 mm thick sheet of clear perspex to an 80 mm diameter disc. Paint eye (any paint will do) on reverse side of perspex. Insert and glue into place.

Drill hole same diam dowel, insert arm and glue
8 FIXING THE ANTENNA
Cut an opening 140 mm long, 34 mm wide, in the head.
Take two pieces of 9 mm ply and cut to shapes shown below.
Fix into inside of head with screws.
Fix antenna into position with 65 mm nut and bolt.

9 MAKING THE HEAD TURN
From a sheet of 9 mm ply cut a disc 480 mm diameter (A) and another
disc 480 mm diameter (D). From a sheet of 3 mm hardboard cut a disc
480 mm (C). From that disc, cut an inner disc 340 mm diameter, (B).
Drill 6 evenly spaced 6 mm holes right through ring (to hold 6 mm
diameter ball bearings). Assemble as below and screw dome to (A).

10 MAKING THE RINGS
From a sheet of 15 mm ply, cut 3 rings as shown below. Drill 8 evenly
spaced 15 mm diameter holes PCD 530 mm. Insert 8 wooden dowels,
12 mm diameter, 235 mm long. Cut ends to same angle as inside of dome.

11 MAKING THE MESH CYLINDER
From a sheet of 15 mm ply, cut 2 discs 480 mm diameter. Cut 8 softwood
struts 10 x 25 x 275 mm and assemble with discs as in diagram.

12 MAKING THE INNER SHELL
From a sheet of 9 mm ply, cut a disc 550 mm diameter. Cut a hole in
this 400 mm diameter (A).
Also cut out shape (B) with a hole in it 500 mm in diameter. Attach
these two pieces with 4 struts using same
method as Section 2, 11.
See over for shapes of struts.
15 MAKING THE ARM
Cut a piece of 40mm diameter aluminium tube to 615mm long. Drill hole through 95mm diameter solid wooden ball and insert tube securely. Cut a piece of 56mm diameter aluminium tube 775mm long. Plug one end with wood and screw sink plunger on to this.

16 MAKING THE EXTERMINATOR
Cut a piece of 26mm diameter aluminium tube to 455mm long. Drill a hole in identical wooden ball and insert tube as shown in Section 3, 15. Fix 2 brass rings in position as shown. Cut 8 equal lengths of 3mm steel rod to 315mm long. Bend 10mm at either end of each at a right angle. Arrange at equal intervals around the rings and braze – don’t solder.

14 MAKING THE ALUMINIUM SKIRT
From a sheet of aluminium, cut 2 shapes shown opposite. Fix to inner shell using same method as for mesh collar – Section 3, 13. Take 4 identical pieces of brass shim 100mm long, 10mm wide. Roll them tightly round a pencil so that they will spring open when pushed out of the tube. Using fine tacks or tape, attach these to one end of the wooden d

13 MAKING THE MESH COLLAR
From a sheet of aluminium, cut 2 strips 65 x 10 mm. Join at front and back with a piece of soft aluminium 40 x 170 mm and clamp. From a sheet of large aluminium mesh, cut 2 strips 655 x 180 mm. This fits over aluminium belt...

and is held in position with 16 vertical strips of 3mm ply 50mm x 215mm and 6 vertical strips of 3mm ply 50mm x 125mm, all anchored with pop rivets.

The aluminium belt and the aluminium mesh are separated from the inner shell by a block of wood 20mm thick, 40mm x 40mm, and fixed through to the shell with nuts and bolts.
MAKING THE ARM AND THE EXTERMINATOR MOVE

18 holes in the inner shell as follows:

From a sheet of 15 mm ply, cut a piece 2mm x 15mm (front panel). Cut a hole in the 90mm diameter one side, chamfered to 70mm diameter on the other. From a sheet of 6mm ply, cut one piece 2mm x 112mm (side panel), and one piece 122mm x 133mm (top panel). Pin and glue these together to form a box as shown below.

same process in reverse for the other side.

From a sheet of 15mm ply, cut 2 pieces 12mm square, each with a hole in the centre 90mm diameter on one side, chamfered to 70mm diameter on the other.

Next, drill 4 holes 4mm diameter in the front panel of the box at a 135° angle.

Nuts and bolts (not shown) are used to secure the arm and the exterminator can be moved freely but are locked into place.

SECTION 4: BODY
MAKING THE FRAME

15 mm ply, cut base and top shapes.

Assemble arm and exterminator as shown below.

SECTION 5: BASE
22 MAKING THE RUBBER SKIRT

Cut a strip of thin black rubber to encircle the platform. Screw into position with aluminium angle.

Assemble the Dalek, screwing the sections together. All that remains is to paint it (see these colour schemes in our photograph, pages 33-34). Now you've seen how to make a Dalek yourself, turn overleaf and read how the behind-the-scenes professionals bring Dr Who to life.