



PROJECT '66

PHASE 1—THE HULL

Daily Express photograph

This month's big **free plan** marks the start of PROJECT 66. Follow it through, and you can have a super radio controlled winner ready for the 1966 season. **Brave Moppie**—winner of the 1965 International Daily Express Offshore Powerboat Race—was the inspiration for RON WARRING'S exciting model.

THE full size plan included in this issue is a near-scale model of 1965's outstanding powerboat—'Brave Moppie', winner of the International Offshore Powerboat Boat race. The full size craft is based on the now famous 'deep vee' hull form originated by Ray Hunt (who previously used to design high speed naval craft, incidentally). We have chosen a near-scale rather than an exact scale model for two reasons. First, the hull shape we are using is very straight-forward and easy to build. Second, the same basic hull can also be used for making a variety of other near-scale models of still more famous power boats—'Surfury', the 1964 winner; 'Thunderbird' second in 1965; the well known Fairey 'Huntress', and so on.

In this first article we are giving complete details of building the hull for 'Brave Moppie'. **Phase 2** next month will give full details of finishing and fitting out for powering by electric motor or diesel motor, to your choice. **Phase 3** in the series will appear in March with further plans and details for building other famous models using the same hull. You can either modify your 'Moppie' or build new hulls for each of

these extra models and end up with a whole fleet of powerboat racers! Finally, in **Phase 4** we shall be giving complete details of how to fit out and operate your model with radio control.

To simplify construction and make for quicker and easier assembly balsa is used throughout for all parts of the hull (with the sole exception of the transom, which is cut from $\frac{1}{8}$ in. ply). The majority of parts are cut from balsa sheet and, where necessary, you will find full size patterns of the parts required on one or other side of the plan. These patterns must be transferred onto the balsa sheet for cutting out, either by tracing or using carbon paper, or laying the plan over the sheet and pricking around the outline. In the latter case the prick marks can be joined with a pencil line as a final guide for cutting out. In the case of the *chine shelf* and *foredeck* only half the pattern required is given on the plan, so a tracing should be made of this half pattern on a sheet of tracing paper. Turn the tracing paper over and align with the centre line marked on the balsa panel, then mark one half outline. Turn the tracing paper over again and realign, and mark the second half of the pattern layout. This will

ensure that your chine shelf and foredeck shapes, when traced onto the balsa, are exactly symmetrical.

Since building follows a sequence of logical steps we are grouping these under separate headings, illustrated by a diagram where necessary as a further aid.

- Step 1** Cut two $20\frac{1}{2}$ in. lengths of 2 in. by $\frac{1}{8}$ in. sheet balsa and one $22\frac{1}{2}$ in. length of 3 in. by $\frac{1}{8}$ in. sheet balsa and cement together carefully on a flat surface as shown in Fig. A. Leave until the cement has set. Mark a centre line in pencil on the middle sheet and then trace or mark out the *chine shelf outline*, taken from the full size plan. Now cut out carefully to this outline shape with a sharp modelling knife or a fretsaw.
- Step 2** Mark out and cut all the bulkheads—1, 2, 3, 4, 5, 6 and 7—using the full size patterns on the plan. These are cut from $\frac{1}{8}$ in. sheet balsa. (You can do this whilst the three sheets cemented together in stage 1 are setting.) Also cut two $12\frac{1}{2}$ in. lengths and two $3\frac{7}{8}$ in. lengths of $\frac{1}{2}$ in. by $\frac{1}{8}$ in. balsa strip.
- Step 3** Lay the cut out chine shelf (step 1) over the plan and mark on the position of the bulkheads. Cement these bulkheads to the chine shelf, as shown in Fig. B and photo 1.

decking pieces, which are $12\frac{1}{2}$ in. by 2 in. by $\frac{1}{4}$ in. balsa sheet panels onto which the aft deck shape is marked. Cement in position leaving a gap between them of 3 in. When set, trim down to the correct outside shape and cut away for the cockpit, to the lines previously marked on these panels. (Photo 3)

Step 7 Now fair in the sides carefully with a sandpaper block so that the edges of

the deck and bulkheads blend together. At the same time the edges of bulkheads 1, 2, 3 and 4 must be chamfered to blend with the curvature of the deck—Fig. F, and photo 4

Step 8 Cut two 20 in. lengths of 3 in. by $\frac{1}{4}$ in. balsa sheet. These are cemented in place as shown in Fig. G, finishing at the front so that they overlap half the thickness of bulkhead 2. When set, trim down close to the deck and bottom of the chine shelf. (Photo 5)

Step 9 The remaining part of each side between bulkhead 1 and bulkhead 2 is then covered with a 3 in. wide piece of $\frac{1}{4}$ in. sheet with the grain running vertically—Fig. H. You will have to offer this piece up in position and cut and trim for an exact fit. When satisfied, cement securely in place. Trim off surplus sheet when set.

Step 10 Cut two bow blocks, each $2\frac{1}{2}$ in. long from 2 in. square balsa block. Now trim their height so that they fit exactly into the space between the deck and chine shelf alongside the bow piece and forward of bulkhead 1—see Fig. I. Then taper to the stem profile shape, as shown, and cement in place.

Step 11 The whole assembly should now be left for several hours for the cement to set (preferably overnight). Then you can carve and sand the bow blocks down to final shape—Fig. J—and also sand off any surplus side sheeting flush with the upper line of the deck panel and the bottom line of the chine shelf.

Step 12 Mark and cut out the keel piece from $\frac{1}{4}$ in. sheet balsa and then separate into two pieces by sawing along the angled line marked 'cut'. Cut the two doublers from $\frac{1}{8}$ in. sheet and mark on the lines indicated in pencil. Now assemble by cementing together as shown in Fig. K with a space of $\frac{1}{4}$ in. between the two parts of the keel piece, taking special care to position the doublers so that the rear edge of each doubler corresponds to the front line of bulkhead 6A position (i.e. $4\frac{1}{2}$ in. in from the extreme end of the keel).

Step 13 Lay the keel piece over the plan and mark the positions of formers 2A, 3A and 5A on each side of the keel assembly. Then cement the keel piece to the bottom of the chine shelf as shown in Fig. L.

Step 14 Cut all the triangular formers (two each off 2A, 3A, 4A, 5A, 6A and 7A) from $\frac{1}{4}$ in. sheet balsa, using the full size drawings given on the plan. Cement in position as shown in Fig. M.

Step 15 When set, fair off the bottom edges of the sides from former 2A aft so that the sloping edges and bottom edge of the sides line up, as shown in Fig. N. Use a sanding block or a sanding stick for this job. Now fit the $\frac{1}{8}$ in. doubler behind former 2A.

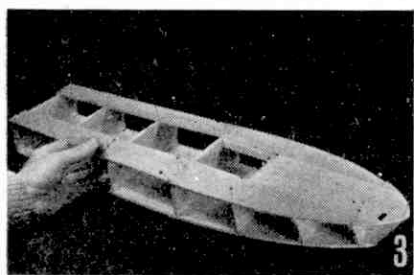
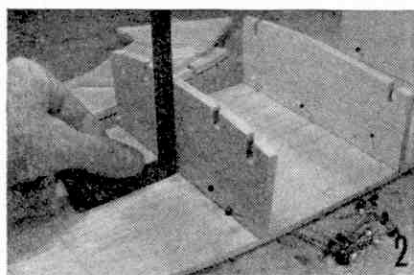
Step 16 For covering the bottom you need two panels of $\frac{1}{4}$ in. balsa $19\frac{1}{2}$ in. long by $3\frac{1}{2}$ in. wide. You can buy 4 in. wide sheet for this, or work as follows. Cut two $19\frac{1}{2}$ in. lengths of 2 in. by $\frac{1}{4}$ in. sheet and one $19\frac{1}{2}$ in. length of 3 in. by $\frac{1}{4}$ in. sheet and cement together edge to edge. When dry, cut down the centre to give two $3\frac{1}{2}$ in. wide panels. Chamfer one edge of each panel and cement the bottom panels in place as shown in Fig. O. Don't remove too much balsa in the chamfering operation—as a $3\frac{1}{2}$ in. sheet is just wide enough!

Step 17 Trim off the bottom sheeting square and flush with the sides, Fig. P.

Step 18 Cut two 3 in. lengths from 2 in. by $1\frac{1}{2}$ in. balsa block and cement in position as shown in Fig. Q. When set, carve and sand down to final shape to blend with the hull lines.

Step 19 Cut the plywood transom (part 7B) and cement to the rear of bulkhead 7, as shown in Fig. R.

On this PICTURE PAGE you can see how the Editor's hull is progressing. Visitors to the Schoolboys and Girls Exhibition will be able to study his finished model on the Meccano Magazine stand.



1 A Razor-Saw will cut beautifully straight lines in $\frac{1}{4}$ in. sheet

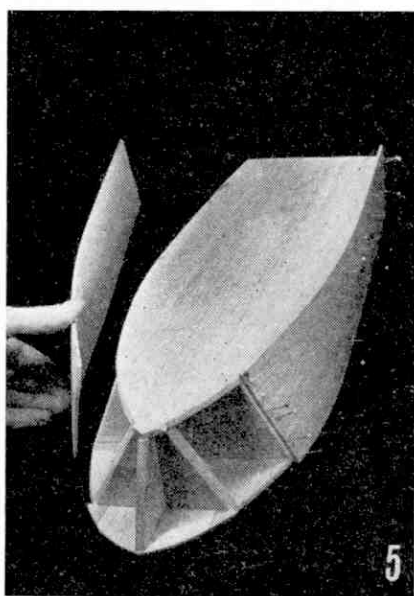
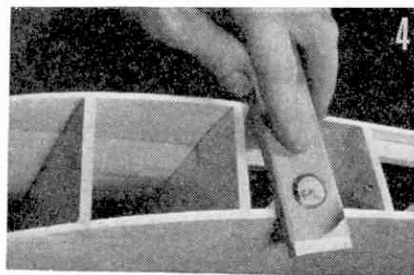
2 Use a 'Square' to ensure upright bulkheads

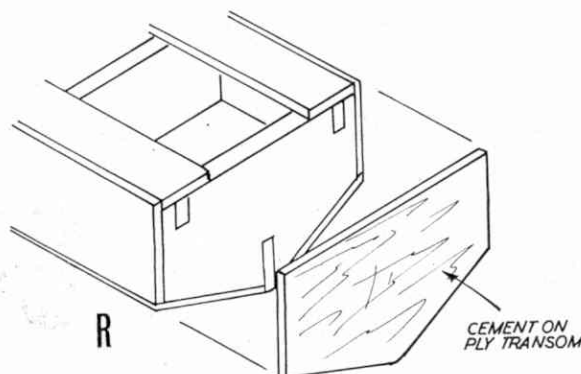
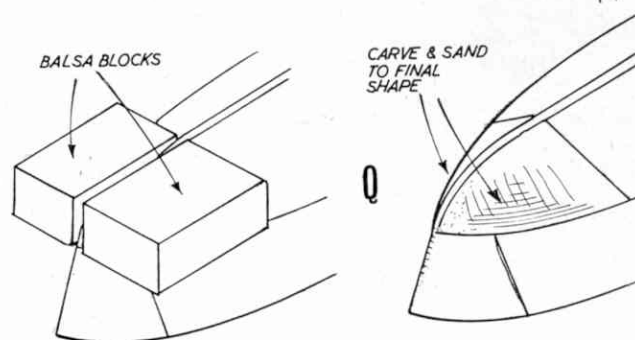
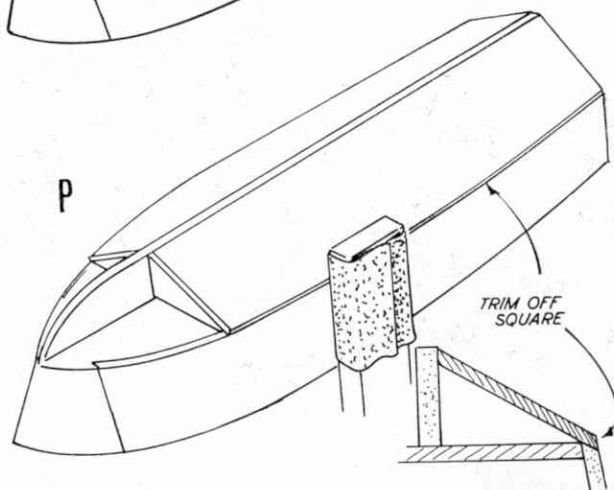
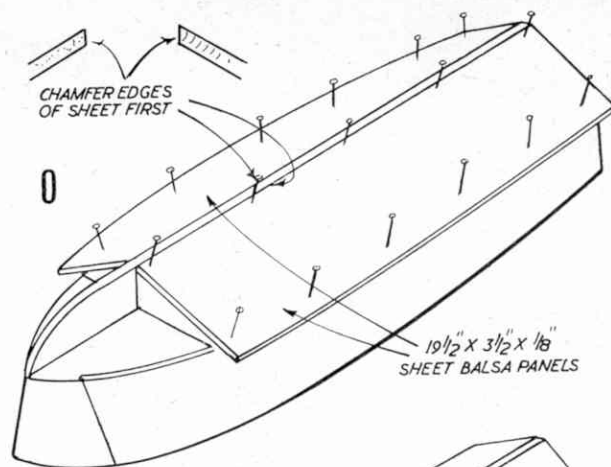
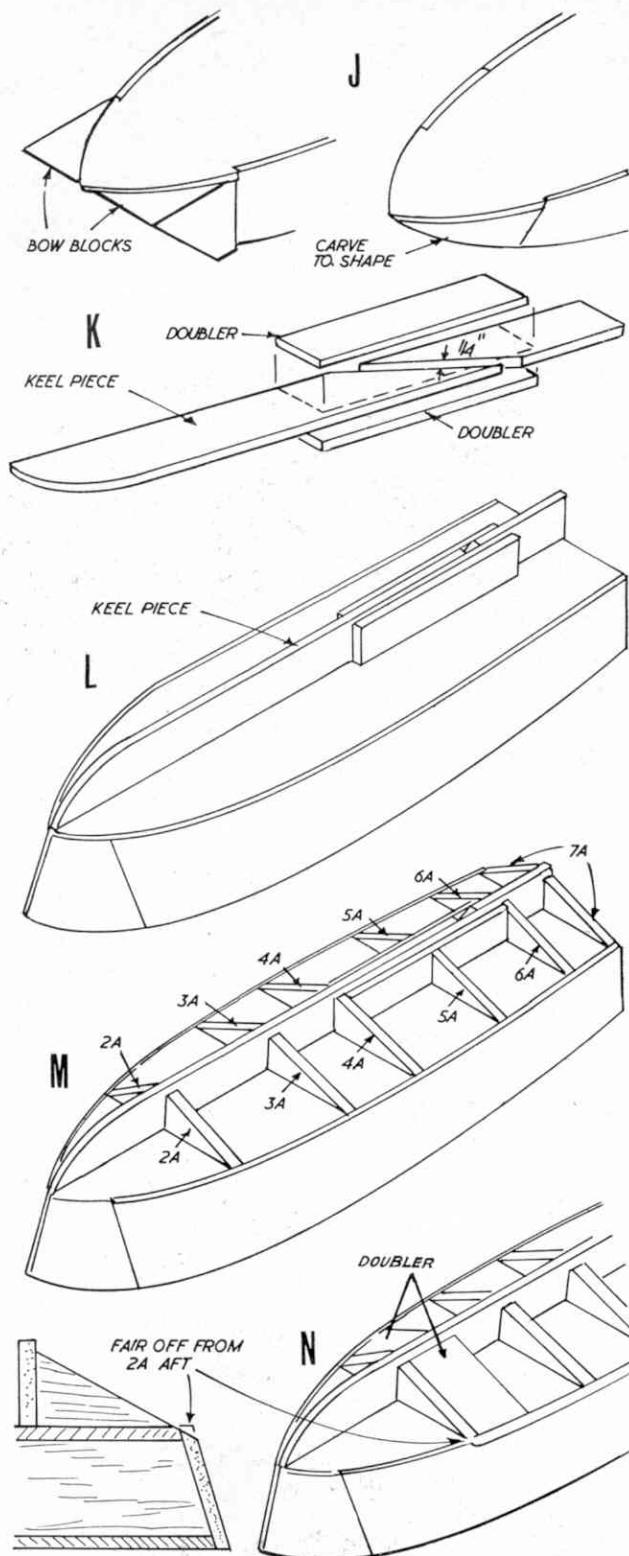
3 Glass-Headed Pins are useful for holding cemented parts

4 The secret of good balsa construction is always to use sandpaper wrapped round or stuck to, a piece of wood. Make up several such 'Sanding Sticks' with both flat and curved wooden shapes

5 The curved side sheets may be steamed to approximate shape before cementing in place. Balsa becomes quite flexible when held in the steam from a boiling kettle—mind your hands!

6 Using Clear Dope as an adhesive for attaching the Heavyweight Modelspan tissue to the hull. Dope the hull first, sand lightly when dry, then dope OVER and THROUGH the tissue, rubbing it firmly into contact before it dries





Finishing

The whole hull should now be worked over carefully with fine sandpaper, finishing to an extremely smooth finish. The edges of the chine should be left sharp, not rounded. Where the bottom sheeting meets the keel, however, round off

slightly until sheeting and keel blend uniformly. You can also work a little 'flare' into the bow blocks if you like by sanding to a slightly concave surface, but do not overdo this as you may sand right through the side sheeting. Finally we recommend that the complete hull (bottom, sides and

deck) should be covered with thin nylon or heavyweight model aircraft tissue, pasted down all over with tissue paste. This will add considerably to the strength of the hull and also provide an excellent surface for subsequent paint finishing. The little extra time that this job takes is well worth the effort. The Editor is

using a cellulose finish and so he stuck his tissue covering on with dope—see photo 6. Polyurethane finishes however, will take better to pasted-on tissue.

NEXT MONTH:—
FITTING OUT AND FINISHING THE HULL, AND MOTORISING.

PROJECT '66

Part 2



by Ron Warring

Last month we built the hull with the aid of the free full size plan; that was PHASE 1.

This month we add the finishing touches and install the power unit.

Next month in PHASE 3 we will present a second free full size plan showing no fewer than SEVEN different power boats that can be adapted from the basic hull. Finally, PHASE 4 in the April issue, will show how you can fit any of these boats with radio control.

ELECTRIC OR DIESEL?

If this is your first model powerboat, you will find it much easier to build the electric-powered version. The standard Meccano Power-Drive motor is ideal for this model and is not too heavy on batteries.

A diesel-powered boat is faster, and perhaps rather cheaper to operate in the long run. BUT far more skill is required to install a diesel engine, and great care must be taken to completely fuel-proof the inside of the boat, to prevent the fuel waste and exhaust gases from destroying the paint.

The noise of diesel operation often limits the number of places where the boat can be operated. Even with a 'silencer' the engine can be very noisy. Another point to bear in mind is the possibility of running out of fuel with the boat out of reach of dry land! An electric motor will continue to run, and eventually bring the boat within reach—even though the battery may be getting flat, but a diesel engine just stops—take your pick!

IN this article we shall describe how to complete 'Brave Moppie' as a working model with *either* electric motor *or* diesel power. The choice of power unit is, in fact, wide open. The more powerful the motor the faster the model will go. Thus if you decide on electric motor power, choose a reasonably powerful motor like the biggest models in the 'Orbit' or 'Mabuchi' range. If these are too expensive, buy the largest of the alternative sizes or makes you can afford.

In the case of diesel power, the hull will take any size of engine from 0.5 cc up to 1.5 cc. We have shown the DC 'Spitfire' on the installation drawing and we consider this, or the DC 'Merlin', an ideal power unit for this size and type of hull. Alternatively, if you want more speed, try a 1.5 cc motor.

Before fitting out the model, however, there is still some work to do on the hull. The hull has already been prepared virtually ready for painting if all the stages described in part (1) have been completed. The next thing is to fit the chine strips and gunwale strips, as shown in Fig. 1. Two strips are used in each case since these can readily be bent to the curve of the hull where a single solid strip will probably break. Cement in place securely and hold with pins until dry. When set, lightly round off the edges of the gunwale strips but round off the uppermost side of the chine strips to a complete quarter-circle section.

Each bottom panel now has four $\frac{1}{4}$ in. square balsa spray strips cemented along it, as shown in Fig. 2. These run parallel to the keel, with each strip spaced $\frac{1}{4}$ in. apart. Carry them round the curve of the bow up to the extreme bow or chine

line and trim off neatly. It does not matter how the curves of the strips run at the bow, provided they are the same on each side.

Next make and fit the hatches—Fig. 3. These plug into the opening left in the hull. The forward hatch top will protrude above the deck and so must be sanded down to blend into the curvature of the deck. Both hatches should be a nice 'plug' fit in position. It is advisable to cement reinforcing strips of $\frac{1}{4}$ in. square or $\frac{1}{2}$ in. by $\frac{1}{4}$ in. under the edges of the permanently fitted afterdeck pieces along the hatch line to support the decking in this region. This need not be done if the model is to be diesel powered since there is no need to gain access to the rear part of the hull once the steering has been linked up and so the aft hatch can be cemented in place permanently after ballasting. If the model is to be converted to radio control, however (to be described in the April issue), the aft hatch must be removable.

At this stage the propeller shaft tube and rudder tube should be fitted. There is already a 'channel' in the keel unit to take the stern tube and the position of this can be located by measuring $4\frac{1}{4}$ in. along the bottom of the keel from the extreme stern. If the stern tube is more than $\frac{1}{4}$ in. diameter this 'channel' should be opened up with a round file or a similar tool, until the stern tube can be slid up in position until it reaches bulkhead 4. A hole will then have to be cut in bulkhead 4 to allow the stern tube to pass through to its final position. Fill the bottom end of the 'channel', if necessary, with scraps of balsa driven in place and then thoroughly seal the area where

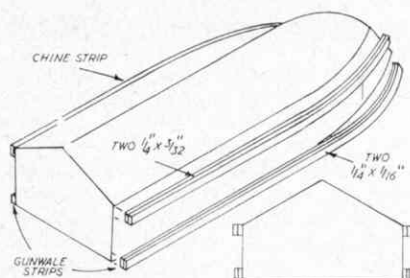


Fig. 1

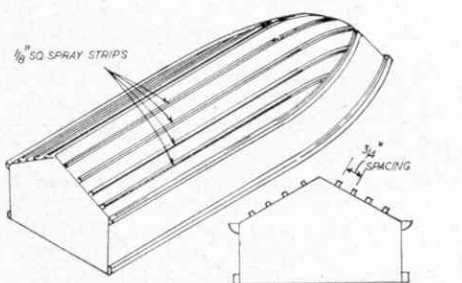


Fig. 2

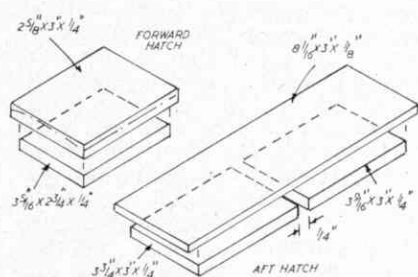


Fig. 3

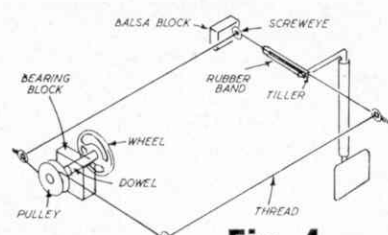


Fig. 4

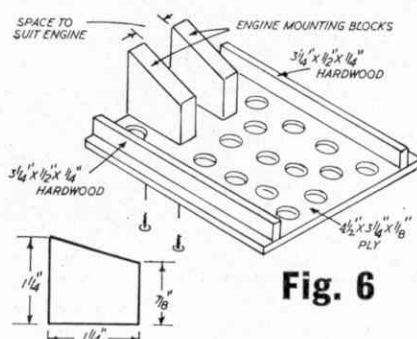


Fig. 6

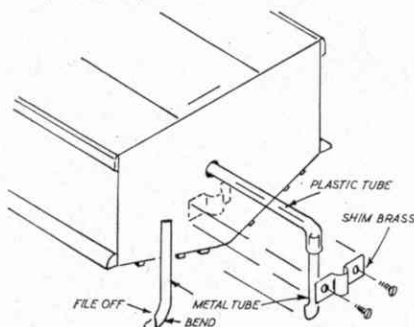


Fig. 7

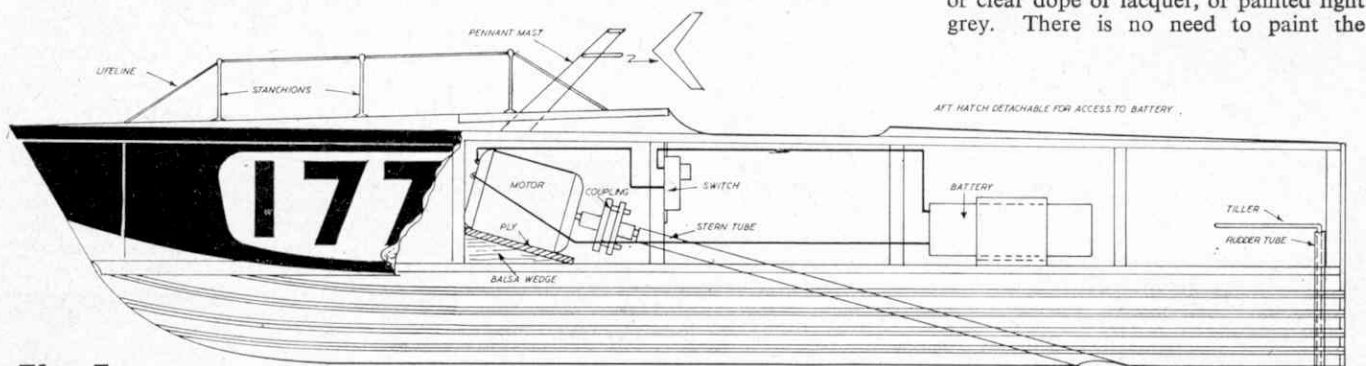


Fig. 5 Electric

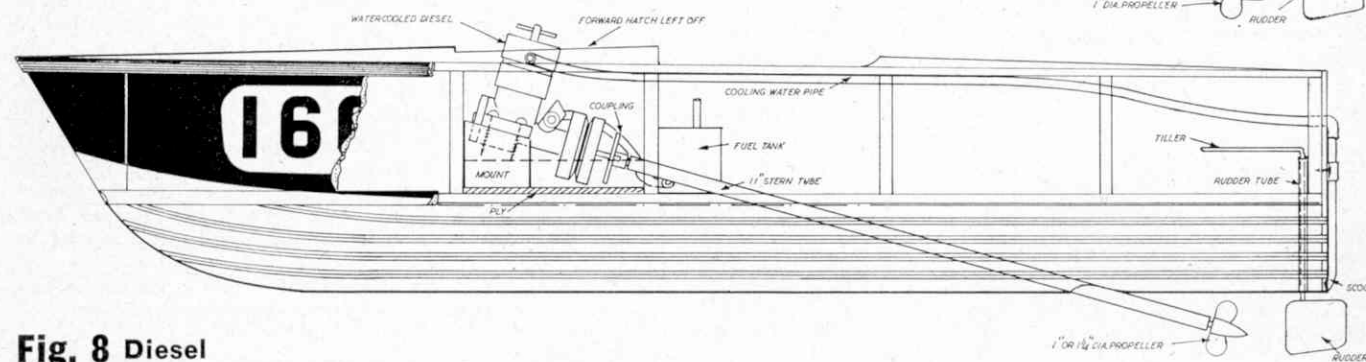


Fig. 8 Diesel

the stern tube emerges from the bottom of the hull with a generous coating of cement or Araldite.

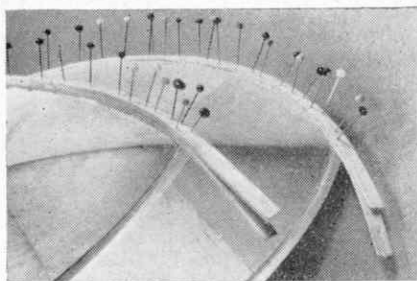
The rudder tube is much simpler to fit. Simply drill a hole up through the keel immediately in front of bulkhead 7 position—i.e. $\frac{1}{8}$ in. from the outer edge of the transom—and pass the tube up through this hole. Secure in position by cementing, or preferably Aralditing, to the inner face of bulkhead 7. Note that the hole drilled for the rudder tube should be slightly smaller than the tube diameter, so that when the tube is finally fitted it is a very tight, leakfree fit.

Both the rudder tube end and the propeller shaft tube end, incidentally, finish in the hull above the waterline and thus eliminate leakage troubles which are often commonplace with more conventional model boat designs.

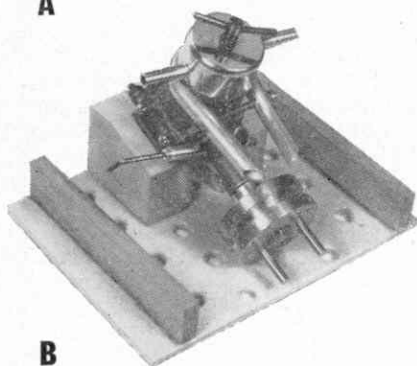
At this stage the whole model can be finish painted. If you are using ordinary cellulose dopes, then these can be applied directly over the tissue or nylon-covered hull. If you prefer to use a modern polyurethane finish—which is thoroughly to be recommended—the hull should first be painted with a suitable polyurethane filler-undercoat, rubbed down with garnet paper when dry. This will provide a good 'keying' surface for the polyurethane gloss coatings to follow.

The colour scheme to use for 'Brave Moppie' is black for the hull sides with the rest of the hull and deck white. The racing number is painted in black on a white panel. You can, of course, equally well use other colour schemes if you prefer.

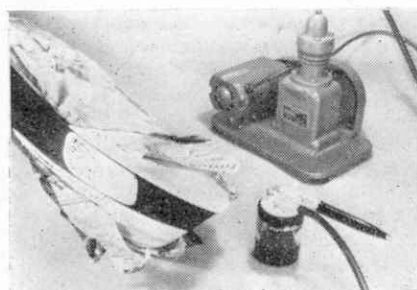
The inside of the cockpit can be left plain, 'varnished' with several coatings of clear dope or lacquer, or painted light grey. There is no need to paint the



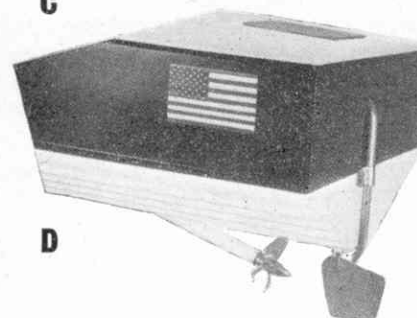
A



B



C



D

A The chine and gunwale strips are held in place with pins until the cement dries

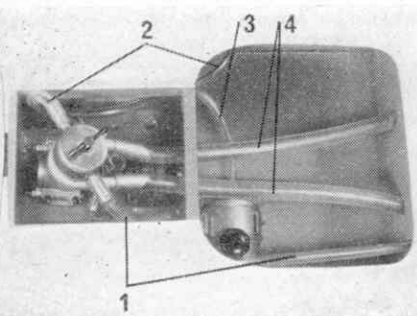
B The D.C. Spitfire securely mounted and ready to install

C The Maxispray unit produces a really professional finish. Spray the entire hull white, then mask the deck and bottom using adhesive tape and newspaper, and spray the sides

D The propeller, rudder and water intake

E The 'plumbing'. 1: water inlet tube, 2: water outlet tube, 3: fuel feed tube, 4: exhaust pipes

E



inside of the hull unless the model is to be diesel powered, when both the cockpit and the engine compartment should be given several coats of light grey dope (preferably butyrate or fuel resistant dope). Do not paint with oil colours as these will be attacked by diesel fuel.

Once finished painting, and with all the paint quite dry, the model can finally be fitted out. Assemble the rudder in its tube and bend the tiller at right angles to hold the rudder from dropping out. It is suggested that you hook up the tiller to a proper steering system, as shown in Fig. 4. This is quite easy to rig. A suitable wheel (e.g. a Ripmax plastic launch wheel) is cemented to a short length of $\frac{1}{4}$ in. diameter dowel. Drill a $\frac{1}{4}$ in. diameter hole in bulkhead 4 where you want the wheel to go, and also on a block of balsa to go behind the bulkhead to act as an additional bearing for the dowel. Mount in place with a small pulley on the other end of the dowel, cementing the bearing block to the back of the former but making sure that the dowel is not cemented as well and is free to turn when the wheel is turned.

The motors

To carry the steering cables four small screw eyes are required, screwed into small blocks of hard balsa. These blocks are cemented to the inside of the hull in convenient positions to carry the cable, as shown. The cable itself is simply a length of stout thread. Tie one end to the tiller, pass through the screw eyes on one side and across to the pulley. Wind about half a dozen turns round the pulley, then take back through the other screw eyes and make off by tying to a rubber band which also fastens to the tiller. Check for easy movement, i.e. the tiller and rudder moving as the wheel is turned, and adjust the tension of the rubber band as necessary. Note: holes will have to be drilled in bulkheads 4, 5 and 6 to pass the cable on each side, but the position of these holes is readily found by 'cut and try'.

Installation details for electric motor drive are shown in Fig. 5. The motor is mounted on a ply plate of suitable size, the plate then supported on balsa wedges to line up with the propeller shaft. The size of plate, and of the balsa wedges, will depend on the size of motor used. Mount the motor on the ply plate first and line up temporarily by 'trial and error'. When you are satisfied with the line-up, cement in place permanently, using plenty of cement. Any type of flexible coupling can be used to connect the motor to the propeller shaft—and again the type used will depend largely on the choice of motor. Alignment should be made with the two coupling units in position (i.e. one on the motor shaft and the other on the propeller shaft) as this makes it easier to establish satisfactory alignment.

The battery for the electric motor can be laid in the space between bulkheads

5 and 6, resting on the chine shelf; or you can make up a simple battery box from balsa sheet to hold in position. Use a reasonably large size of battery, such as a 4.5 volt flat flashlamp battery. Accumulators are better still, if you can afford them. All that has to be done then is to wire the battery to the motor through an on-off switch. This switch should be mounted on the cockpit side of bulkhead 4, where it is easily reached.

With the motor in position there should be no need to have to gain access to this compartment again, so the fore hatch can be cemented in place and the single lifeline supported on stanchions added; also the pennant mast, cut from $\frac{1}{8}$ in. ply.

Fitting of a diesel power unit demands a little more work for it is most important that the engine be securely mounted. Otherwise it can vibrate loose or, more likely, be pulled loose when starting with a cord round the flywheel. This time, therefore, we need a very robust engine mount, as shown in Fig. 6. This consists of two blocks of really hard wood, at least $\frac{1}{2}$ in. thick and shaped with an angled top edge, as shown. These are glued and screwed in place to a $4\frac{1}{2}$ in. \times $3\frac{1}{2}$ in. ply panel, with the spacing between the blocks arranged to suit the engine being used. In the case of the 'Merlin' or 'Spitfire' the blocks should be spaced exactly $1\frac{1}{8}$ in. apart so that the crankcase of the engine just fits between the blocks with the crankcase lugs resting on the angled faces of the mounts. The ply base piece is further stiffened by two lengths of $\frac{1}{2}$ in. by $\frac{1}{4}$ in. hardwood screwed and glued in place about $\frac{1}{2}$ in. from the edges, as shown. The ply base should then be drilled out with a large number of holes as this will considerably improve the strength of the glued assembly when this mounting unit is finally cemented in place.

Accuracy is essential

Do not cement in place until you have checked that the motor lines up correctly with the propeller shaft. First, lay the mount in position resting on the chine shelf, lay the engine on the mounting blocks and see if the alignment is satisfactory. If all is well, secure the engine to its mounting blocks with steel wood-screws at least $\frac{1}{2}$ in. long and recheck that the alignment is OK. Then 'flood' the floor of the hull with cement and press the mount in place, making sure to line the motor up with the propeller shaft before leaving to set.

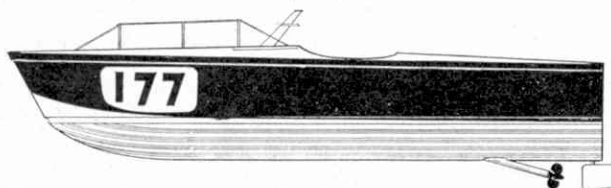
If the alignment is not satisfactory, then see if it can be improved with washers under the engine lugs. If so, proceed as above, with the alignment washers in position. If still not right then you may have to trim the engine blocks to get the correct alignment. Time spent in getting the engine alignment as near perfect as possible will be thoroughly worthwhile as the engine will run with less vibration and develop more power.

Continued on page 35

See
Page 10



There's one important point, though. You need the *best* Balsa for a job like 'Project 66' . . . and that means SOLARBO Balsa. Solarbo Balsa is specially selected and graded for modelling use and there just is no better Balsa obtainable anywhere. Use Solarbo Balsa for all your models. It costs no more, but the brand name ensures you that 'little extra' in quality!



REMEMBER! . . . next month 'Meccano Magazine' is giving plans for making SEVEN MORE MODELS based on the 'Project 66 hull'. Make sure you have stocks of Solarbo Balsa ready to start building! The material list above shows the requirements for making the hull.

Solarbo

SOLARBO LIMITED
COMMERCE WAY
LANCING, SUSSEX

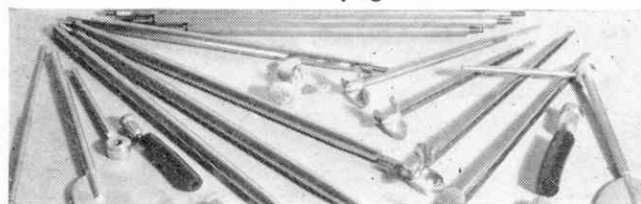
THE BEST BALSA YOU CAN BUY
ALWAYS ASK FOR IT BY NAME

**IF IT'S
RipMax
IT'S
GOOD!**

**SELECT "RIPMAX" FITTINGS
FOR YOUR "PROJECT 66" ★**

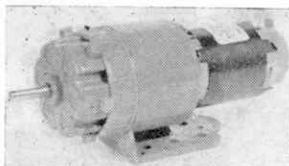
AT YOUR MODEL SHOP!

See page 10



'PROJECT 66' — DIESEL

- | | |
|----------------------------------|------|
| * TD.11 11" shaft and tube . . . | 6/8 |
| * MP.30 nylon Racing prop. . . | 2/7 |
| * MA.40 Rudder assy. . . | 4/6 |
| * C.741 Ball Coupling . . . | 5/6 |
| * MA.31 Fuel Tank . . . | 7/11 |
| * MA. 27/2 Silencer . . . | 8/6 |
| * MA. 61 Transom Flange . . . | 4/11 |
| * 18" ± bore Plastic Tube . . . | 1/- |



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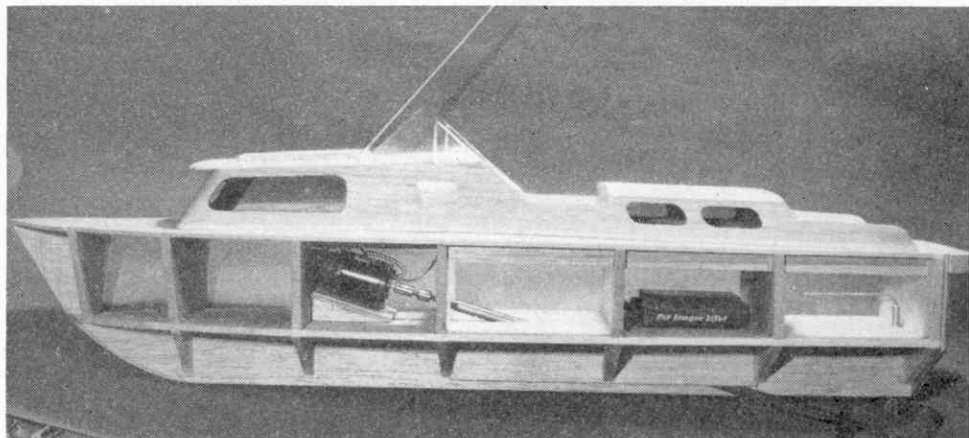
PROJECT

'66

PHASE — 3

BY

RON WARRING



7 SUPERSTRUCTURES

**Huntress
Ranger Tropical
Surfrider
Thunderbird
Christina
Coronet
Dell Quay Ranger**

In the January issue of Meccano Magazine we gave you a free full size plan to make the hull of Brave Moppie. Last month we showed you how to instal diesel or electric motors. This month there's another free full-size plan with details of seven superstructures that can be added to your hull to represent other famous power boats. Next month we will show you how to fit any of these models with radio control!

If you missed either of the earlier issues, they can still be obtained from our back-numbers department price 2/- each including postage.

THE full size plan this month shows the parts required to make SEVEN more models based on the same (Brave Moppie) hull—all well known high speed craft. These, together with 'Brave Moppie', make up a complete fleet of off-shore racers. You can build them all—or, perhaps better still, get together with some other chaps and each of you build a different racer for trying out against each other on the local pond.

Remember, the hull and fitting out details are exactly the same as described in Parts 1 and 2 for all the models. It is merely a case of 'converting' this hull by the addition of a cabin and related details, the cabin shape being different, and differently placed, in the seven models shown on this month's plan. Having done this it may then be necessary to remove some of the original after decking so as to produce an open cockpit. Details like this are given in the individual descriptions of the various models.

The method of building up the further models is the same in each case. Two cabin sides are required, traced or copied off the full size outlines given. These

are then joined by formers and the cabin unit then cemented in place on the hull, the after part of the sides coming over the deck beam position so as to leave the aft side decking intact. The exact position for fitting the sides can be determined from the full size plan.

Motor installation (diesel or electric motor) should be completed as described in Part 2 *before* fitting the cabin in place and the original forward deck hatch can be left off as this area is covered by the cabin. In the case of an electric powered model the cabin roof can be cemented in place permanently. With a diesel powered model the cabin roof must be made detachable, in order to get at the engine for starting.

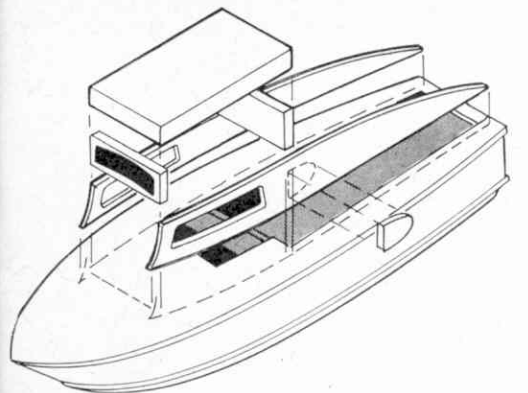
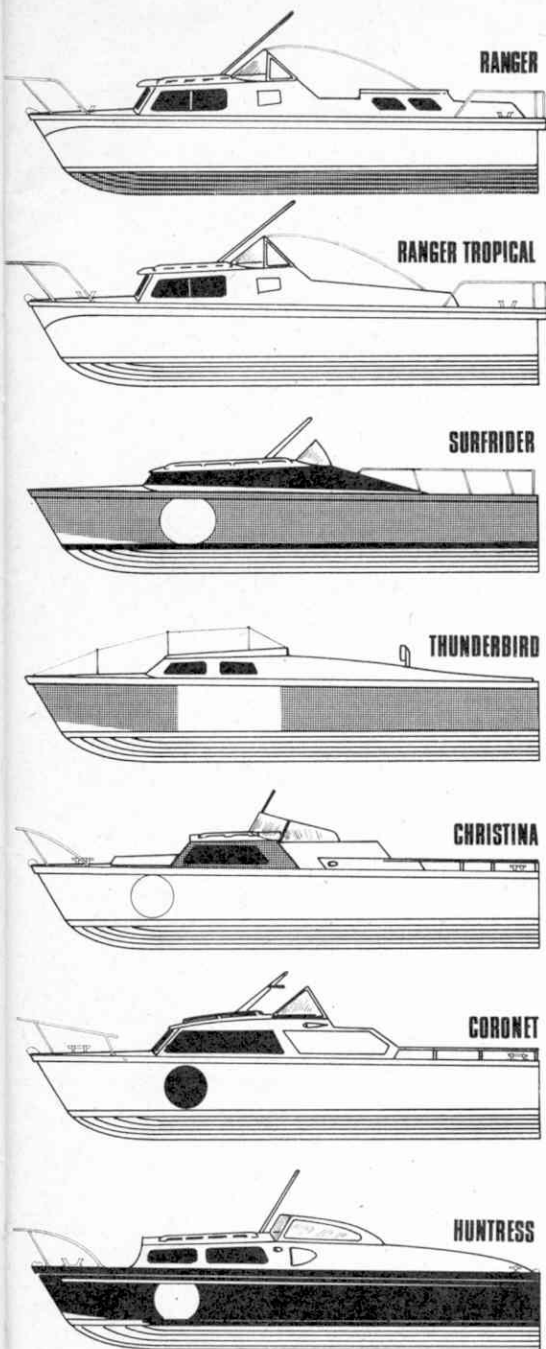
Glazing of all cabin windows is done with clear plastic sheet, which for best appearance should be cut to the shape of the window, but slightly oversize, and cemented on the outside. Alternatively, cabin windows can be painted on in black (or cut out from black paper cemented in position). This is necessary in the case of the 'Coronet' cabin windows in any case because of the large window area. To cut out windows of

this size would weaken the cabin sides unduly.

Many of the models employ a wrap-around windshield, which should be cut to shape by trial and error from thicker plastic sheet. The metal frame outline and vertical struts can be indicated by painting on in silver.

Further details such as the pulpit, side rails (where appropriate) and deck fittings such as cleats and fairleads, can be added to the model after painting in the form of plastic fittings. These will add considerably to the realism of the model and the cost of such fittings is usually only a few pence each. You can use your own ideas as to what fittings to add and where to position them. For guidance on this subject, study photographs of the full size craft. There is really no standard layout for deck fittings, etc., and individual owners have their own ideas on this subject.

Note: The full size patterns for the sides and formers, etc., are to approximate size (slightly oversize) to allow for chamfering to fit snugly and accurately on the deck. It is impossible to give exact sizes as individual hulls may vary



The simple construction of the 'Huntress' superstructure is fairly representative

slightly in deck curvature. In all cases, therefore, a certain amount of trimming up is required on the parts to ensure accurate final assembly. This is quite a straightforward job and should present no difficulties.

In all cases the sides are cut from $\frac{1}{4}$ in. soft sheet balsa, except where noted (e.g. 'Christina' sides 2 and sides 3) and for 'Huntress' (sides from $\frac{1}{8}$ in. sheet).

Dell Quay Ranger

Full size patterns are given on the plan for cutting the following parts needed to complete this model.

2 'Ranger' cabin side pieces cut from $\frac{1}{4}$ in. sheet balsa.

1 Cabin roof from $\frac{1}{4}$ in. sheet balsa* (note pattern is half plan of the shape required).

1 Aft cabin roof $\frac{3}{8}$ in. sheet balsa* (half plan shown).

1 Off each bulkheads R1, R2, R3 and R4, from $\frac{1}{4}$ in. balsa sheet.

1 Deck extension cut from $\frac{1}{8}$ in. sheet.

2 Grab rails cut from $\frac{1}{8}$ in. sheet.

2 Air scoops from $\frac{3}{8}$ in. balsa; $5\frac{1}{2}$ in. length $\frac{1}{8}$ in. dia. dowel; fairly thick celluloid or acetate sheet for the windshield.

* Cut two pieces each from 3 in. wide sheet and cement together.

The cabin sides need to be slightly chamfered along the bottom edge to conform to the curvature of the deck and stand vertically. Assemble by cementing formers R1, R2, R3 and R4 between the sides. Note that R1 needs to be chamfered top and bottom and is cemented only just inside the front edges of the two sides. This joint is then backed up with scrap lengths of $\frac{1}{4}$ in. sq. balsa and the front of R1 sanded to a curved shape. The whole assembly is then cemented permanently on to the deck in the position shown on the plan.

Trim the tops of the formers flush with the sides, as necessary, and fit the two roof panels in place. In the case of a diesel powered model, do not cement the front cabin deck in place but cement a frame to the underside to make it a plug fit between R1 and R2. In the case of an electric powered model, the aft cabin roof should be made detachable to get at the battery compartment.

Round off the two cabin roofs, shaping the ends as necessary, and sand to finish flush with the cabin sides.

Cement the deck extension piece on to the transom in line with the top of the deck.

Windows should be 'glazed' by cutting out pieces of clear plastic sheet to the same shape as the window cut-outs but slightly oversize and then cementing in place on the outside. In the case of a diesel model, do not glaze the side windows of the forward cabin.

The superstructure is finished by cementing the two grab rails in place to the cabin top, shaping the scoops from $\frac{3}{8}$ in. balsa and cementing in place and also adding the wrap-around windshield

cut from thicker clear plastic sheet. The pennant mast is a length of $\frac{1}{8}$ in. dowel pushed into the cabin roof and held with a touch of cement.

Other details such as the pulpit and rails, anchor, cleats, etc., can be added in the form of plastic fittings obtained from any model shop.

Suggested colour schemes:

Hull—white, dark blue or light green; with red, green or blue bottom.

Decks—white, natural wood or stained with a light coloured wood dye.

Superstructure—all white.

Ranger Tropical

This is very similar to the 'Ranger' except that the shape of the sides is different from behind the windscreen and there is no aft cabin. The sides must be cut to the dotted line aft and R3, R4 and the aft cabin roof are not required.

The model is fitted up in a similar manner as before. When completed the after decking is cut away right up to the sides from R3 to a distance of 1 in. in front of Bulkhead 6 position in the hull. Bulkhead 5 should then be cut away down to floor level to provide an unobstructed cockpit area.

Suggested colour schemes: as for 'Ranger'.

Surfrider

This is the 1964 Power Boat Race winner featuring a low cabin shape and no windows. Parts required to complete this model are:

2 Sides cut from $\frac{1}{4}$ in. balsa sheet to the shape shown.

1 Each S1, S2, and S3, from $\frac{1}{4}$ in. sheet.

1 $1\frac{1}{2}$ in. sq. panel of $\frac{3}{8}$ in. sheet (hatch).

Pennant mast cut from $\frac{1}{8}$ in. ply.

S1 has to be chamfered to line up with the front of the sides, and the bottom edges of the sides must be slightly chamfered so that they conform to the curvature of the deck. Join the sides by cementing S1 and S2 in place. S3 is cemented into the hull itself through the cockpit reaching right down to the chine shelf. When this is fitted, cement the side assembly permanently in place.

The cabin roof is shaped from an $8\frac{1}{2}$ in. by $5\frac{1}{2}$ in. panel of $\frac{1}{4}$ in. sheet balsa, rounded off as shown and trimmed down flush with the edges of the sides. The hatch is sanded to a concave shape on the underside to fit snugly on to the deck and cemented in place. Add the pennant mast, and the simple windscreen cut from thin clear plastic sheet.

The whole of the decking from bulkhead 5 right aft to the transom (bulkhead 7) is now cut away between the sides, i.e. in line with the deck beams. Bulkheads 5 and 6 are also cut away vertically right down to the chine shelf to produce a completely open cockpit. Colour scheme: blue or green hull with white bottom. Decks and cabin sides and top white, with colour band in same colour as hull topsides or darker colour. Authentic racing number '66'.

Thunderbird

This was the second place boat in the 1965 Power Boat Race, close behind 'Brave Moppie'. Construction is very similar to that of 'Surfrider' except that the cabin sides are longer and extend well aft to protect the occupants from spray. Join sides first with T1 and T2 (after chamfering T1 and the bottom edges of the sides) and then cement to the hull and line up with the position of the deck beams.

The cabin top is shaped from a $5\frac{1}{2}$ in. by $5\frac{1}{2}$ in. piece of $\frac{1}{8}$ in. sheet balsa (join two 3 in. wide pieces) and either cemented in place or made a plug fit.

Cut away the after decking back to the point shown on the full size plan and cement in a reinforcing piece of $\frac{1}{2}$ in. by $\frac{1}{2}$ in. strip running between the two deck beams. The backrest is made from $\frac{1}{2}$ in. by $\frac{1}{2}$ in. strip with four lengths of $\frac{1}{8}$ in. strip cemented in place. When set, cement in place to the reinforcing strip previously fitted. Colour scheme: hull top-sides—yellow, hull bottom, deck and cabin sides and top—white. Authentic racing number '283' in black on white panel on each side, and in black across the cabin roof.

Christina

A 'Christina' won the first Cowes-Torquay Power Boat Race and remains one of the 'classic' craft of its type, noted also for its attractive styling.

Parts required to complete this model are:

2 Side 1's from $\frac{1}{4}$ in. balsa.

2 Side 2's from $\frac{1}{4}$ in. balsa.

2 Side 3's from $\frac{1}{4}$ in. balsa.

Formers C1 and C2 from $\frac{1}{4}$ in. sheet.

6 in. by 4 in. by $\frac{1}{2}$ in. balsa block (for front cabin).

Two 11 in. lengths of $\frac{1}{8}$ in. by $\frac{1}{8}$ in. spruce or obeche for handrails.

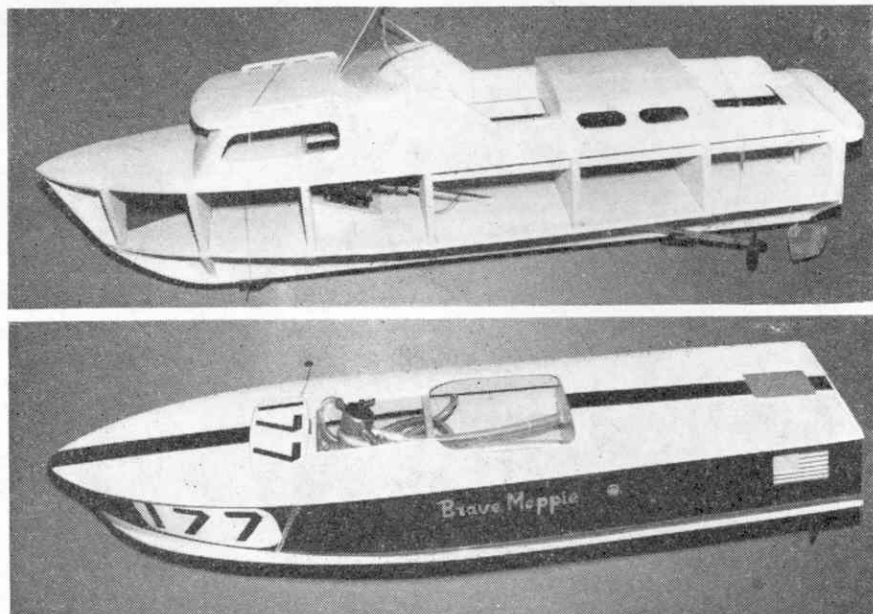
About 4 in. of $\frac{1}{8}$ in. or $\frac{3}{16}$ in. dowel; celluloid for windshield.

Start by fitting former C2 in the position shown on the full size plan. Note that this former extends right down to the chine shelf and fits between the deck beams. Fill in between the sides of this former and the sides of the hull below the deck line with scrap sheet.

Now fit the cabin sides and C1, chamfering C1 to angle back correctly, and also chamfering the bottom edges of the sides to conform to the curvature of the deck. Carve and fit the front cabin block, shaping the top curve to match the curve of the front window.

Cement the two Side 2 pieces in place; and the two Side 3 pieces outside them, as shown. Complete by adding the hand-rail supported on short lengths of dowel. For greater security of fixing the deck can be pierced to insert the dowels which are then levelled off and the handrail cemented on top.

The cabin top is covered with $\frac{1}{8}$ in. sheet balsa. In the case of a diesel powered model the top will have to be cemented to a built-up framework so that it is a plug fit and can be removed for



As thousands of readers saw them at the Schoolboys and Girls Exhibition. The Editor's completed, diesel powered Brave Moppie, and above, the 'un-skinned' hull, with Dell Quay Ranger superstructure temporarily fitted in position, as described in this feature

access to the motor for starting. With an electric powered model simply cement the $\frac{1}{8}$ in. sheet cabin top in place.

The whole of the aft decking between bulkheads 5 and 7 should now be removed, out to the position of the deck beams. Bulkheads 5 and 6 are then cut down vertically in line with the deck beams and the centre parts removed to leave a completely unobstructed cockpit.

Colour schemes: hull usually white with red, green or blue bottom.

Decks: natural wood or stained with a light coloured wood dye, or painted white.

Cabin: Sides 3 and front cabin part, white. Sides 1, mahogany. Sides 2, very pale blue or green. Cabin top, same as Sides 2, or white.

Wrap-around windscreen: blue or green tinted celluloid.

Coronet

This model has a fairly deep cabin with large windows. The windows should be painted on rather than cut out, otherwise construction is similar to the other models, except for the cabin roof. Since the cabin shape is 'square', the roof can be planked with $\frac{1}{8}$ in. sheet balsa with the grain running from side to side. The edges are then rounded off with sandpaper.

The second former (G2) is shown fitted between the deck beams roughly 1 in. behind bulkhead 4. If preferred, this can be extended down to the chine shelf and filling the complete space between the hull sides to blank off the cabin completely.

The windscreen is built up as a complete framework of $\frac{1}{8}$ in. sq. balsa which is then covered with panels cut from clear plastic sheet after cementing to the cabin top. Note that the cabin roof

finishes just behind G2.

The two rails extending back to the transom are of $\frac{1}{8}$ in. by $\frac{1}{8}$ in. hardwood strip (spruce or obeche mounted on $\frac{1}{8}$ in. sq. uprights (balsa or obeche). This rail does not extend across the transom.

Cut away bulkheads 5 and 6 level with the deck beams to give an open cockpit from G2 aft.

Colour schemes: hull—white with red, blue or green bottom (or all white).

Deck, cabin sides and top—white.

Racing number in white on black circle.

Huntress

Designed and built by Fairey Marine, the 'Huntress' is a well known offshore power boat racer together with its larger counterpart, the 'Huntsman'.

The cabin sides in this case extend backwards almost to the transom, but the whole of the cockpit is open from F3 (fitted over bulkhead 4) to the transom. The sides are cut from $\frac{1}{8}$ in. sheet.

The cabin roof for this model is cut from $\frac{1}{8}$ in. sheet carved and sanded to a well rounded shape. The front window is painted in F1. Note that F1 is vertical and does not slope backwards.

The windscreen sides are cut from $\frac{1}{8}$ in. ply and cemented directly on to the main side pieces in the position shown. The windshield assembly is then completed by covering both sides with celluloid (or thin plastic sheet) and adding a curved windscreen front. The complete screen (sides and front) can be cut from a single piece of celluloid on a trial and error basis, if preferred.

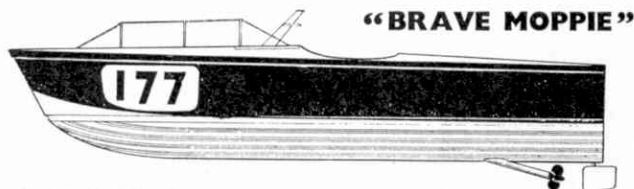
Typical colour scheme: hull topsides—dark blue; bottom—red or white.

Cabin sides and top—white.

Racing number in black on white circle.

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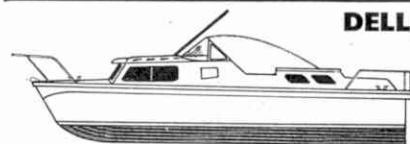


"BRAVE MOPPIE"

- ☐ 4 off 36" x 3" x 1/4"
- ☐ 1 off 36" x 3" x 3/8"
- ☐ 2 off 36" x 2" x 3/8"
- ☐ 3 off 36" x 3" x 1/8"
- ☐ 2 off 36" x 2" x 1/8"
- ☐ 6" length 2" x 1 1/2" block
- ☐ 6" length 2" x 2" block

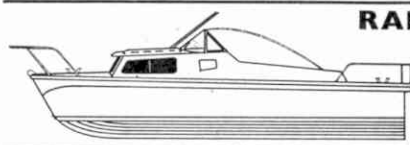
- ☐ 1 off 36" x 1/4" x 1/4"
- ☐ 3 off 36" x 1/4" x 1/8"
- ☐ 3 off 36" x 1/4" x 3/8"
- ☐ 6 off 36" x 1/8" sq

Other materials required include 1/8" ply, balsa cement, tissue and pins.



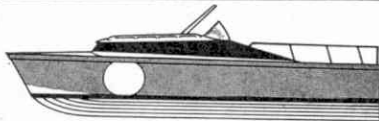
DELL QUAY RANGER

Hull materials as for 'Brave Moppie' plus 1/4" sheet for cabin sides and 1/4" and 1/8" sheet for fwd and aft cabin tops.



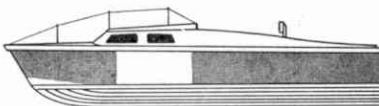
RANGER TROPICAL

As 'Moppie' plus 1/4" sheet for cabin sides and 1/4" sheet for cabin roof. Same as 'Ranger' without rear cabin.



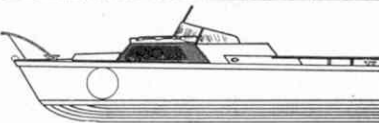
SURFRIDER

Basic hull materials will leave enough sheet for cabin sides, etc., 1/4" sheet panel will be required for cabin roof.



THUNDERBIRD

Cabin sides, etc. from spare basic hull materials. 5 1/4" x 5 1/4" x 1/4" panel for cabin roof.



CHRISTINA

You may need some extra 1/4" sheet for cabin sides and rails; also 1/4" x 2" x 6" front cabin block and 1/8" sheet for cabin roof.



CORONET

Some additional 1/4" sheet may be required; also 1/4" sheet for cabin roof and 1/8" sheet overlay panels, plus strip for rails.



FAIREY HUNTRESS

Sides can be cut from 36" x 2" x 1/4" sheet. Cabin roof is 12" x 3" x 1/4". Wind-screen sides from 1/8" ply.

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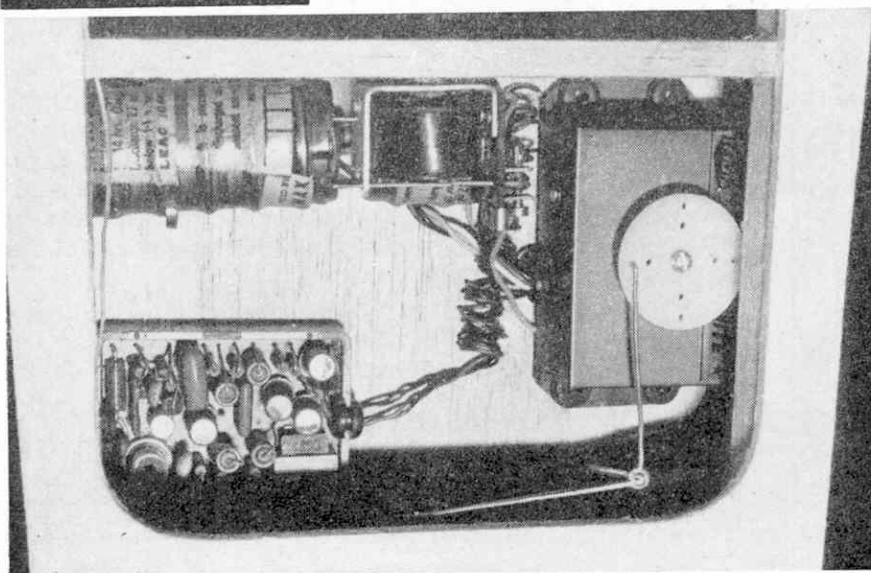
PROJECT 66

..ADDING RADIO CONTROL

This month, Ron Warring completes his four-part model powerboat series by showing you how to install radio control in any of the eight model powerboats which have been featured in his three earlier articles. Copies of the January, February and March issues with which two free, full size powerboat plans were presented, are obtainable from the back-numbers department, Meccano Magazine, St. Alphage House, Fore Street, London, E.C.2., price 2s. each including postage



Above: A Meccano Magazine reader works on 'Brave Moppie' built from plans in the January issue. Below: Suggested component positions for a single channel installation. Note the slave relay fitted between the batteries and the actuator



WHICHEVER version of 'Project 66' you have built, adding radio control is a logical step for getting the most satisfaction from your model. This is, of course, an expensive addition—but it need not be *too* expensive. If you are prepared to build the transmitter and receiver from prefabricated kits you can complete these for about £8-£10—and once made they can be used for other radio controlled models as well, of course. The same applies to ready-made radio equipment, although this will cost anything from about £14 upwards for the transmitter-receiver combination.

On top of this you will also need an actuator (which must be bought as a ready-made item), plus batteries. There is, unfortunately, no cheap way of obtaining reliable radio control—but the extra satisfaction you can get out of a radio controlled model is well worth it.

The simplest—and cheapest—form of radio control is *single channel*. This means a transmitter-receiver combination capable of giving a *single* 'on-off' signal, which is turned into 'muscle power' by the actuator in the form of a *sequence* movement. That is to say, if the actuator is used to move the rudder, *one* signal from the transmitter will move the rudder to the right and the *next* signal will move it to the left. With *no* signal, the actuator returns to neutral and centralises the rudder.

You just have to remember which rudder position was signalled last as the next signal given will produce opposite rudder movement. The modern actuator, however, does simplify this system by working on the principle that *one* signal from the transmitter, held on, gives one rudder position (say, right rudder), whilst a 'double signal' always gives the opposite rudder position. As far as making the actual signals are concerned, this means that 'press and hold' on the transmitter button always gives, say, right rudder. 'Press-release-press and hold' always gives left rudder.

The actuator may also be a 'compound' type which gives a third 'selective' signalling position—either a quick blip on the transmitter button, or 'press-release-press-release, press and hold'. This can be used to operate *another* actuator providing the power to operate another control (usually engine speed).

The choice

The alternative system is 'multi-channel' where the transmitter can produce two (or more) separate signals, each of which operates a specific control. Normally *two* channels are used to operate *one* particular control. Thus a two-channel system would be used to operate rudder only. Movement of the transmitter key one way will *always* produce right rudder; and movement of the key the other way will *always* produce left rudder. As with the single-channel system, the actuator automatically returns the rudder to neutral once the transmitter signal is released. Further

services, such as engine speed control, need additional channels to operate.

Multi-channel is a much better system for working, and gives a better form of control, but it will cost considerably more than single channel. Even a two-channel radio will cost more than twice single channel and still only give rudder control. It is worth going into, however, if you can afford it.

A lot will also depend on how much control you need. With an electric-powered model which is not capable of reaching high speeds, normal single-channel radio is quite adequate for steering (rudder control)—Fig. 1. You can also use the 'third' position on a compound actuator to operate a motor switching control via a 'changeover' or three-position non-neutralising secondary actuator. This can provide two or more switching positions for the motor circuit, arrived at in sequence. Thus a two-position secondary actuator could give motor 'on-off-on . . .' A four-position secondary actuator could give motor 'forward-stop-reverse-stop-forward', etc., in sequence (Fig. 2). Note: This diagram shows 'mechanical' switching of the main motor circuit. Some secondary actuators incorporate switching contacts in the actuator itself and so the wiring can be made direct to the motor contacts instead of using the actuator to drive an external switch. Either method—just rudder only or rudder plus motor switching—is a practical system with single-channel for an electric powered boat. It would need three channels of 'multi' to perform the same functions (two for rudder and the third for sequence switching of motor).

Diesel Power

With a diesel powered boat using engines up to 1.5 c.c. throttle controls are comparatively rare. We need, therefore, only consider rudder control, unless the motor used has got a throttle. In this case it can be operated via a 'change-over' type secondary actuator off a 'compound' main actuator in the case of single-channel; or from the third or third and fourth channels with multi-channel control (the first two channels being used for steering). Since the diesel powered boat will be fast, multi-channel control for rudder will be better than single channel, but we can still get by quite all right with single-channel if we do not want to go to the extra expense. With single-channel, however, we would recommend forgetting about any form of engine throttle control.

As regards the actuator, a motorised type is recommended (and essential with multi-channel operation anyway) as being simpler to install and providing all the power necessary to move the rudder. Aircraft-type escapements are not suitable for this job.

For our model we have chosen the 'Minimac' single-channel receiver and the RMK 'Dynamik' single-channel motorised actuator as thoroughly reliable

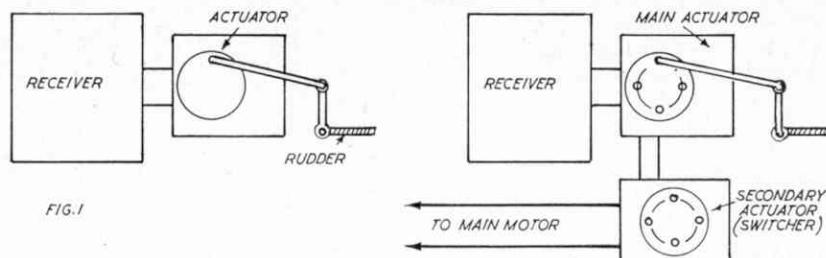


FIG. 1

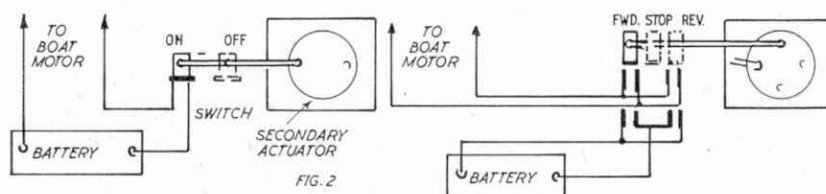


FIG. 2

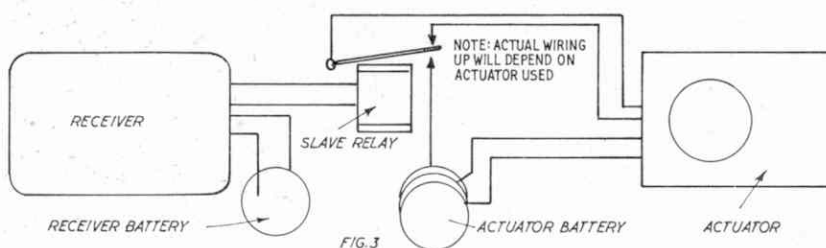


FIG. 3

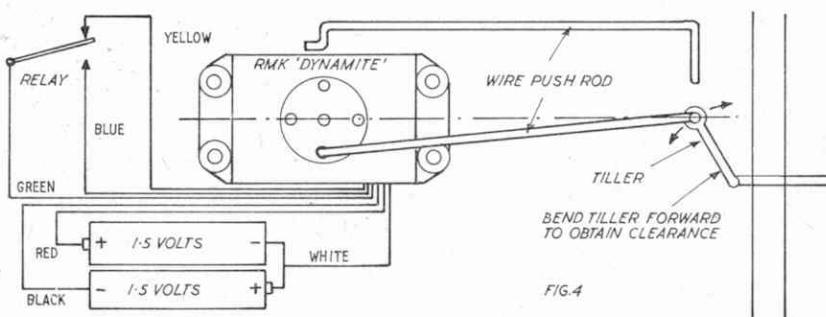


FIG. 4

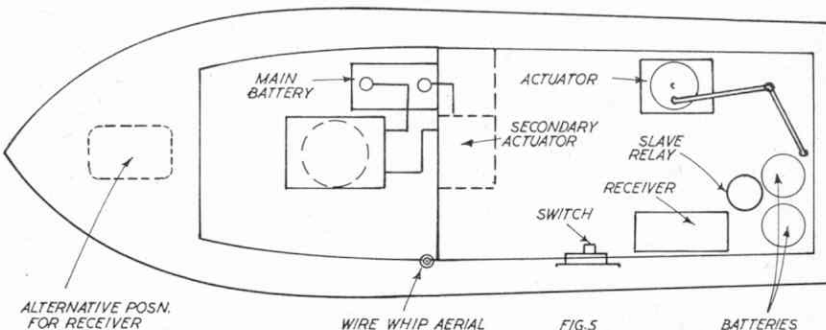


FIG. 5

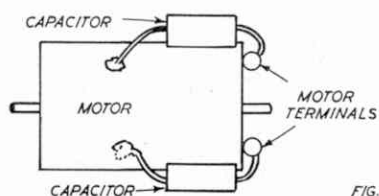
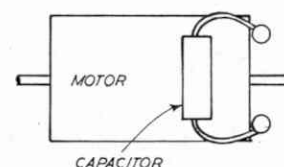


FIG. 6



and first class equipment, although other types of single channel receivers and motorised actuators can be used if preferred.

Component Location

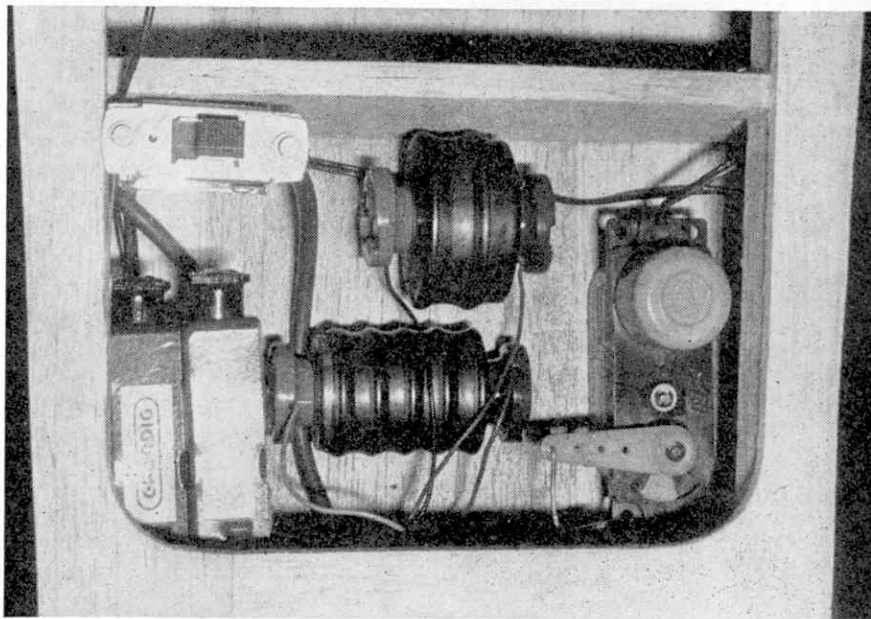
The 'Minimac' receiver is a relayless type which normally connects direct to an actuator. This is not a particularly satisfactory arrangement with a motorised actuator, however, and so the receiver is connected to a *slave relay* which in turn acts as a switch for the motorised actuator circuit—Fig. 3. This completely separates the receiver and actuator circuits, each of which have their own separate battery, and makes for fully reliable operation. A similar system is recommended whatever type of *relayless* receiver is used, the slave relay being of about 20 ohms coil resistance. A suitable type is the Ripmax T.40. Relay receivers already have a relay incorporated for switching and so the slave relay can be eliminated in such cases. The actual wiring connections required for the actuator used must be exactly as specified in their instructions, however.

Installation should present no problems at all, the wiring up following the diagram of Fig. 3 (or Fig. 4 using the RMK 'Dynamite' servo). The mechanical hook-up is even simpler since it is only necessary to connect the output disc of the actuator to the tiller arm with a simple wire linkage, as shown in Fig. 4. For a better 'engineering' job use an adjustable linkage, such as the Graupner set. This enables the neutral position of the rudder to be adjusted, as necessary. With a simple wire linkage, adjustment can be made by bending the tiller arm.

This leaves the question of where to place the various components. Logically, the actuator should be placed fairly close to the tiller and the receiver as far away from the actuator as possible to minimise the risk of interference. At the same time, the receiver also wants to be as far away from the boat motor in the case of electric power, also to avoid interference; and remote from the engine and fuel tank with a diesel powered model to avoid getting smothered in fuel.

About the ideal position would be to stuff the receiver right up in the bows, sealed off in a watertight compartment, in which case the aerial should be mounted behind it on the deck or forward part of the cabin roof. However, a more practical installation is to group actuator and receiver in the cockpit area aft of bulkhead 5 position—see Fig. 5—with the aerial in a more or less 'scale' position amidships. The aerial is a vertical piece of 20 s.w.g. wire which should be at least 20 in. long.

With all the radio components and batteries mounted in the cockpit area some protection is really needed against spray, etc., in the case of open-cockpit versions. The neatest arrangement is usually to box-in with balsa sheet. Alternatively, the batteries can be 'sunk'



Above: Suggested positions for Grundig two channel radio equipment which just plugs together—there's no soldering. The DEAC battery-packs would need balsa boxes built for them, but as you can see, there's plenty of room to spare!

through the cockpit floor and actuator and receiver on top of the floor covered over with a false floor. If the receiver is already enclosed in a case this will provide adequate protection; otherwise wrap the receiver up in a small polythene bag with the neck sealed with a rubber band where the wiring emerges. Avoid taking the aerial wire from the receiver out in a bunch with the other wires.

Hints and tips

Before finally deciding on positions for the actuator, receiver and batteries, lay in position and check that the *balance* of the boat is satisfactory when afloat. If not, adjust the positions as necessary until the hull trims level and slightly bow up. Then 'fix' the components. The actuator needs to be firmly secured. Receiver and batteries can simply locate in a tray or box of balsa. Deacs are recommended both for the receiver and actuator batteries as being compact, extremely reliable and rechargeable. Move the main motor battery into the engine compartment in the case of an electric powered model to avoid possible interference from motor wiring adjacent to the receiver.

The main boat motor will also need to be suppressed, one of the most effective methods being to solder two suppressor condensers (0.01 microfarad) from each motor terminal to the motor casing as shown in Fig. 6. If the motor casing is not metal, then a single suppressor condenser can be used connected directly across the motor terminals.

A more or less similar layout can be used for multi-channel installations. If a secondary actuator is used for motor control (e.g. operated off a compound actuator in the case of single channel;

or off one or two further channels with 'multi'), this should be located immediately behind bulkhead 4 on the cockpit floor, where it can be covered in with a balsa box. This simplifies wiring to the electric motor—Fig. 5.

Finally, here are some important points to check or remember in connection with radio controlled boats.

- (i) The most common cause of 'radio failure' is flat batteries, so always make sure that the receiver and actuator batteries are fresh or fully charged. This applies to the transmitter batteries, too. Deacs are recommended for maximum reliability. If you use dry cells, buy the 'high energy' type.
- (ii) The receiver can only be correctly tuned to the transmitter *with the boat in the water*. The actual setting may be quite different to that established by tuning out of the water.
- (iii) Never leave the receiver or batteries in the model when not in use. Remove them and keep the receiver in a dry atmosphere.
- (iv) Never leave a radio controlled boat in a damp place as this can cause deterioration of the actuator and motor.
- (v) If for any reason the radio installation gets swamped with water, remove receiver and actuator from the model and dry out carefully, but not by heating.
- (vi) Make sure that the aerial wire is not 'earthed out' by coming into contact with a damp part of the deck or cabin sides.
- (vii) Make sure that you are not touching the aerial, or the aerial is not touching anything else, when tuning the receiver.