

MINNOW SAILING DINGHY

BUILDING NOTES

These notes will enable you to build a Minnow without difficulty. Minnows are amongst the simplest of boats to build and have been made by builders as young as 11 years old.

If this is the first boat you have built, read these notes carefully until you thoroughly understand them. A golden rule of boat building is:- "Measure twice and cut once!"

The Minnow can be built in about 35 hours. If you take 70 hours or more don't be concerned. Building a boat is very enjoyable if you forget the clock and don't rush it. If you force yourself to keep to a timetable, the boat will look like it.

The hull may be built from a pre-cut kit which includes ply parts, timber, and the fastenings needed to finish the boat.

Alternatively, it may be built using a set of paper patterns which are traced onto the ply and timber you have selected and purchased. The materials required are listed at the end of these notes, together with cutting diagrams.

Only simple tools are needed, a list of which is given at the end of these notes.

There is a set of measurements which help define a Minnow Sailing Dinghy. A boat which is built in accordance with the building notes will "measure" satisfactorily. Builders are strongly cautioned against "modifications" in order to "improve" the boat.

The Measurer will also use templates marked from the official patterns in order to check that panels have not been altered.

The major opening for a builder's talent is in the quality and finish of the boat. Some people produce boats which are almost "too good to get wet" by the careful selection of timbers and fine craftsmanship. A visit to a sailing club around noon may assist you here. Sailors are usually very willing to talk about their boats.

Warner C/Board

11 1/4 C/Board Case.

MATERIALS

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SHOWN.

Plywood

3 sheets 2440 x 1220 x 4.5 waterproof plywood.

Klinkii is ususally satisfactory if checked to avoid flaws.

Gaboon and Cedar are good but becoming more and more expensive.

Cedar is soft and easily damaged. Coachwood and Maple are good but a little heavy.

914 x 812 piece of 12mm ply for centreboard, rudder box and blade.

Timber

-- 50 x 19	3m	thwart, deckbeam, transom top.
38 x 19	0.8m	tiller.
75 x 16	2m	splash rails.
16 x 16	12m	gunwales, rails on bulkheads and tank sides.
22 x 14	3m	centre case rails
45 x 10	3.8m	floor battens (2 x 1.3m, 1 x 1.5m).

Meranti, Western Red Cedar etc. are satisfactory for the above.

16mm diameter dowel 0.7m tiller extension.

- 25 x 6	6m	gunwale capping. (2 x 2.54m) "D mould"
		KD H.w.d. is satisfactory if excess depth is planed off after fitting.

Fixings

Stainless steel bolts, 2 x 63mm	centre board case.	41.20
Brass pins (brads) 90g. 16mm.		
Brass screws 6 x 44mm x 8g.	splash rails.	54.00
3 x 31mm x 8g.	thwart to centre case and	37.00
	strengtheners.	21.00
2 x 31mm x 8g.	mast step/deck.	14.00
2 x 31mm x 8g.	tiller/rudder box.	14.00
10 x 19mm x 8g	centre case to floor	68.00
8 x 19mm x 8g	floor strengtheners.	32.00
4 x 19mm x 8g	thwart surround.	32.00
2 x 19mm x 8g	nose block.	12.00
16mm monel nails 70 (2 x 35)	gunwale.	1.50
(or silicon bronze) 20 (4 x 5)	centre board case.	
10	bow rail.	
31mm monel 18	gunwale corners, bulkhead tops/sides,	38.00
(or silicon bronze)	bow/deck beam, mast web/deck beam.	
1 litre polyester resin plus catalyst.		8.70
30m 37mm fibreglass tape.		9.00
10m copper wire. X		
1 litre waterproof glue.		2.00

ASTOM

BRUSH

~~4.80~~

A CHECKLIST OF STEPS

Stage 1 - Setting up parts

1. Check edges of ply.
2. Mark panels.
3. Cut gunwales and side rails.
4. Assemble bulkheads.
5. Centre case.
6. Glue 1.
7. Paint inside centre case.
8. Fit remaining bulkhead timbers.
9. Glue 2.

Stage 2 - Assembling the Hull

10. Setting up building cradle or rails.
11. Stitching up floor panels and transom.
12. Stitching on sides.
13. Fitting centre case.
14. Fitting centre case bulkhead.
15. Fitting web bulkhead.
16. Fitting bow.
17. Fitting deckbeam.
18. Check hull.
19. Glue 3.
20. Fibreglass 1.
21. Chain plate blocks.
22. Mast web.
23. Buoyancy tank sides.
24. Floor battens.
25. Floor blocks.
26. Thwart and thwart strengthener.
27. Transom top.
28. Gunwales.
29. Glue 4.
30. Fibreglass 2.
31. Transom strengthener.
32. Aft fixing blocks.
33. Bow rail and nose block.
34. Side deck supports.
35. Glue 5.

Stage 3 - Decks and Coaming

- 36. Trim for decks.
- 37. Trial fit decks.
- 38. Main sheet block.
- 39. Clean up inside.
- 40. Seal inside tanks and under decks.
- 41. Glue 6.
- 42. Trim; chain plate slots.
- 43. Mast step.
- 44. Coamings, transom cap; bow cap.
- 45. Splash rails.
- 46. Glue 7.
- 47. Trim.
- 48. Varnish 1.
- 49. Punch nails and fill holes.
- 50. Varnish 2 etc..

Stage 4 - The Underside of the Boat

- 51. Trim off stitches.
- 52. Sand chine, keel etc..
- 53. Cut and trim centre case slot.
- 54. Fibreglass 3.
- 55. Sand.
- 56. Fibreglass 4.
- 57. Paint.

Stage 5 - Centreboard and rudder

- 58. Centre board.
- 59. Rudder.

A FINAL NOTE

We hope these notes will make the building of your Minnow easy and enjoyable. However, building notes are never perfect and we need your help. Please write down any helpful corrections you have to offer and then phone or mail them to us.

Good Building and Good Sailing in your Minnow.

Terry Brain (Building Advisor)
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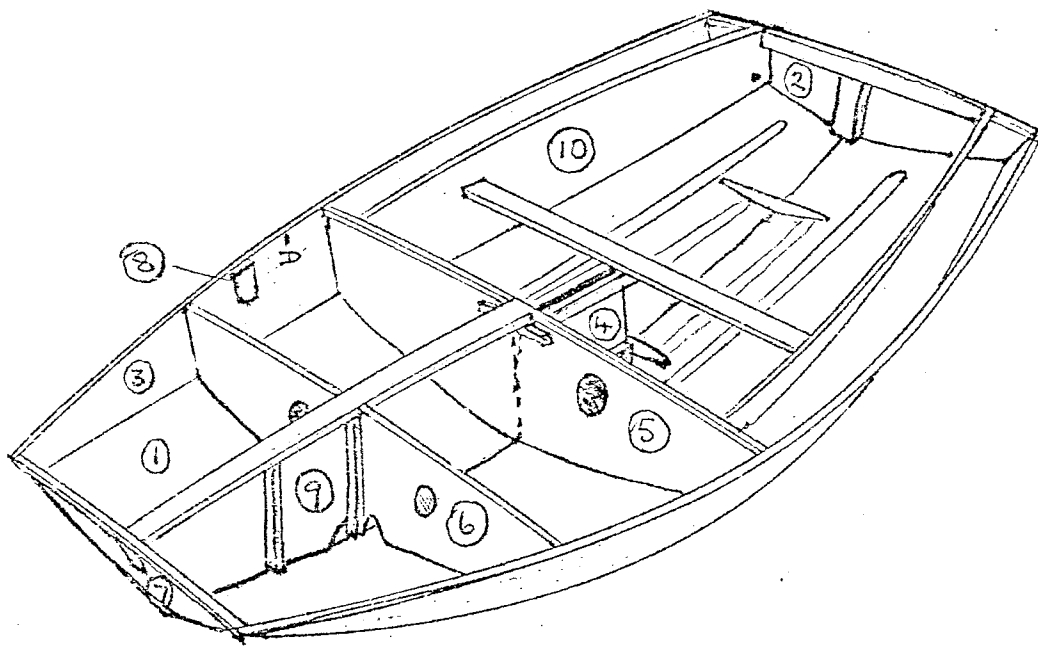
David Jagger (Secretary)
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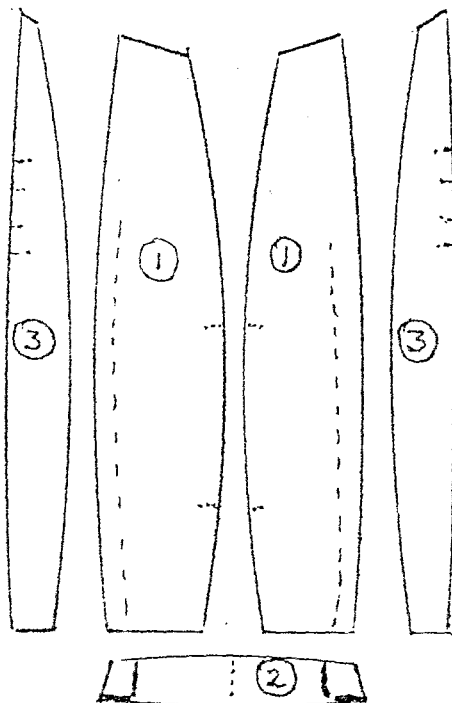
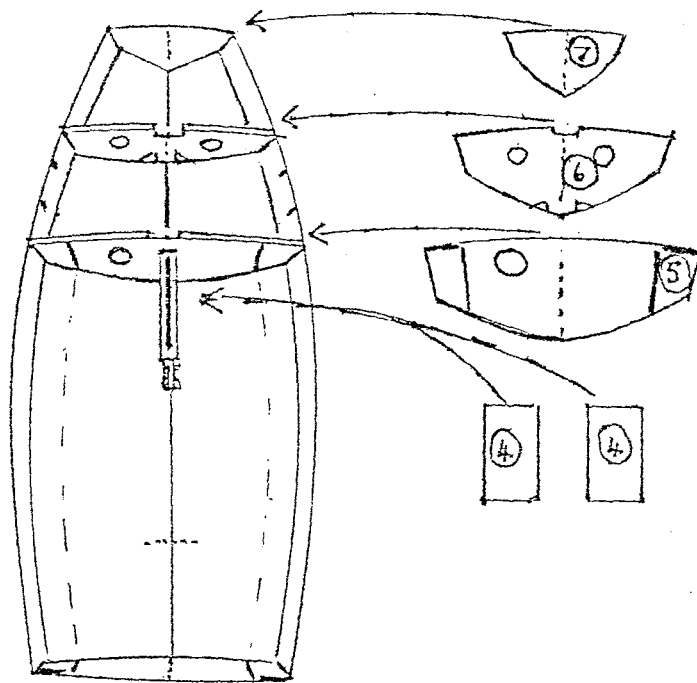
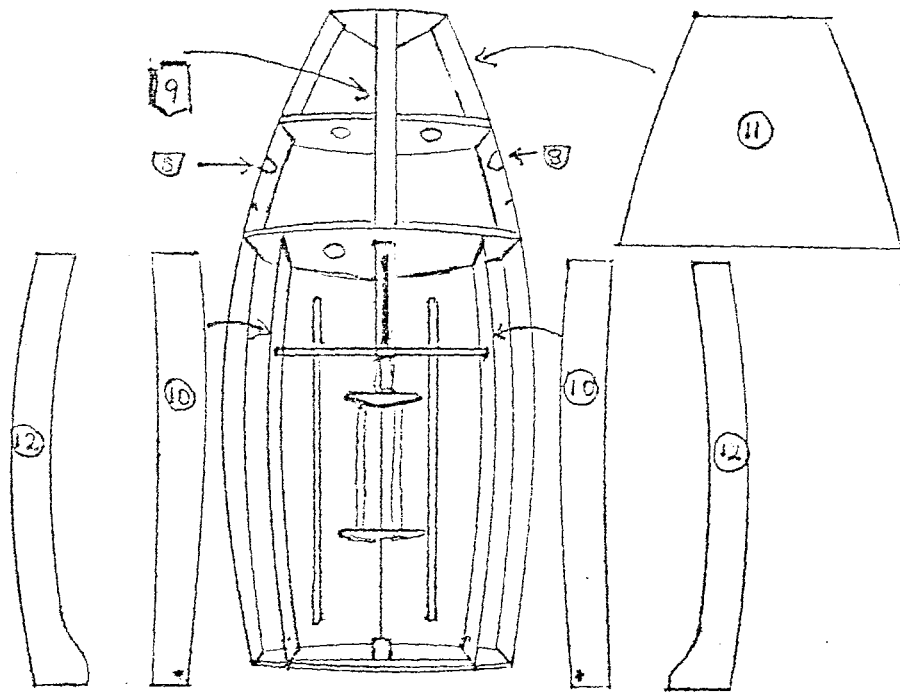
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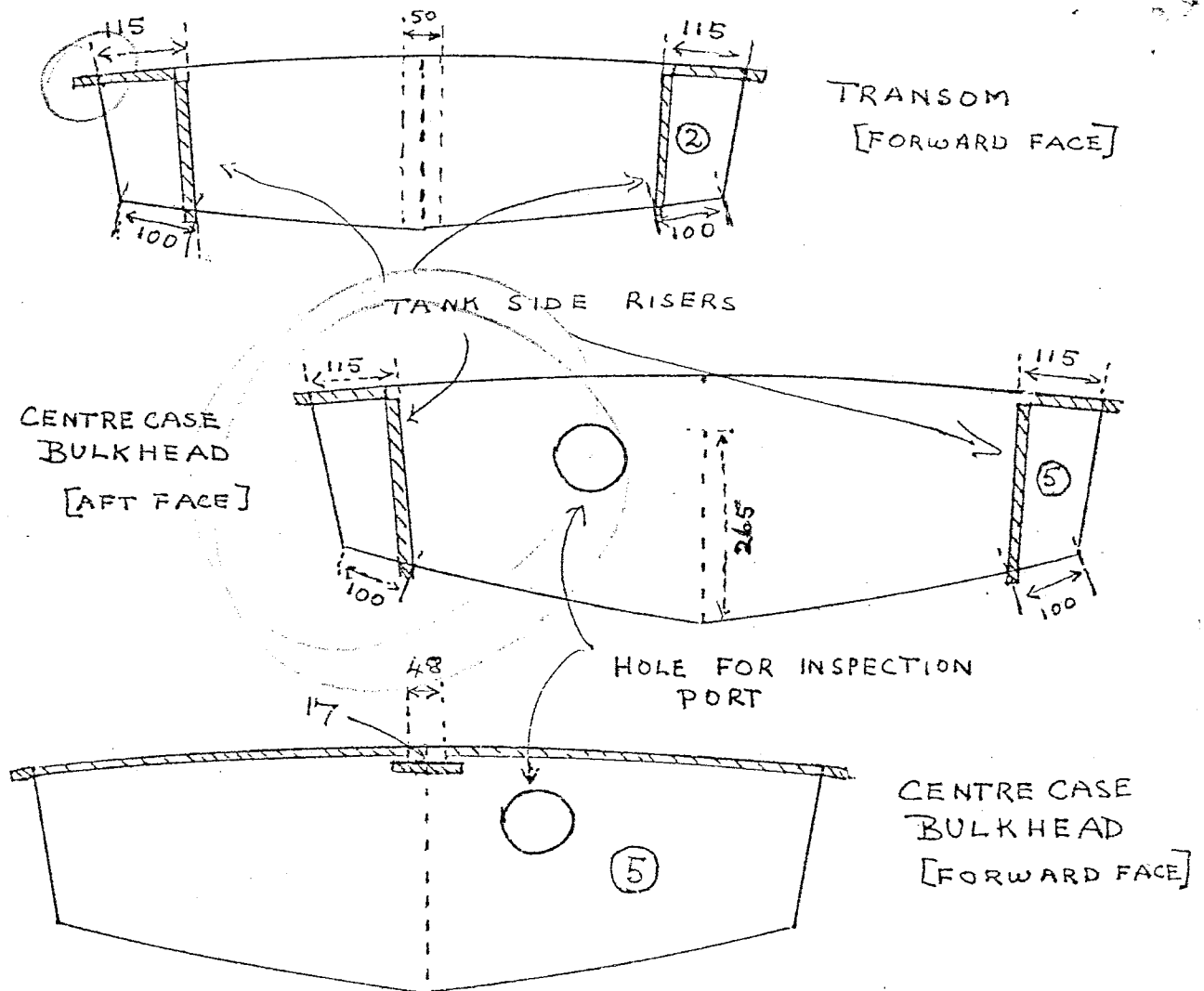
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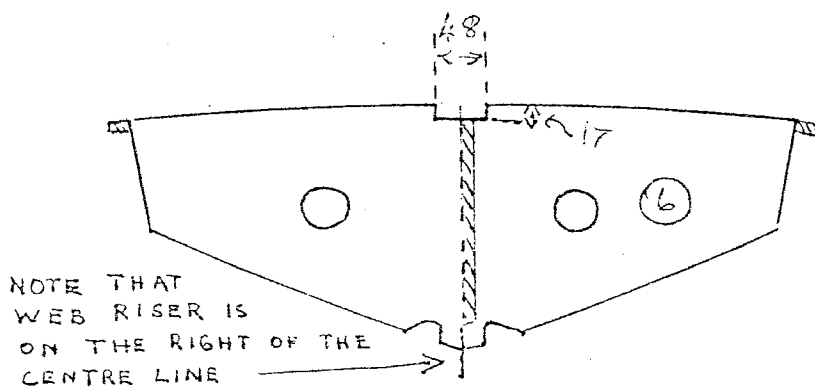
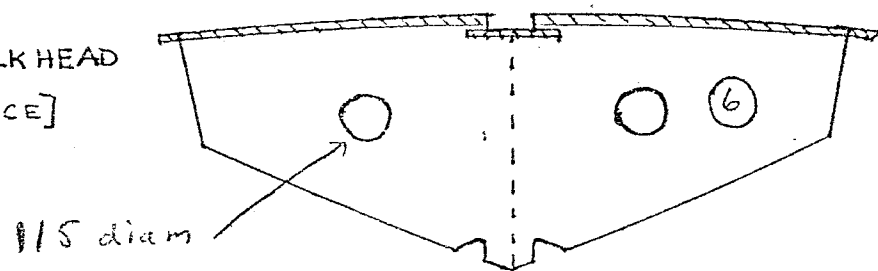
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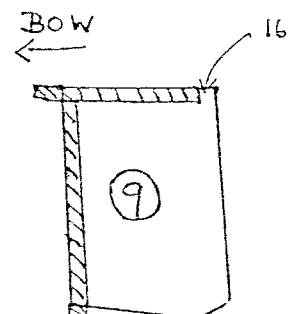


WEB BULKHEAD
[AFT FACE]



WEB BULKHEAD
[FORWARD FACE.]

NOTE THAT
WEB RISER IS
ON THE RIGHT OF THE
CENTRE LINE



MAST
WEB

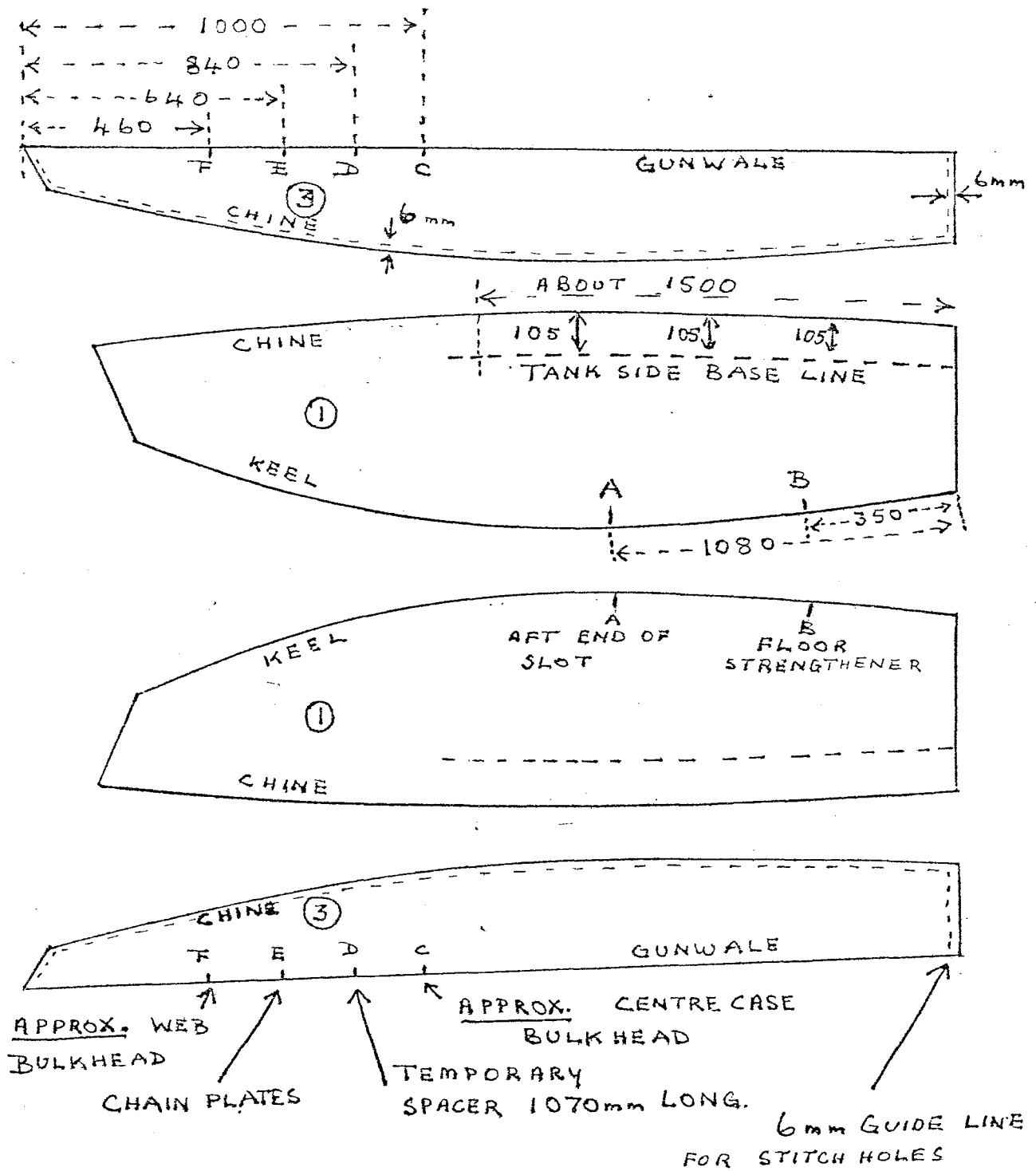
DIAGRAMS NOT TO SCALE.

ALL DIMENSIONS IN MILLIMETERS.

TRIM EXCESS WHEN FITTING IN HULL

ALL TIMBER PARTS ARE CUT FROM 16mm SQUARE.

MARKING THE PANELS



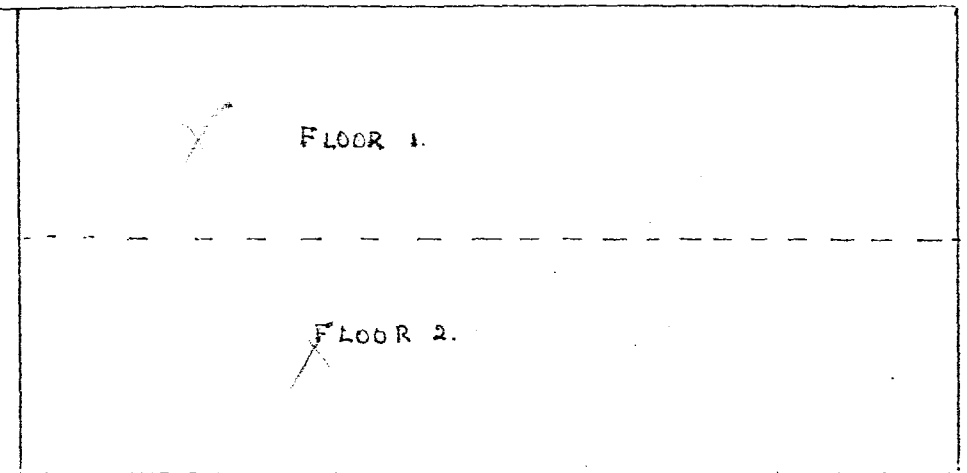
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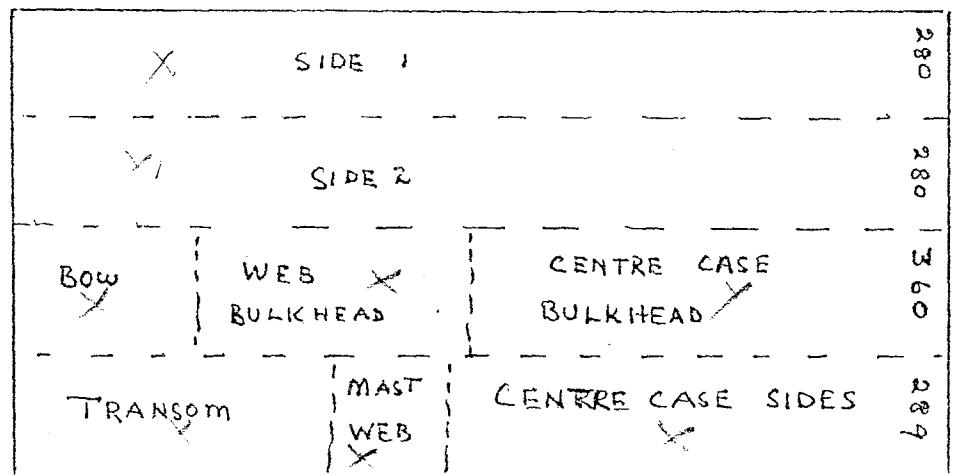
PLYWOOD CUTTING DIAGRAM

3 off 2440 x 1220 x 4.5

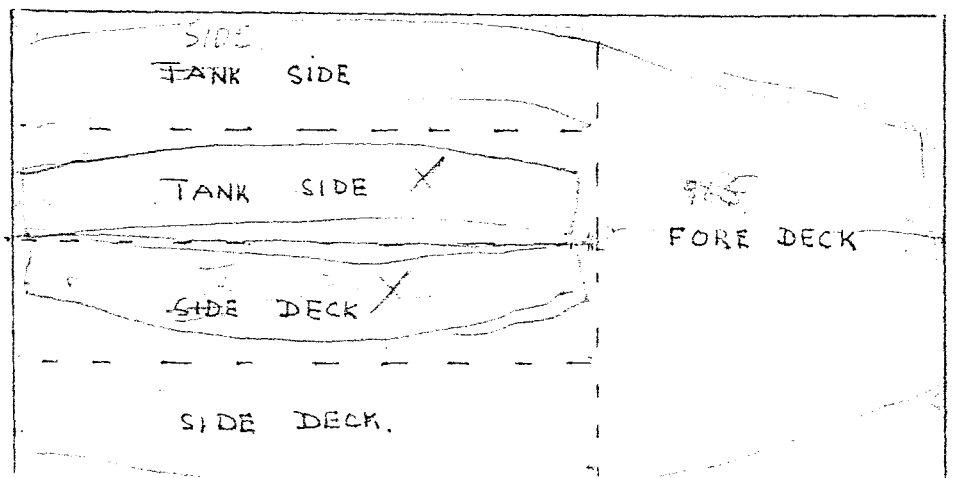
SHEET 1



SHEET 2



SHEET 3



1. CHECK EDGES OF PLY

Sight along the edges of the ply parts. Sand off any slight bumps (caused by inaccurate sawing) to produce a smooth curve or line. This is mainly relevant to those who have cut out their own ply wood.

PLEASE DO NOT CHANGE THE SHAPE OF THE PARTS

More than 500 boats have been built with parts shaped this way. DO NOT CHANGE THEM.

2. MARKING THE PANELS

The centre case and bulkheads are built into the hull at various points. It is easier to mark these on the panels before they are stitched together.

Mark both floor panels (1) and both side panels (3) on their inner faces as shown, using light pencil marks. Lightly label each mark A, B, C, etc.. Do not concern yourself with ultra-accuracy but be as precise as you can.

Mark the position of the chainplates (mark "E") with a line 50mm long down the outside as well as the inside.

Mark a line 6mm in from the edge, around one floor panel on its outside face. (This is not shown in the diagrams).

3. GUNWALES AND SIDE RAILS

Select two 16mm square pieces of timber with the grain most parallel to its length.

Cut two lengths of 2540mm for the gunwales.
Cut two lengths of 1550mm for tank side rails.
Cut one length of 600mm for the bow rail.

Put these aside in a safe place until later.

4. ASSEMBLY OF BULKHEADS

Select the best face of the transom (2). Make this the aft face if you are going to varnish the transom outside.

Similarly, select the best face of the centre case bulkhead (5) as its aft face. It does not matter on which side you have the large hole for the inspection port.

Lightly pencil in the centre line on both sides of the transom, centre case bulkhead, web bulkhead (6) and bow (7). Extend the line up only 260mm on the aft face of the centre case bulkhead. Mark the lines for the tank risers on (2) and (5) as shown.

Cut 16mm square timber for the transom, aft face of centre case bulkhead, forward face of the web bulkhead and the mast web (9) as shown.

Temporarily tack these in position using two brass pins on each piece of timber. The top rails should protrude 1-2mm above the edge of the ply to allow for later planing.

5. CENTRE CASE

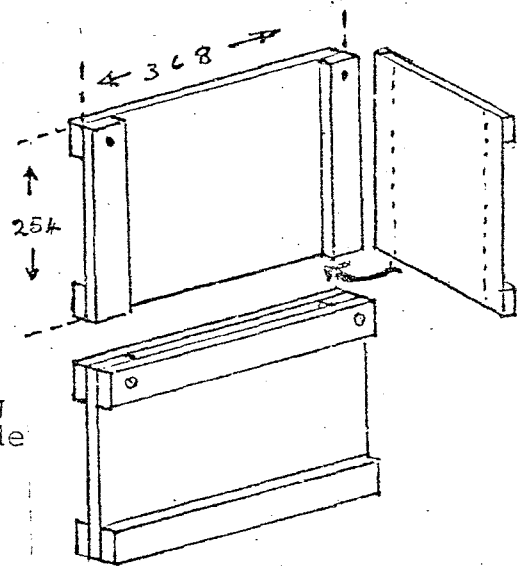
Select the best faces of the centre case sides (4) as the outsides of the case.

Cut four lengths of 14 x 22mm each 368mm long.

Cut two lengths of 14 x 22mm each 254 mm long.

(Note:- use 14 x 22mm, not 16mm square).

Temporarily tack a 368mm rail to the top and bottom outside edge of each ply rectangle using 5 monel nails per rail. The wide face of the timber goes to the ply. Check that the timber edge is square with the ply running your fingers across it.



Now temporarily tack the 254mm lengths vertically at each end of the inside face of one side using brass pins. (See diagram).

6. GLUE 1

Mix up glue. Take off one piece of timber at a time and glue and nail the parts prepared in the previous two steps.

Remember that nails do not hold the boat together. Use just enough to hold the timber to the ply while the glue cures.

Do not glue the two sides of the centre case together. Punch the nails below the ply surface of the centre case sides. Fill the holes of the inner faces with "Plastibond" or a similar filler.

Note:- 1. If you want to keep working on the boat while the glue and filler cures, go to step 10 and return to step 7 later.

2. These notes have been arranged to minimize the number of times you need to mix up glue and resin. They provide the most time-efficient method. If you would prefer to do smaller gluing jobs as you go along, then do so if it suits you better.

7. PAINT INSIDE CENTRE CASE

Sandpaper the filler over the nail holes until it is smooth.

Mask a 20mm (not 22mm) wide strip up the ply at each end of the plain side. Paint the inner surfaces of the centre case with "Estapol" (or similar) thinned with 10% turpentine. Don't paint where the glue needs to adhere later.

Lightly sand this when dry.

Paint with three more unthinned coats, sanding lightly after each is dry.

Put the two sides together and check that the centreboard will slide easily within it. There should be a gap of 1.5 to 2mm.

8. REMAINING BULKHEAD TIMBERS

This is a completion of the work started in step 4.

Make up the timbers for the forward face of the centre case bulkhead and the aft face of the web bulkhead. Temporarily nail them in place.

Remove the masking tape from the centre case side.

Drill a 3/16" hole through the top corners of the verticals and rails on one side of the centre case.

Lightly clamp the two sides together. Check that the top and forward edges are square. Complete the drill hole out the other side. Screw a 63 x 5mm (2 1/2" x 3/16") stainless steel (or brass) bolt through each end (using washers both sides) and do up the nut. These bolts are to stop the top of the centre case breaking away if (when ?) the centreboard hits a sandbar or rock. They also assist in keeping the case lined up when you glue it.

Note: Even stainless steel does rust! Fortunately it is a slow process. To prevent it staining the surrounding wood on decks and other varnished areas, always follow these steps.

Put the bolt or screw in to check that the hole is correct.

Take it out!

Dip it in thinned varnish/Estapol.

Drip some into hole and then replace screw or bolt.

This seals the wood grain to some extent.

9. GLUE 2

Glue up the work prepared in step 8.

You have now completed Stage 1. The parts are now ready to be assembled into a boat.

10. BUILDING CRADLE OR PADDED RAILS

The boat can be built quite satisfactorily on two padded cross rails set about one metre apart.

You may decide to build a "beach cradle" and build the boat on this. A diagram for its construction is at the end of the notes.

The most comfortable height for the rails is about 250mm below the waist of the person who will do most work on the boat.

11. STITCHING THE FLOOR PANELS AND THE TRANSOM

Clamp the two floor panels together with their inner faces together and the panel with the edge line on the top.

Drill 1.5mm (1/16") holes through both panels along the edge line and about 150mm apart. Start each row of holes about 15mm from the corners.

Cut up half the copper wire into 65mm lengths.

Wire through the holes along the keel only, cross the wires and give them a loose twist.

Note that ALL wire twisting is done on the outside of the boat.

Place the panels on one side of the rails, remove the clamps and open up the panels.

Bevel the chine edges of the floor panels to about 45° for about the first 1500mm from the stern with a rasp, plane or surform.

Check that the aft edges of the floor are in line.

Trim off excess 16mm square from the transom, and put it on the aft end of the floor panels. Mark matching holes, drill them and wire it on.

12. STITCH ON SIDES

Bevel the inner edges of each side panel to approximately 45° for about the first 1500mm from the stern.

Put one side on the floor panel so the bevelled edges meet. A really accurate fit is not needed as the small gap at the join will be filled with resin later. The side should be outside the transom.

Make matching holes to those already drilled in the floor panel. Stitch the side to the floor, starting at the transom and working towards the bow.

The junction between side and floor becomes progressively steeper and so less bevelling is needed. Bevel with a rasp as you go when you reach the unbevelled section towards the bow.

Stop about 500mm from the bow and stitch on the other side to within 500mm of the bow. You will also need to put three stitches up the corners to link the transom and the sides.

Cut a temporary spacer 1070mm long from the 50 x 19mm timber. Nail it in so it links the "D" marks on each side. Don't drive the nails right in. This piece later becomes the foredeck beam.

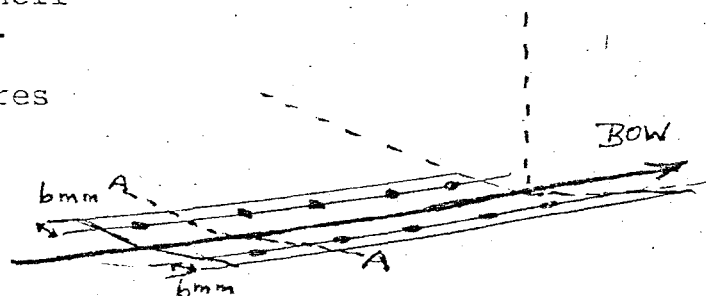
Continue rasping and stitching to the bow.

Tighten all stitches.

13. FITTING THE CENTRE CASE

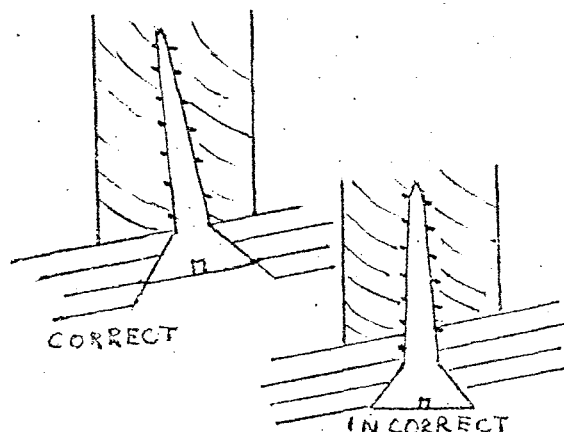
Select the top corner with the best and squarest finish. This goes towards the centre case bulkhead; the other can hide under the thwart. Thoroughly sand paper the centre case now. It is much easier to do it at this stage. Bevel the bottom rails of the centre case to match the angle of the floor as shown on the centre case bulkhead.

Place the centre case with the slot along the centre line. Move the case along the boat until the aft end of the slot is at mark "A". Pencil on the floor around the case. Drill 5 holes evenly spaced along each side. Their centres should be 6mm in from the pencil lines and a fraction smaller in diameter than the 19mm long, counter sunk brass screws.



Counter sink each hole from underneath. Check that the screw heads will fit up into the countersunk holes with sufficient room for filler.

Remove any stitches that are in the way of the end timbers but replace them with ones that are not in the way.



Replace the centre case and ask someone to hold it in place for you. Drill a slightly angled hole at one back corner. Put in the screw. Check the centre case is still accurately positioned. Put in a screw in the opposite front corner. Check the position of the centre case. Do not worry about minor mis-alignments at this stage. A very thorough lining up takes place later.

It does not matter if the centre case has moved a couple of millimetres away from mark "A".

Now put in a third screw at the other front corner. The slot will be cut out later.

14. FITTING THE CENTRE CASE BULKHEAD

Put the bulkhead in the boat against the forward face of the centre case. It will APPROXIMATELY line up between the "C" marks.

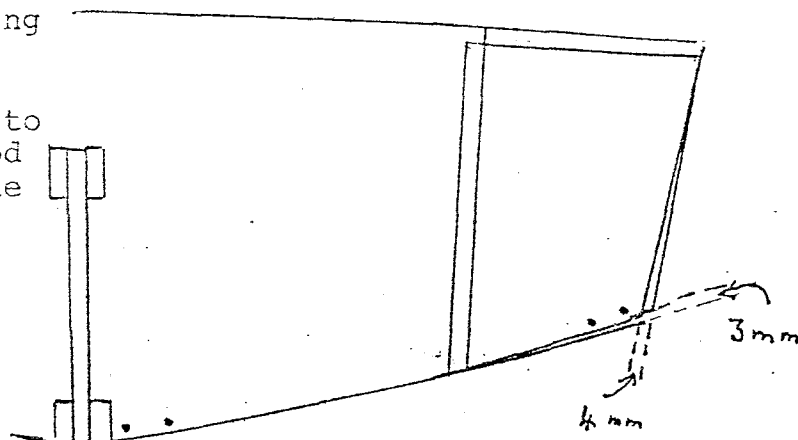
Press the bulkhead down until it fits, forcing a curve into the floor panels. Moving the boat along the building cradle and putting packing at the keel and chine will also help.

If the sides are being forced out unnaturally at the chine, you may plane off a wedge of up to 4mm at the base.

If the top edge protrudes too much at the gunwale, you may plane off up to 3mm at the chine within the side tank.

If it is still not right, drill small holes in the bulkhead and corresponding holes through the floor. Put stitches through to hold it. You will need to put a small piece of wood within the stitch outside so it will not cut into the ply.

When the fit is satisfactory, drive a temporary nail through the bulkhead and into the centre timber of the centre case (about half way down the centre case).



Temporarily nail through the sides into the top rail of the bulkhead.

Do not be concerned with small gaps of a couple of millimetres. Try to reduce them but remember that they will be filled with resin later and do not matter.

Remove the temporary spreader. Put it aside to use as the fore deck beam.

15. FITTING THE WEB BULKHEAD

Put the web bulkhead in position APPROXIMATELY between the "F" marks.

Clamp the mast web (9) to the vertical timber on the forward face. You may have to adjust its depth as it is usually too deep.

Press the bulkhead down to obtain a good fit and then nail through the sides into the top rail.

The same comments apply here as to the centre case bulkhead. If you are not satisfied with the fit, re-read Step 14.

Do not be concerned with small gaps of a few millimetres. Try to reduce them but remember that they will be filled with resin later and do not matter.

Remove the mast web.

16. FITTING THE BOW

Bevel the inner edges of the sides and floor panels and the edges of the bow to match.

Stitch it into place inside the floor and sides.

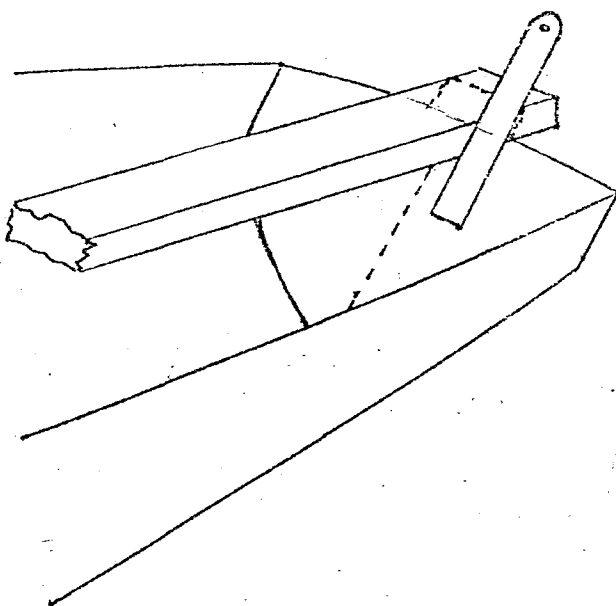
Do not be concerned with small gaps.

17. FITTING THE DECK BEAM

Take the piece of 50 x 19mm timber used for the temporary spacer and lie it flat along the centre line of the foredeck. The bow end should protrude about 20mm in front of the bow.

Mark the bow angle on one side with a chisel. Mark a line square across the timber with a chisel. Mark the bow angle on the other side. Saw the timber at these marks.

Invert the timber and lie it along the boat with the angled edge just touching the bow. The beam should be marked and cut about 2mm short so it does not bend the bow or bulkhead. Lie it down in its correct position rasping out the underneath and sides to get a good fit at the bulkheads. It should be flush with the ply at the top.



Temporarily nail through the bow with a nail each side with 31mm monel nails. Using a clamp at the centre case bulkhead adjust the deck beam so that neither the bow nor the bulkhead are bent out.

Temporarily nail the beam down at the centre case bulkheads with a nail each side. Do not nail at the web bulkhead yet. The beam will have a slight downward curve. If the web bulkhead has been set too far forward, the curve on the beam may be excessive. In this case, the web bulkhead cut out may be made slightly deeper.

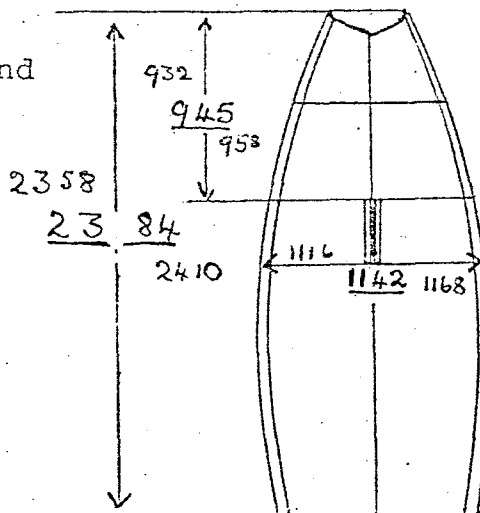
18. CHECKING THE HULL

If you have followed the steps and not altered the panels, the boat will have the correct measurements. It is worth checking at this stage as any mistakes can still be fixed easily.

The overall length should be about 2384mm. Somewhere between 2358 and 2410mm is still O.K..

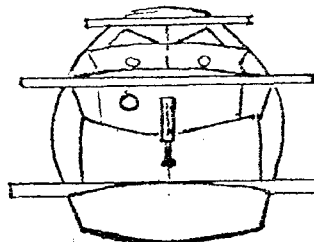
The overall width should be around 1142mm. Between 1116 and 1168mm is still O.K.. The width (or "beam") is measured at the line which crosses the aft end of the centre case.

You can make the boat shorter and wider by moving the supports wider apart.. Moving them closer together makes it longer and narrower at gunwale level.

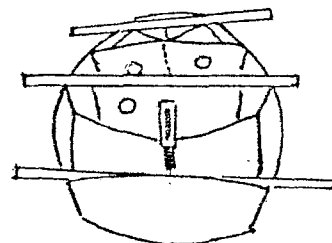


The length of the fore deck should be checked. It should be 945mm but between 932 and 958mm is O.K.. Some minor adjustment of the foredeck beam may be necessary.

Level the boat by lying three pieces of timber across it, sighting along them and adjusting the supports.



Tighten all wire stitches and press them down firmly inside using a piece of hardwood. Recheck everything. When you are satisfied with the measurements, put two temporary nails on each side of the deck beam at both bulkheads.



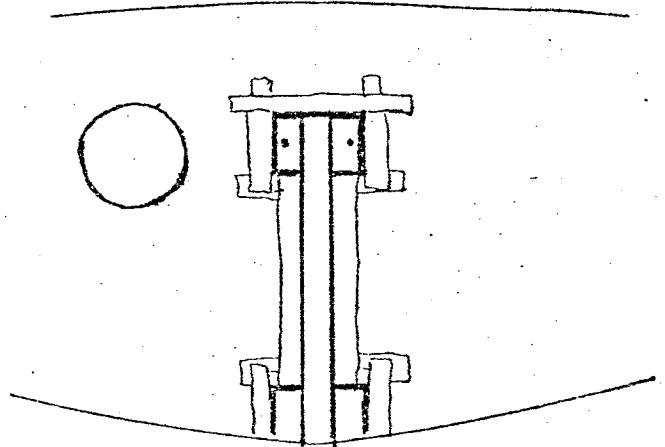
19. GLUE 3

Put masking tape on the centre case bulkhead where the centre case butts up to it.

Take out the centre case.

Drill two fine guide holes through the bulkhead at the top of the centre case.

Put glue along the front and liberally along the bottom at the centre case. Replace it in the hull and put in the 3 screws. Do not tighten them too much or you will create a dip in the bottom line.



Stretch a string from the centre of the bow to the centre of the stern.

Check that the centre case is ACCURATELY aligned with this. It is very important for the performance of the hull that the centre case be in line. It can be adjusted by enlarging the holes through the ply.

Put two nails back into top rails through the guide holes in the bulkhead.

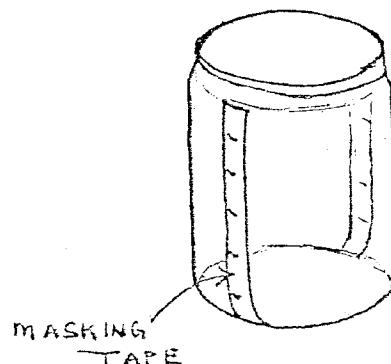
Glue and nail both bulkheads where their top rails meet the sides. Glue and nail in the foredeck beam. Use 31mm nails.

Put the remaining screws into the centre case after the glue has set.

20. FIBREGLASS 1

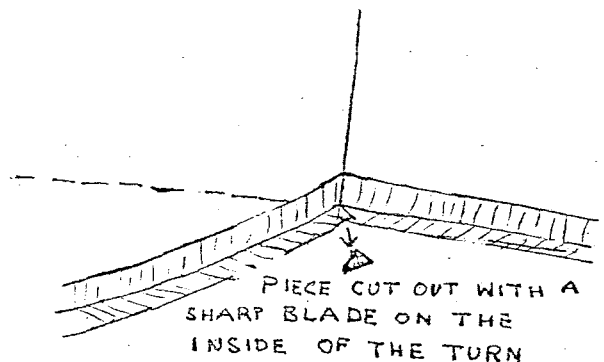
Measure quantities accurately when mixing resin using jars appropriately marked. A medicine glass is useful for polyester activator.

Paint the resin mixture on the seams in the front buoyancy tank. Feed the fibreglass tape out of a plastic bag onto the band of resin. Work it into the resin with the brush. Use just enough resin to thoroughly "wet" the tape from underneath.



The whiteness of dry tape should completely disappear. The inside of the tanks are not seen, the cockpit is and so until you become practiced, work in the tanks first.

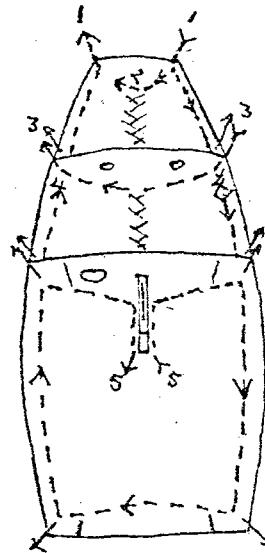
Try to work with long, uncut pieces of tape as much as possible. Where the tape turns a corner, cut out a small wedge from the inner edge to help make a neat turn. The pattern shown in the diagram works well. Note that first, a double layer of tape is put along the keel line inside the front tank. The keel line in the cockpit is not done at this stage because the floor strengtheners are not in.



Make sure there is no bump in the floor ply where it crosses a support rail or cradle.

Run the tape straight past the drain holes. It is easily trimmed out later.

Cut the tape where it passes the tank side risers so there are no hollow spots.



When the resin has cured to the point where the tape won't move, paint on a second coat of resin. This second coat can be applied when the first is still sticky or it can be done later.

21. CHAIN PLATE BLOCKS

These small pieces of plywood (8) strengthen the sides where the chain plates screw on. Fix them temporarily inside with brass pins at mark "E". They are glued on permanently in step 29. (They are easy to forget and are put in here to make sure!).

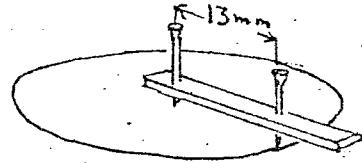
22. MAST WEB

Put this back in the boat ready to be glued along the top and aft edges in step 29. Some trimming along the bottom edge may be necessary.

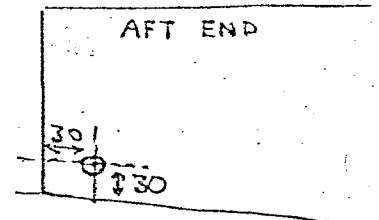
23. BOUYANCY TANK SIDES

Five preliminary steps are needed before these are fitted.

- (a) drill 25mm diameter holes at the lower aft corner for drain plugs. A satisfactory cutting scribe may be made from two sharpened nails, if you don't have a 25mm drill bit.

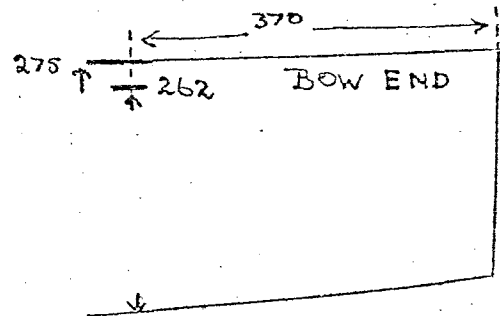


- (b) The transom must be kept straight by clamping a piece of timber across it on the outside.

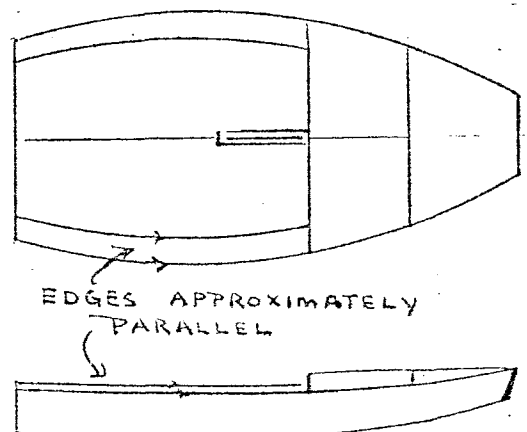


- (c) The floor of the boat must be supported at or near the centre case bulkhead and at the transom. This enables it to take up a natural smooth curve.

- (d) Put two pieces of masking tape on the cockpit side of each panel about 370mm back from the front edge. The top edges of these limit marks should be 262 and 275mm from the bottom of the panel. When trimming the top edge of the tank sides, make sure it is between these marks. Pencil equivalent marks on the face inside the buoyancy tank. The top edge of the tank side should be approximately parallel to the sides when viewed from the top and the side.



- (e) drill five holes equally spaced along the bottom edge of the panel to enable it to be stitched to the floor.



Bend the panel till it will fit in the boat. If it is too long, take off a 3mm wide strip at the aft end.

Do not alter the angle of the line at the ends. Continue to trim and fit CAREFULLY until both panels fit in and follow the curve marked on the floor. The top edge should be approximately parallel with the side.

Drill holes through the floor and thread the wire in. Give the middle stitches a light twist. Temporarily nail the sides to the risers at each end.

Trim and fit the 1550mm piece of 16mm square (cut in step 3) along each tank side inside the tank. Temporarily nail it so it passes between the limit marks. The protruding ply along the top will be planed off later. Arrange the 16mm square so that as little ply as possible will have to be planed off.

24. FLOOR BATTENS

Take the two pieces for the floor battens. (The floor battens must be between 40 x 8 and 50 x 19 in section. There must be a gap of at least 50mm at each end when they are fitted in the boat.) Round off the top edges and ends with sandpaper. Place them along the floor each side with their inner edges 160mm out from the centreline at the aft end of the centre case and 150mm out at mark "B". They should be equally spaced at the ends. Pencil in the outline of the battens. There are three alternative methods for holding them down whilst the glue cures.

- (a) Pin up from underneath with someone else holding the batten down with a "dolly" (padded brick, heavy hammer etc.). Bend over the pins with the dolly held under them. Use 6 pins per side. This method is provided for in the kit.
- (b) Screw them down from underneath. Remember to countersink the screw heads into the bottom of the boat. File off the protruding points of screws later.
- (c) Hold them down with stitches.

The pencil outline shows where to drill holes and place the battens.

Two additional battens may be fitted between the floor blocks (optional but recommended). They should be of similar cross-section to the main battens. They may be butted up to the floor blocks, let into, glued and/or fibreglassed to them.

Prepare the method of your choice and glue the battens down in step 29.

25. FLOOR BLOCKS

Place one floor block against the aft end of the centre case and the other just in front of mark "B". They may need to be shaped to fit the floor angle. Pencil around them, drill two holes each side and either nail or screw them down. They will be glued down in step 29.

3/12/75

26. THWART AND THWART STRENGTHENER

Screw the thwart strengthener onto the back of the centre case.

Take a piece of 50 x 19mm and lie it across the top of the cockpit so its front edge lines up with the aft edge of the centre case slot.

Transfer the angle of one tank side to the timber and cut off the end to this angle.

Measure accurately between the side tanks at the level of the top of the centre case.

This is the length of the underside of the thwart.

It should be between 865 and 885mm. A length of about 875mm is ideal.

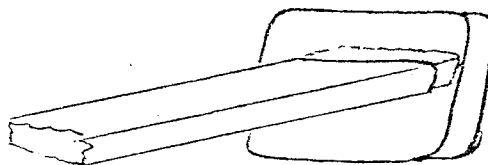
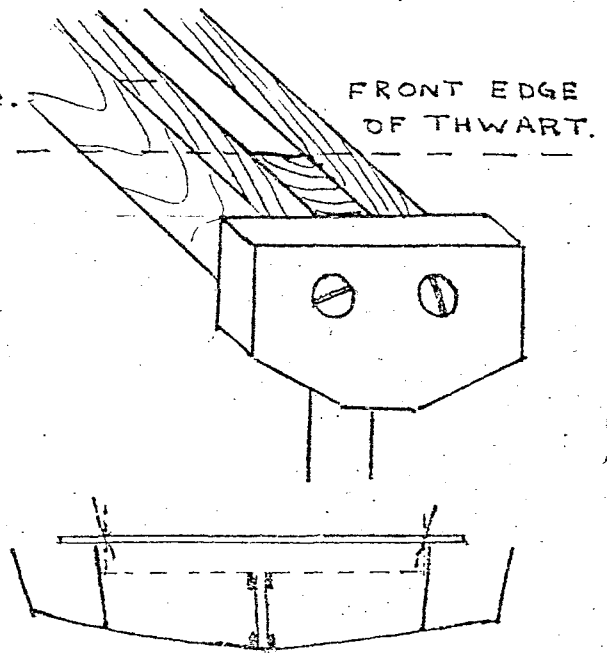
Mark the tank angle at the other end of the timber using the off-cut from the first cut. Cut the thwart.

Check the fit. If it is too long, adjust the length. If it is a firm fit, it may be worthwhile putting some masking tape down the tank side to avoid scratching the ply with the cut end.

Check the thwart is the same distance back from the bulkhead on each side and is level across the boat. Mark this correct position.

There are two methods of fixing the thwart to the tank sides.

- (a) The kit provides a surround. This is trimmed out to fit the end of the thwart. It is glued in place in step 29.



- (b) An alternative method (used previously) is to glue and screw a 150mm length of 16mm square to the side tank. The thwart is then glued and screwed to this and to the thwart strengthener.

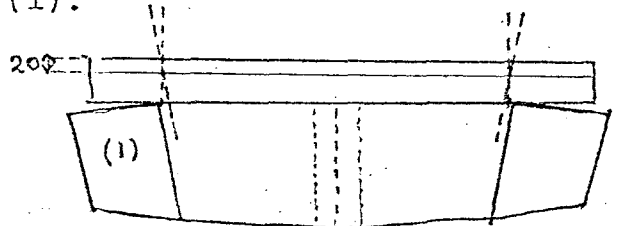


27. TRANSOM TOP

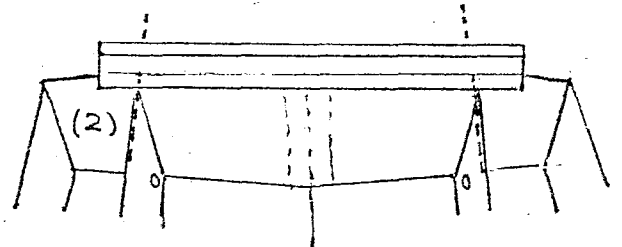
Take a piece of 50 x 18mm timber at least 660mm long and stand it across the tank tops, pressed against the transom. Fit a ruler between it and the transom and mark the line of the tank side.

Measure the distance between the side tanks at the top of the transom. Mark this on the aft face of the timber along a line 20mm down from the top (1).

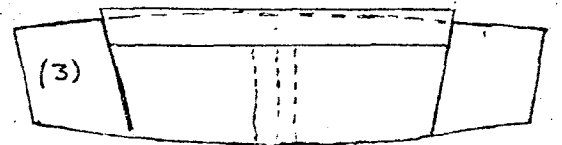
On the underside of the 18mm face, mark a line to show the angle of the side tank (2). Cut the timber to the outside of these lines (angled out towards the top and angled out towards the bow.)



Put it against the transom between the tank sides. It should be too long.



Trim the end until the top is still just proud of the ply (3).



It is glued on in step 29 and planed off when the glue has cured.

28. GUNWALES

Take the two 2540mm lengths of 16mm square cut in step 3.

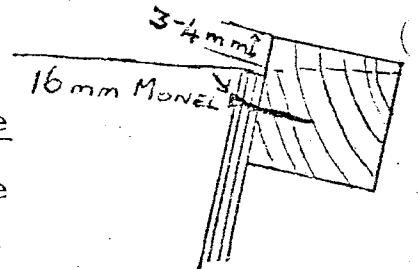
Bend them around the outside edge of the side so there is an even amount protruding each end. Pencil a mark opposite the centre case bulkhead so they can be easily positioned later.

Drill fine holes along the top of the side ply 6mm from the top and at about 150mm apart. Make the holes closer as you approach the bow.

29. GLUE 4

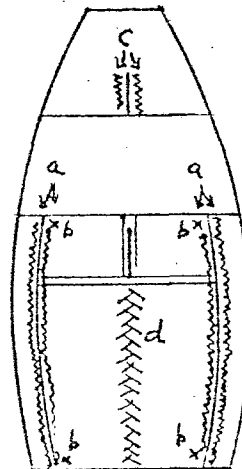
Glue the parts that you have set up previously.

- (a) Chain plate blocks. These are best clamped or you can use brass pins from the outside and bend them over inside.
- (b) Mast web. Glue this up under the fore deck beam and onto the web bulkhead. It does not matter if it is a few millimetres clear of the bottom.
- (c) Buoyance tank sides. These should be glued and brass pinned onto the risers on the transom and centre case bulkhead. Make sure they are pressed firmly against the floor and the ends of the tank sides before you drive in the pins.
- (d) Glue and pin the 16mm square along the top of the tank sides inside the tank.
- (e) Floor Battens.
- (f) Floor blocks. Put in only one nail or screw each side while the glue is wet. Put the others in after the glue has cured.
- (g) Thwart, thwart strenghtener and end blocks. The thwart should be screwed onto the strengthener later.
- (h) Transom top. Clamp or pin from the outside.
- (i) Gunwales. Start at the middle and work out to each end, making the timber protrude 3 to 4mm above the ply to allow for trimming. Hold a "dolly" against the gunwale as you pin from the inside.

30. FIBREGLASS 2

Fibreglass the following seams when the glue has cured.

- (a) both sides of each tank side.
- (b) vertically at each end of the tank sides.



- (c) each side of the mast web along the keel line.
- (d) two layers of tape along the keel line and 20mm up the transom.

Put a second coat of resin on each seam as soon as the first lot of resin has cured sufficiently to prevent the tape moving.

31. TRANSOM STRENGTHENER

Cut a piece of 50 x 19mm to fit from the join in the floor panels up the centre of the transom to beneath the transom top. Glue in place in step 35.

32. AFT FIXING BLOCKS

Cut two 35mm lengths of 16mm square. Drill fine holes at the aft top corner of each tank side. Glue and pin these blocks in place in step 35.

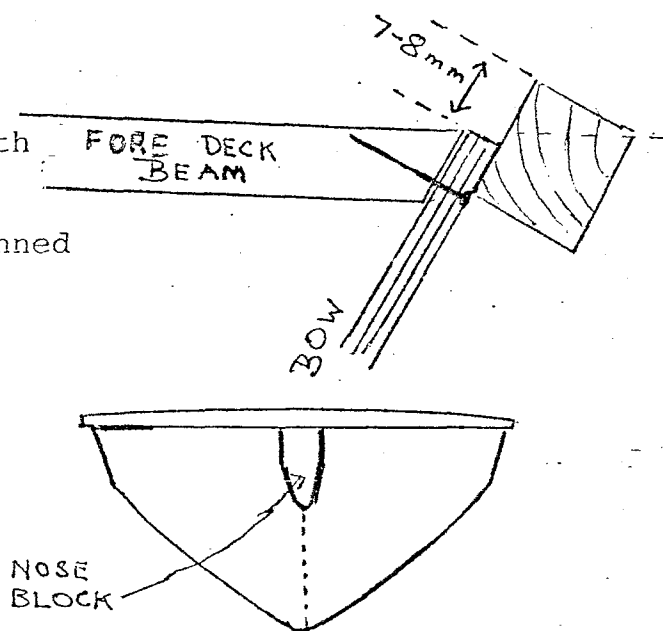
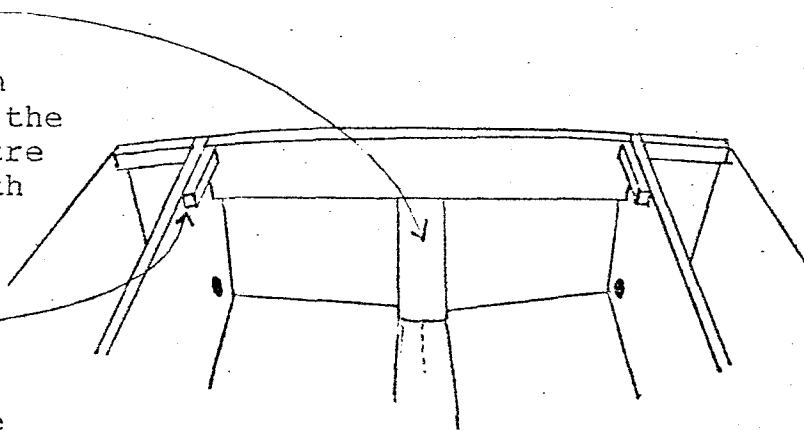
33. BOW RAIL AND NOSE BLOCK

Cut the gunwales off flush with the bow panel. Drill fine holes about 4mm from the top. When the rail is glued and pinned in step 35, it will need to protrude about 7 to 8mm above the ply. A few fine saw cuts along its underside will help it take up the curve.

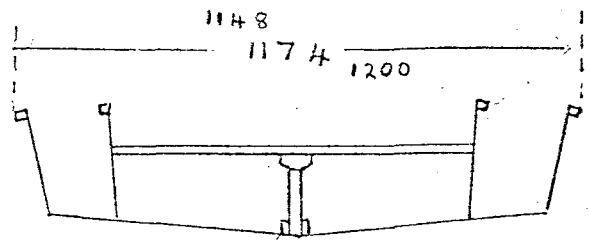
Round the outer edge of the nose block. It is glued and screwed on the centre line, hard up under the bow rail.

34. FIXED SIDE DECK SUPPORTS

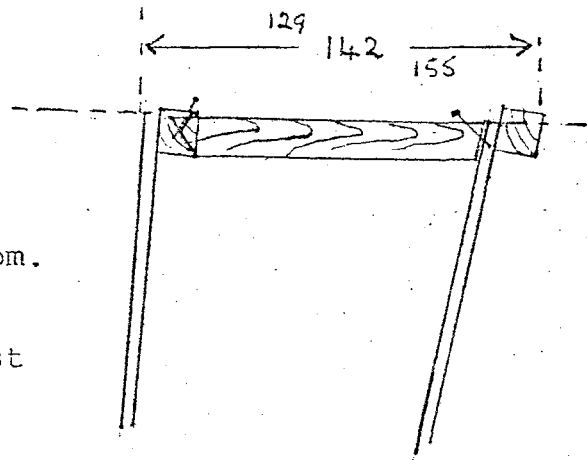
Various widths need to be checked before the exact width of the side decks is fixed. The width of the boat should be between 1148 and 1200mm across the line of the thwart. 1174 is ideal.



The side decks should be between 129 and 155 along the same line. 142 is ideal.



A piece of 16mm square is fitted across inside each buoyancy tank to make sure the boat and side deck widths are within these limits.



A second piece is fitted half way back to the transom. Its exact length and position are unimportant. These deck supports are best fitted too low rather than too high so they will not need trimming down.

35. GLUE 5

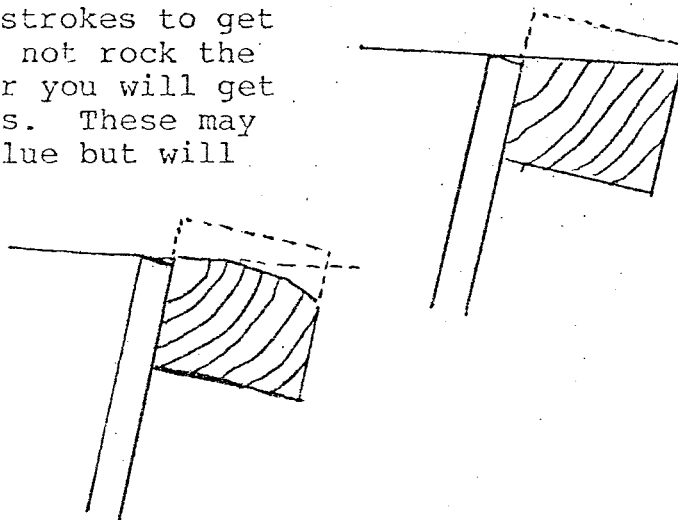
Glue in the transom strengthener, aft fixing blocks, bow rail, nose block and side deck supports.

You have now completed stage 2. The boat is now ready for decking.

36. TRIM FOR DECKING

Plane off the excess ply and timber in order to get good surfaces to which the deck can be glued. Make sure you understand the angles of the decking and then work CAREFULLY. The surfaces and edges you are preparing are the most important ones on the boat if it is to be watertight, strong and look good.

Plane with long strokes to get even curves. Do not rock the plane sideways or you will get gaps at the joins. These may be filled with glue but will look unsightly.

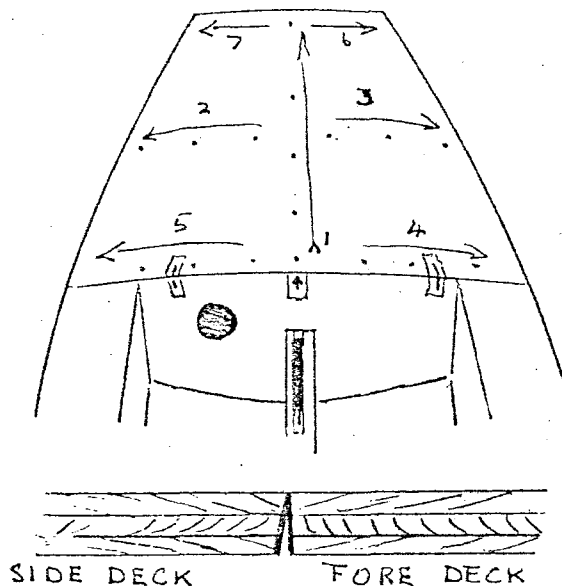


37. TRIAL FIXING THE DECKS

Mark the centre line of the bow and the centre case bulkhead (on a piece of masking tape, not the ply).

Put the foredeck in place. Make sure the aft edge of the foredeck and the centre case bulkhead line up properly.

Temporarily pin the fore deck in place, putting in pins in the order shown. Press the deck down before putting in the pins. Put some pieces of masking tape over the back edge and mark a line on these. This will permit easy positioning when the glue is applied.



Take a side deck and slightly bevel the front edge where it meets the fore deck. Temporarily pin it down in a few places. Put lines on masking tape on the hull where the nails go in to permit easy positioning.

When you are satisfied that the decks are properly positioned, pencil around underneath along the edges. You might also find a very light pencil line along the centre and across the web bulkhead is useful when pinning down later.

Remove the decks and trim the excess down to between 5 and 10mm.

Mark where all the beam and bulkheads are on the underside of the fore deck. The underside is sealed with paint later and it is important to avoid the bands where glue needs to adhere.

38. MAINSHEET BLOCK

A small block of wood may be fitted lengthwise on the floor hard up against forward floor strengthener. Its purpose is to hold the swivel base for a final block for a centre mainsheeting system. The block is cut from 50 x 18mm timber to a length of 95mm.

Mark its position on the floor, drill holes and glue and screw it in position in step 41.

Note: The class rules say this block is optional. You do not have to put it in. The point is, many boats use this system and it is much easier to put one in at this stage.

39. CLEAN UP IN BOAT

Turn the boat upside down and tip out the shavings and dust. Turn it the right way up.

Vacuum or wipe the boat clean.

40. SEAL INSIDE TANKS AND UNDER DECKS

This is the last opportunity to work inside the tanks. The inside surfaces must be thoroughly sealed at this stage.

Seal the entire inside with Estapol (or similar) thinned with about 10% turpentine, including the undersides of the decks.

Do not paint where glue will need to adhere when you put on the decks.

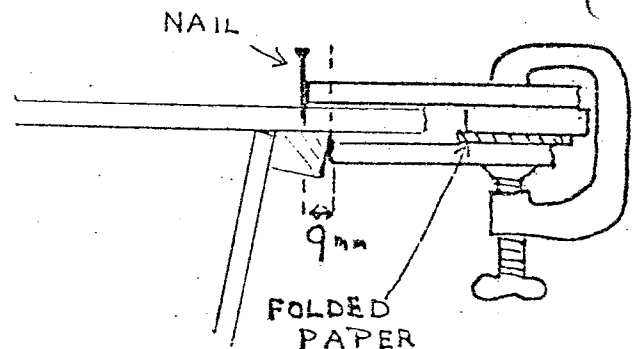
Apply two more coats of unthinned Estapol.

41. GLUE 6

Make up a nailing guide.

Glue on the foredeck nailing up the centre line first. DO NOT drive the nails right in before you are absolutely sure the deck will go down properly everywhere.

Then nail out across web bulkhead followed by the centre case bulkhead, gunwales (using nailing guide) and bow. The pins should be about 100mm apart.

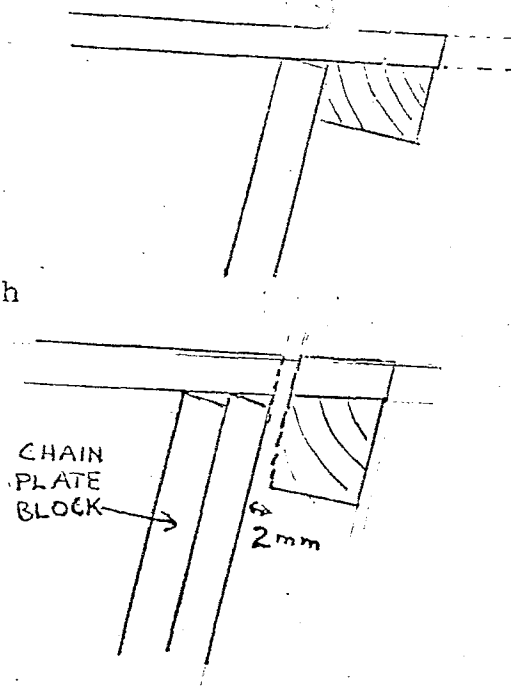


Similarly, glue and pin down both side decks. Position them in the correct place as indicated by the temporary pins. When pinning them down work from the fore deck towards the transom. Again, do not hammer the nails home until you are sure it has all worked properly.

42. TRIM, CHAIN PLATE SLOTS

When the glue has set, trim off the excess ply CAREFULLY. Do not rock the plane and work with long strokes. You should finish with the edge flush with or 1mm proud of the gunwale on the outside. The cockpit edges are best finally sanded down to a slightly rounded edge.

Cut a 15 x 2mm slot down through the deck and gunwale at mark "E" on each side so the chain plates can be slid down through them and screwed on outside of the ply. Mark the 15 x 2 rectangles with a sharp blade, drill and then clean out with a fine file, sharp blade or strip of abrasive.

43. MAST STEP

The mast step is made out of two pieces of ply glued together. The centre of the hole of the mast step is to be positioned on the centre line between 600 and 680mm in front of the centre case bulkhead. Mark these two limit points on the deck neatly.

The mast step is screwed to the deck after the two pieces are glued together (in step 46) and it has been smoothed off. It may need to be moved later but start with it 610mm from the bulkhead.

44. COAMINGS, TRANSOM CAP, BOW CAP

Take the long thin strips and fit one round each side to cap the gunwale and deck edge. Trim off the excess. The ends cut off are used to cap the bow rail and to fit as a capping across the top of the transom. The transom cap is fitted neatly between the ply at the side decks. The ply may need to be trimmed square where it meets the transom cap.

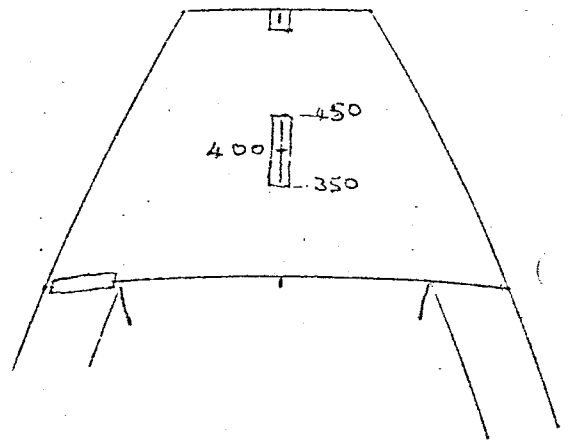
The coamings and transom cap are glued and pinned on in step 46. When the glue has dried, trim the coamings at the bow and glue the bow cap across the bow.

45. SPLASH RAILS

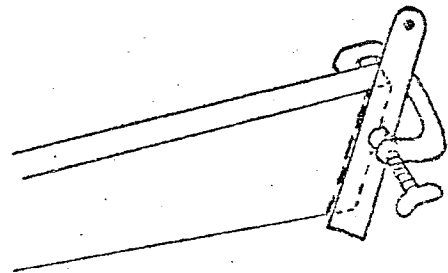
Fitting the splash rails is often regarded as a difficult task. It is not difficult if it is done in a series of all, easy steps.

1. Put masking tape along the centreline from about 350mm to about 450mm forward of the bulkhead. Rule the centreline of the boat on this tape and mark it at 400mm.

Mark the centreline on a small piece of tape at the bow. Put a piece of tape along the deck join on the left (port) side.

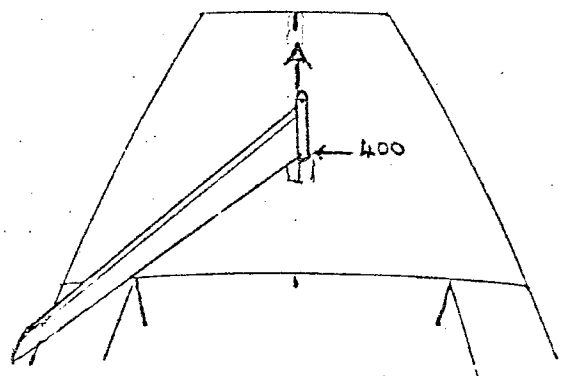


2. Take a small ruler or straight edge and clamp it on the aft face of the splash rail timber parallel to the angled cut and about 20mm in from the edge. Mark the aft face of the timber with a chisel. Do not remove the straight edge.



3. Place the timber at the 400mm mark at the centreline. It should pass near the cockpit corner and finish near the edge of the deck.

Tilt the timber forward until the straight edge lines up with the mark at the bow. Ask a helper to hold it against a block of wood (or similar) to keep it still and at the proper angle.

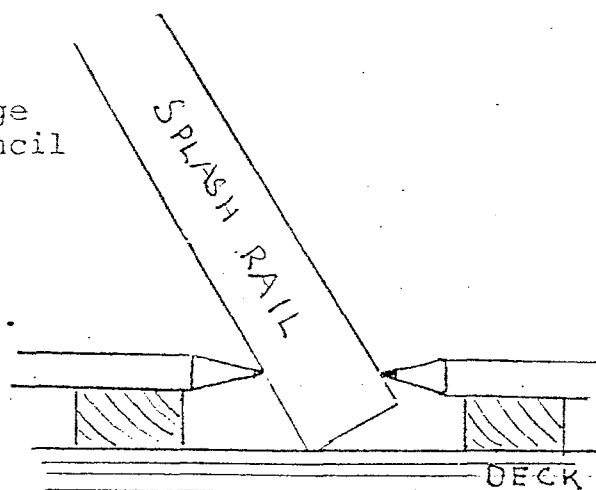


4. Mark the top edge in line with the straight edge (and the centre line) using a chisel.
5. Pencil a mark where the timber passes the side deck tape.

6. Mark along the bottom edge on both faces using a pencil on a small block of suitable thickness.

7. Remove the timber and unclamp the straight edge.

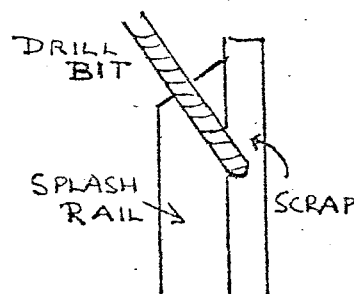
8. Saw the angled cut marked out with great care. If it is not accurate enough, set it up again but at 380mm if the timber is too short to reach the gunwale.



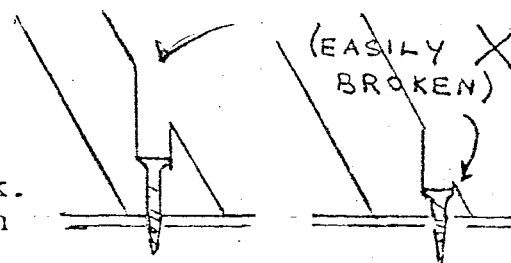
9. Plane the angled curve along the bottom edge. It should be a smooth, continuous curve with about 5mm dip in it. Do not follow the slight irregularities of the pencil line, specially halfway across the deck where it is unsupported.

10. Replace it on the fore deck and check the fit.

11. Drill three screw holes through the bottom edge. Put a scrap of timber over the aft face to prevent the drill bit splintering the timber as it breaks out.

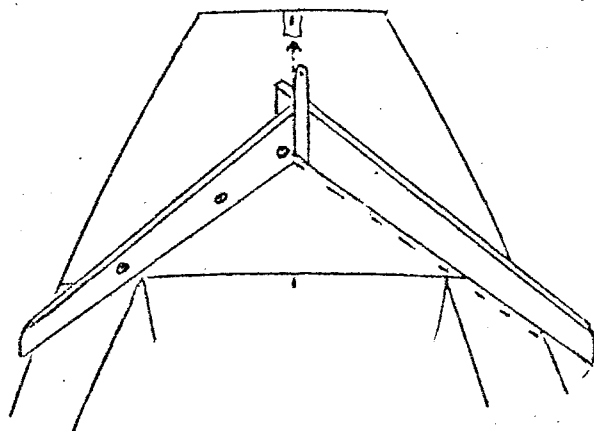


The screws should go into the deck beam, the front edge of the side deck and half way across the fore deck. Countersink the holes from on top.



12. Screw the timber to the deck with countersunk brass screws. Do not be concerned if the cut end is a few millimeters off the centre line. Remove all masking tape before tightening the screws.

13. Put the second timber into place on the other side but "one timber thickness" forward. Clamp the straight edge in place and mark the top edge (with a chisel) in line with the cut of the first piece.



14. Remove the timber, mark along the straight edge and carefully saw the angled cut.
15. Replace the timber; mark the bottom curve on both faces; plane the curve; check the fit.
16. Drill and countersink the three screw holes.
17. Put the timber in place and put in the middle screw. If the join opens up a little at the top, close the gap temporarily by putting a nail across. Put in the other two screws.
18. Put masking tape along the front and back edges. Mark the ends if they protrude to the coamings. Take them off. Trim and sand off the ends if necessary.

46. GLUE 7

Glue and fix the coamings, transom cap, bow cap and splash rails.

Glue the mast step together but do not glue it to the boat. It is screwed to the hull using two 31mm screws.

Check steps 58 and 59 before mixing the glue.

47. TRIM

Trim off the coamings and round the corners with sandpaper.

Trim and round off the top edge of the splash rails. Smooth them with sandpaper. Remove the masking tape.

48. VARNISH 1

Inside the boat, all decks, transom, splash rails and gunwales seem to appeal to most people if they are varnished. The first coat of Estapol, Dulux polyurethane clear High Gloss or varnish should be thinned with 10% turpentine.

49. PUNCH NAILS AND FILL HOLES

Punch down all visible nails, revealing fresh timber around the rim of the nail hole. Fill the nail holes by dripping resin off a match stick. Screw holes will need "Plastibond" or similar.

50. VARNISH 2

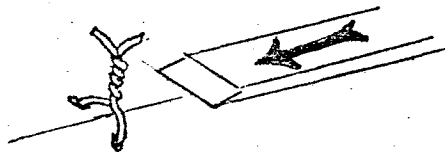
Sand off the filler where necessary.

Varnish and lightly sand between coats until a satisfactory finish results.

51. TRIMMING OFF THE STITCHES

Turn the boat over.

Cut off the stitches using a sharp chisel. Slide it firmly through each stitch.

52. SAND ALONG CHINES, KEEL, ETC..

Round off all edges as the tape will not lie flat around sharp bends. Along the keel aft of the centre case, cut into the ply a little to accommodate the tape without producing a bulge. Fill any large gaps with Plastibond.

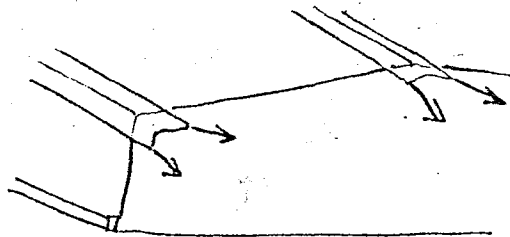
53. CENTRE CASE SLOT

Drill holes along the centre case slot. Cut out the ply and trim the edges with a coarse file. The precise method used depends on the tools available. It is much easier if the boat is stood on its end against a wall.

54. FIBREGLASS 3

Paint the resin mixture along the chines and keel. Put on the tape and work it in. Wrinkles along the edges of the tape at the chine may be removed by pulling along and slightly outwards at each end.

When the resin has cured sufficiently, trim off the ends of the tape and paint the tape with another coat of resin.



Paint resin around the bow and stern transom.

Put on the tape and work it in, cutting out wedges from the inside of the corners. Paint another coat of resin on when it has cured enough for the tape not to move.

55. SAND SMOOTH

Sandpaper all the fibreglassed seams. DO NOT cut into the tape at the corners as this is where you need maximum strength. The aim is to remove any high spots at the edge of the tape.

56. FIBREGLASS 4

This step involves only resining along the seams, extending the resin about 10 to 15mm beyond the tape. The seams of the boat should be quite smooth after sanding off. If the texture of the tape can still be felt, give it another coat of resin.

57. PAINT

Paint the bottom of the hull, sanding lightly between coats.

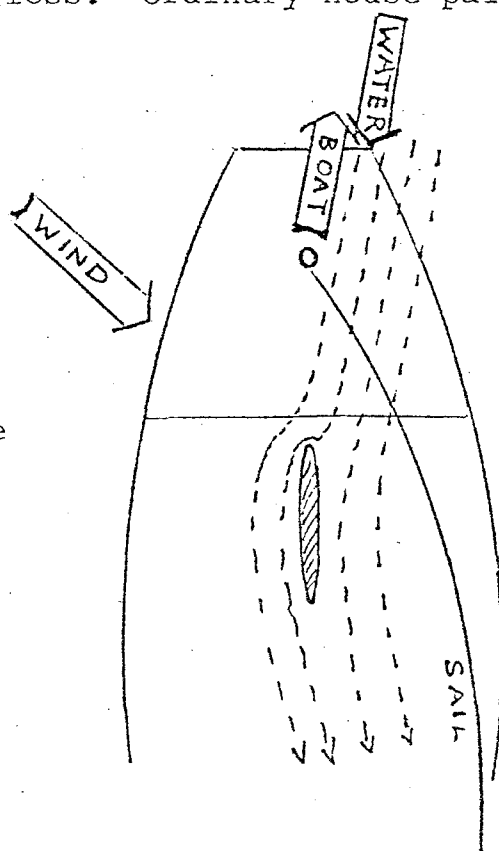
First Coat - Pink Primer (not Red Lead).

Second Coat - Undercoat, tinted by the supplier to the same colour as the finished coat. Sand with "wet and dry" paper, particularly on the fibreglass areas where ridges may show. Apply another coat to bare-looking patches.

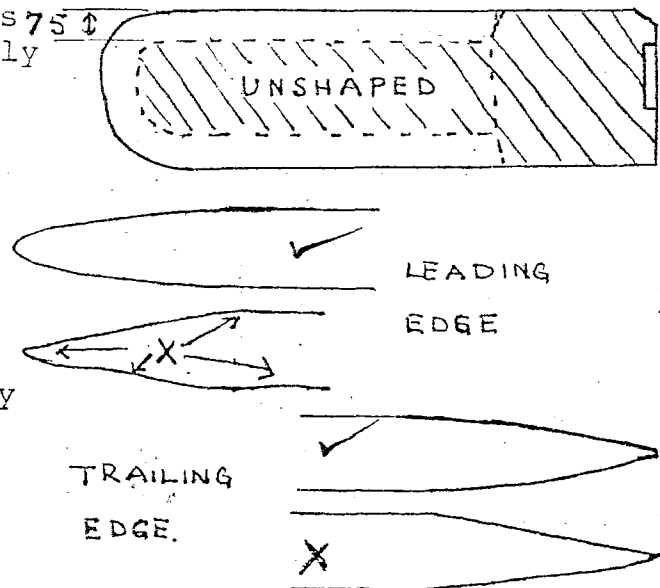
Third Coat - Final colour high gloss. Ordinary house paint is quite satisfactory.

58. CENTREBOARD

Sailing boats move slightly sideways through the water. The centreboard does not "cut" straight through the water. Instead, some of the water approaches from the lee side, moves forward, goes round the corner (!!) and then flows back along the board. The front edge should be rounded to permit a smooth flow. It should not be sharp. The back edge may be sharp but it is more practical to leave it 1 or 2mm thick.



Clamp two pieces of 16mm square along the top. These will be glued, and nailed on permanently later. The cut away part at the top is usually taken as the front. Slide the centreboard into the centre case and mark the keel line on it. Unclamp the top rails. The area within the centre case is left unshaped. Mark a line 75mm in right round the area to be shaped on both sides. Put masking tape around the inside of this line. Surform and finally sandpaper the edges to produce smooth, progressive curves. Avoid sharp ridges and transitions. The trailing edge may be fibreglassed. Glue and nail on the rails after they have been sanded. Seal the board thoroughly with several coats of thinned Estapol, particularly the end grained edges of the ply.



Remember, a sail costs well over \$100. The centreboard produces an equivalent force to the sail and is equally important. Prepare its shape carefully, store and transport it without damaging it.

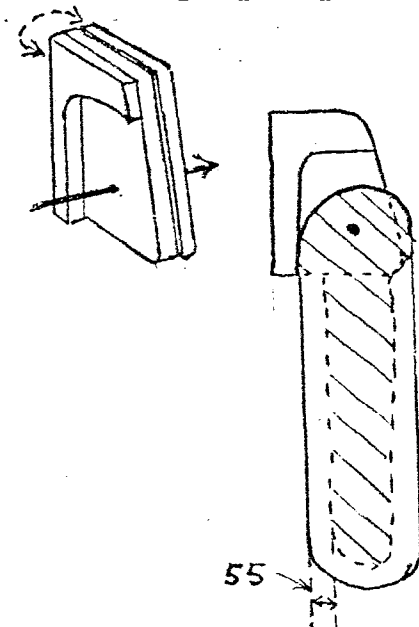
59. RUDDER

Glue a side and the centre spacer together.

Make a paper copy of the blade and locate the pivot point so that the blade will swivel up and down properly.

Clamp the other side "wrong" side of the assembly. Drill a 6mm ($\frac{1}{4}$ ") hole for the pivot bolt.

Assemble normally and check that the blade pivots properly. Mark the line of the sides on the blade when it is right down. Mark a line 55mm in from the edge. These areas should not be shaped but the corners may be rounded off.



Shape the blade similarly to the centre board, rounded leading edge and sharper trailing edge.

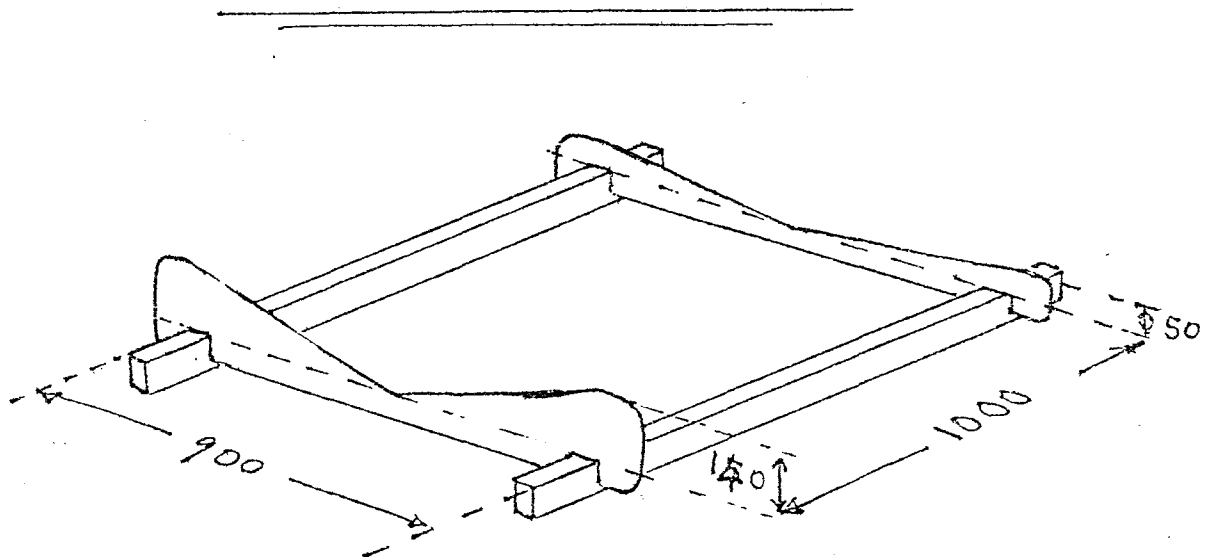
Glue the second side on, clamping or nailing whilst the glue cures. Put the pivot bolt in to ensure it is all square.

Glue on the tiller. This joint may be strengthened with screws or a strip of fibreglass tape.

Sand off all the corners and edges.

Seal the inside of the box, the bolt hole and the blade (particularly the end grain) with several coats of thinned Estapol (or similar).

Please note that the rudder blade and centre board must be made from ply if your boat is to be a registered Minnow.



BEACH CRADLE.

SUPPORTS TO BE COVERED WITH
CARPET.

TOOLS AND EQUIPMENT

The following tools are needed:-

saw	plane or surform
light hammer	drill (hand or electric)
chisel	rasp or coarse file
screw driver	metric rule or tape
fine nail punch	pencil
two 75mm (3") G clamps	pliers
scissors	Stanley knife
drill bits:-	1/4", 3/16", 5/32", 9/64", 1/8" 7/64"
	3/32", two 1/16" and a counter-sinking bit.

Three or four "Trimit" brushes (or other cheap brushes) are needed to apply glue and resin.

A roll of 19mm masking tape to control excess glue.

The roll of fibreglass tape should be kept in a plastic bag and pulled out as required.

Rubber gloves should be worn when sanding glass tape and when handling epoxy resins or glues.

Suitably marked glass jars are handy for measuring resin. Graduations can be mared on masking tape up the outside of the jar. A medicine glass, suitably labelled, is useful for measuring out resin activator. Do not use it for anything else.

It is easier to paint the inside of the centre board case before it is glued together. You need a 500ml tin of Estopol (or similar) along with a bottle of turpentine and a cheap brush early in the process.

You will also need a small tin of polyester filler. Plastibond (or similar) is satisfactory.

MINNOW SAILING /

MEASUREMENT

OWNER:

ADDRESS:

DATE BUILT:

BUILDER:

CLUB:

Transom template

Bulkhead template

Stays

Mainsheet system

Vang

Rudder keeper

C'board keeper

Towing ring

Sail release

Bailer

Paddle

Battens

Weight (20.25kg min

Items to be adjuste

Measurement fee paid
Certified correct:
(Measurer)

Date:

SAIL NO.

MEASUREMENT CERT. NO

