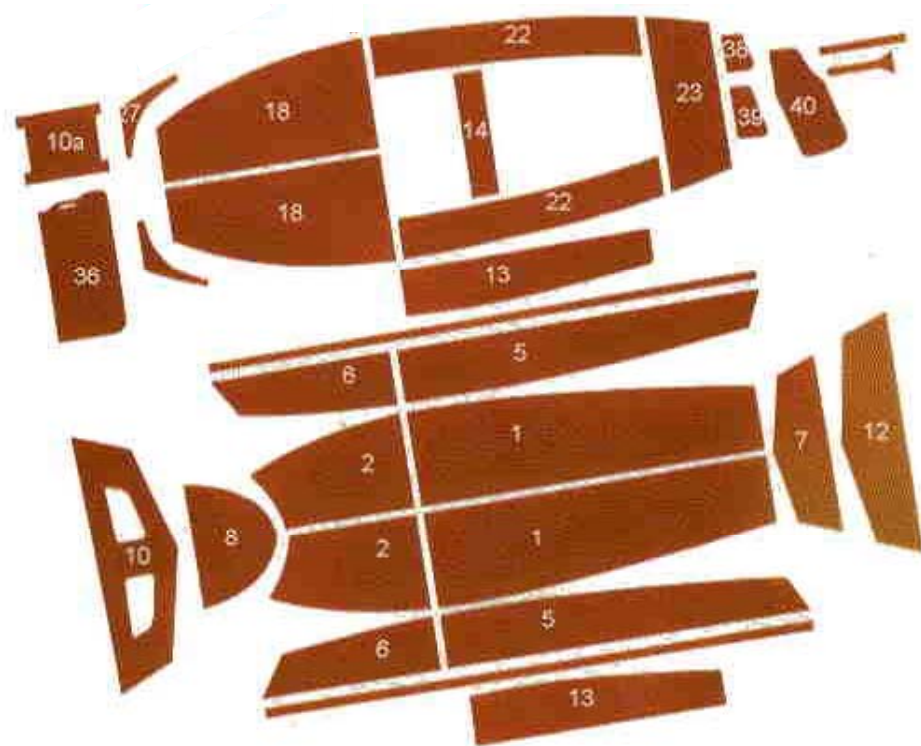


Mirror Class Dinghy Building Instructions





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FOREWORD

The INTERNATIONAL MIRROR DINGHY is a "One-Design Class" of the International Sailing Federation (ISAF). The copyrights of the Mirror Dinghy are held by ISAF who also regulate and license the kit builders. If you wish to race your Mirror in official events, its measurements and construction must comply with the Class Rules. At this time, racing may not be your priority, but at some time in the future you may wish race or to sell the boat to someone who does. It is important to build your boat according to the rules. If the boat "does not measure" the second-hand value would be affected.

Using these instructions, and the parts provided in the kit, the dinghy should automatically measure correctly. This manual is a set of assembly instructions and not the "Rules". To make things easier for you, an up-to-date version of the Class Rules of Measurement is included at the time of shipment. The Rules of Measurement can also be downloaded from the ISAF Internet site at www.sailing.org. Although the International Mirror Dinghy is in a strict one-design class, there are certain options and tolerances to the standard kit that you should consider before starting to build.

Mirror Sailing Development hopes that building your Dinghy will be a rewarding and enjoyable experience. Should you have any questions about the construction, or any other aspect of the Dinghy, please do not hesitate to contact us. We are here to help! Our e-mail address is mirrors@interlog.com

Our best wishes and good luck!

MIRROR SAILING DEVELOPMENT

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THE INTERNATIONAL MIRROR CLASS DINGHY KIT

Made in Canada by



If parts are damaged in transit please notify the carriers and us within 24 hours so that we can proceed with any claims. Please notify us if delivery of all or part of the consignment is not complete within 15 days of dispatch date.

Replacements will be sent for any item which you consider is unsuitable for its purpose but we must be notified within 7 days of you receiving the kit, this also applies to any "missing" items. We may request the return of faulty items in which case carriage will be refunded. Items damaged in transit should always be returned to us consigned "goods damaged in transit returned to senders" and no carriage should be paid on them.

The consignment comprises 2 items:

One cardboard box 98" x 28" x 5 1/2"

One package 12' x 6" x 4"

Total weight approx. 150 lbs

For shipping long distances by common carrier, we usually use wooden containers. This adds approx. 125 lbs to the shipping weight.

Paint, varnish and resin for the fiberglass are not supplied in North American kits due to shipping and fire regulations.

After unpacking the kit, store the parts in a cool dry place with low part numbers uppermost. The kit is assembled in numerical sequence. Finish off and varnish the spars first.

The Mainsail, Jib, Sail bag and three battens are supplied and packed with the Kit. The sail numbers may be provided loose and should be fitted as instructed.

IMPORTANT: RECORD YOUR SAIL NUMBER here: _____

ALWAYS refer to this number when corresponding.

Your sail number is depicted on the plaque issued by ISAF. This indicates that the building fee has been paid. This is an important document that should be eventually fixed to the forward face of the rear transom of the finished boat in accordance with Class Rule A-4.2. The plaque is in an envelope along with a stamped, certified Measurement Certificate, a Class Rules booklet and an epoxy users' manual. Keep these documents in a safe and secure place! As you build the boat you may wish to refer to the Rules of Measurement... MAKE A COPY to use in the workshop!

KIT OPTIONS

There are certain options and tolerances that can be incorporated during construction. Before building commences, you should consider all the options carefully.

The rules of the International Mirror Class allow tolerances to cover variations on building from a kit. Some of the tolerances can be used to give the boat a more aqua-dynamic shape. For example: the size and finishing of the bilge keels, skeg, and foils.

An international Mirror Dinghy is in a “one-design” class. It is not permitted to change the shape of the panels except as noted in the rules of measurement.

We do not recommend reshaping the hull panels to take advantage of the measurement tolerances. Deliberate alteration to the panel shape at one point adversely affects other measurements. Keep in mind that the original concept of the Mirror Dinghy was, and still is, a tough little dinghy that is both versatile and a pleasure to sail. To construct a Mirror as a high performance racing dinghy requires extensive knowledge and building experience. The techniques involved can often lead to a possible loss of strength; extra costs for specialist fittings; and a much longer construction time. The standard Mirror Dinghy with some “go-fast” gear is more than adequate for most needs including club level racing.

Providing that the parts remain within the stated tolerances the sizes and shapes of the following items may be reduced or altered:

Skeg	Mast
Outer gunwales	Gaff
Bilge keels	Boom
Centre case (size and position)	Rudder stock
Internal battens (floor)	Centerboard

The inner gunwales can also be reduced, but we do not recommend this as it incurs a considerable loss in strength

Please note that some of the items in the kit have been provided at the mid-point of the allowable tolerance range. The centerboard, as supplied has no “radiuses” cut in, and there has been no fairing. To finish the centerboard you will need to work closely with the Rules of Measurement. Similarly, the rudder blade requires further fairing.

We have included in the kit some extra pieces of hardwood to place as backing blocks for fixing fairleads and cleats for “inside sheeting” arrangements.

In all cases, we strongly recommend that the Building Instructions be followed closely; a measurement form and rulebook is supplied so that the boat can be checked during construction.

ADHESIVES AND COATINGS

The kit does not contain the adhesives and paint required to finish the dinghy. There are alternatives! Make a trip to the local paint supplier, fiberglass dealer or marine chandlery.

Materials such as carbon fiber are not allowed in the construction of the Mirror Dinghy. However, epoxy resins and additives can be used. In some places, epoxy fillets can be applied providing that they are used in conjunction with glass tape (See: Class Rule 1.2.2).

While epoxy resins are generally more expensive than polyester resins, we recommend that epoxy resins be used. Epoxy resin will result in much stronger, waterproof joints. A mix of epoxy resin and adhesive fillers (e.g. cotton linters/microfibres) can be used to glue wooden parts together and make fillets. Epoxy resin and fairing fillers (e.g.: micro balloons) can be used to fill gaps and to make finished faired surfaces. The advantage of epoxy glues is that they are stronger and less mechanical fasteners are needed. The Gougeon Brothers have published several

booklets and brochures on using the West System. Check the Internet at <http://www.westsystem.com>. Included with your kit is a West System *User Manual*. Please study it!. Note that exposed epoxy must be protected with a UV resistant coating (varnish or paint).

Adhesive Fillers vs. Fairing Fillers

Fillers are used to thicken the basic resin/hardener mixture for specific applications. Each filler possesses a unique set of physical characteristics, but they can be generally categorized as either Adhesive (high-density) or Fairing (low-density).

Adhesive filler mixtures cure to a strong, hard-to-sand plastic useful in structural applications like bonding, filleting and hardware bonding.

Fairing filler mixtures cure to light, easily sandable material that is generally used for cosmetic or surface applications like shaping, filling or fairing.

COATING AND FINISHES

Epoxy coating resins for priming and sealing are available. Unlike conventional primers, these resins saturate the grain of the wood. A minimum of two coats, applied to all wood surfaces, will prevent any ingress of moisture and will give a very hard finish. Details are included in the supplied West System *User Manual* under "Epoxy barrier coating". MSD suggests that the builder seriously considers this procedure. Conventional primers and coatings may also be used.

Conventional paints can be applied over the epoxy resin, but we recommend urethane paint or even a two-part polyurethane finish. They give better protection and are harder wearing. Again, study the *User Manual* under "Final surface preparation " and "Finish coatings"

Note:

➤ Polyester resins will react if applied over epoxy resins. Most epoxy resins can be applied over cured polyester resins.

➤ For best results, epoxy and two part materials should be used on dry days with relatively high temperatures.

PLANNING AND MANUAL LAYOUT

This manual has been written so that each job is self-contained: between each set of printed horizontal lines is a complete task.

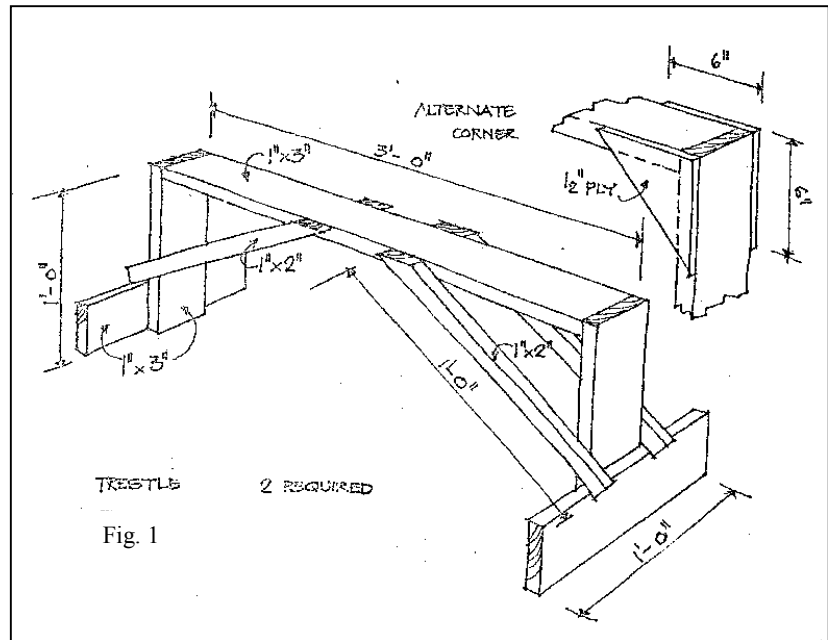
MSD recommends reading through each section prior to commencing actual work - this will give an overall picture of the procedure and allow work-space, helper, tools, materials and tasks to be planned and organized.

GENERAL NOTES

First, there are a few general notes to review. Please read this section thoroughly and, REMEMBER, while the sight of all the pieces of the kit appears daunting; the construction is really very simple. The difficult carpentry has been done in the factory.

To make life easier, enlist the aid of a willing assistant: a "step-and-fetch-it"; a panel holder; a tool finder; a coffee bearer!

Before starting on the dinghy, make a pair of trestles as shown in Fig.1. You will find these invaluable during building. Make up two supports, or angled pieces, to hold the boat steady and to prevent the hull rocking while working on it. Use the bottoms of the forward and aft transoms to mark the angles for the supports. So the gunwales will rest on them when the hull is turned upside down, make the supports wider than the boat.



These items will be needed::

1 pin hammer
1 back saw
1 set square
1 drill (preferably electric)
2 screwdrivers
2 chisels (1/2" and 1")

1 top-cutter (wire cutting pincers)
1 smoothing tool or hand plane
1 pair broad-nosed pliers
1 carpenters' rule
Sandpaper (coarse and fine)
Drill bits: 1/16, 3/32, 1/8, 3/16 and a Countersink bit.

A word about the screwdrivers — they must be a #2 (Red) and #3 (Green) Robertson (Square) screwdriver- a pair are included in your kit if you are in the USA (Robertson screws are the best screws in the world... they are Canadian!).

A Japanese style "pull saw" with a fine blade is an excellent tool to have around for close trimming and cutting.

"C" clamps are not vital to the operation but they will make life very much easier. Spring clamps are useful too. Get about 6, 3½-inch size.

In addition to the above you will require a box of inexpensive ½" brushes (for putting on the resin) and plenty of old rags for wiping the resin off tools, fingers and anything else it gets on. Latex gloves are really nice to wear when working with epoxy resins! To coat the panels ("saturate") with epoxy, a supply of inexpensive, throw away 1" diameter by 3" paint rollers and throw-away trays is required.

FIXING AGENTS

CAREFULLY READ AND FOLLOW THE MANUFACTURER'S INSTRUCTIONS FOR MIXING THE RESINS and CATALYSTS THAT YOU ARE USING!

For gluing, MSD recommends: epoxy resin with some microfibres, or cotton linters, (e.g.: West epoxy resin 105, Hardener 205 and 403 Microfibres). Refer to the *User Manual*!

When using resins, most cases of undue delay or failure to cure are caused by:

1. Cold weather.
2. High humidity.
3. Insufficient catalyst.
4. Mixture not thoroughly mixed together.
5. Use of an old paintbrush with traces of paint left in bristles.
6. Applying the resin mix over painted, damp or otherwise contaminated timber.
7. Use of resin over 12 months old.
8. Frost damaged resin.

THE STITCH AND GLUE METHOD

This is a misnomer for the actual process, which uses neither stitches nor glue!

Basically, the method is to “weld” together adjacent panels with epoxy resin (not glue) to make a permanent and immensely strong joint. While the resin is setting, the panels are held edge to edge with individual links, or “stitches”, of copper wire. The resin itself is held in place by glass fiber tape.

The following is an overview of the basic procedures involved in Wiring and glassing seams...

A series of “stitch” holes are drilled, as instructed, along the edges of the panels to be joined. Each hole has a counterpart in the opposite panel.

A piece of copper wire about is threaded through a pair of matching holes and twisted on the outside to form a link, like a loose leaf diary.

Before the resin and tape is applied, all the twists are tightened to pull the panels together and the inside loops are flattened, or pushed, into the joint.

Resin is painted along the line of the seams to the width of the tape. The tape is laid into the resin and more resin is stippled on to it.

After the initial coating of the resin in the seam has “set off”, it is lightly sanded, wiped and a final coat of resin applied.

HEALTH & SAFETY

Follow the epoxy manufacturers recommendations for protection of self, others and the environment.

Wear plastic or latex gloves, or use barrier cream when handling epoxy resins.

Use respiratory protection when sanding.

Have a helper to assist with moving and handling large unstable parts.

BEFORE STARTING TO BUILD – Some points to remember

1. When driving in nails or pins make sure that the head of the hammer is clean.
 2. All nails, etc. should be driven in using a flat, firm surface as a backing - iron weight or the head of an old hammer.
 3. The usual practice for screwing two pieces of wood together is to drill a hole the same size as the screw shank in the first piece of wood to be fixed and then a smaller, lead hole, in the other piece of wood. A screw should never have to be really forced into position. In soft wood, lead holes need to be somewhat smaller than ones in hardwood.
 4. Brass screws are easily twisted and broken. For the most part, MSD includes stainless steel screws in the kits. Put a drop of epoxy into screw holes to seal the wood.
 5. Do not try to glue wet, greasy or painted wood.
 6. When working in an out-building in frosty weather, do not let the glue or resins freeze before setting. This particularly applies to joints left to set overnight.
 7. The hotter the atmosphere, the quicker the glue and resin sets.
 8. Fiberglass strips must be absolutely bonded to the wood at all points with no air bubbles beneath them. Only sand the edges of the strips - the bonded corners must be as strong as possible.

(*You may be using fillets on the outside (visible) seams in the cockpit – read about this in the West System User Manual.*)
 9. Sanding: Use a softwood sanding block. Sand ACROSS the grain for PAINTED surfaces, and WITH the grain for VARNISHED surfaces.
 10. Do not use more glue than is necessary! A thin film of glue is quite sufficient to make the strongest joint.
 11. Cover the floor of the building area with paper or any covering material. Drips of epoxy will stick firmly to most flooring materials! Provide adequate ventilation when using epoxy.
 12. Place plastic cling wrap between clamping blocks, weights, sawhorses, etc. and the joint when gluing or coating. (This prevents them all becoming one!)
 13. DON'T try to build to a thousandth of an inch - it is not necessary. Try, by all means, to achieve accurate work but don't get worried if there is a tiny gap between seams (the resin will fill it) or if a piece of wood doesn't quite fit (trim it off slightly).
 14. DON'T listen to know-all's who are better at giving advice than building boats!
 15. Most parts are machined exactly to shape, and unless stated, they do not require any alteration apart from slight trimming. This particularly applies to hull panels and bulkheads. It is necessary however to chamfer some edges (e.g.: deck and side panels) to obtain a closer fit.
 16. Memorize these points - they apply at every stage of construction. To forget any one of them might prove a costly blunder.
-

If you are going to seal the wood parts (Epoxy barrier coating) do it now!
Follow the manufacturer's instructions and apply 2 coats.
The third coat may be applied during construction and sealing steps.

PRE CONDITIONING THE GUNWALES

Although it will be some time before they are used, the inner and outer gunwales should be curved roughly to shape in the following manner:

- Determine the way that each will be fitted in the boat.
- Suspend them in the roof of the garage, or support them between two boxes.
- Suspend a weight 48" (1.2 m) from the forward end to force them into the curve. (Note: This is not at the mid-point. More curvature is necessary around the area of the shroud blocks,
- Mark where the weight was attached.

When released the gunwales will resume their original shape, however, they will be less springy to handle.

CONSTRUCTING THE HULL

JOINING HULL PANELS

Parts 1 and 2 are joined together to produce the bottom two pieces of the hull. Parts 5 and 6 will, when joined, become the sides of the boat, and 7 and 8 are the ends (transoms).

The **bottom panels (1 & 2)**, and the **side panels (5 & 6)**, are to be made up in matching pairs. First, it is important to establish the pairs and mark the face sides accordingly.

A **butt strap (2i)** joins panel pairs 1 and 2.

With the pieces end to end, lay the butt strap centrally over the join and mark its position on each section. Apply glue (epoxy with some filler) to the butt strap, to the panel edges where they meet, and to the marked area of the panels. The butt straps can be held in place temporarily with 7/8 " copper nails at the corners. Clamp the joint with clamps and cauls (long clamping blocks) or put weights (bricks) on top of the joint to apply clamping" pressure. *(Don't forget: Put some plastic between the bricks and the joint, and under the joint on the work surface so that they don't all wind up glued to the boat!)* Allow the joint to set up and then remove or pinch off the nails.

Use **butt strap part 6i** to join panel pairs 5 and 6 in the same way. Ensure that the butt strap is far enough away from the top edge of the panel (25 mm) to permit the inner gunwale to be fitted later.

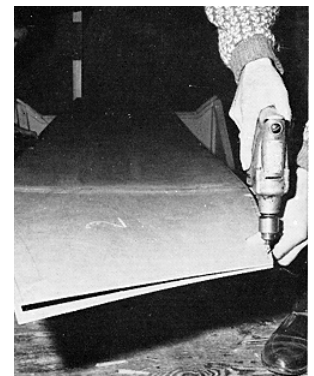
MARKING AND DRILLING HULL PANELS

Before lacing the hull together it is necessary to mark and drill the lace holes, install glue blocks, and mark the position of the stringers...



Place the one bottom section on top of the other, with butt straps on the inside, so that the two shapes match exactly and the cutaway portions that will form the centrecase slot are together. Draw a pencil line $\frac{1}{4}$ " (6 mm) from the edge all the way round the top panel, excluding the centrecase slot. A marking gauge is useful. Along this line, at 4" (100 mm) intervals, mark positions for lacing holes. To provide extra strength at each corner and at the butt joints, mark two extra points between the 4" (100 mm) marks.

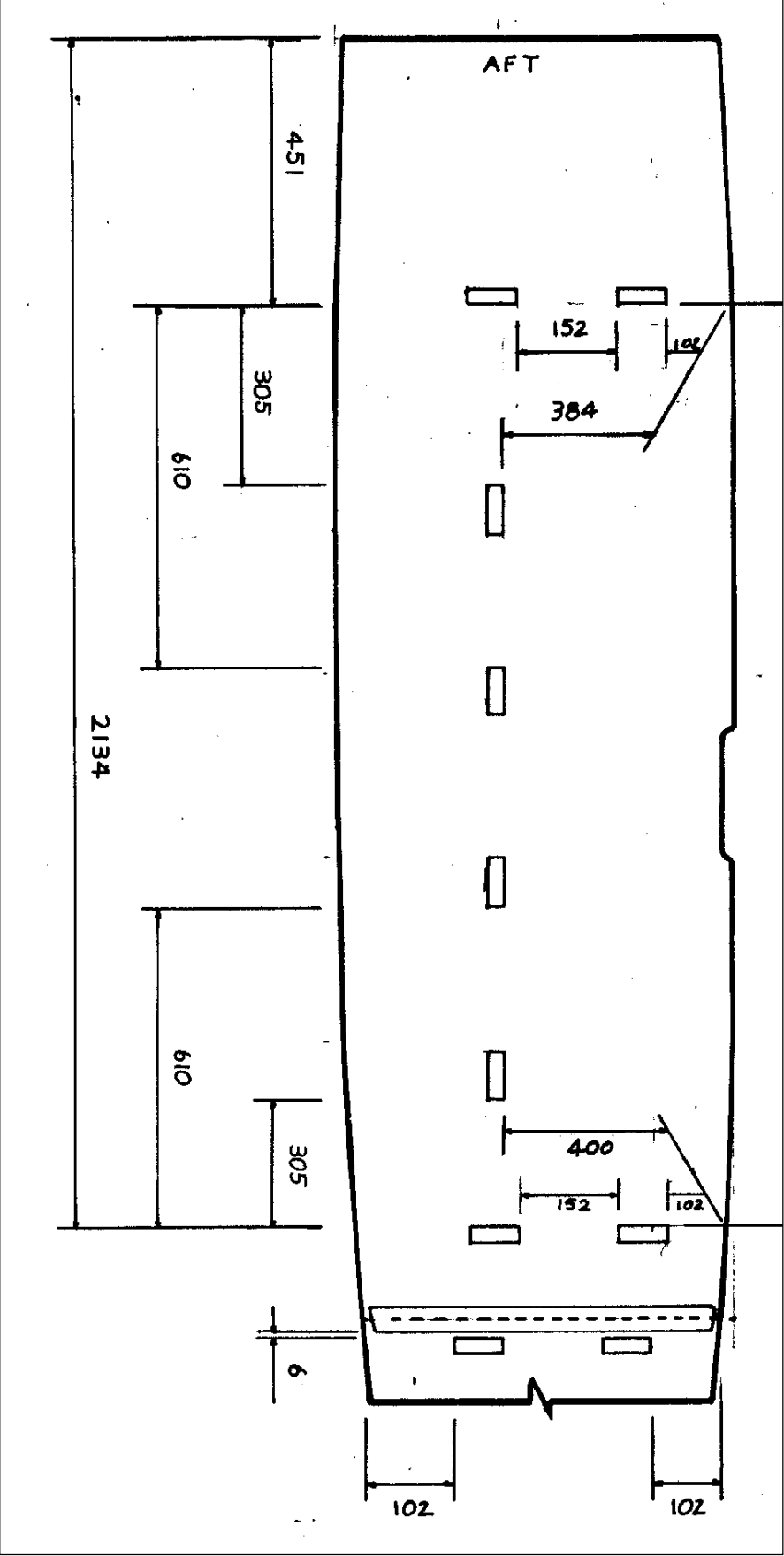
NOTE: The holes closest to the centercase slot must be at least $1\frac{1}{2}$ " (40 mm) away from the slot.



Holding the panels in correct alignment, use a $\frac{3}{32}$ " (2 mm) diameter bit to drill the lacing holes through both panels at the same time.

Because the holes on the side panels have to coincide exactly with those on the underside hull panels when one curve is tensioned against the other, a slightly different technique is used to mark their positions...Place one side exactly on top of the other with the butt straps on the outside. Draw a line $\frac{1}{4}$ " (6 mm) from the edge along the curved edge of the panel for only 3 FEET (900 MM) from the **NARROWER END** (i.e. the bow) and along the two ends of the panel. Make the drilling marks 100 mm apart, as before. Along the straight edges, at the bow and the stern, the holes should be $1\frac{1}{4}$ " (32 mm) apart.

Glue Block Layout Diagram 2



All dimensions are shown in millimetres.
Not to scale.

Glue Block Alignment



The top edges of the side panels do not have holes because they do not form seams.

Again, hold the panels in correct alignment and drill 3/32" (2 mm) lace holes through both.

IMPORTANT: Each hole on one panel must, when the hull is assembled, be directly opposite a matching hole in the adjoining panel.

The position of the **glue blocks** is shown in Diagram 2. Mark the bottom panels and fix the glue blocks with epoxy glue. Apply the glue to the block and to the panel position and slide the blocks around in a circular motion to obtain a "vacuum" so that the blocks are held in position while the glue sets. Do not move the panels until the glue has set solid.

NOTE: All glue blocks are beveled. The beveled side is always facing towards the centre of the boat.

Marking the position of the stringers (9)

Make a **pencil line** 5 inches (125 mm) from the top edge of the side panels (this will be a guideline for placing the stringer (Part 9) later).

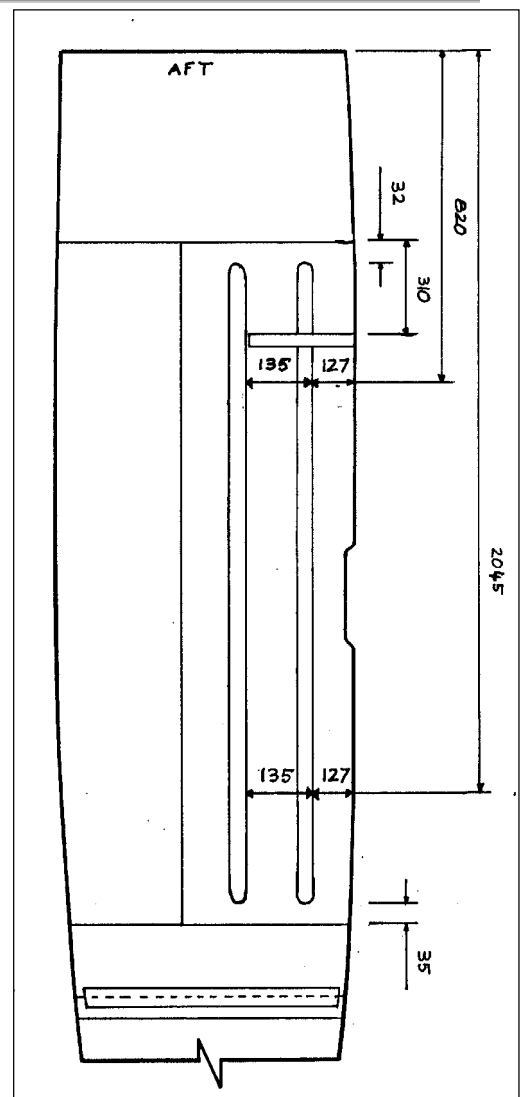
FIXING THE FLOOR BATTENS (4)

It is easier to fit these battens on the bench before the boat is assembled, but a much sweeter curve of the bottom panels is achieved if the Floor Battens are fitted once the hull is completed. Either way; they are fitted with the same technique.

Before fitting the battens, round off and fair the ends and edges (check Rule 1.6.12).

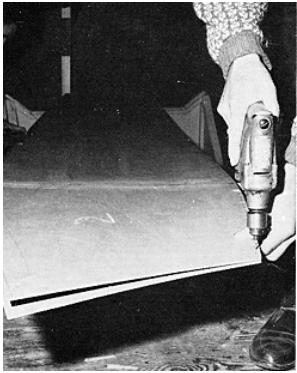
Mark the position of the battens as shown. Extra battens may be installed as noted in Rule 1.6.12. Fit them between the centrecase and the footrest, on either side of the taped centre joint.

Drill a series of holes 3/32" (2 mm) through the plywood bottom panel in a zigzag pattern the length of each batten position at 4" (100 mm) spacing. Do not drill holes at the extreme end or centre. Apply epoxy glue. Lay the battens in their relative positions as shown and drill & screw (#6 x 1/2") both ends and centre of each batten, through the batten into the plywood panel. Once this has been done, turn the panel over, drill pilot holes in the battens through the holes in the plywood, and fix the rest of the screws through the ply into the batten. Set the screws in epoxy glue (i.e. put a drop into each screw hole and behind the head). Ensure the screw heads are seated below the surface of the ply.



LACING THE BOTTOM - (Joined Panels 1 & 2)

Cut the **copper wire** in 2 ½" (65 mm) lengths

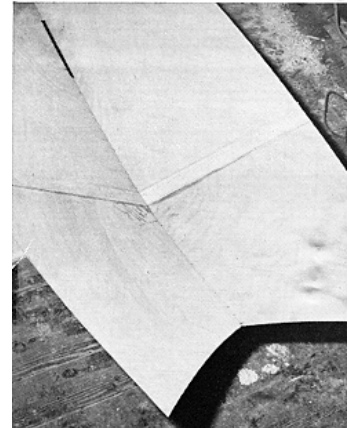


To be able to appreciate the next steps, lay the four long panels on the floor in their respective positions with the two bottom panels together and the cutaways forming the centrecase slot and with the side panels either side of the bottom section. (See the inside front cover of this booklet.)

Put the bottom panels together, with the butt straps on the inside, and each pair of corresponding lace holes in line. Thread pieces of copper wire through the matching holes in the edge that contains the centreboard slot to link the panels together. Twist the ends of each piece of wire two or three times to give only a

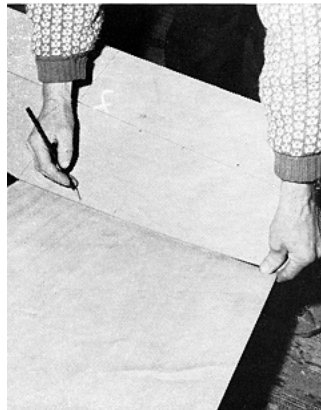
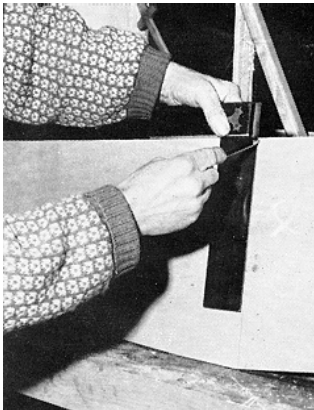
loose fixing. Wires will be tightened later when the hull is aligned. To simplify matters at a later stage, twist all wires in the same direction!

Open the bottom panels out like a book to form the lower section of the boat. The two joining edges should NOT overlap but fit **EXACTLY EDGE TO EDGE**. The two cutout portions should also coincide to form a complete open slot.



FITTING and FIXING THE AFT TRANSOM (7)

NOTE: The aft transom, fits INSIDE the Hull Panels.



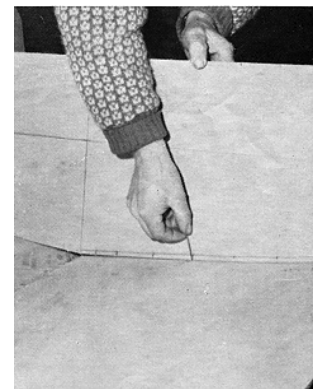
Draw a vertical line exactly down the centre on both sides of the **aft transom (7)**. Use these lines to match the transom with the seam of the bottom panels. Mark off corresponding lace holes on the lower edge of the transom against the corresponding holes in the after edge of the bottom panel – ¼" (6 mm) from the edge.

Match the side edges of the transom with the corresponding after-end of each side panel and mark the lace holes. Drill the 3/32" (2 mm) lace holes in the transom.

Note that the top 6" (150 mm) of the side panels in contact with the aft transom top are nailed and glued, not wired.

Use the trestles and the support pieces to support the bottom panels. Rest the transom on the aft edge of the bottom panels and fasten with pieces of copper wire through the corresponding holes. *It is important that the aft face of the transom is flush with the aft edge of the bottom panels.*

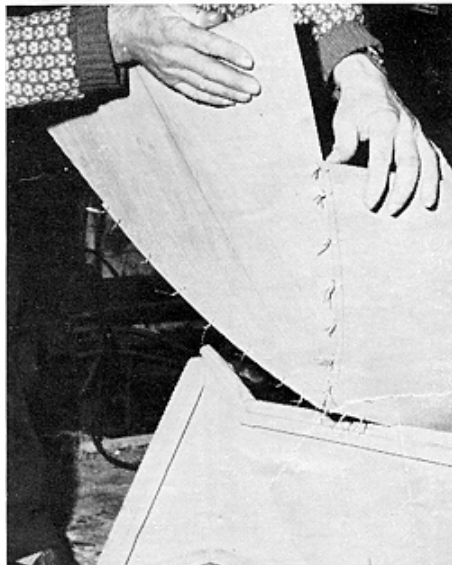
You may find it necessary to use pliers to ease the wire through the holes.



FITTING AND FIXING THE FORE TRANSOM (8)

NOTE: the fore transom fits INSIDE the Hull Panels.

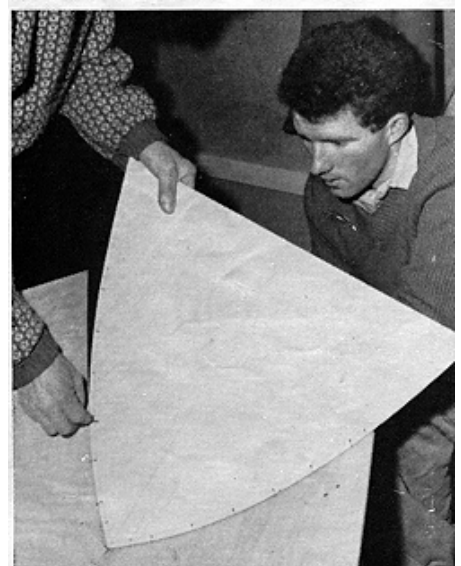
Mark the fore transom in a similar manner to that used on the aft transom... Again, draw a vertical line on both sides through the exact centre of the transom so that it can be matched to the centre line of the hull. Note that the gunwale and stem post (not shown in the pictures) face out! Also, note that the fore transom riser has been fixed to the fore transom - it requires trimming at both ends. Bevel the two curved edges of the transom to make a cleaner and tidier joint between the fore transom and the bottom section. Drill the 3/32" (2 mm) lace holes.



Fix one side of the fore transom to the corresponding bottom panel using the copper wire pieces to the same tension as that on the aft transom. Note that the ends of the bottom are curved, but when they are bent around the transom the two curves cancel each other out and appear to straighten.

Two people are needed for the next stage - lacing the other curved edge of the fore transom to the other bottom panel.

While tensioning the bottom panel against the curve of the fore transom and fitting in the wire laces, the assistant tightens them on the outside by twisting. As far as possible, the fore transom should be flush with the bottom panels.

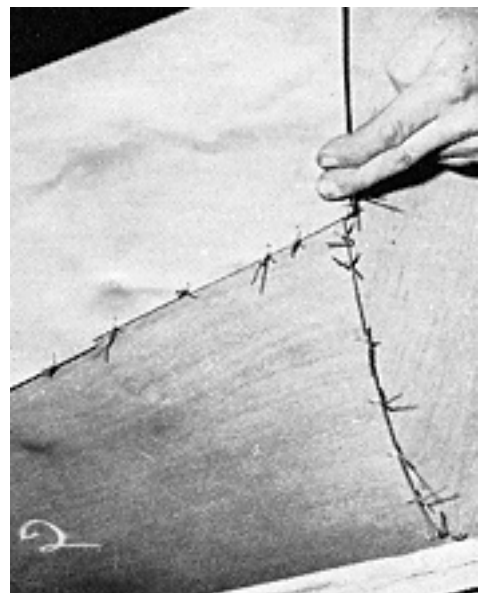


FIXING THE SIDE PANELS (5 & 6)

Another two-man job: one to hold the side panel at the correct angle; one to do the lacing.

When fixed, the side panels should be flush with the front of the fore transom and the aft of the aft transom, i.e., the transoms fit inside topside panels.

Begin at the narrow end (forward) of the panel and progress to the stern. Lace the lower edge of the sidepiece to the bottom section through the matching holes so that the curving edges fit exactly (at the front, for about 12" (300 mm), the sides butt to the outside edge of the bottom). There is a notch cut on the edges of the topside panels that allows the panels to go from being edge-to-edge to being outside the bottom (i.e.: forward of the notch, the bottom and side panels butt up together; aft of the notch the side panels overlap the bottom panels). Some



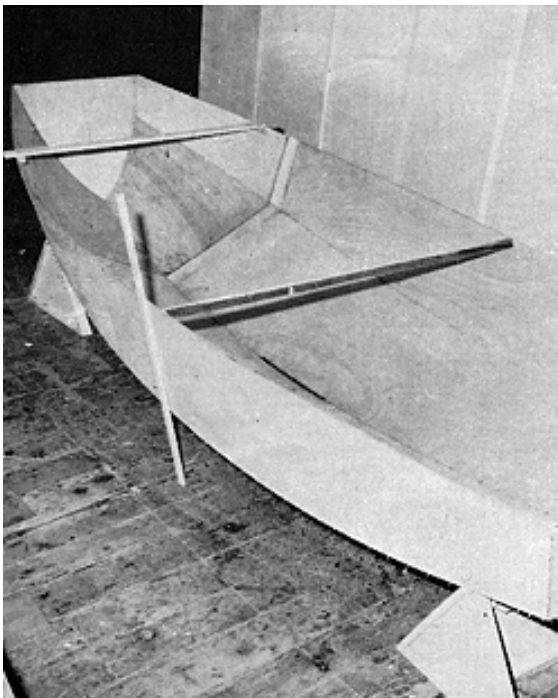
beveling or trimming at the notch may necessary to make a nice fit.

Only the first 36" (900 mm) of the sidepiece has been drilled for lace holes. Work along the lower edge - towards the stern - drill holes and lace with wire (one at a time) corresponding to the holes in the bottom panel.

Before lacing the last few holes near the aft transom, apply glue to the side of the transom beam and fasten the side panel to the transom beam using 7/8" copper nails or glue and clamp (requires long clamps and angled clamping blocks).

Attach the other side panel in the same manner.

ALIGNING THE HULL



To ensure that the hull is held in the correct shape, two **shaping cross struts (34 & 35)** have been included in the kit. Measure along the curve of the top edge of the plywood side panel 27" (686 mm) and mark. Fix the shorter strut (34), level with the top of the plywood and centred on the marks, with screws through the plywood into its ends.

Place the longer strut (35) in the same manner at a distance of 52½" (1334 mm) from the aft end of the side panel measured along the curve at the edge of the panel.

About 4" (100mm) forward of the longer cross strut fix a vertical prop on either side of the boat.

The props are not supplied as part of the kit. Use any longish piece of wood (a piece of the wooden crate?). A screw holds each of these to the hull and the lower end rests on the floor.

Aligning the hull...

The tops of the two transoms have to be fixed parallel and square to each other in all three dimensions!

To see if the line of the top edge of the fore transom is parallel to the corresponding top edge of the aft transom, look along the length of the hull just over the aft transom. Adjust the props until the transoms line up and any twist in the hull is remedied. Alternatively, two pieces of thread, or light string, can be stretched taught from corner to corner, over the top corners of the transoms... adjust the props until the threads just touch where they cross.

Some builders use a long spirit level to true up the top of the transoms, and subsequently, use it to use it to set up the bulkheads.

To check if the hull is square, measure the diagonals. When square, both measurements will be the same. Adjust the hull until it is square.

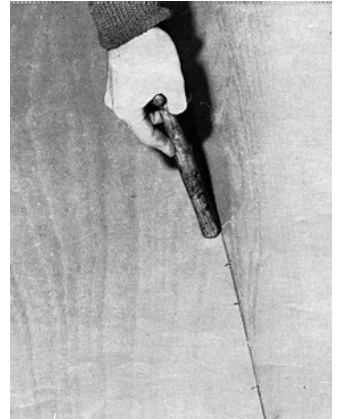
FROM TIME TO TIME, DURING THE FOLLOWING STAGES OF HULL CONSTRUCTION, DO A QUICK CHECKS ON THE ALIGNMENT.

Tightening the laces

Tighten all the wire laces coaxing the panel edges as flush as possible.

Inside the hull, flatten the loops formed by the wire laces to the shape of the hull: use a long piece of wood, e.g., the handle of a hammer, and press it hard into each loop.

For successful sealing, it is vital that every loop is completely flat and pushed tight into the joint.

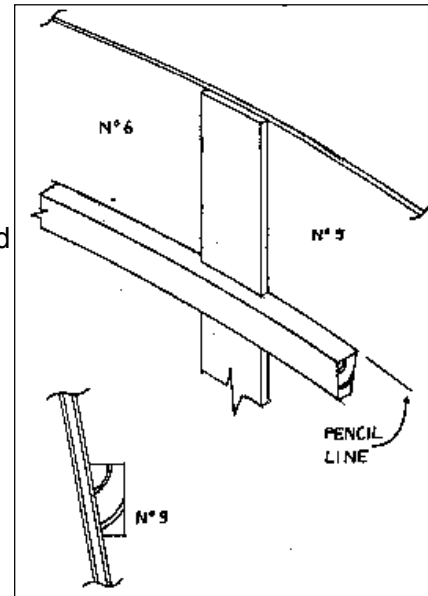


Fitting Stringers (9) to Side Panels (5/6)

Earlier, a pencil line was drawn 5" (125 mm) from the top of the side panels. This is guideline for installing the stringers (9)

At the fore and aft transoms, the lines on the side panels should coincide with the position of the risers that are already fixed to the transoms. Adjust the guideline along its length if necessary.

Using a 1/16" drill bit, drill through the hull (inside to outside) 1/4" (6 mm) below the adjusted guidelines at 9" (230 mm) intervals. Place the stringer with its beveled face to the plywood, and the wide side up, below the guideline. Mark the butt strap position on the stringer and chisel out the wood to accommodate this. Apply glue, and pin with 5/8" brass pins. Take care not to split the stringers at their ends. Saw slots, cut halfway into each stringer, about 1 1/2" (40 mm) apart, for the forward 18" (650 mm) may help fit the stringers to the curve of the hull.



MAST STEP WEB - STOWAGE BULKHEAD ASSEMBLY (10 & 10A 10v)

Glue and nail (1 1/4" copper nails) the mast step web (10 a) to the forward side of the stowage bulkhead (10). Make sure the web is vertical, centred, and between the doubling pieces of the cut out on the stowage bulkhead. At this time the openings in the bulkhead can be sanded and faired off before installing the **DRIP RAIL** (10v) (glue and pin or clamp) across the aft face of the bulkhead just above the openings.

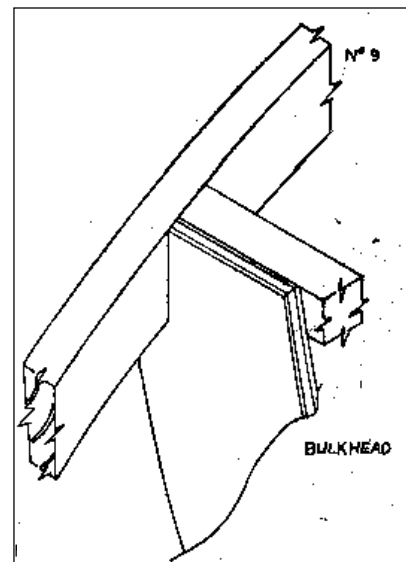
PREPARATION OF BULKHEADS AND TRIAL FITTING

So that the hull panels will conform to the correct shape the three bulkheads will be forced into their respective positions before the resin sets in the seams. Therefore, before the next step, where the seams in the hull are sealed the bulkheads must be prepared and trial fitted.

Enlarge the notches in the plywood at the corners of all the bulkheads so they will fit neatly under the stringers.

Bevel the bottom and sides of each bulkhead so that they sit easier in the hull, i.e. the forward face of (10 & 11) and the aft edge of (12). Bevel the battens at the top of the bulkheads to match the side stringer (9).

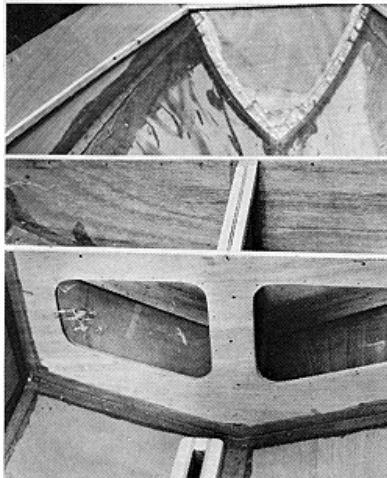
Check the drain holes vs. the supplied fittings. (It's easier to adjust now rather than after the bulkheads are in position)



Since the forward inspection hatch may be fitted into the forward bulkhead or the fore deck. – See Rule 1.6.9 – make a decision! If you are fitting the inspection hatch into the aft face of the forward bulkhead (11), do it now! Also, fit the drain hole fittings now!

IMPORTANT: Seal the edge of the plywood and surrounding area with epoxy prior to fitting the hatch and plug fittings.

ALL BULKHEADS NEED TO BE STRONGLY FORCED DOWN INTO THE HULL ESPECIALLY IN THE CENTRE.

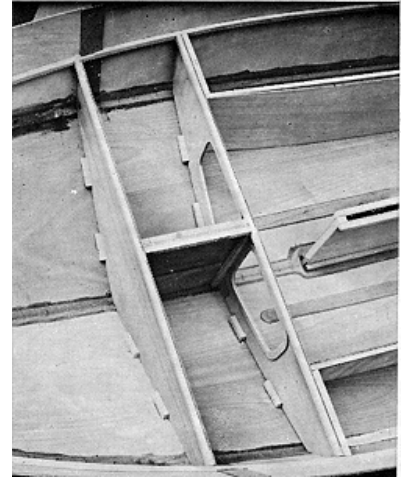


The forward bulkhead fits between the butt strap and the 4 forward glue blocks. Trial fit it into this position.

The stowage bulkhead – mast web assembly fits between the forward bulkhead and against the aft face of the glue blocks.

The aft bulkhead fits against the forward face of the glue blocks.

(Note: These pictures were taken at a later stage after joint taping! Shown here to illustrate general arrangements of bulkheads)



The side tank sides (13) fit against the upright pieces on the aft and storage bulkheads. These panels may need to be trimmed slightly to fit. Bevel the bottom outside edges. They must fit snug. (In some cases the top batten (13i) is not fixed to the side tank panels. Fix with glue and copper nails.) Drill a 15 mm +/- 5 mm drain hole in what will be the lowest position (check appropriate size vs. the supplied fittings)

SEALING THE HULL SEAMS

THE RESIN USED FOR SEALING THE SEAMS MUST BE MIXED STRICTLY IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

DO NOT EXPERIMENT.

DO NOT MIX TOO LARGE A QUANTITY FOR IT WILL NOT LAST AND CANNOT BE USED LATER.

We suggest using 6 or 8 oz plastic drink cups, Popsicle sticks for mixing and disposable brushes for spreading.

Wear latex gloves (get the heavyweight blue or purple ones).

Before mixing resins (and getting it on your fingers!):

- Cut appropriate lengths of the glass cloth tape for all the interior seams;
- Check that the wire ties have all been pressed tight into the seam; and,
- Re-check that the hull is straight with no twist along its length.

Depending on the working time for your resin (i.e., the set-up time which is determined by the type of epoxy used and the temperature, etc.) you may have to seal the seams in sections. Follow the manufacturer's recommendations and suggestions.

Paint the resin on both sides of the seam just wider than the tape. Lay the tape on the seam, angling it into the shape of the hull and pressing it flat into the resin. Once the webbing is in position more resin must be applied to its top surface pressing it down with a stippling action, right into the weave of the strip. Sticky fingers will pull the tape apart! A 1" spatula or a wide blade screwdriver will be very useful here. Take care not to stretch the woven fiberglass tape when placing it along a joint.

Make sure that there are no air bubbles and that the glass strip is fully wetted out with resin (it almost goes invisible!).

While the resin is hardening it is vital that the hull is not moved out of alignment!

So that the hull panels will conform to the correct shape the three bulkheads should be forced into their respective positions before the resin sets in the seams.

FIXING THE BULKHEADS

Forward Bulkhead (11)

The forward bulkhead is positioned between the butt strap and the four forward glue blocks. Glue and nail (3/4" brass pins) through the ply bulkhead into glue blocks. To hold the bulkhead down in position it may help you if you pin through the top corners of the bulkhead edges from above and angled into the stringers using 1" copper nails.

STOWAGE BULKHEAD & MAST STEP WEB ASSEMBLY: UNITS (10 & 10A)

Apply glue to the glue blocks and the forward edge of the mast step web. Use brass pins (3/4") to fix the stowage bulkhead to the glue blocks. It is essential to press the underside of the hull upwards to meet the bottom of the stowage bulkhead. Ensure that the top of the web assembly is level with the forward bulkhead. Using 1" copper nails in a zigzag pattern, nail through the forward bulkhead into the mast web uprights.

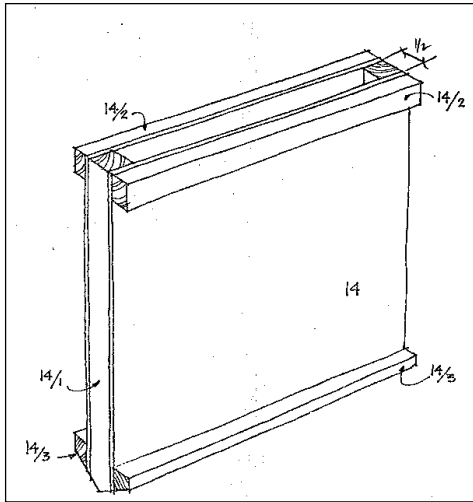
AFT BULKHEAD UNIT (012)

The aft bulkhead is fitted the same way as the forward bulkhead except the glue blocks are on the aft face of the bulkhead.

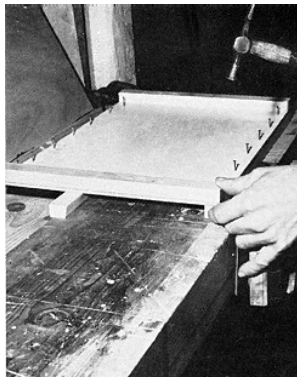
SIDE TANK SIDES UNIT(013)

Glue and pin to the uprights and glue blocks. It is essential to press the underside of the hull upwards to meet the bottom of the side tank sides.

ASSEMBLE THE CENTREBOARD CASE UNIT (14)



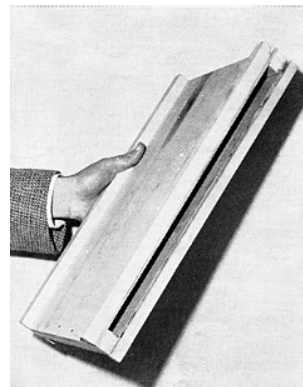
Glue and $\frac{3}{4}$ " brass pin the two centreboard packing pieces (14i) to the shorter edge of a centreboard panel (14). Fix the top ends flush with the edge of the centreboard side panel so that the packing pieces project at the other end. That end now becomes the bottom of the centreboard case. These packing pieces will be sandwiched between the outer edges of the plate case.



Fix the top (14ii) and the bottom (14iii) edges with $\frac{3}{4}$ " brass pins to what will be the outside of the centreboard (the bottom pieces are the two beveled strips. The bevel goes at the bottom where the packing pieces protrude slightly). The top and bottom edges are pinned and glued flush with the outside edge of the centreboard.



Coat all surfaces that will be inside the centreboard case and exposed to water with 2 or 3 coats of epoxy. Sand between coats and make sure that there is a smooth finish.

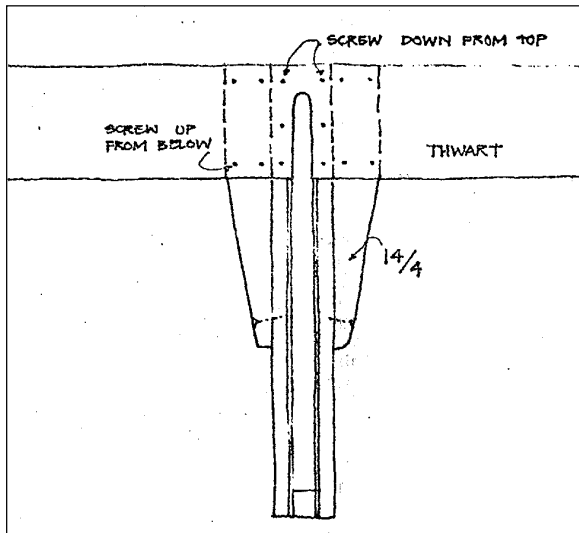


Glue and pin the two separate sides together to form a deep slotted case.

IT IS IMPORTANT THAT THE TWO SIDES BE EXACTLY IN LINE WITH EACH OTHER SO THAT THE TAPERED BOTTOM EDGES FIT THE BOTTOM OF THE BOAT WITH THE CASE STANDING AT THE SAME RELATIVE ANGLE TO BOTH SIDES OF THE BOTTOM.

FITTING THE CENTRECASE UNIT AND THWART

To protect the **Thwart (14a)** from splitting and damage while shipping, the cutout has not been completed. The cutout in the thwart has to be opened as indicated to allow the dagger board to fit into the box. That should be done later. The thwart is drilled with 2 - 5/8" holes. Pegs are supplied to ensure that the centre case and the thwart cut-out are aligned and held in place while the glue sets.



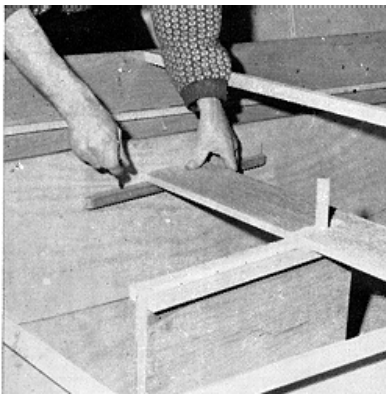
Drill 6 - 3/16" (2 mm) holes down through the thwart into the battens of the centre case and counter bore.

Use 1" x 8 SS screws and glue to fasten.

Alternatively, today's epoxy resin glue permits this joint to be glued and clamped until set. This will leave the top of the thwart free of screw heads and give a nicer appearance.

The centrecase knees (**Centrecase supports, 14ai**) are fitted underneath the thwart up against the sides of the centrecase top battens. They are glued to the

underside of the thwart and to the centrecase. Screw to the underside of the thwart with 1 1/4" x 8 screws. At a point 1" (25 mm) from the narrow end of the thwart knees drill a 3/16" hole through the sides into the battens. Fix with 2 — 1 1/4" x 8 screws. Round off and fair all edges & corners with sandpaper (with the exception of bottom battens) to make a more professional job.

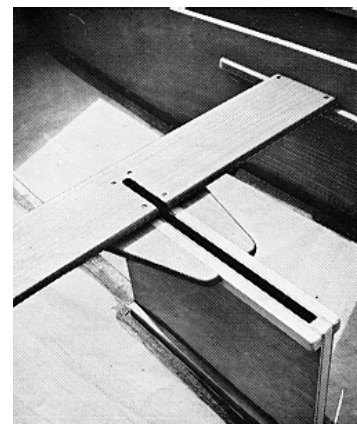


The unit will be installed into the hull and the ends of the thwart will be supported by the **Thwart Supports (13ii)**. The approximate position of the thwart supports has been marked on the side tank panels (13). To determine the exact position, with an assistant, place the centrecase/thwart assembly in position with the slot in the hull aligned with the centrecase opening. The two side tanks will have been forced outwards by this action. Ensuring that each end of the thwart is at the same distance from the top of each side tank, draw a pencil line along the underside of the thwart on each side to indicate the position for the top edge of the thwart support. The aft end of each riser should be 30" (75 mm) from the aft bulkhead. Before attaching the thwart supports taper the ends and fair the edges where they will be exposed (leave the area that contacts the

thwart square). Noting that the Rules allow some (50 mm) tolerance in the fore-aft position of the thwart, hence the fore-aft position of the centrecase, glue and nail the thwart supports in position.

Before putting the unit into the hull, drill 2 - 3/16" holes at each end of the thwart, 1/2" in from the ends and 1" in from the sides and counter bore. Alternatively do not drill if glue alone is going to be used to fasten the thwart to the thwart supports.

The centrecase/thwart unit is now ready to be fixed into the hull. Apply glue to the bottom of the centre case battens (beveled edges) and around the slot in the hull panels. Make sure that the slot in the hull panels is in line with the centre case slot in the unit, and the aft edge of the thwart measures the same distance from the forward face of the aft transom at both sides (Rule 1.6.8: min.1315 mm, max. 1365 mm). You



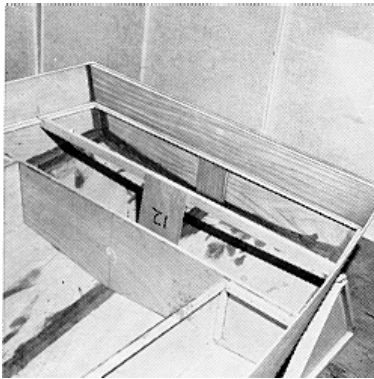
can now screw the ends of the thwart onto the thwart riser, using 4 - 1" x 8 SS screws, or, alternatively, epoxy glue and clamp.

Turn the hull over. Use 3/4" copper nails to nail through the hull ply into the centre case battens at 2" intervals to fix the centre case to the hull. When set, clean off excess ply around the slot, to form a clean exit for the dagger board.

Note: that the centre case is central in the hull and that it is plumb upright, otherwise the dagger board will be out of true.

Turn the hull over!

FITTING THE AFT DECK BEAM (15) AND SUPPORT (15i)



The aft deck beam is simply fitted centrally across the aft deck compartment; parallel to both transom and bulkhead; with the cutaway corners at either end fitting up to the stringers. It is fastened by an angled pin the same as for bulkheads. Later on, the aft deck will be fixed with pins along the line of this beam. To locate its position - make a mark on the hull above each end of the beam.

The aft deck beam supports the aft deck. The aft deck beam support (15i) supports the beam from the floor of the hull. Place the support tight against the hull and fasten with glue and nails to the centre of the beam. Later, the lower edge of the ply will be glass taped to the hull. Any ply protruding above the deck beam is to be trimmed off.

PREPARATIONS FOR FIXING DECKS

At this point the hull of the boat has a well in the centre surrounded by what will be four buoyancy tanks. Before the decking is placed into position, to complete these tanks, the seams and joints must be sealed. Before sealing fair off the corners of the glue blocks so that there are no corners, or pockets that could trap water that may accidentally enter the tanks.

Sealing must include BOTH inside and outside of all bulkheads and side tank sides where they meet the hull and also the vertical joins where they meet each other. Rule 1.2.2 requires 1 layer of tape on these joints and seams. You may wish to use a fillet joint on the outside (i.e.: in visible areas). Fillet joints are described in the epoxy handbook. Apply the resin and tape or fillets to the cockpit well first, so that any resin applied to the inside of the buoyancy tanks will not drip through. Also more care should be taken brushing the resin on neatly in the cockpit as this will be seen under the varnish.

Inside the tanks, seal all inside seams in the same manner as the hull seams. The purpose of the webbing and tape inside the tanks is strength. Fix short strips between each pair of glue blocks and NOT one long piece curving round each block. Give another coat of resin to all existing seams. Also, fair out the corners around the glue blocks with epoxy.

Glass tape and resin must also be placed along the foot of the mast web and the aft beam support. It should also be placed around the centre case unit where it meets the hull inside the well of the boat. The centre hull seam in the well needs an extra coat of resin, and, because of extra wear in this area, an extra strip of tape may be applied.

The insides of all tanks and the stowage compartment must be painted or sealed with epoxy in order to prevent condensation rotting the wood. MSD recommends sealing with epoxy according to the

manufacturers' instructions. Make sure that every surface inside the tank gets at least two good coats and that all joints are well sealed.

FITTING DECK PANELS AND FIXING BEAMS AND BATTENS

As a general note, each piece of decking, because it is made of thin ply and is liable to receive heavy treatment, needs some form of strengthening beneath it. The aft deck beam holds up the aft deck and has already been installed. In the case of the fore deck and the side decks you merely have to fit battens of wood to give a certain rigidity to the ply.

FITTING AFT DECK

The aft deck is supplied slightly larger than required. Trim for a neat fit. The forward edge must be level with the forward edge of the aft bulkhead. Seal the underside of the aft deck with epoxy according to the manufacturers' instructions.

FITTING SIDE DECKS, FIXING OF SEAT BATTENS (17) Backing Blocks and Side Tank Bulkheads (extra parts)

Side tank bulkheads have been supplied as kit extras. These should be installed within the thwart area approximately 1400 mm from the forward face of the transom. They may need trimming to fit. Tape and glue these, on both sides of the joint, to the tank side panel and the hull panels. Seal the bottom inside corner edge of the plywood, but leave an open channel for drainage.

Also, supplied as an extra in the kit, are two obeche backing blocks for the fairleads. If you are installing (later) fairleads positioned for "Inside Sheeting" you may want to fasten these blocks to the underside of the side decks at this time. (It is easier to do this now than having to work through a 6" diameter inspection hole!) The blocks are positioned aft of, and clear of, the side tank bulkheads. Glue the blocks into position and pin through the deck into each corner of the block. The pins show the confines of the block area when the fairleads are fitted later. See rule 1.7.3. (Note that blocks do not have to go under the seat, they can be placed on top of the side decks).

Check to see that the side decks fit correctly. Do not trim the panels at this time. Trim them later, when fitting the shroud blocks.

Rather than fitting the seat battens lengthwise (along the grain of the plywood) along the underside of each side deck, MSD recommends the following - see photo page 49:

- Cut the long **batten (17)** into short lengths that will fit between the stringer and the side tank batten;
- Glue one piece to the top edge of the side tank bulkhead (and mark its position on the side deck top), and;
- Evenly space and glue the other pieces across the side deck panel (22).

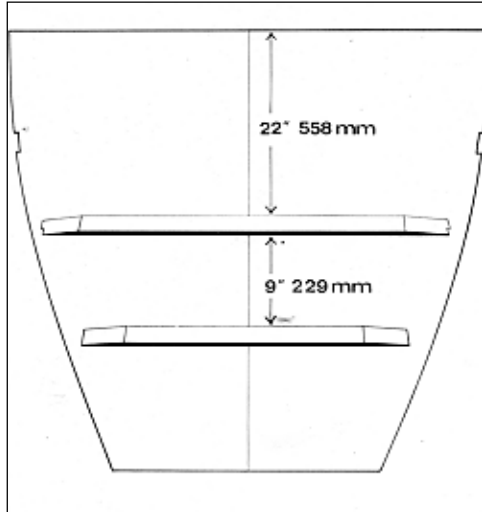
Seal the underside of the side decks with epoxy according to the manufacturers' instructions.

ASSEMBLY AND FITTING OF FOREDECK (18)

Fair off and smooth the edges of the **butt strap (19)**. Join the two pieces that form the **fore deck (18)** with the butt strap. Use the same technique as before. Use ¾ " brass pins if you wish to nail (they will be visible). When the deck is finally in position the butt strap will lie on top of the deck along the centerline of the boat.

Put the fore deck into the hull and trim where necessary to obtain a good fit. Bevel the sides and forward edge of the completed deck so that it fits neatly up to the hull and forward transom. Notch the ply where the butt straps are. The decks in your kit may be slightly longer than is necessary (up to 1/2") this allows for slight adjustments. It is important to trim the aft edge of the fore deck, so that it lines up with the aft face of the stowage bulkhead ply.

FIXING FORE DECK BEAMS (20, 20a)



The illustration indicates where these beams are fitted to the underside of the fore deck. Mark their outline on the underside of the fore deck. Glue, and if desired, pin with 3/4" brass pins from the top.

Seal the underside of the fore deck with epoxy according to the manufacturers' instructions.

THE UNDERSIDES OF EACH PIECE OF DECKING MUST BE SEALED SO THAT WHEN THE FOUR TANKS ARE ASSEMBLED THE INTERIORS ARE COMPLETELY COATED

"FAIRING OFF"

This is the technical term for leveling or smoothing off the stringers and battens onto which the decking will be glued. There should not be a lot of fairing off to do but the tops of the bulkheads should all be flush with the side stringers and side tank sides. This is to give the best possible gluing area. Check that the hull is still square, by aligning up with the bulkheads and transom, and measure the diagonals. Make any adjustments prior to fitting the decks.

FIXING THE DECKS (018, 022, 023) AND SHROUD BLOCKS (21)

Fixing The Decks Locks The Hull Shape In Position! Any Adjustments For Twist Or Squareness Must Be Made Now!

Once again you may elect to use only epoxy glue with some filler (cotton linters/microfibres) to fasten the decks in position. Today's materials lend themselves to this. Have at hand a supply of plastic wrapped bricks or other materials for applying "clamping" pressure during set-up.

You may also elect to use glue and nails (pins) that are visible.

Fix all the decks in position in the following order:

FOREDECK (018)

Glue (and pin) along the stowage bulkhead, around the stringers and fore transom riser and along the mast step web and forward bulkhead. If used, all pins are spaced at 2" intervals.

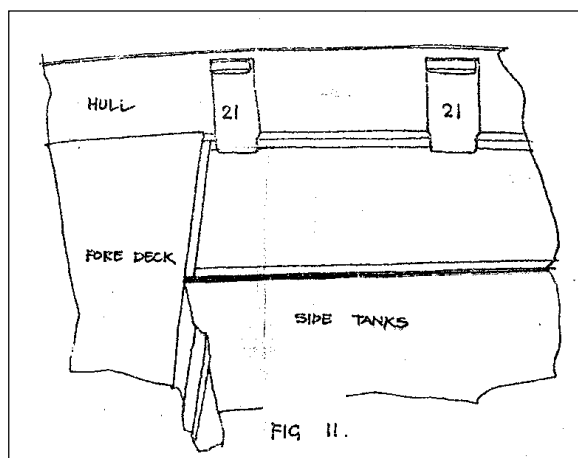
AFTDECK (023)

This is glued (and pinned) to the aft transom riser, aft bulkhead edge, aft deck beam and the stringers.

SHROUD BLOCKS (021)

The shroud blocks have rebated ends one which fits over the stringers and the other end into the gunwale recess. These blocks are fixed into the hull by means of four $\frac{3}{4}$ " x 8 brass screws set in the form of a square, from the outside of the hull into the lower half of the block.

Two sets of shroud blocks are supplied in the MSD kit. You may elect to install only one pair if you do not intend using the boat with the mast in the forward "CAT RIGGED" position i.e.: sail the boat with only the Mainsail. There is only one notch cut in the side decks and only one notch cut in the inner gunwales. If the second pair of shroud blocks is installed then these notches need to be cut.



The Class Rules (1.6.14 – also, Measurement item #34) state a measurement of 1823mm +/- 15mm forward of the aft face of the aft transom to the centre of the aft shroud block measured parallel to the centerline. The centre of the second pair is 10" (254 mm) forward.

Put the side decks on top of the side tanks, so that the position of the cutout for the shroud block can be checked. Having put the side deck into this position mark the cut outs in the side decks on the vertical side panels. Remove the panels and cut out the second shroud block notch if required and bevel the panel edge to fit nicely with the hull side panel. The blocks

can now be fixed on the marks. Drill four $\frac{3}{16}$ " holes through side and counter bore. Glue and screw blocks into position and finally check their position. The Class Rules are strict at this point and so measure accordingly as a further check.

SIDE DECKS

These should be first laid into position before gluing and the length trimmed at the aft end. This end of the side deck must be level with the forward edge of the aft bulkhead.

Fix the side decks with glue (and pins). Leave the outer edge until last since, after removing the cross strut, the sides of the boat must be pressed inwards to form a close fit between the deck and the hull.

AFT DECK

Glue (and pin) to the aft transom riser, aft bulkhead edge, aft deck beam and the stringers. Glue between the ends of the side decks and the forward edge of the aft transom where they meet.

FITTING OUTER GUNWALES (016)

A gunwale is attached to the outside top edge of the hull from bow to stern.

Having been curved under pressure for a few days the gunwales should bend quite easily.

You will find it easier to sand the rounds on the bottom edges before fitting the gunwales.

Drill a hole for a forward retaining screw (1 ½" x 8) in each gunwale positioned so that the screw will run into the end of the fore transom top. The screw hole must angle in two directions to counteract the curves of the hull.

Apply glue to the gunwale and to the top outside edge of the hull (depending on the set-time of the epoxy you may need to do this in sections). Screw the gunwale it to the bow level with the fore transom and the top edge of it protruding above the side panel of the boat by about 1/8" (3 mm), at bow transom only. (The inner gunwales will be left 1/8" (3 mm) below the plywood side panel at the most forward end so that the bow shapes can be fitted flush after the edge is planed down.)

"C" clamps will be very useful at this next stage.

Once the forward end is screwed, the gunwale is nailed (5/8" nails) into place, progressively, a nail at a time, 4" apart gradually bringing the top edge of the gunwale flush with the ply edge of the side. You should achieve this after fixing about 2' (600 mm) of the gunwale. When nailing, support the back of the gunwale so that the nails get a good grip.

ALTERNATIVELY, the gunwales can be glued (epoxy with microfibres) and clamped in place until set.

When the gunwale is in position, it will actually overlap each end slightly. The after end of the gunwale can be trimmed flush to the transom.

SEALING THE DECKS

All the decking should now be sealed with glass tape and resin. This is used exactly as before and completely circles the hull where it joins the deck and also where the side decks meet the fore and aft decks. Some builders choose to use an epoxy fillet joint all around the decks and the hull (refer to the West System manual) believing that it offers more strength. Tape can be applied, sanded down on the edges, and a fillet applied.

There might be one or two small holes around the outer edge of the decking, e.g., at the butt strap position. Fill these first with a mixture of epoxy glue and sawdust.

Webbing should be applied over the edge of the side and aft tanks. This offers some wear resistance at the edges. Apply the tape with a single coat of epoxy as before. After it has set, sand down the edge of the tape to fair it into the panel. If all the panels are being "barrier coated" then treat the whole surface.

FITTING INNER GUNWALES (24)

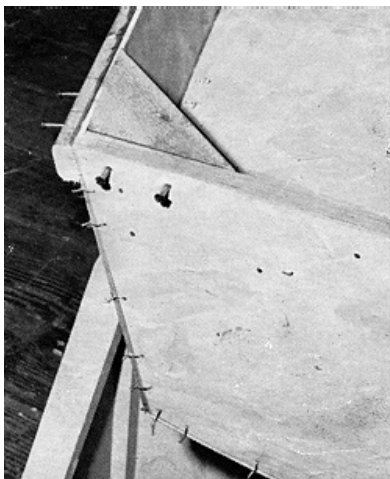
The inner gunwales are fitted on the inside of the boat opposite the outer gunwales. They have cut out portions which fit over the tops of the shroud blocks. You will see that the cut outs in the Inner gunwales have rounded edges. **DO NOT SQUARE THESE TO FIT SHROUD BLOCKS, CHISEL THE CORNERS OFF THE SHROUD BLOCKS.** If the second pair of shroud blocks is being installed you must make a second pair of cutouts in the inner gunwales. Do not cut these with square corners, cut the ends at 45 degrees.

In order that you have a bit of leeway with fitting, there is some extra wood at either end of the inner gunwales. Trim to fit inside the fore and aft transoms. Again, sand the bottom inside corner round and smooth prior to fitting, but leave it square where the gunwale sits on the shroud blocks. At the forward end fix the gunwale about 3 mm below the edge of the plywood. The edges should be lined up within 600 mm of the end.

Locate the inner gunwale over the shroud block(s), then working out towards the stern and then forward to the bow, glue and screw into place with 1 1/4" x 8 screws spaced 180 mm apart. Fix a screw each side of each shroud block. For a better job, put all the slots in the heads of the screws in line, or better still, plug them.

ALTERNATIVELY, you may glue (epoxy and microfibres) and clamp the inner gunwale in position until set.

FITTING OF QUARTER KNEES (25)



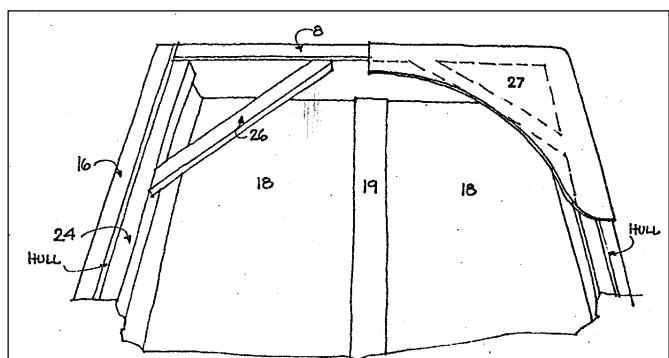
These are two triangular pieces of hardwood that fit into the top aft corners of the boat to strengthen the structure.

In turn, put each of these in position and mark where the transom and gunwales must be drilled. The knees should form a flush surface with the top edge of the hull. Drill 3/16" holes, with the knees in position, so that the drill pierces through, both parts as a guide for your screws. Glue and screw with 8 x 1 1/2" and 8 x 2" screws, each end into place.

Note: Picture does not show the inner gunwales installed - install the Quarter Knees after installing the Inner Gunwales

FITTING OF BOW SHAPES (27)

The **bow shape battens (26)** are placed under the inside edge of each bow shape. They lie diagonally across the corners of the bow to form a tangent with the curve of the bow shape.



Before fixing the battens and bow shapes, smooth off the top corners of the bow to make a flat surface on which the shapes rest. These are fitted and glued into position (with 3/4" brass pins) meeting at the centre line of the bow with the side edges running flush along the gunwales.

When the glue is hardened trim off the projecting corners of the gunwales. First, remove the two forward fixing screws and counter bore the holes. Replace the screws after trimming and plug the holes. Smooth off the edges of the bow shapes so that they blend into the outer gunwale.

FIXING THE MAST STEP(S) (28)

The Mast Step (28) is a square block of plywood that holds the foot of the mast in place.

The mast step web was fixed into position below the fore deck at right angles to and between the forward and stowage bulkheads. The mast step(s) is situated along the centre line directly over the mast step web. Measure 2160 mm +/- 15 mm forward from the forward face of the aft transom at deck level. This is the centre of the aft mast step. The centre of the second (Forward mast step for cat rigging) is 254 mm forward. The mast steps should be epoxy coated before installation. Note that there is a drain hole in the aft edge of the mast step. Do not plug up the hole! Glue and screw into position, with 4, 1" x 8 screws.

FITTING AND FIXING THE FOOTREST (31)

The footrest fits on the floor of the boat, over the floor battens, with its back edge 12" (300 mm) from the aft bulkhead and parallel to it - the centre line must coincide with centre line of the hull. Trim the footrest or the floor battens, if necessary, to ensure a neat fit. Draw a line around the footrest and drill four evenly spaced 3/16" holes along this position. Glue and fix with 3/4" x 8 SS screws. Wipe off any excess glue, especially from the central drainage hole.

FINISHING UNDERSIDE OF HULL

Turn the boat upside down and clip off all protruding portions of the wire laces flush to the woodwork. What ends remain have to be smoothed down level to the hull. An iron soled hand plane is best for this job because, although the cutting edge will suffer from the copper wire, the edge will be more uniform - apart from that, it's quicker.

With a "Surform" or file, work along all the outside seams making a smooth surface between panels. Trim off over-hang where necessary. Remove any overlapping ply from the centerboard slot,

Create a flat surface about a 1/2" (13 mm) wide along the centre line of the hull. Be careful not to plane so much away as to weaken the structure! At the stern end of the boat, for about 2'-3" (680 mm) of its length, the flat section along the centre line must be slightly wider (19 mm). The skeg will be fitted here.

Use medium sand paper on a block to finish smoothing off the edges and give the butt joints in the skin a thorough sanding in a diagonal direction. Keep in mind that the "Chines", (i.e., the joint between the bottom panels and the topside panels) will be finished to a sharp edge except in the bow area where the panels match up edge to edge.

The hull should now be entirely smooth and you are now ready to seal the outside joints.

SEALING THE SEAMS

By this time you should be quite an expert at using the webbing strip and resin for sealing the seams! Be warned that you are going to find this particular process rather more difficult than you did before: the corners curve away from the strip, and as webbing tends to be resilient, the edge of the strips persist in lifting off the hull. It is important that all the outside joints are absolutely smooth.

If, at the first attempt, the webbing will not lay tight – with patience and continual stippling with the resin, allowing intervals between each application for it to partially set, the best result will be achieved: a tightly bonded and smooth seam. Do not mix too much resin at a time.

Sufficient tape has been provided for two layers both inside and outside along the keel joint. The centre case slot should have only ONE LAYER of tape folded into the slot each side.

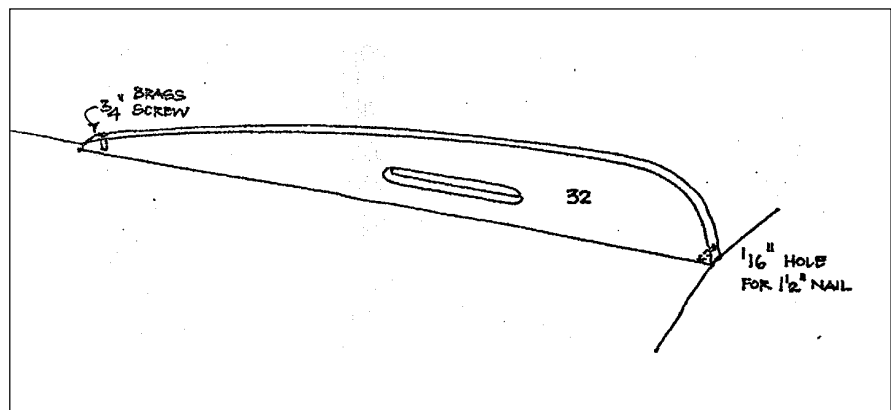
Before it sets, clean off surplus resin inside the centrecase to avoid binding or scratching the dagger board later.

Every single plywood joint has to be covered with one layer of tape and ample applications of resin, resulting in a completely waterproof hull. It is not necessary to apply tape down the join of forward and aft panels; the butt strap should be adequate. Give the outside of the hull a barrier coat of epoxy.

FITTING THE SKEG (32)



Fair off and roughly finish the skag according to the rules of measurement before fixing on the hull. This piece can be fitted while the resin on the bottom seam is still wet. It is held into position entirely by tape and epoxy. To keep it in place while the resin hardens use a retaining nail, (1 1/4" copper) sloping inwards fixed at aft end. The wider end of the skag is at the stern of the boat with its edge flush to the aft transom and exactly over the centre line of the hull. The forward end is fixed with a 3/4" screw.



Cut two lengths of tape 1" longer than the skag. Apply an extra coat of resin to the area which the skag will cover, screw the piece into position set the nail and apply the tape and resin to bond it down to the boat on either side.

FIXING THE BILGE PIECES (33)

Roughly fair and finish the bilge pieces before fixing to the hull (Class Rule 1.4.9) The aft ends of the bilge pieces are 760 mm +/- 30 mm from the aft of the aft transom, and they are 405 mm +/- 30 mm from the centreline and parallel to the centreline of the boat.

The bilge pieces are fixed to the outside of the hull either side of the centre line; they are actually screwed into the side tank glue blocks that are easily located by looking for a line of three pairs of pins. (If the glue blocks were not nailed, then measure, using the diagram with the glue block layout, ensuring rule compliance.) Drill 5/32" screw guide holes into the hull and countersink corresponding holes on each bilge piece, glue and screw into position with 1" x 6 screws.

FITTING OF ALUMINUM KEEL BAND

To finish off the underside of the hull, an aluminum keel band is screwed with 1/2" x 6 screws along the full length of the lower seam and up the fore transom for about 1". The keel band must finish at the forward edge of the centerboard slot. It starts again at the aft edge of the slot and continues along the seam and up over the skeg until it meets the hull. Short strips, either side of the centreboard slot, are fitted not more than 1" from the hull centre line.

Holes for the screws should be drilled and countersunk starting not more than 2" (50 mm) from the end of each piece and spaced about 4" (100 mm) apart between the holes at the ends. The ends of the aluminum pieces should be faired off and rounded with a file.

This job must be done very carefully. Set the keel band pieces in epoxy resin painted, and before putting in the screws dip them into resin to fully seal the screw holes. Finally, give the outside centre seam a coat of resin over the keel and resin over any protruding tips of screws on the inside of the cockpit.

AQUA DYNAMICS

The edges of foils and the skeg are beveled to make a more “aqua dynamic” shape: a good entry and a sharp exit. Bull nose (bullet shape) the leading edge of each piece (the aft edge of the hole in the skeg) and feather the aft edges. The amount of fairing or tapering that can be done is noted in the Class Rules.

FITTING OUT AND FINISHING

ASSEMBLING THE CENTREBOARD: (36)

The centerboard supplied with the kit must be shaped and faired off and the bottom corners rounded. Check the Rules (Rule 2) to see what the limits are. Note: The front edge is bullet nosed and should be smoothed off with sandpaper. The aft and bottom edge may be tapered off. A file or rasp is a handy tool for this job.

At either side of the centerboard top are **finger grips (37)**, glued and screwed (1" x 8 screws) in line with the edge. The crescent shaped cutouts facing down and out. The angled end of each finger grip is placed flush with the cut-off corner.

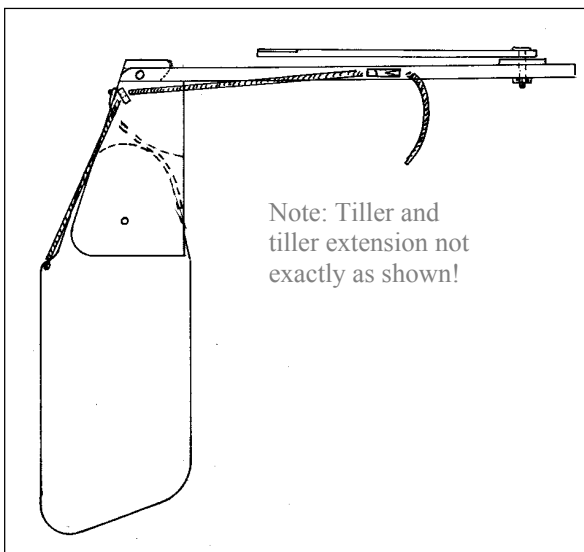
In the fittings you will find a centreboard retaining assembly. This holds the centreboard in any position. Install as indicated.

ASSEMBLING THE RUDDER: (038), (039), (040)

The **rudder-packing piece** is sandwich between the top ends of the **rudder cheeks** with the straight sides and the tops aligned.

Glue and screw (1" x 8), the packing piece in correct position to one of the rudder cheeks.

Coat the all the INSIDE portions of the rudder cheeks and packing with at least 2 coats of epoxy. Sand and finish with a third smooth coat.



Finish off the **rudder blade** the same way as the dagger board, but keep the feathering to a maximum of 25 mm (see Rule 3) Remember, the leading edge is bullet nosed and the trailing and bottom edges are feathered.

The **extruded tiller socket** is fitted down into the slots cut into the top of the rudder cheek assembly. It is set in epoxy (i.e.: to fill the slots) and fastened with pan head screws. The angled end should be in line with the aft of the assembly...

➤ On both sides, draw a light line across the top end of the cheek blocks 3/8" (8 mm) down from the top. On one side mark a point 1" (25 mm) in from the front edge and another approx. 2 1/2" (65 mm) away. On the other side make the marks at 1 1/4" (32 mm) and 2 1/4"

(60 mm), (this is to prevent the screws running into each other!).

- Mount the aluminum extrusion into the cheek blocks, Making sure that the packing is in contact with the extrusion and the cheek blocks come up to the shoulder on the extrusion. On the marks, drill 3/16" (4 mm) holes through the cheek block and through the aluminum extrusion only. Do not drill into the packing piece. After drilling the first hole, secure the socket with a screw (1"x 8 pan head) and then drill the other 3 holes.
- Remove the socket. Clean off any sharp edges and burrs with a fine file & or emery cloth.
- As this extrusion is a permanent fixture, coat the top edges of the plywood cheeks, and the packing with epoxy to seal the raw wood.
- Mount the extrusion: Set it in epoxy in the slots and fasten with the 4 pan head screws that have been dipped in epoxy. Wipe off any excess resin.

Fix the **rudder gudgeon** to the rudder cheek assembly.

Line up the first hole in the gudgeon over the holes already drilled in the rudder cheeks (038) to take the pivot bolt. The closed end of the fitting is parallel with the bottom of the rudder cheeks (038). This should be about 20mm (3/4") up from the bottom of the cheeks. Do not force the fitting into position! A shallow channel, the width of the metal bracket arms may have to be carved along the setting line on either side of the cheek assembly. This channel may only have to be about 1" (25 mm) long. Insert the rudder blade and temporarily insert the bolt. When fitted, tighten up the pivot bolt (not so as to prevent the blade from swinging). The rudder blade must be thoroughly sealed, and varnished or painted prior to final fitting into the cheeks. When assembly is finally completed, remember to rivet over the end of the bolt to prevent the nut coming off when under way!



The **rudder pintle** is fitted on the rudder assembly in conjunction with fitting the **transom gudgeon and pintle**. These are fixed up the vertical centre line of the stern. They are positioned as follows: ensure that there is 225 mm (9") between the BEARING SURFACES of each pintle and gudgeon when the transom pintle is fixed to the aft transom with its bearing 256 mm (10 1/4") below the top edge of the transom. It is most important that the rudder sits vertically on its bearings and arcs freely over a complete half circle.

Partially fix, BY JUST ONE SCREW, each metal fitting in its respective position and make slight adjustments to achieve the perfect positioning before the final fixing. With the boat turned upside down, with both the rudder and centerboard extended in position. Visually check that the rudder blade, skeg and centerboard are all in line with each other and they are all vertical.

In the fittings bag, there is a short piece of **elastic**, some whipping cord and 2 screws with washers. Form an eye formed at both ends. Fasten one end with a screw and washer to the top edge of the shoulder where the curve of the upper part of the rudder starts. The other eye in the elastic is led between the rudder cheeks. It is fastened on the aft side by a screw and washer as high as possible to the packing piece. Exert as much tension possible to ensure that the rudder blade stays down when under way.

To retract the rudder blade, a **cord** is fastened through a hole on the aft top corner of the rudder blade. From there, the cord runs up through an **eye** that is screwed on the side of the cheek and continues to a cleat on the side of the tiller. This can be assembled left or right –handed.

Tiller Assembly (New Style) (043)

This aluminum tiller is a more durable, stronger and simpler than the old style wooden kit tiller. It is supplied with all MSD kits. There are no rules of measurement for the tiller and many Mirror sailors have modified theirs to suit personal requirements. We believe that this tiller meets most of the requirements of the average Mirror sailor and will give you many years of satisfactory use.



Assemble and fit **the tiller tube and tiller extension**:

- Mount the forward edge of the **tiller extension-mounting pad** approximately 4" (100 mm) from the end of the tube. Use the pad as a template to mark the holes. Drill 1/8" (3mm) holes and secure the mounting pad with the supplied screws.
 - On the same centre line as the mounting pad, drill another hole 1/16" (1.5 mm) approximately 18" (450 mm) back from mounting pad. Fix the extension **handle clip**. (Take care not to turn off the head of the screw!)
 - Use the **jam-cleat (R3670)** as a template and mark the mounting holes on the right or left side of the tiller tube approximately 15" (375 mm) from the forward end. Drill holes and mount with the supplied screws. Again, take care not to screw off the heads of the screws! Use a little oil, or chicken fat, to keep them from sticking while they are forming their threads as you screw them in.
 - Knock any drill cuttings from the inside of the tube. Set the end of the tube on a piece of softwood, place the **end plug (R 0686)** on the end, hold vertical, and tap the plug into place with a piece of soft wood. Repeat for the other end.
 - Assemble the tiller extension and hold it in place with the clip. Insert the tiller tube into the tiller socket mark a spot on the centre of the topside of the socket and drill a 1/8" (3 mm) hole through both pieces. Remove the tiller tube and enlarge the hole in the socket to 3/16" (4.5mm) re-assemble the tiller tube into the socket and secure with a 3/4" x 8 screw. This permanently fixes the tiller to the rudder assembly.
 - ALTERNATIVELY To have the tiller removable: Drill the 3/16" (4.5 mm) hole right through both the top and bottom of the tiller socket and the tube into the centre packing, deep enough to take a 2" long cotter pin that should be tethered to the cheek block, so that it won't get lost.
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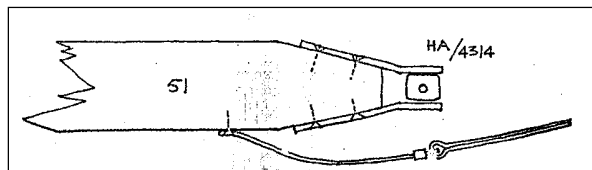
FITTING OF ALL SPARS

Fitting Up The Boom (051)

Refer to (Rule 5.2).

Finish the boom on all four faces with medium and fine sandpaper so that all the edges are rounded including the top edges of the tapered section.

The **boom gooseneck fitting (HA 4314)** is fixed over the shaped end of the boom with the arms screwed to the tapered sides.



The retaining cord for the gooseneck **split pin** is screwed to the side of the boom.

Screw the metal **tack-eye (BW155102)**, centred on the top, approximately 1" (25 mm) from the forward

end of the boom, directly above the gooseneck fitting.

Nail and glue the **kicking strap block (052)** on the top of the boom 21" (53.5 mm) from the tapered end to the vertical (square) side of the block away from the forward end of the boom.

Centred 1" from the outboard end of the boom, mount the **clew outhaul cheek block (HA 386)** on the centreline of the top of the boom.

Approximately 48" (1200 mm) forward of the outboard end of the boom, mount the **outhaul jam cleat (R 3670)** to the centreline of the underside of the boom.

Fitting Up The Gaff (48)

Refer to Rule 5.3

Finish the boom on all four faces with medium and fine sandpaper so that all the edges are rounded.

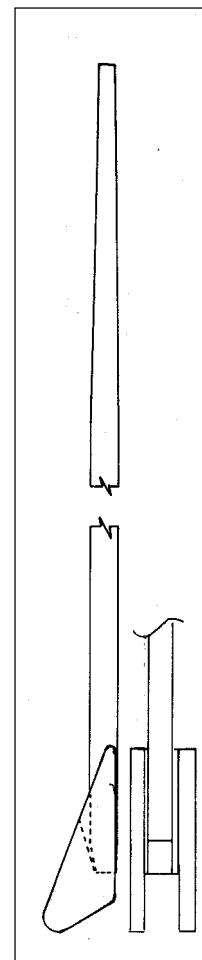
Taper the lower front surface of the gaff for about 6" (150 mm) reducing the end to measure about 1 1/4" (38 mm). (The front surface is the side opposite the slot!).

Fair and sand the slot and groove. The slot and groove should have a nice faired entry at the bottom end. The sail should slide in and out of the gaff easily with no snags. Coat the groove with epoxy, sanding between coats, and finish off smooth. Sand paper wrapped around a piece of 1/4" or 3/16" dowel is useful here! To be more sophisticated, make a small slot along the piece of dowel and fit a thin piece of Masonite to it to form a handle that fits in the slot. Wrap sand paper around the dowel and up the side of the handle insert into the slot and groove and sand away!

The **gaff jaws (49)** project to the front of the gaff away from the sail and align with the straight (grooved) side. The **gaff jaws packing (50)** fits between the gaff and the jaws to give the assembly side-to-side clearance on the mast. Check this clearance and adjust the thickness of the packing pieces before fixing in place.

Fix the gaff jaws and packing with glue (and screws). Do not screw into the slot or groove!

When the jaws and packing are set, fair off the edges of the outside of the jaws, and enlarge one of the holes into a small slot about twice as long as the hole diameter, and finish. Attach the piece of **elastic** through the hole (a figure-eight



knot whipped in place on the outside) and whip an eye on the other end of the elastic. To attach the completed gaff to the mast, the elastic eye is pushed through the enlarged hole in the other jaw and held in place with a wooden peg (a piece off a clothes pin, perhaps?)

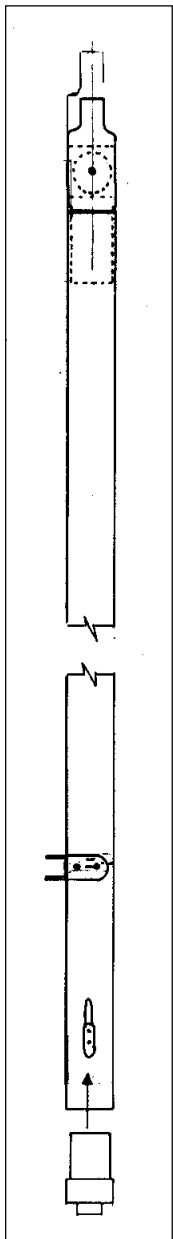
Drill a hole 5/16" (7 mm) centrally through the spar 3/4" (19 mm) from the top end going through from side to side (not through the groove)

Screw the **gaff band** to the gaff at a distance of 68" (1725 mm) from the top (tapering) end of the gaff to the bottom edge of the gaff band. The arms of the fitting should be either side of the gaff and the cross member (to which the mainsail halyard is eventually fixed) should be across the front surface.

Fitting Up The Mast (45)

See Rule 5.1

Assemble the mast:



➤ Attach the **mast gooseneck fitting (HA 4314)** to the mast using 4, 3/4" x 8 SS pan head screws. Drill four holes that match the four holes in the fitting. The bit size is just under the size of the screws. The lower edge of the gooseneck is 22 11/16" (575 mm) from the base of the aluminum tube. The portion of the mast gooseneck that the boom gooseneck fits into is now the AFT SIDE of the mast.

Fit the **bottom plug** into the mast...

➤ With a rasp or 80 grit sand paper, rough up the portion of the bottom plug that goes into the mast. Apply a heavy coat of epoxy glue all over (including the end). This ensures that there is a good seal between the plug and the aluminum. Insert the plug into the mast and align the square end peg directly fore and aft and side-to-side. Hold the plug in alignment with the outside of the tube (wrap the join with wax paper and tape tightly) and allow the epoxy to set.

➤ Attach the two **halyard cleats (R3632)** to the sides of the mast, 1 3/4" (45 mm) from the lower edge of the tube. These are screwed (1" x 6g. SS pan head) through the aluminum into the plug. Drip some epoxy into the drilled holes before inserting the screws. The screws hold the plug secure.

Assemble the **top plug**...

➤ Fair off the edges of **the slot** in the upper plug. Do not enlarge the width of the slot inside the plug itself. There should be a clean smooth edge for the halyard to pass over. Seal the inside of the slot with epoxy and smooth off the final coat.

➤ Fix **sheave (HA150)** in the upper wooden plug: Drill a 5/16" blind hole just over three quarters of the way through. Ensure that this hole is central to the slot and at right angles to it (or the sheave will bind on the side walls). Make a trial fit of the sheave and axle and trim the length of the axle so that it fits inside the plug. Seal the axle hole with epoxy. Inset the sheave and axel and stop up the axle hole with a piece of dowel, or epoxy and filler.

➤ As before, with a rasp or 80-grit sand paper, rough up the portion of the top plug that goes into the mast. Apply a heavy coat of epoxy glue all over (including the end). This ensures that there is a good seal between the plug and the aluminum. Insert the plug into the mast and align the slot directly fore and aft. Hold the plug in alignment with the outside of the tube (wrap the join with wax paper and tape tightly) and allow

the epoxy to set. When set, secure the plug with the $\frac{3}{4}$ " x 8g. SS pan head screw 1 $\frac{1}{2}$ " (45 mm) below the top of the tube.

➤ Test fit the bottom **end peg** into the mast step. Note that Rule 5.1.9 permits a maximum clearance of only 2 mm. Also, the mast should rest on the mast step and not be supported by the peg resting on the butt strap. (It's easier to replace the mast step as it wears than it is to do repairs to the deck!) Trim the plug end if necessary.

➤ Seal, smooth and finish the plugs.

FITTING ANCHOR PLATES etc.

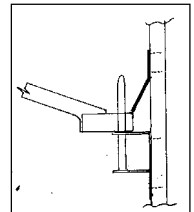
A **shroud anchor plate HA3** is fitted in upright position centrally to each aft shroud block.

The **forestay anchor plate HA3** is fitted inside the bow on the centre line of the fore transom about 1" (25 mm) from the fore deck surface.

A **kicking strap anchor BW 155102** is screwed in a vertical position, two-thirds down, on the centreline of the stowage bulkhead so that the screws penetrate into the mast step web.

Rudder Retaining Clip (R0760)

This is screwed to the transom as shown in the diagram. The lower edge of the clip rests above the lower rudder gudgeon and holds the rudder assembly in place. To remove the rudder depress the spring and slide the gudgeon up, off the fitting.



Centreboard Hold Down Assembly

Whip a small eye on one end of the **elastic cord**. Thread the **plastic tubing** onto the elastic and whip an eye on the other end of the cord.

Mount the **two jam cleats (R3670)** to the underside of the thwart centreline, 3" (75 mm) from the centrecase sides. Angle the cleats so that they face the forward edge of the centrecase. Do not insert the screws all the way at this time!

Place one end of the cord into (under) one of the jam cleats and tighten the screws into position. Stretch the cord over the centrecase and into (under) the second jam cleat. Fix the cleat into position. Adjust the tension of the cord by pulling one end back and jamming it into a cleat. The cord (and tubing) holds against the forward edge of the centreboard when it is partially raised. It passes over the top of the board when it is fully extended.

Jib Fairleads

DO NOT INSTALL JIB FAIRLEADS AT THIS TIME!!!

Wait until the boat is completely finished, fully rigged, with wind in the jib, and ready to launch!

The position of the jib fairleads is very much dependant on the cut of the sails and your personal preferences for sail set. You should also decide whether to rig for inboard or outboard sheeting. With inboard sheeting you may be able to sail closer to the wind but you will be able to stall the sail a lot easier!

Only fairleads are supplied with the kit. There are no cleats supplied. You may wish to install a combination fairlead/cleat assembly or two separate compatible units of your choice.

The fairlead position is approximately 12" (300 mm) aft of the aft edge of the rear shroud block. Position the jib fairleads so that they are both the same distance away from the forestay fitting.

Jib fairleads R2942 (as supplied) may be installed for outboard or inboard sheeting. For out board sheeting, the fairleads are mounted on the top edge of the hull and screwed down into the gunwale. For inboard sheeting the fairleads are mounted on the side deck tops (screwed into the backing blocks that were previously installed) or into blocks mounted on top of the side decks. See Rule 1.7.3.

Rowlocks

Rowlocks are optional extra items. They are located approx. 27" (635 mm) aft of the rear of the shroud blocks.

Drainage Bungs

Fix into the drainage holes in the tanks. Use clear, marine grade, silicone caulking to ensure a watertight/airtight seal. Fasten with 1/2" x 6 screws.

Transom Holes

Before finishing the boat, the transom **drain holes** should be faired and finished. Note the details in Rule 1.4.4.

Also, a **mainsheet attachment hole** must be drilled in the port side of the aft transom (see Rule 1.4.4), faired and finished. The **mainsheet block** is attached to the starboard side of the aft transom. (Note: when fastening down into the top of the transom, use a long - 2" (50 mm) - screw that is set in epoxy).

VARNISHING AND PAINTING

A really professional looking boat is painted on the exterior and varnished inside - the interior includes all the spars, the centerboard, tiller, rudder assembly and gunwales.

Before finishing, carefully remove all metal fittings from the boat and spars.

Refer to the West System *User Manual* for finishing. There is lots of information there (page 13).

For a really professional look, consider having the outside sprayed at an auto body shop with two-part linear polyurethane. This can often be done "after hours".

Finish with UV resistant coatings.

The I.S.A.F. plaque, which carries your sail number, must be fixed onto the inside face of the aft transom upon completion.

SOME BOOKS YOU MIGHT LIKE TO CONSIDER:

The Spare Parts and GO-FAST Accessory Handbook by John McCulloch available only from Mirror Sailing Development

Sailing the Mirror by Roy Partridge.

Mirror Racing by Guy Wilkins.

These last two books are available in most nautical bookstores and from Mirror Sailing Development.

May we wish you very happy safe sailing.
MSD thanks you for buying our Mirror Product.

APPENDIX

Building to Race

The Instructions for assembly of the standard Mirror kit are not so vastly different. You should follow each step as described in the book, with the following exceptions...

The centrecase, and thwart risers, have not been assembled. If you decide to shorten the height of the case sides, profile the bottom edges of these panels to the eventual shape of the hull. Only trim the top edge. The bottom rails (bed logs) must be shaped to conform to the case sides. Current thinking is to fit the centrecase as far aft as possible. You may have other ideas!

If you are working to the extremes of the tolerances allowed in the measurement rules, allow 5mm inside the tolerances for fitting and trimming.

Stiffen up the top aft corner of the mast web with a triangular brace in the corner.

Adjustable chain plates must be bolted to the shroud blocks, and positioned so that they are both the same distance away from the forestay fitting.

Keep the weight as light as possible at both ends and topside of the hull. Remember that a build up of resin adds weight.

Profile an aqua dynamic shape to the Dagger Board, Rudder Blade, hole in skeg and the bilge keels. The rule is to have a good entry and a sharp exit.

Extra floor battens may be fitted in the cockpit area on either side. They should be fitted between the centrecase and the footrest, on either side of the taped centre joint.

Because of the strength of epoxy, much less mechanical fixing can be used. Mirrors have been built with no screws or nails!

In North America we strongly recommend the WEST Epoxy System for all your resin requirements. Study the provided user manual, talk to your fiberglass dealer for his input into the technical aspects of this system, and refer to the website: www.westsystem.com

YOUR NOTES:

MIRROR SAILING DEVELOPMENT
Parts List
(Jan. 2002)

Part No.	No. Required	Name
1	2	Aft Bottom Panel
2	2	Forward Bottom Panel
2i	2	Bottom Butt Strap
3	20	Glue Blocks
4	4	Floor Battens
5	2	Aft Topside Panels
6	2	Forward Topside Panels
6i	2	Topside Butt Straps
7	1	Aft Transom unit
8	1	Forward Transom unit
8iii	1	Forward Transom batten
9	2	Stringer
10	1	Stowage Bulkhead unit
10v	1	Stowage B'head Drip Rail
10a	1	Mast Web Unit
11	1	Forward Bulkhead unit
12	1	Aft Bulkhead Unit
13	2	Side Tank Panels
13i	2	Side Tank Battens
13ii	2	Thwart Supports
14	2	Centrecase Panels
14i	2	Centrecase Side Batten
14ii	2	Centrecase Top Panel
14iii	2	Centrecase Bottom Batten

14a	1	Thwart
14ai	2	Centrecase Supports
15	1	Aft Deck Beam
15i	1	Aft Deck Beam Support
16	2	Outer Gunwales
17	2	Seat Battens
18	2	Forward Decks
19	1	Forward Deck Butt Strap
20	1	Deck Beam (Short)
20a	1	Deck Beam (Long)
21	4	Shroud Blocks
22	2	Side Decks
23	1	Aft Deck
24	2	Inner Gunwales
25	2	Quarter Knees
26	2	Bow Shape batten
27	2	Bow Shapes
28	2	Mast Steps
29	2	Jib Fairleads (R2942)
30	2	Extra Hardwood blocks
31	1	Footrest
32	1	Skeg
33	2	Bilge Pieces
34	1	Rough Fwd. Cross Strut
35	1	Rough Aft Cross Strut
36	1	Centreboard
37	2	Centreboard Tops
38	1 pr	Rudder Cheeks
39	1	Rudder Packing
40	1	Rudder Blade
41	1	Aluminium Tiller
42	1	Aluminium Tiller Socket
43	1	Tiller Extension
45	1	Mast

46	1	Mast Top Plug
47	1	Mast Bottom Plug
48	1	Gaff
49	2	Gaff Jaws
50	2	Gaff Jaws Packing
51	1	Boom
52	1	Boom Block

Assembly Packs for MSD Kit

01-03BKR	Boom	Copper Nails; Fairlead; Clip; Cheek Block; Cleat; Screws; Rope
01-03BGKR	Boom Gooseneck	Gooseneck; Screws; Pin retainer; Washer; Whiplcord
00-04BTSKR	Drain Bungs	Bungs; screws.
00-05CBHDKR	Centreboard Hold-down	Cleats; Shock cord; Nylon Tube; Screws
01-05CBKR	Centreboard	Screws
01-07GBSKR	Gaff	Band; screws; Shock cord; Whiplcord.
00-08HCKR	Hatch for Forward Tank	Hatch Cover; 'O' Ring; Screws
02-10JSKR	Jib Sheet	19ft - 5/16" dia. Braided rope; Fairleads; Screws
01-11JHKR	Jib Halyard	Rope; Cleat; Pulley; Screws; Jib Strop
01-13KSKR	Keel Strip Screws	Flat head: 10 - #6 x 1/2" & 18 - # 6 x 3/4"
01-14MHKR	Main Halyard	Rope; Cleat; Screws; Mast Sheave; Axle

02-16MSKR	Main Sheet	19ft. - 3/8" dia. Braided rope; Fairleads; Screws
01-17MABKR	Aluminium Mast	Screw
01-20RKR	Rudder	Screws; Shock cord; Washers; Whiplcord
01_20RPHKR	Rudder Pivot Hardware	Pintles; Gudgeons; Screws
00-20RRCKR	Rudder retaining Clip	Clip + Screws
01-22SRKR	Shroud Rigging	Shrouds +Fore-stay + Rope
02-22SFAPKR	Shroud & Forestay	Anchor Plates HA3+ shackles
01-29TNKR	Tiller	Tube (part 41); Plugs; Extension (part 43); Saddle; Clip; Socket (part 42); Cleat; Screws; Fairlead Bridge; Rope

Nail & Screw Hardware bag:

500 (200g)	Brass pins	3/4"x1/16"
200 (160g)	Copper Nails	3/4" x1/16"
3	Copper Nails	1 1/4 "x 3/32"
36	Flat Head SS Screws	#10 x 1/2"
4	Flat Head SS Screws for Gunwales	#10 x 2"
64	Flat Head SS Screws for Floor Battens	#6 x 1/2"
22	Flat Head SS Screws for Centrecase	#8 x 1"

