Building a Scarab 32 folding trimaran

This boat was designed and built by Ray Kendrick. He wanted an easy to build affordable trimaran to live aboard and travel the coast of Australia.

The rig was designed as a sloop but Ray plans on making this one into a schooner. The plan calls for a pivoting centreboard but there is the option of a fixed keel.

The boat can be built using plywood or laminated foam panels.

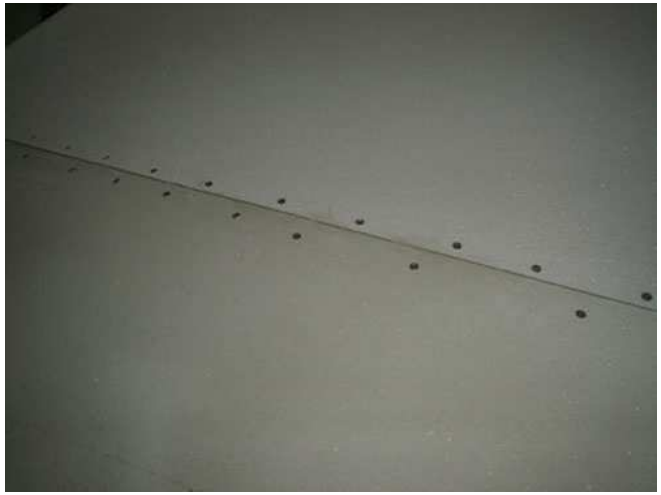
MAKING THE PANELS

FOAM COMPOSITE PANELS

We choose to make our own panels for convenience and cost. We use low emission styrene polyester resin (but you can use epoxy resin). Use Klegecell foam or similar.

The panels can be made to length before glassing. Tables are joined together using clamps. The foam is glued together (polyester/epoxy resin and Aerosil works well) and the foam is attached to the table using drywall screws. When the glue is dry remove the screws and fill the holes with resin and filler (Q-cells). Roll the glass out over the foam and smooth out. Resin is spread beginning at one end and only covering as much as you can work at a time. Make sure the glass is covered and compacted into the resin. Cover with peel ply and smooth out the air bubbles. It is much easier to work epoxy because of the longer set up time but the foam can shrink when the temperature drops quickly.

The panels are 10 metres long and we were making them in a 9 x 9 metre shed so our laminating tables were placed diagonally across the shed. We used polyester resin and could work about 2 metres at a time and immediately cover with peel ply. You would have more time using epoxy resin but we were working in summer and had to work fast.



LOFTING

After the panels are made or scarfed together if you are using plywood or pre-made sheets the panels are drawn up using the off sets dimensions. Plywood sheets can be stapled together and foam can be screwed together using drywall screws. This way you only have to draw the panel once and it saves time. The measurement for lofting are simple. Draw the datum line and mark the stations (500 mm) and measure up from the line using a square. Attach screws or small nails in the point and bend a batten to form a curve. Once one panel is drawn it can be cut using a jig saw and used as a template to cut the others.

BUILDING THE FLOATS

The building frame made from plywood or similar was set up as shown.

The panels were then attached to the temporary bulkheads using screw (for foam) or wired together (plywood).

The stem of the float is clamped together and bog is applied to all joints.

The joints are sanded and taped (if using pre-laminated panels) or glass over-all if using plywood. Taping the joints using fibreglass tape and resin. If the joint will be in an area to be finished then you can use peel ply. This will make finishing much easier. The bottom panel and the bilge panels are covered with an additional layer of double bias glass and peel ply to protect the bottom of the float.

The float is turned and joints taped on the inside (pre-laminated panels) or glassed overall (plywood). It is easier to tape the inside joints using a wet fillet before taping.

Before gluing the bulkheads, the area is well sanded. Stringers are laminated in to strengthen the sides of the float.

The bulkheads are temporally held in place and taped. A couple of deck beams are added to support the deck.

The transom is cut and added. In-wales were glued and clamped to support the deck.

Pre-drilled metal to support the chain plates was attached to inside of float.

Glue was liberally spread on top of bulkheads, deck beams and in-wales. Deck was added using metal strapping to hold it in place.

The deck was taped to the float. All joints were sanded and float was filled ready for paint.

The floats were primed and anti-fouled ready for the beams to be added.

BUILDING

THE BEAMS

One of the most important things is to start with a strong mould that can last through 4 beams. It can be made from plywood or form-ply with plasticine as a fillet. The plasticine will have to be re-done with each beam.

This beam mould was built using plywood primed and painted. The fillet on the inside joint was made with resin and filler so no need for plasticine and the moulded beam just slips out. When the beam sides are made drill small holes to show the pivot positions.

The mould is waxed and polished about 5 times initially and once between mouldings. It's best to use soft wax over plywood but I used hard wax over the painted mould and it worked well.

Cutting the glass is a bit time consuming but it is a job that can be delegated to a willing helper.

We have found that there are air bubbles in the surface of the beam, difficult to remove before painting, unless gelcoat or resin containing filler is used as the first coat.
We use polyester un-waxed (laminating resin) except for the final coat of resin which contains wax. If you use un-waxed resin laminating can be spread over several days. This allows the builder time to rest and prevents too much heat building up which will cause shrinkage and distort the beam. If you use a thin CSM (chopped strand mat) layer as the initial layer you will have a smooth finish that is ready to paint.

By using polyester laminating resin, the job can be spun out over many days. Some people insist on using epoxy resin but there are horror stories of people who have developed allergies.

The glass is layered in the beam mould. The pilot holes for the pivot positions were drilled in the beam before it is released from the mould.

The beam flanges are trimmed and the beam is ready to be installed in the floats.

BUILDING THE MAIN HULL

The building frame was set up like the float building frame. The pre-cut panels were attached to the building frame like the floats using screws for foam or wire for plywood. The distance between the temporary bulkheads must be accurate but using this method the boat will be self-levelling. Add one panel at a time making sure the joints are tight.

When all the panels are attached bog between the joints and sand. The joints can then be taped with glass tape (covered with peel ply. If the boat is plywood then the boat can be covered with glass and peel ply. The stem is clamped as the float and glued and taped.

Once the boat is taped or glassed then the whole hull is filled and faired.

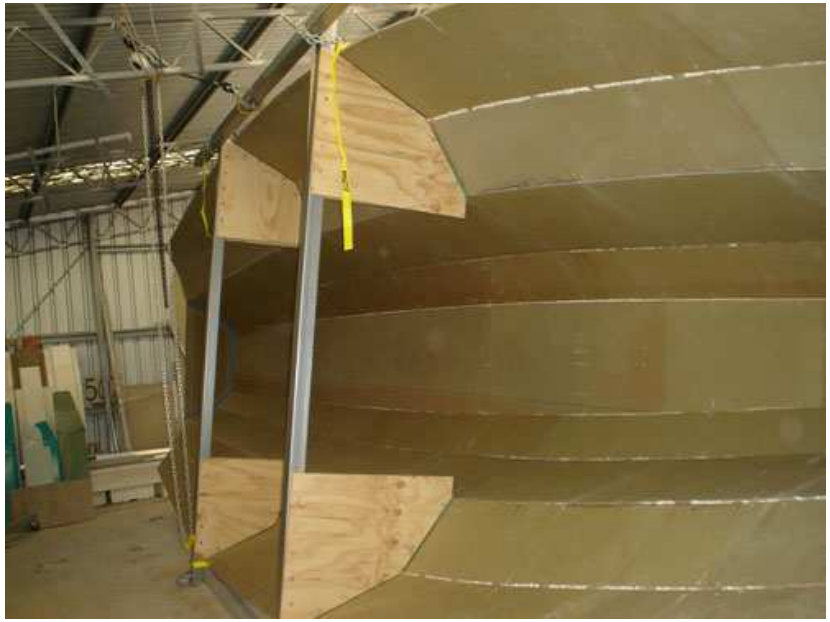
The boat can be primed and painted. Mask the top panel so the beam stubs can be added when the hull is turned. We also added anti-fouling on the bottom.

The water line was set up using a laser leveller on a tripod and the system worked really well.

Now the hull is ready to turn over. This can be a big job but Ray managed to turn it on his own with the help of a little physics.

Two 75mm x 75mm steel square sections across the hull at deck level bolting them to temporary plywood partial bulkheads which were in turn bolted to the hull. The forward one was bolted at Station 4 where the beam stubs will extend outside the hull so no worries about the bolt holes, the aft one was attached at Station 6 so I will have some bolt holes to fill and patch.

A chain block was used to lift one side of the hull and then carefully let down to allow the hull to sit on its' bottom.



After the hull was turned over the joints were taped.

Bulk-head Number one has been taped in two halves, a lower half and an upper half. This was done to facilitate the installation of the anchor locker shelf. By splitting the bulk-head the builder can stand on the bottom of the hull while installing the anchor locker.

Partial bulkhead (2) was taped in. Not shown.

Bulkhead 3A is lofted cut out in two pieces. The foam around the opening is removed and filled with filler. Then the bulkhead was tacked in and taped.

The area under the forward lockers was painted.

The bunk top is best cut along the centreline with a butt strap glued to the underside. Ray did it in one piece but would strongly advise doing it in two halves.

The locker lid support frames were then glued in.

Bulkhead Number 4 was cut out and the beam stubs added It was too large to handle so it was cut on the centreline to be re-joined when set up in the hull.

The extra glass was added on the beam stubs. Total thickness is 60 mm. Pivot holes were drilled using a hole-saw.

All the ragged glass was cut off the edges using a combination of diamond studded cutting disc and angle grinder.

The edge of the beam stubs was filled and covered with 600gsm double bias cloth. To set up the two halves of the bulkhead the location was marked and checked many times before cutting the panels for the beam stubs to protrude. A temporary aluminium square section was laid across the hull and the two halves of the bulkhead were able to be clamped and aligned.

The two halves of the bulkhead were lifted into the hull using an engine crane. Once everything was fitted and aligned the filleting and taping was done.

This bulkhead (4) and (8) are double taped to the hull.

The outside taping was filled and faired ready to paint.

Bulkhead 6B was taped in next, then 8 also with the beam stubs using the same method as used for Bulkhead 4.

The outboard motor will be supported by Bulkhead 8A, this was taped in together with the sides of the outboard motor well and the cockpit floor between 8A and the transom. The large volume of hull between Bulkhead 8 and 8A was made into a 'wet locker' about 500mm wide between 8 and 8A which will hold about 60 litres of fresh water in 3 containers. The hatch will be a fairly tight-fitting lid and will only leak in prolonged heavy rain, with the fresh water in jerry cans there will not be much water to pump or sponge out.

Horizontal shelves to the sides were added for a navigation station and a shelf for the portable fridge and platform for the porta-potti.

The inside has been polyester Flo-coated white, applied with a mohair roller. If any modifications need to be made or additions laminated on, the polyester flo-coat will be easier to prepare than grinding paint back to the fibreglass.

The cockpit was built with number 4 and number 6 bulkhead used as supports for the cockpit seats.

The deck and cockpit were painted with Jotun Imperite and Kiwi Grip non-skid deck paint.

The curved panels for the cabin roof were made using foam that had been glassed both sides, saw cuts were made through the top layer of glass at 50mm spacing and just more than half way through the foam using a diamond studded blade in a small circular saw.

A batten mould was then constructed to the correct curve to correspond with the tops of the bulkheads. The sheet was then draped over the batten mould, the saw cuts filled and the top covered with double bias glass, four of these panels were made and placed on to the top of the cabin sides.

To move the main hull out of the shed it needed to be laid over on a trolley so it can pass through a 3metre wide opening. The trolley is made using 75x75x3 square hollow section steel on large castor wheels strong enough to handle the weight.
To get the hull onto the trolley 2 Gantry cranes from 75x75x3 square hollow section steel with the uprights were welded to the floor bearers and the top beam bolted to the uprights. Polyester slings, purchased from a specialist lifting shop, were slung one about station 3 and one about station 8.

The anchor roller and mooring pennant roller were bolted to the deck.

The boat was painted with Jotun Imperite with Kiwi Grip for the non-skid areas.

Masking tape was used to mask around hatches and where fittings will be located, winches, cleats and mast steps. The Kiwi Grip was applied with a thick brush and then textured with the special texturing roller. The finish can be modified for the depth and severity of the non-skid by adjusting the pressure on the texturing roller.
The anchor and mooring pennant rollers are from EX-CELL same as the anchors, they were a bit expensive but beautifully made, real works of art. I had to make two L shaped brackets to bolt to the sides of the stem to effectually extend the deck so that the mounting was efficient with enough bolts holding it horizontal.