

The Building of Freedom.

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April.2013.

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Introduction.

I cannot remember the first time I ever thought that I would like to build a boat.

Maybe I should explain that last sentence because it sounds like if I wanted to build a boat then I would quite simply start building, and of course, I would have the skills to do this.

I think maybe I should have stated how wonderful it would be to be able to build a boat.

It is something I have always marvelled at but never believed I had the skills necessary to complete such a task.

My understanding of boat building over the years has been quite limited and I thought that wooden boats needed an internal skeleton upon which planks could be fitted and sealed to form the shape of the boat and seats etc added as required.

Then there was the fibreglass boat but I thought the only means of building this was to first make a mould and add gel coat and fibreglass to construct the boat.

I have always thought that I could probably have handled the building of a wooden boat more so than a fibreglass boat.

However, the years have rolled by and I have never attempted to build either, and yet, I have still maintained my thoughts about how nice it would be to build one's own boat.

Here I am today, close to sixty and suddenly discover that I can build my own boat using wood work skills developed over the years plus cover the wooden boat in fibreglass making it much tougher and more durable.

I determined this by watching a clip on You Tube by a gentleman named Sam Devlin who showed just how easy it could be to build your own boat.

The boat in the clip is a small row boat which Sam calls the Pollywog, it is a wooden boat, made from marine plywood and covered with fibreglass and resin.

This clip inspired me so much that I purchased the plans for this boat and set about building my own little row boat which when finished would be named Freedom.

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1: Getting the basics.

The first task was to obtain some marine plywood and I needed two sheets of 6 mm ply, 2400mm x 1200mm, and one sheet of 12mm marine ply, 2400mm x 1200mm.

I checked out Bunning's and Master's but their selection of marine plywood was rubbish plus what they did offer for sale was a bit expensive.

Fortunately, I live close to a sawmill named Frost's Sawmill, and if the guys there never knew where I could get some good marine ply then nobody would know.

They informed me that I could buy some Queensland Hoop Ply for \$115 per sheet or I could buy some marine ply from Malaysia at \$35 per sheet and never know the difference.

In their opinion the Malaysian ply was just as good as the more expensive hoop ply.

So I placed an order for the Malaysian ply.



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I received my delivery of Malaysian marine plywood and then of course could not wait to get started.

The only other wood I bought was some Meranti which is a good hardwood suitable for the seats and the gun whales.

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2: Lofting the boat.

Lofting is quite simply drawing the shape of the boat components onto the plywood.

Here the bottom and the sides of the boat are drawn by dividing the board up into 300mm sections lengthwise.

Each line drawn then has a measurement marked upon it which will form the actual shape required for the bottom or the side.

Small nails are then driven into the plywood at every lofting mark made and then a softwood batten is then positioned against these nails and held in place by some additional nails.

This then forms a very nice smooth curve on the batten and a pencil line is then marked upon the wood along the curve of the batten.



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As mentioned previously, two sheets of marine plywood were purchased.

This allowed me to place the two sheets on top of each other and clamp to hold in place.

Only the top sheet needed to be marked which was then used to cut out both sheets.

The boat requires two bottom pieces and two side pieces so by doing it this way I could be assured that the two bottom pieces were identical to each other, likewise with the side pieces.

One thing that I was learning very quickly is that the boat must be symmetrical in every way.



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Here we have the two bottom pieces cut out.



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Here we have the two side pieces.

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3: Planing to shape.

The saw cut was made just outside the drawn line and now needs to be carefully planed to not only fit the drawn line but to also provide a smooth edge on both pieces of marine ply.



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4: Transom & Bulkhead.

With the sides and bottom cut and planed to shape I just needed two more pieces to be cut to allow the build to continue.

The first is the Transom, which is basically the back of the boat and the second is the bulkhead which is used to both strengthen the boat and provide the basic boat shape.

I could have cut these from the same 6mm marine ply as I did with the sides and bottom but then I would have had to glue the pieces together.

Instead I opted to cut these pieces from the 12mm ply that I purchased.

Once I did this I had all the pieces required to allow me to continue the build.



5: Parts Ready for Assembly.



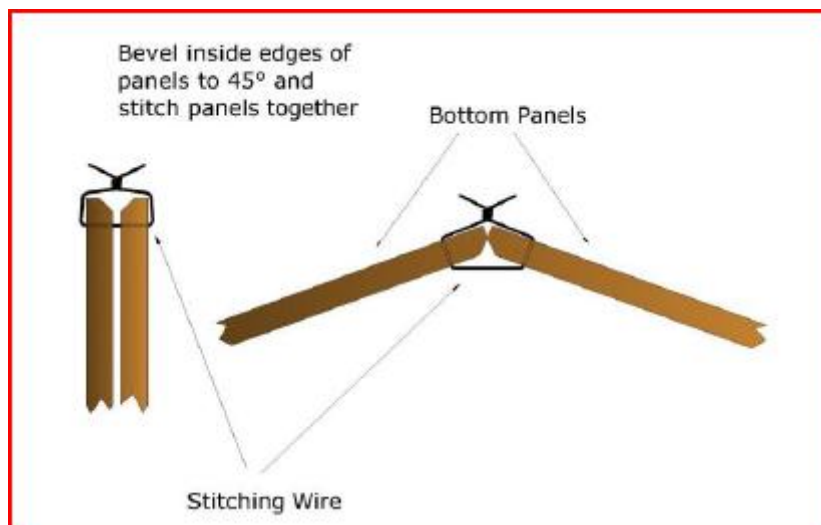
Here are all the pieces required to make Freedom.

Two bottom pieces, two side pieces, a Transom and a Bulkhead.

The assembly begins by taking both the bottom pieces of the boat and planing an angle on the joining edges.

The angle is approximately 45 degrees and is planed to only half the thickness of ply.

This is to provide a much better join to these pieces when assembled to the shape required by providing some friction between the mating surfaces.



6: Stitch n Glue.

These pieces of marine ply are now joined together to form the basic shape of the boat.

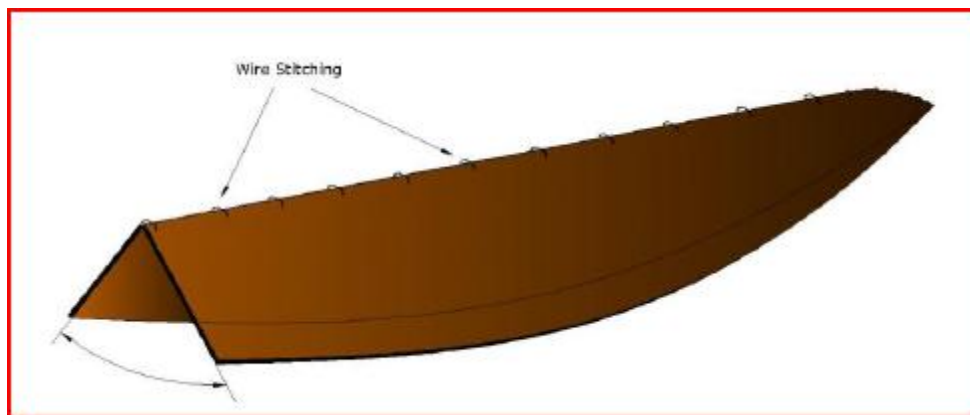
The method of joining this wood together is known as Stitch 'n' Glue and could be likened to the tacking method employed when welding metal together.

Metal is commonly tacked first to hold the parts together prior to being fully welded, stitch and glue employs this same method.

Two edges are joined together by first drilling 3mm holes through the ply spaced approx 50mm apart.

Baling Wire (1.6mm diameter), is then fed through the holes and twisted together to basically hold the two pieces of ply together.

This is the “stitch” component of the stitch n glue method.



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7: Assembling to Bottom of the Boat.



The two bottom pieces of the boat are placed on top of each other just like pages in a book.

The two ends to be joined are then drilled approx 50mm apart using a 3mm drill.

The baling wire is then threaded through each of the holes and twisted together.

A pair of pliers is then used to twist the wire tighter to hold the two pieces firmly together.

When stitching is completed the two bottom pieces are opened just like opening the pages of a book to form the shape of the bottom of the boat.



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8: The Transition Line.

The next step is to stitch the Sides to the Bottom Assembly but before this can be done a Transition Line needs to be cut from the Bottom pieces and the side pieces.



This Transition Line allows the sides to fit neatly and in line with the front of the bottom assembly.

Without this line it would be almost impossible to provide a good fit of the sides to the bottom.

On the bottom pieces it is a case of measuring approx 300mm from the front and then cutting approx 10mm off the rest of the bottom, all the way to the back.

In the case of the sides the 10mm cut is made to the first 300mm from the front of the sides.

This then allows for the sides to fit neatly to the bottom assembly.

Since building this boat, I believe a much easier method would be to cut out the Transition Line on both pieces when first cut from the marine Plywood stock.

It was certainly quite difficult cutting 10mm off the entire length of the Bottom Pieces (300mm back).

Once the Transition Line has been cut from sides and bottom the next step is to assembly the sides.

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9: Assembly of Sides to Bottom.

The bow or front part of the Sides was stitched together first which made it much easier to align the Sides to the Bottom assembly so the line was perfectly straight where the four joins came together.



The bow (front) ends were wired first to keep the nice straight line then the sides were both wired from bow to stern, (front to back).

By the time the sides were completely wired to the bottom assembly there was a slight overhang of the sides at the rear, but the front of the boat was perfectly aligned and looking how you would imagine the front of a boat to look.



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10: Assemble the Transom.

The Transom is the back panel on the boat and of course once fitted completes the overall boat shape.

A few holes were drilled and then the Transom was stitched first to the bottom panels and in line with the back edge of these panels.

The Transom was then angled slightly to match the cut edge of the sides and then wired to the sides.

This means that the transom is not sitting dead vertical but has a slight angle to it making it much more comfortable for anyone sitting on the back seat of the boat and leaning against the Transom.



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11: Cutting & Preparing Bulkheads and Seats.

Before starting to glueing component of Stitch n Glue I decided to cut all the parts needed for the Bulkheads and the Seats just so I could assure everything fitted ok before starting to add resin and fibreglass.

Freedom has a longitudinal front seat which is attached to the first bulkhead and a rear seat across the back of the boat attached to a rear bulkhead.



Image showing basic positions of the front and rear bulkheads.



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Image showing basic framework of the rear seat attached to the rear bulkhead.



Image showing basic framework of front seat attached to first bulkhead

The Framework for both front and rear seats and both bulkheads was cut from 12mm marine plywood.

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12: Final Checks then tack weld the boat together.

The assembly is now basically ready to tack weld together, although in this case of course the tack weld is achieved by using a resin and filler mix.

However, before starting a final check was made of all the stitching.



The resin used for this project is a West System 5:1 ratio, so basically 5 parts of resin to one part of hardener. I bought two 4 litre resins but never realised until later that one of the 4 litres was a slow curing resin and the other was a fast curing.

I started with the slow curing and mixed a filler material also provided by West Systems.

After mixing resin with hardener I mixed the filler material until it was like the consistency of a peanut butter, basically when I lifted it on a spatula it never fell off.

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The basic procedure for tack welding the assembly together is to use a flat wooden stick, much like an icy pole stick, and fillet the joints between each of the wire stitches.

This is done on the inside of the boat and is performed on all of the stitched joints between both panels and side panels and the transom.



The above images show the boat assembly tack welded together by the resin/filler mix.

They also show temporary spacers used to provide the basic shape of the boat.

These tack welds were left for 24 hours and then the wire stitches were cut on the inside of the boat and then removed on the outside of the boat.

Whereas the boat was once held together by wire stitches it is now held together by tack welds of resin/filler mix.

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13: Filleting the Joints.

With the wire stitches removed the next step is to fillet the remainder of the joints with the resin/filler mix.

Once again, this was mixed to a peanut butter consistency and then applied to the areas once occupied by the wire stitches.

Of course this also meant going over the previous tack welds to provide a much thicker fillet overall.

During this process all the holes made for the wire stitches was filled by the resin/filler mix.



The image above shows the thicker fillets of resin mix applied after the wire stitching was



removed.

After 24 hours curing time these filleted joints were lightly sanded with 80 grit sandpaper.

14: Adding the first layers of Fibreglass.

With all the joints filleted with the resin/filler mix the next step is to apply some strips of fibreglass to reinforce these joints.

I could have purchased pre-cut 100mm wide fibreglass cloth but I chose instead to cut my own strips from a bulk roll of fibreglass.

The fibreglass purchased was a 200 grm woven fibreglass cloth, one metre wide.

From this I cut a number of 100mm wide strips, 1 metre long.

The filleted joints were painted with the resin mix to a width of approx 300mm.

These joints were intended to be covered with 3 overlapping fibreglass strips. The first strip was laid over the joint and wetted with resin until the fibreglass became clear and fully saturated. This was achieved by dabbing with a paint brush although it became apparent later in the project that it was better to use a plastic squeegee to smooth out any trapped air bubbles in the fibreglass.

Once the first layer was applied a second layer was immediately applied slightly overlapping the first strip and increasing the width of the reinforcement.

Once again additional resin was used to saturate the fibreglass.

Once this was done a third and final strip was laid slightly overlapping the first strip on the other side, thus increasing the overall width of the reinforcement.

The final width of this fibreglass reinforcement would have been around 250mm – 260mm in width after the overlapping.

Once cured after leaving overnight the fillets were lightly sanded again where I tried to feather the edges of the fibreglass to make it a smooth transition between the fibreglass and the raw wood surrounding it.

During this procedure of applying the fibreglass strips no pictures were taken but it is hoped that the description I have provided is sufficient to allow the reader to understand what was done.

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15: Fitment of Bulkheads and Seat Frames.

the Bulkheads and Seat Frames.

The next step in the project is to fit

Before doing this however, the front and rear seat frames has to be disassembled and coated with resin/hardener mix and then re-assembled.

The reason for this was to ensure there are no “dry” joints in the boat where moisture could enter. Every join made in the wood is first coated with the resin mix.



Once in position these frameworks are secured in position using the resin/filler mix and filleting around all the frameworks both inside and outside.



Bulkheads and seat Frames secured in place with Resin/filler mix.



16: Fitment of Breast Hook and Stern Knees.

The Breast Hook and Stern Knees are basically added to provide strength to the overall structure of the boat.

The Breast Hook reinforces the two side panels and the Stern Knees (2) connect the top of the Transom to the sides of the boat and also provide additional reinforcement.

These names must have been derived from long ago in the history of boat building and whilst they are there to provide structural reinforcement they are also there to improve the overall looks of the boat.



The Breast Hook joining and reinforcing the sides of the boat.



The Stern Knees (2) joining and reinforcing the Transom to the sides of the boat.

The Stern Knees are also slightly angled to provide a better visual appearance.

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The Breast Hook and Stern Knees are attached by a resin/filler mix more to a honey like consistency applied to both surfaces and reinforced with screws inserted through the outside skin of the boat into the Breast Hook or Stern Knee.



Once again, all joints are coated with resin to ensure no resin starved joints are on the boat.

It should be worth noting here that this project was not mine alone but was also Jacquie's project.

Working as a team, I was mainly responsible for all the woodworking side of the project and Jacquie was responsible for all the "wet" side of the project meaning that she did basically everything to do with the fibre glassing and the painting on the boat.

I am quite sure that without Jac's input this boat would not have been finished to such a high standard.

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17: Fitting the Inwhales.

The Inwhales are basically hardwood battens that are fitted to the top of the side panels on the inside of the boat.

This Inwhale is also fitted between the first Bulkhead and the side of the boat making the Inwhale in a constant state of tension and basically always trying to push the side of the boat out.

I used Meranti to make the Inwhale and it is fitted to the side of the boat by means of the resin/filler mix mixed to a honey consistency and screws from the outside skin of the boat into the Inwhale.



Inwhales are now fitted.

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18: Sanding.

One thing learnt very quickly that when doing fibreglass there is quite a bit of sanding involved, but it needs to be done to achieve a good finish to the boat.

The boat is at the stage now where it basically needs to be painted inside with resin mix so it is important to not only sand everywhere to provide a good surface for the resin to bond to, but also to ensure there are no lumps and bumps which could affect the overall appearance.



19: Preparing the outside of the boat for fibre glassing.

The inside of the boat has been sanded and is now ready for painting with resin.

However, before doing this it is now time to prepare the outside of the boat for fibre glassing.

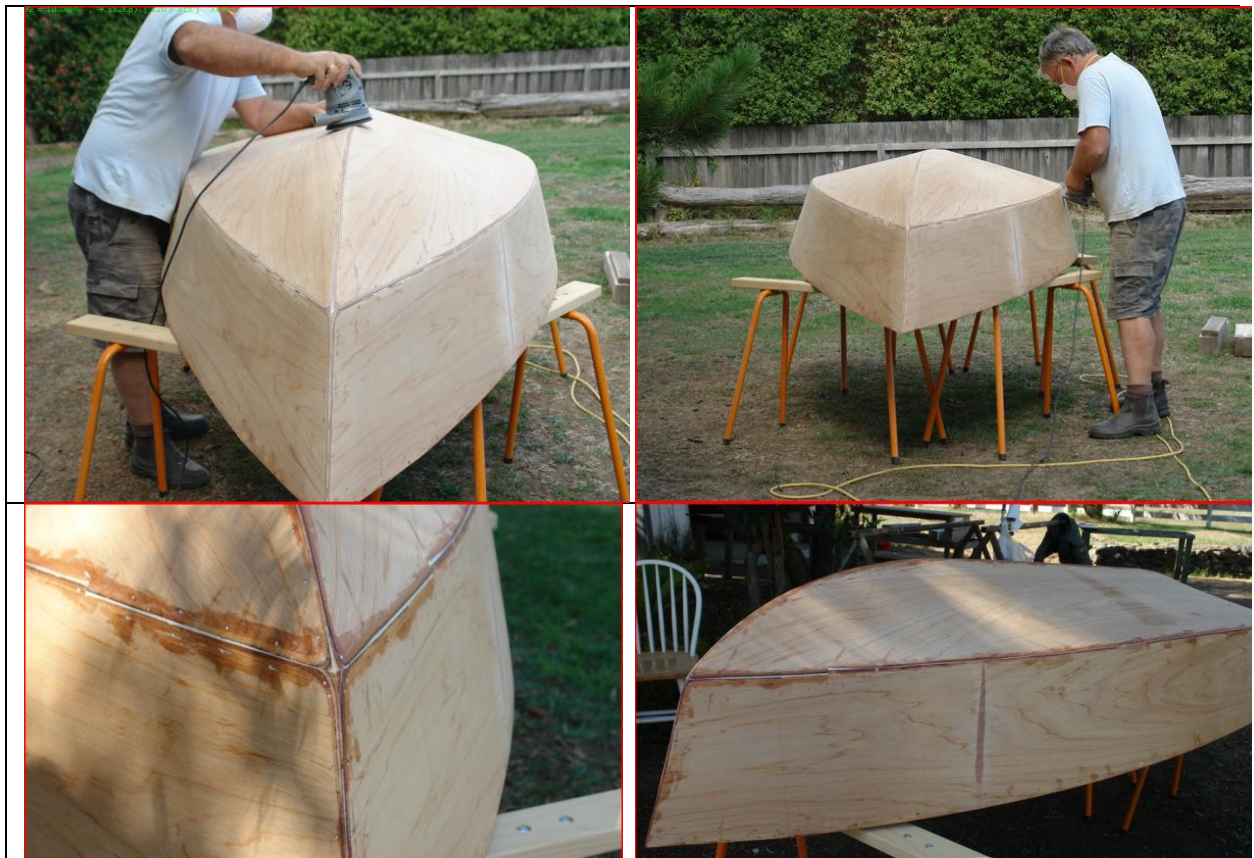
This entails trimming the overhang of the side panels at the back of the boat and then sanding the outside so it is smooth all over.

The next step is to fill all holes and joints on the outside with the resin/filler mix, once done, sanding takes place again.

Every joint on the boat must have at least two layers of fibreglass reinforcement so just as we did with the inside seams we do the same with the outside seams and lay 100mm wide strips over every joint and saturate with resin.

Once cured the edges of glass fibre are sanded to feather smooth.

The boat is then ready to have the entire outside covered with glass fibre.



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20: Fibre glassing the outside of the boat.

As mentioned previously 200 grm woven fibreglass cloth was used in this project.

With the outside of the boat sanded smooth the cloth is now draped over one half of the boat with a slight overlap on the other half.

Resin mix is then poured over the cloth and a plastic squeegee is used to spread the resin to completely cover and saturate the cloth.

This was Jacquie's job and one which she did exceptionally well.



This was allowed to cure overnight and the next day was sanded again to feather the edges smooth on the overlaps.

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Once completed the other half of the boat was covered with fibreglass.



The boat was then allowed to cure and had a final sand to feather any edges.

It would then have a final coating of resin all over ready for final painting.

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21: Fitment of the Gunwhales.

The hardwood batten called the Inwhale was fitted to the inside of the boat and now it is timed to fit the Gunwhale to the outside of the boat.

The Gunwhale is also made of Meranti hardwood and is fitted to the top edges of the boats sides opposite the Inwhale.

Fitment is the same as per the Inwhale in that it uses the resin/filler mix, honey consistency and also screws.

However, this time the screws are fitted through the Gunwhale which are then screwed through the marine ply side and into the Inwhale.

The screws are sunk into the Gunwhale and then are fitted with wooden hardwood plugs to hide the screw heads.

Just like the Inwhale, the Gunwhale is in tension and is always trying to push away from the boat, this is why it is important to ensure the screws are driven right into the Inwhale hardwood to secure the Gunwhale.

Whilst providing support and overall shape of the boat the Gunwhale is also used to mount the Rowlocks and provide support for the effects of rowing the boat.



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21: Fitting the Skeg.



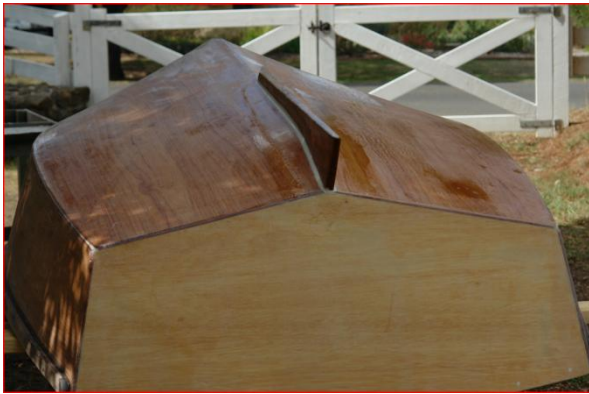
After a welcome cup of tea it is time to crack on and make the Skeg.

The Skeg is fitted to the bottom of the boat at the back and is used to keep the boat tracking in a straight line whilst rowing.

I had to make a template from off cuts to get the exact shape required and then I cut out the Skeg from this template onto meranti hardwood.

It was fitted by using the resin/filler mix and just stuck onto the bottom of the boat and left overnight.

The next day it was filleted with the resin/filler mix to fill all gaps and then fibreglass strip was applied to reinforce.



Skeg fitted to bottom
of boat.



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22: Painting resin on inside of boat.

The inside of the boat has been sanded and after a final check all the inside is coated in resin prior to final finish.

The resin was applied by roller.



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23: Painting outside of boat with resin.

After the inside had cured it was time to apply resin to the outside of the boat.

This was also applied by roller.



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24: Adding Buoyancy.

In order to assist with the buoyancy of the boat foam was located to the cavities under the seats.



The spaces were completely filled with foam and when the seats are fitted these spaces will be completely sealed off .

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25: Fitting the Seats.

The next step is to fit the seats which are glued in place with the resin/filler mix.

I used heavy weights to hold the seats in place during curing.

The following day all gaps were sealed around the seats by applying fillets of the resin/filler mix.



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26: Taping up: Ready for painting.

All that is left is to tape the gunwhales and inwhales and seats ready to apply the final finish.



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27: Applying the Final Finish.

Jacquie and I decided on painting the boat white and we used a two part polyurethane paint.

Once the can was opened and the hardener was mixed we had to use all the paint as it only had a life of 6 – 8 hours and then would go rock hard.

The plan was to paint inside the boat first then turn it over and paint the outside of the boat and consume all the paint.



The boat was then left to cure before a light sanding ready for the second and final coat.



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The second coat was applied the same as the first, inside the boat first then turned to paint the outside.



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28: Painting the Seats and Gunwhales.

At first we decided to have the seats and gunwhales stained in a very dark brown but after seeing the colour of the masking tape against the white of the boat we decided to paint them green instead as it just seemed to lift the boat altogether and give it a boatie, summery feel.



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29: Naming the Boat.

All boats need a name and I guess our boat is no different so we decided to name this boat Freedom.

We needed the name on the boat so Jacquie used her great talent of sign writing on the back of the boat.

I think the hand painted sign looks fantastic.



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30: Fitting the Oarlocks and Cleat and Oars.

The last thing needed to do on Freedom was to fit the Oarlocks for the oars and also a Cleat on the Breast Hook so the boat can be tied to a jetty.



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31: Launch Day.

Well the big day arrived and it was time to launch Freedom.

We took the boat to a river in Melbourne and with the help of family we formally named the boat Freedom and cracked a small bottle of champagne over it then it was on board for a row up the river.



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...and so began many happy hours on the water!

On a boat named Freedom!