



This is part one of a two part article on making basic repairs to the occasional knocks that your pride and joy may suffer, as well as dealing with those oh-so-annoying leaks.

This part deals with timber repairs. Part two will address repairs to foam composite boats. Many owners will already know how to put their boats back together when the need arises. Therefore, the aim here is to assist those who may have minimal or no experience with boat repairs. The repair methods proposed have been used successfully by the authors but are not necessarily the only (or best) way to address the issue. If anyone would like to share their expertise for follow-up articles, please feel free.

Before we get into the nitty gritty, you might consider the following:

- It is not easy to repair damage without having some adverse effect on the surrounding area. However, time spent protecting these areas will minimise this.
- The materials used to do the repairs are not intended to be inhaled, or smeared on the skin and in the eyes, so don't do it. Neither are they intended to be removable from clothing. Some eye protection, a face mask and gloves will keep you safe...and don't wear your favourite gear while doing the work.
- Epoxy resins are generally the best to use for timber hull and foil repairs as they penetrate well and are strong and tough. Epoxy is also slow curing, giving more time to complete the work. Epoxies rely on mixing **exact** amounts of the two components for the resin to set properly. If the quantities are wrong, the resin won't set properly no matter how long you wait. Don't use "5 minute" epoxy as it tends to be less durable in the long term.
- Paint removal wipes (available from hardware stores) are very effective at removing errant resin and paint from you, your mixing gear and the boat before they become permanent features.

For starters you will need some epoxy resin or glue. The advantage of resin is that it can do everything you will want to do to fix the boat. It can be mixed with glue powder to bond components; filler powder to fill up surface irregularities; or used straight to laminate fibreglass patches and seal bare timber. Ready to use epoxy glues can be a bit thick for some of these tasks and too thin for gap filling.

DIY
FIX IT

BY RALPH SKEA

You'll also need some containers for measuring and mixing your resin. Plastic medicine cups are good measures, as are small containers (like "Yoplait" or spice bottles) which can be accurately marked up. It is recommended that the resin components be combined and mixed in the one measuring container so that the proportions are accurate. Empty into a working container before adding filler powders. Glass jars and long wooden paddle pop sticks are good for mixing and applying glue. The sticks can often be bought from "\$2 shops" or craft suppliers for very little. DO NOT mix up your equipment for handling resin and hardener as you risk accidentally contaminating and ruining your resin or hardener supplies.

Get some sheets of aluminium oxide abrasive paper (80, 180 and 240 grit will do for starters) and a roll of clear plastic, stick-on book covering (the stuff you get from supermarkets) to protect the areas around the repair. For simplicity I'll refer to it as "stick-on". You will also need an assortment of tools, depending on the job at hand. As you have decided to take on the repair, I will assume that you have some tools, or at least have access to them.

SURFACE DAMAGE

Minor damage which only effects the top veneer of plywood is a relatively easy fix. The aim is to remove any paint on the damaged surface, fill the surface back to its original level and repaint it. You will need a short metal or plastic straight edge. Lets begin:

- Wash the area with fresh water to remove any salt and let it dry thoroughly, then clean with turpentine.
- Cut a piece of stick-on at least 150mm bigger all around than the damaged area, then cut a hole in the centre with a sharp knife, 5mm bigger than the area to be repaired. Trim a little off the edge of this piece and keep the piece for later. Position the stick-on around the damaged area.
- Now use a small piece of 80 grit paper to carefully sand away any paint without going much beyond the edge of the damage.
- Thoroughly mix some epoxy filler (a little more than is required to fill the depression) to the consistency of toothpaste (follow product directions).
- Work some of the filler into the bare timber with a PP stick or gloved finger tip, then slightly overfill the depression with filler. Place the filler carefully to avoid bubbles or voids.
- Position one edge of the small piece of stick-on, removed earlier, against the corresponding edge of the hole in the larger piece. Now work the straight edge side to side to slowly position the stick-on over the filler, removing any excess that squeezes out as you go. (See Diagram A)
- When the patch is in place, remove excess filler and keep it so you will know when it has set. Carefully

remove the outer stick-on, clean around the patch with soapy water, turps, acetone or wipes and check for any sticky finger marks or drips that may have accidentally ended up elsewhere on the boat.

- Once the filler has set, remove the piece of stick-on. If all has gone well, the filler should be pretty close to level with the surrounding surface and free of surface imperfections. If the filler is low, lightly sand the surface with 180 grit paper and add a little more filler. If it is high, move on to the next step.
- Cut a new piece of stick-on, but with a central hole 15mm bigger than the edge of the repair, and apply it to the boat.
- Cut a piece of ply or timber, smaller than the central hole, to use as a sanding block. Wrap a small piece of 180 grit paper around it and gently sand the filler with a circular motion, checking the level of the filler frequently. When you reckon it is pretty even, stop!
- If the filler and the surrounding paint have merged without exposing bare timber, you can move on to painting. If there is bare timber exposed, apply a coat of mixed resin over the filler, bare timber and the sanded paint. When it's set, sand again with 240 grit, but more gently this time.

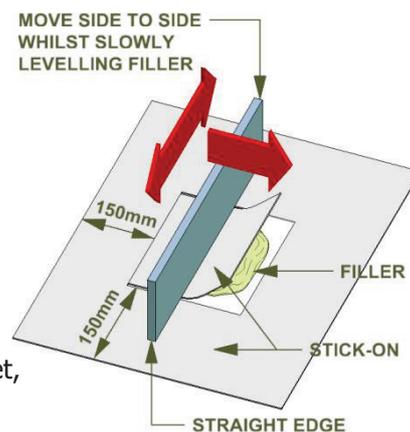


Diagram A

HOLES

Once the damage has penetrated beyond the top veneer it will most likely have damaged the full thickness of the ply, creating splits and voids that will allow water penetration. A proper repair involves removing the damaged ply, installing a replacement patch and repainting.

To repair a hole, you will need some 4mm marine ply offcuts. If you can't get marine ply, exterior grade ply can be used, provided the exterior veneers are free of defects and there are no voids in the middle veneer (check the edges and reject the piece if voids are detected). You will also need a small, fine bladed saw (a key-hole saw or pad saw is good), a drill and bits, a screw driver, something to draw right angles with, a pencil and something to measure with.

- Prepare and protect the areas around the repair as previously described. Mark a rectangle on the hull close around the obviously damaged area, then cut to the marked lines and remove the piece.

- Check the edges of the hole, and feel inside the hull (and / or use a mirror) to see if the ply is sound. If the damage extends further, enlarge the hole as required.

There are two ways to make a patch; square cut edges with a backing piece, or bevelled edges with no backing. Square cut is the simplest method but produces a slightly heavier repair than bevelling (i.e. scarfing). (See Diagrams B and C).

Square Cut Patch

- If you can't access the damage from behind, check that the backing piece will fit through the hole and adjust if required, or make the backing in two pieces. Place positioning marks on the outside of the hull so the backing piece can be correctly aligned.
- Position the backing piece and drill through both layers with a bit that suits the screw thread. Enlarge the drill holes in the hull so that the screw thread won't bite (see Diagram B) and screw the backing piece in place inside the hull. Use more screws on larger patches to get a close fit.
- Cut a patch slightly larger than the hole, then trim to a neat fit with 80 grit paper (align ply grain on the patch with the grain on the hull). Drill and screw the patch in place as shown.
- If it all fits OK, remove the pieces, sand smooth, then glue and screw in place. Use plastic sheet under screw heads for easier removal. When glue is set, remove screws and fill holes with epoxy filler.
- Carefully sand the patch level with the surrounding surface, fill imperfections if required, seal with epoxy and then paint.

Scarfed Patch

- Once the hole is cut, a 25mm wide bevel is marked around the hole and carefully cut away with a coarse file, 80 grit paper wrapped around a narrow wood or metal strip, or a VERY sharp 25mm wide chisel (only try this if you're good with tools, and be careful not to split the inner veneer).
- Make a ply patch to accurately fit the hull cut-out, then position, drill and screw it in place as shown (See Diagram C).
- If it fits neatly, remove the patch, sand smooth, coat inner surface with mixed resin (before adding glue powder), then glue and screw patch in place.
- Sand and finish the patch as described for the square cut patch.

GUNWALES AND FOILS

The basic principle behind solid timber repairs is to spread the loads at the joint over a wide surface area at an angle to the direction of the load (See diagram D). Minor surface damage can be filled the same as minor hull damage. However, large filler patches are relatively heavy and have to be formed up, so consider timber patches. Deck repairs where you are unlikely to sit can

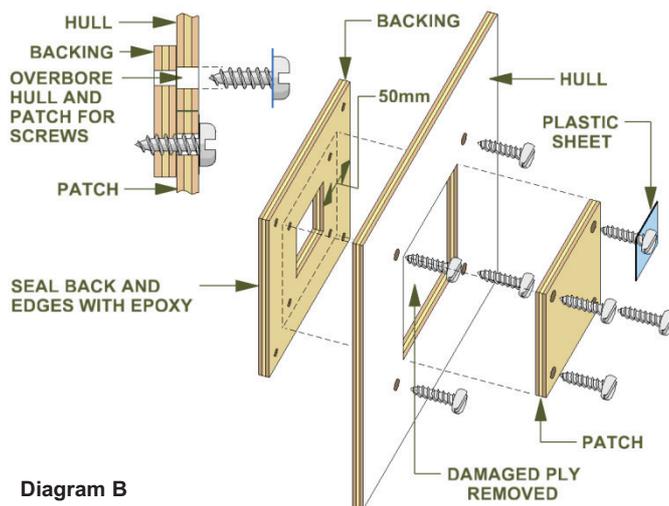


Diagram B

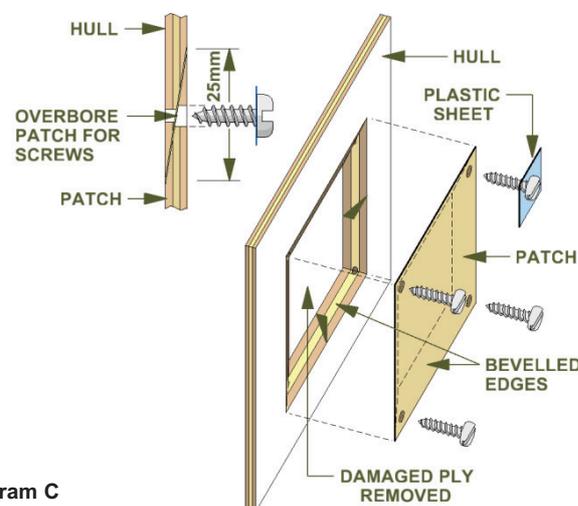


Diagram C

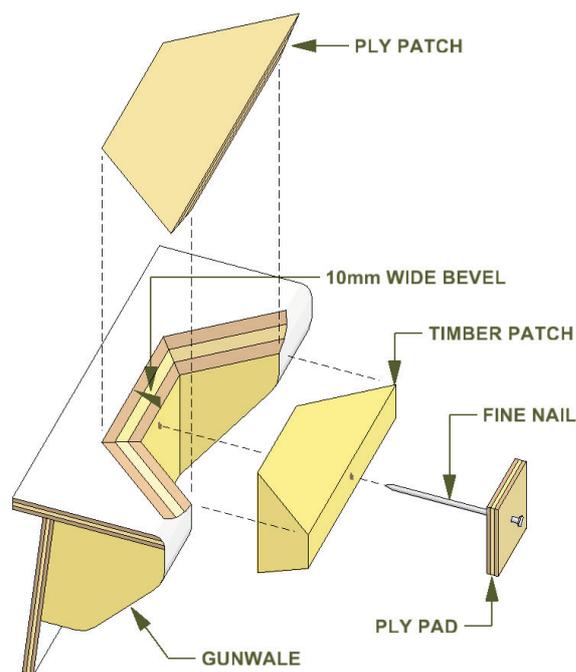


Diagram D

be quite simple (See Diagram E). However, where the deck has to support body weight, the deck ply should be scarfed in to avoid cracking at the join.

You will need some clear grained, light weight timber (Cedar or Hoop Pine are good, but Maple or Radiata Pine can be used if you are not fussy). You may need one or more sharp chisels of different sizes.

- Start by preparing and protecting the areas during the work as previously described. Draw a shape closely around the damaged area that you can easily replicate on the patch (align the grain of the patch with the grain of the area to be patched).
- Carefully remove the damaged timber, trim to the lines, and make a patch that fits neatly in the trimmed area. (See Diagrams D & E)
- If the patch is to be painted, it can be held in place with fine nails while gluing. If the patch is to be varnished, it should be clamped or taped, as long as a tight joint can be achieved.
- When the glue has set, remove the nails, shape the patch smooth with the surrounding surface, fill the nail holes with mixed resin, lightly sand smooth and paint.
- If the damaged surface had been glass sheathed, sand the patch slightly below the surrounding surface (fractions of a mm) and taper back over a 15mm width. (See Diagrams F & G)
- Place a piece of glass cloth (slightly larger than the repair) on the surface and work mixed resin through it until transparent. Don't make the cloth too wet or it won't bond tightly. Cut and fold the glass to fit around foil ends.
- When resin is firm but still sticky, overcoat with filler.
- When dry, sand smooth and paint..

LEAKS

Before a leak can be fixed, it has to be found (obviously) and at times this can be a serious challenge. Likely sources of leaks are: inspection hatches, beam bolts, rudder pintles, chainplates, centrecases, gunwales, keel and chines, internally fitted trampoline tracks, and construction holes. A sponge or two of water after a race means that the leak is very small. Large quantities imply a significant failure which should at least be easier to find. If the boat doesn't leak in light weather, the source of the leak is above the normal water line.

Check that beam, pintle and chainplate bolts are tight (add sealer under the washers then re-tighten). Clean inspection hatch seals and threads and check for seal damage. Check that the hatch rim is still sealed to the deck. Now look along the gunwales, chines and keel and feel for splits with your finger tips (water entry can swell the timber, raising the edges of the split). If a crack in a joint is found, it can be reglued and should preferably be glass taped as well. Just glassing over a crack isn't

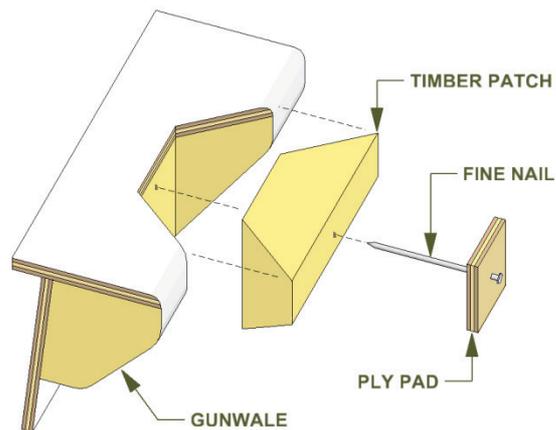


Diagram E

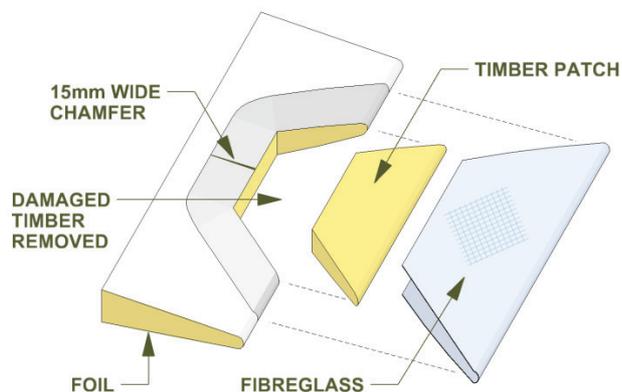


Diagram F

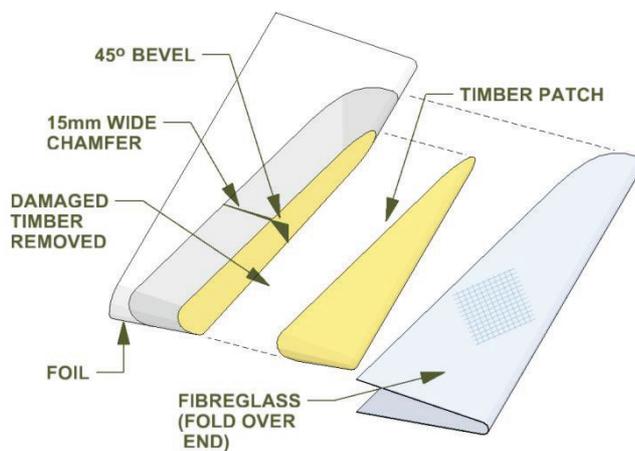


Diagram G

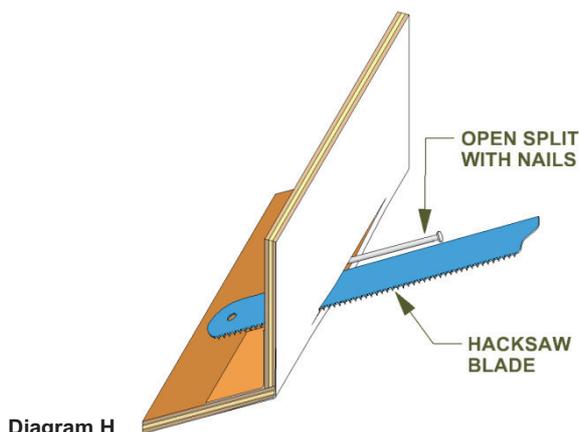


Diagram H

enough; it will soon crack again.

Protect the area around the split to be fixed, then:

- Assuming the split can't be accessed from inside the hull, gently tap a small nail into its midpoint to open it up without extending its length. As glue won't spread into fine gaps, use a hacksaw blade to carefully cut to each end of the split (See Diagram H).
- Remove the nail, with the blade still in the split, and carefully saw along the length of the split (short strokes) to remove any splintery bits and roughen the surfaces. This is OK for taped joints and fillets.
- Remove the blade and check that the joint closes up neatly (there will be a slight gap). If the panel dips at the repair, trim toothpicks or similar to use as supports.
- Reinsert nails to open the split, fill joint with thickened glue, add supports and remove nails.
- If adding glass tape reinforcement, bevel 25mm back either side of the joint, and apply 50mm wide tape and filler as described previously (see Diagram I).
- When set, sand flush with hull and paint.

So, that's the easy bit; now things get more challenging. Internally fitted metal tramp tracks can pull away if not securely installed. Look for hairline cracks indicating separation of the metal track from the gunwale or deck ply. The deck can be fixed as in Diagram H. Having to fix under the track would be harder, but less likely.

I am aware of a case where a leak occurred through a construction staple hole which hadn't filled properly. The hole was found by partially filling the hull with water (remember that water weighs 1kg per litre, so take care), then tipping the boat to check different areas while looking for seepage. The low water pressure may only produce slow drips, so be patient. Drill and inject small holes with epoxy filler. Large, used, plastic syringes from vets are good for this job.

If everything else checks out, this pretty much leaves the centre case. Centre case leaks can vary in quantity under different weather conditions as the hull flexes. Don't use silicone to fix centre case leaks. It is seldom effective and won't last. It is also difficult to get a clean surface to glue to once silicone has been used. Unfortunately, a permanent cure could mean open-hull surgery, but let's think positive. Start by checking around the deck slot as flexing under bum loads can crack the deck ply away from the framing. If this is the case, fix in the same way as other joint splits. Also adding extra deck framing, or another layer of ply either side of the case under the deck is good, if you can reach it.

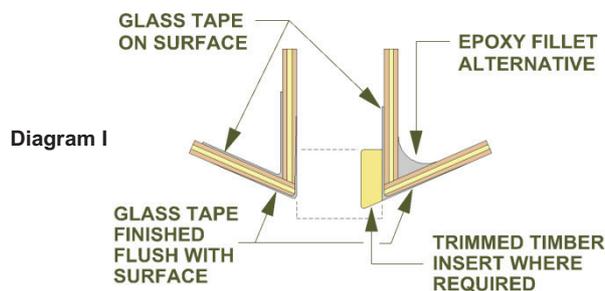
Now check the fore and aft vertical ends of the case. The ply can come away from the framing, or the timber ends can split. Both of these problems could theoretically

be fixed in the same way as for other splitting, but access and visibility are significant issues. If you are using narrower centreboards, there should be enough spare room in the cases to glue in a new end piece (ply if the timber has split or 19mm timber if the ply has come away from the ends. Use plenty of glue to seal the cracks. Ensure that any area to be glued is well stripped back to bare timber.

If the leak is at the bottom of the case (commonly at either end), access to the work area will be seriously compromised by the narrow slot. If the case has cracked, here are two possible options.

Option 1.

Cut away the bottom slot where the leak is, in line with the inner surface of the centre case. If the leak is through a small hole, rather than a crack, use the drill and syringe method. If it's cracked, repair the leak in the same way as for other splits, including chamfering the inner face of the case and the bottom of the hull and applying 50mm wide fibreglass tape. When set, sand the tape flush with the surfaces, glue a timber block into the cut away area and reform the slot. If the keel slot for the centreboard is narrower than the case, the case need not be chamfered and the block can be glued in at the same time as the glass.



Option 2.

Use a hacksaw blade to cut an opening in the side of the hull (preferably the inside surface) large enough to get your arm in to do the work and to be able to see what you are doing (this may include mirrors and lights). You are probably looking at a 300mm x 250mm hole at least. The position of the hole will depend on the location of the leak and the presence of bulkheads, but should ideally be towards the end of the case.

If the bottom of the case is glassed in, remove the failed area of glass back to bare timber (not easy) and re-glass the joint. Consider glass taping around the vertical ends of the case while you are in there. Epoxy filleting can also be used. If the centre case is held in with timber framing, repair the split joint as described earlier. The piece of hull previously removed can then be re-installed using a backing piece, or new ply can be scarfed in.

In the next issue, we will tackle foam boats.

