Retro – fitting buoyancy

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How to go about the conversion job itself. Hold onto your hats, chaps!

1. The starting point.

We are dealing here with shells built over the last 20 years (older boats can be discussed another time) & which have so-called monocoque construction. In reality, that means they have a solid board as the slide bed, probably with a hand hole near its middle. And they have some kind of perforated bulkhead as a downward extension of the rigger shoulders/knees/ribs.

Holes were made in the bulkheads because it looked lightweight (it saved very little weight) & sporty, & because there was a misplaced belief that water had to be able to flow along the boat (Who knows why? To absorb lots of energy as water sloshed along the boat? To precipitate swamping as water could all pool at one end?). The hand hole in the slide bed was there to allow access to slide bolts.

2. What we need to do.

The task in hand is to close all these holes. Simple, really.

3. Preparation.

First, you must ensure that all the surfaces you'll have to work with are clean. And that means really clean! So get out the nitrile rubber gloves (from a good DIY store, check the label) & ventilate the workplace really well. Solvents are bad for you, whether you breathe them or absorb them into the skin & into the blood stream that way. Solvents are biologically poisonous (even ethyl alcohol!), they extract everything soluble from your skin & underlying flesh (which you needed there), & solvent exposure allows other nasties to soak with them into the flesh. Potential consequences of getting solvents + resins into your skin can include infection, dermatitis or a permanent allergy.

Define those areas which have to be cleaned (see later) & then get to work.

You will do best to use solvents (e.g. white spirit) rather sparingly. Avoid low-flash-point solvents (e.g. cellulose thinners, gasoline/petrol, acetone) unless you really know what you are doing! Remember that solvents dissolve surface greases, but only remove it to the extent that you don't leave solvent to evaporate there. So use plenty of paper towelling, wipe solvent on, then immediately wipe it off with a fresh towel.

You must scrupulously clean every bit to which you will later need to bond something. To help this, use a pad of Scotchbrite ™ to scrub into all corners & to abrade all surfaces as you go. When you've finished with solvent, go around again with water, detergent, Scotchbrite & towels. Be sure, too, to remove any flaky paint.

Allow everything to dry out completely before you go any further. So stop for refreshments.

4. The bits & pieces.

You are creating plugs or covers for all the holes. Except where you are going to be applying significant pressure, the loadings are very light (the water pressures are pretty low, but unvented air pressures can be more of a problem).

You're looking for a material to serve as covers or plugs for those holes. It should be light, waterproof (or proofable), bondable (not everything takes good adhesive bonds), stiff enough, durable &, where it will serve as a hatch surround, able to take screws as well as adhesive.

Possible materials include, as Robin has indicated, the lightweight double-skinned material used for some signboards - but I'd need to know more about its bondability before confirming that. Also possible are:

a) Single-thickness resin/glass-fibre laminate. You can make this by floor-waxing a flat surface (a sheet of flat metal, a pane of plate glass, or a taped-over sheet of plywood), buffing the wax really hard (to drive out the solvents & harden the wax, or the laminate will not release), applying a polyester gel coat & then laying onto that (when tacked off) a couple of layers of 100 gram/sq metre (~4oz) or 150 gm (~6 oz) glass cloth into which you will stipple polyester resin. When cured, the resulting laminate can be cut up with stout scissors, tin-snips or a fine-bladed jigsaw.

b) Thin plywood. You can obtain birch plywood right down to 0.8mm thickness, but around 2.4mm (3/32") & upwards will do well & cost less. This material should first be sealed with resin (polyester or epoxy - cure epoxy in warm conditions to avoid a greasy surface you'll then have to scour clean with Scotchbrite & soapy water before use). Cutting will be by jigsaw.

c) Foam or honeycomb cored glass sandwich. Such materials are available by the sheet, sometimes up to 8ft x 4ft (2440mm x 1220mm) or could probably be ordered from a friendly composite shell builder as it's the same stuff many still use for slide beds, etc.

In addition you will need hand-sized hatches (in the UK try, e.g. Holt-Allen or RWO). You may hit lucky & find that the holes in your slide beds match the requisite aperture diameters for a particular hatch, but remember that Sod's Law dictates that this will not usually be the case. If there is scope for slightly enlarging the existing hand holes to take the next size of hatch (without the hatch surround then
getting in the way of the tracks or seat clips, then you are nearly as lucky. Otherwise, you may need to make ring inserts for the existing holes to take the hole down to a convenient & affordable hatch-fitting size. More on that later.

And you'll need some stainless screws with which to secure the hatches, as well as the bonding mastic that will seal them in place. And some thin nylon cord, to ensure that the hatch covers stay with the boat. Maybe plus adhesive or other lugs to bond under the deck, to which to fix the other ends of those cords.

And finally we come to the adhesives. Speaking personally, I would always use something like Sikaflex ™, which is a proprietary 1-pack polyurethane mastic which comes in ~300ml caulking gun cartridges. This stiff sticks to most things like the

proverbial to a blanket (especially to your own skin & clothes!). And it is resilient, so the joints won't go brittle & crack. But it is very sticky & messy if you get it wrong. And cleaning up is not easy or pretty. So practice before you use in anger! I do not advocate silicone (e.g. bath) sealants for this job - they can be used with success, they are easier to clean up (slightly!), but they are less strong than polyurethane - however I am sure a good job is certainly possible, especially if you use the acid-cure version (emits acetic acid vapour during cure).

Another possibility for bonding is VHB double-sided tape. This is a foamed elastomer tape (~0.8mm thick) with both sides coated in an acrylic adhesive. It has excellent grab & good long-term bond properties, but is costly & doesn't bend well around corners or curves.

5. Doing the Job

There are 2 ways to do this: the elegant, or the quick & dirty. Elegant means you are sparing with material, apply it only to the relevant apertures & leave the result looking professional. Quick & dirty means what it says - and it is a perfectly reasonable way of going about things if time & resources are limited. OTOH, elegant can also be pretty quick, if you plan the job sensibly.

I'll run through the Elegant method first, because it is always best to see how a job should be done before you decide to take short cuts – your short cuts are then the result of informed judgements rather than ignorance.

5.1 The Elegant method

For this, ideally, you know the friendly owner of a CNC Router. That is not a piece of Internet gear. It is a machine which will cut down into & through sheet material with a fast-spinning cutting tool, & do so to any shapes & depths that you ask of it, all under computer control & at speed. Otherwise you can cut out all the pieces in a number of different ways, including jigsaws & sandpaper, or by hand-held router using patterns or other cunning devices beloved of router enthusiasts.

If machining composites or wood yourself, <u>always</u> wear a proper dust-filtering mask, & wear it properly so no air can leak around the edges.

For this method you need to use one of the thicker materials – either plywood or a cored composite.

Now imagine just one of the holes that you need to plug. If it is circular, you can measure its inside diameter. Next, imagine you have cut out a disc of material which just fits through that hole. If you squirt a bead of adhesive mastic all around the inside of the hole, you could then gently push your new disc into that hole until it is a) bedded into the mastic & b) nicely flush with the outer surface. A strip of masking tape would then suffice to hold the disc in place until the mastic cures. And after that you could apply further mastic to fill & seal any remaining gaps. The job would be done, & neatly as well!

But that is a bit fiddly. And it is a lot more difficult for irregular & non-circular holes.

You could cure the fiddliness if you could machine your disc with a stepped edge: machine most of its thickness down to the diameter which just passes through the hole, & then machine the rest of its thickness to a diameter too big for the hole, to form a flange. Then you can push it into the hole & it will stop on the flange, just before it passes through. And you can have extra sealant under the edges of the flange. That is not just neat, but quick & strong with no going back & no difficulty in working on the adjacent apertures.

But what about those irregular holes? Well, there you can usually trim a piece of stiff paper, card or cardboard so you can press it against the bulkhead. Held thus, you can reach inside under the slide-bed & scribe onto the card, with a long pencil, around the edges of each aperture.

You may then transfer those shapes onto suitable material & cut neatly round them to make the necessary inserts, bonding them into place as before.

Or you can send your drawn outlines (appropriately numbered) to your friendly CNC router shop, together with the sheet material, & ask them to machine out all your inserts, each with the requisite amount of projecting flange.

[I should note, in passing, that my firm does possess just such a CNC machining system. I shall not mention this fact again]

Sometimes these bulkhead perforations never go to the edges of the bulkheads. These are the easier ones to fix. When the hole ends on the skin of the boat, then you need to leave a slightly larger gap between the infill piece & the skin, & ensure that this is well-filled with sealant. The extra thickness allows for the skin to flex in use without either overloading the skin or risking damage to the flexible mastic.

And when you need to make insert rings for the hand-holes in the slide-beds, then I think you would be very wise to try to create a flanged insert so that it cannot at some later date be pushed through by an elephantine foot or clumsy oaf.

5.2 The Quick & Dirty Method

Here you cut your material into sheets which will cover all or most of the bulkhead, then bond the entire sheet thus made against the existing structure.

The difficult part lies in getting your intended additional bulkhead to the right size & shape. The professional method is called "spiling", and can be looked up in any decent craft handbook. It consists of cutting a sheet of material to a bit smaller than the finished object, tacking it in place so it won't move, then running a pencil around at a set distance from the finished edge. Finally place your scribed sheet onto the material from which you mean to make the finished piece &, reversing the scribing process, transfer thereon a close approximation of the required line.

Having ensured that the new piece a) can be got into place (which may not necessarily be possible, even when it ought to fit when actually in place & b) does fit as intended (lots of work with coarse sandpaper, 60-grit recommended for rapid material removal, wear a mask), then you can bond it in with the appropriate application of mastic – especially around every aperture & around all edges. Please remember that, unless you have real

squeeze-out all around, you do not have any guarantee of either a bind or a full seal.

You ought, before getting out the mastic gun, to have worked out how you will hold the new material in place as it is bound to want to curl a bit & sure not to want to lay dead flat against the bulkhead. All kinds of tricks are used in industry which may seem too bothersome for doing a few boats, but there is nothing worse than to have a really sticky sheet of material develop a mind of its own & start sliding off in all directions! A good trick might be to get some double-sided tape an use it to fix a few small blocks to the hull & other strategic places, then insert short stick & wedges between these & the inserted piece of material to keep it in place until the mastic cures. I do recommend a dry run on this before committing to the bonding job itself.

You can, of course, run around the edges afterwards to ensure a perfect seal. But remember that, if water does get between this sheet & the bulkhead, it may go manky with time &, if it freezes, might disrupt the bond.

As for hatch surrounds: if there is room enough to do it, you may safely lay an oversized ring of material, into a bed of mastic, onto the upper surface of the slidebed. You still have to hold it down neatly.

6. The Hatches

These should be large enough to allow hand access to the slide bolts!

Ensure that they fit sweetly into their new apertures. Bed them in with mastic & insert the appropriate screws with care, so as not to over-tighten & strip them.

Be sure to fix an adequate length of nylon cord (not too long!) between the hatch cover & a suitable internal fixing point. If you can find no suitable fixing point, try one of these methods:

a) Tie the other end of the cord around a small piece of wood, lightly sandpaper a patch of the inner hull, spread that patch and the wood block with epoxy resin, & hold the block onto the resin with a piece of tape until the bond has cured.

b) fix a self-adhesive loop to the skin, etc.

7. Cautions!!

a) Work safe: loss of fingers, dermatitis, respiratory problems & upsetting the person who washes your clothes may all impinge adversely on your future in rowing.
b) Avoid distractions - never interrupt the guy doing the job, & keep extraneous noises & activities to the minimum. Otherwise mistakes get made, things may get forgotten & accidents can happen.
c) Always keep your hands behind the cutting edge & you can't get cut.
d) Sharp tools need less force to do their work. Never push hard with a dull tool. Less force means less chance of a big slip. If your hands are not too close, a small slip will not reach your soft flesh.
e) You can't successfully bond dirty, dusty, greasy or unclean surfaces
f) A deposit of silicone rubber, or even a place where silicone rubber was wiped away, acts as a perfect release agent to prevent anything else from bonding other than silicones.