

## Technical Articles

### Retro-Fitting a Sugar Scoop Stern

by Keith Calton

Don't know how many of you folks have ever looked over the stern when you're motoring, seen a pile of water several inches high and thought 'I'm paying for that and it's not helping me at all'!

Now I'm not tight. (Other opinions are available) I thought there must be ways of harvesting that lost power. So I chatted to a Naval pal of mine who used to chase round Russian subs in the 60's. He confirmed that I was wasting energy so I realised that I needed some way of extending the waterline length to keep the water where it ought to be!

Whilst a propeller 'bites' forward it needs back pressure to sort of push against and if the water is being pushed to the surface then the air provides no back pressure. i.e. the blades act like an aeroplane's wing where there is low pressure on the front side and higher pressure behind so your boat goes forward.



I first thought of a sort of hinged board, much like trim tabs on motorboats. Amazing what thoughts go through your head before you arrive at a sensible solution. I soon settled on a sugar scoop extension.

As my original stern is a reverse transom it seemed pretty straightforward to make a flexible mould. Wrap it round the stern and simply lay up the component inside. It's surprisingly straightforward.

I needed to do this in a hurry as I was due for my first bionic hip. I got a couple of sheets of hardboard and piano-hinged them together with the pop rivet heads slightly recessed with the hinge on the outside and the smooth side inside.



I then waxed both sides thoroughly, inside for release from the gelcoat and outside for weather protection (I was doing this in the boatyard and the only protection was a tarpaulin).

The hinged centreline has to be longer than the length you will need. The sides have to be long enough to reach the rubbing strake as this was the height I wanted it to start from. There was a small area on the stern that was antifouled so I cleaned most of this off. But don't worry, polyester won't bond to antifouling! It's also a good idea to clean and polish the whole stern for release purposes though it would be done later.

Fitting the mould needed two people so my pal Les was roped in. (also I can share the blame) We struggled using ropes, compression straps and wedges to get it into position and lined up and hold it there firmly so it wouldn't move as work progressed - and it didn't.



[View from stern showing baton holding mould in place before filleting and gelcoat]

Then using wax or Plasticine the inner corners where the mould contacts the hull are radiused using a small round filleting ball and any gaps where the centre hinge was were filled.

Next the time to polish 6 times plus with silicon free release wax following the instructions on the tin (they can vary but most say apply wax over a few square feet, leave for a few minutes and wipe off)

Once this is done it's best to apply a PVA release agent that is usually blue and should give a failsafe release. If you have access to compressed air and a simple spray gun you can apply the PVA this way using high pressure and low volume with several coats, so it 'mists'. This way you'll avoid the 'fish-eying' that can occur when PVA is applied with a rag.



I used pigmented gelcoat and applied two layers so I had enough thickness to rub out any slight imperfections. I was fortunate to have Oxford Blue pigment that is the same colour as the hull (though I did paint the extension so it was a perfect match). I also partially covered the stern of the boat and used a fan heater to warm it up before applying the gelcoat as the weather was cool.

Once the gelcoat was tacky I applied one layer of 450 gram chopped strand mat (CSM) over the entire mould extension area. Eight inches plus on what would be the vertical edge flange area. Plus extra across the bottom half as there would be two rows of bolts. One above where the shelf would be and one following the curve of the hull.

The first layer is by far the most important. Care taken at this stage will result in no little air blisters (breakouts) on the extension.

On boats a slightly resin rich laminate is recommended though in this instance it would be clear of the water unless underway. I then laminated another two layers of 450 gram CSM and allowed to cure.

LOCATION: You want to be sure to locate the moulding to its exact position after removal at this stage. Drill out the position of your top fastening bolts either side and then fill the holes with Plasticine or wax. This way you will have a perfect fit after you remove the moulding. You can then laminate to the required depth with confidence.

I was fortunate to have some heavy duty woven roving which I sandwiched between two layers of CSM to make sure it was fully

'wetted out'. Be careful if you do this as rovings don't like going around tight corners.

I used 10 layers of CSM, plus rovings and 2 gelcoats which gave me between 15mm and 20mm. More on the overlaps. With glass fibre the corners are usually where the overlaps are and also where you would need the greatest strength. Be careful not to put too many layers down at one time or you might get overheating and possible distortion of the component!

Before the stern extension was removed from the mould I placed in a 12 mm ply floor. Glassed in with three layers of 450 gram mat leaving sufficient space to get the



lower fastening bolts in place with a slight downward angle. Just enough to shed water. This meant that I would have to fit a good quality hatch later to access the fixings. At this point I painted a layer of waxed gelcoat (flowcoat) over the inner surface to get a smooth impervious finish.

The floor was glassed in prior to removal from mould and stern which made it even stiffer. Note the two locating bolt holes (moulding shown after removal from stern)





INSIDE: I was going to have to be able to reach the whole stern bulkhead which entailed peeling back some carpet which was the existing lining and cutting out some of the rear seat panels. All carpet was later replaced when I re-lined the boat with vinyl.

As the seats aren't structural I was able to cut neat lines with my oscillating multi-tool used at right angles against a straight edged piece of wood with a diamond cutter.

Once the cut out panel is removed, simply fit a baton hallway under the cut part and screw in place. Your 'removed' part can be replaced later with no loss of strength.

I was prepared to reinforce the bulkhead but it was sufficiently thick and strong enough so I was spared what would have been an onerous task. It did need to be thoroughly cleaned though in preparation for the nuts and large washers I was going to use.

I did consider using a stainless backing plate to spread the load. But as the bolts were fairly close together and the washers were large I really didn't need to as it's quite over engineered.

**BOLT SPACING:** There are guidelines for spacing, which Les as an aircraft draughtsman was familiar with. These are: 'centre of hole to edge of laminate, 3 times bolt diameter' and for bolt spacing, 'between 5/6 times bolt diameter'.



These are rough guides and both surfaces were close to corners that are inherently strong. The laminates were nearly 20mm thick so I felt able to increase both distances. i.e. The bolt spacing went up to about 100mm without Les wincing too much.

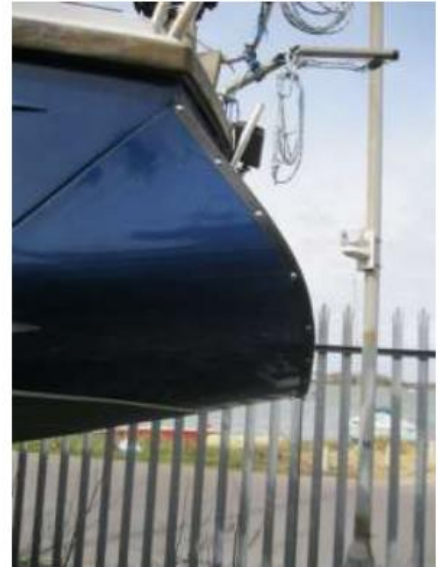
With the moulding in place before the final fitting, trimming, and painting with all the holes drilled and both surfaces dry, once cleaned with acetone I used white Sikaflex

around all the edges with cross patterning beads and then around each bolt and nut. Really messy but worth it so no leaks in five years!



Once fitted I stood back and 'chalked' a line where I thought it needed to be trimmed and cut it. There was more than one attempt at this and when I was satisfied it

was rubbed down and painted. The finishing touch being rubber fendering from Bridge Rubber and Plastics in Woolston, Soton which I riveted on.



**BOLT MATERIAL:** I used stainless 10mm A4 and A2 nuts and bolts and washers, with the A4 (marine resistant) bolts on the Sugar scoop stern extension pointing in. The reason to use different grades was explained to me by Debbie at Margnor Fastenings near Guildford (great for stainless fastenings at normal prices). That if you use the same grade stainless it can 'Gall' or pressure weld when fully tightened.



**BENEFITS:** Storage for dinghy, (*Ed: This folding dinghy, the "Calton Kombi", was designed and built by Keith and featured in an issue of PBO and is mentioned in the Caltoncraft article page 22*) ease of boarding and place to put boarding ladder. When sailing the extra 34 inches when heeled gives slightly more speed and a more pleasant motion. The extra 34 inches waterline length under power (because of the natural tendency to squat) gives better fuel economy and speed. Under power I get the same speed for 200 revs less, (6 knots at 1600 revs as opposed to 1800 revs on a clean hull).

What would be different if done again? More care lining up mould (the extension is slightly off-centre) and inadvertent tumblehome (which is actually a nice feature).