

Cargo Proa Prototype

Building Blog



SEPTEMBER 2020#1

Boat building has been a bit slow for the last couple of weeks and Harryproa enquiries have gone through the roof so I have been spending my non building time responding rather than updating. Rob R has got the rudders ready to trim and assemble. Took a bit longer than expected as I managed to convince myself that moving the edge spacers negated the need to build left and right hand pairs. Not so, idiot. Consequently, we had some reworking to do. This was made a lot easier by the leak detector my brother in law built us using some car parts and a glasses case. Works a treat, leaks sound like loud static and you can home in to a fingernail sized area. It noticeably reduces the discussion (and daft ideas, mostly mine) about where the leaks are and why they can't be found.

The tender work has been mostly boat building. Cutting, filletting and glassing the areas where join ideas did not work as planned. Educational, but

tedious, although as each step is completed, the boat gets stiffer and better looking so not entirely unpleasant. It still looks like a box, but it is getting some curvy bits.

Spent a lot of time thinking about stiffening the panels. The process usually starts with 'should have used foam and to hell with the expense, fragility and expertise required', but after several cups of tea and discussions, we have solutions to most of it. Top hat stringers under the deck and centre cockpit are pretty good, but need more than glue and glass for the ends so we use tow through the deck to attach them.

Fore and aft boxes for the anchor rode and fuel/battery/engine spares divide the other 2 cockpits into smaller panels and a trough down the foredeck stiffens it up and will allow anchoring without needing to leave the cockpit, which will be difficult once the solar panels are installed.

Unfortunately, this will not be until after the Queensland Govt decides to reopen it's borders. Doug the engineer is one of those rare engineers who can converse with laymen and accept ideas which aren't his and/or aren't in the text books. This was accelerated when Rob R built a couple of 700 mm long x 100 mm x 100 mm trusses from 6 mm timber. Amazingly stiff, light and strong. Doug is working on optimizing the trusses for the beams which are considerably lighter, easier to build and much cheaper than the conventional box beams. Rob R will start building a 1/5th scale this week for testing. Analysis of trusses for the lee hull and masts are next on the agenda.

The work on the inflatable sail continues, but it is getting more complex as the inlets need valves. With our new found ability to make non linear rods, Roan has printed the jig and is making an Optimist sized wing rig when he is not repairing vacuum pumps. The quest for student volunteers has resulted in 10 enthusiastic engineering students starting next week, all going well. They came and had a look and seem a pretty bright bunch. It will be interesting to see how my time/people/logistics skills cope. 3 weeks after I announced it happening tomorrow, the tender and table swap places this week and we start to put together the 12m table for the windward hull panels. With the knowledge and experience from the tender experiments, this should be a fun job.



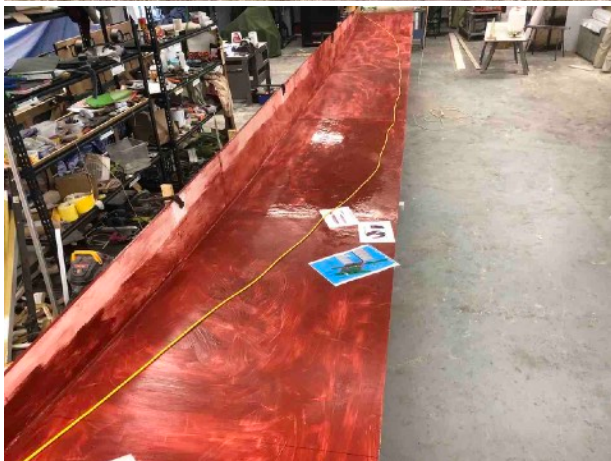
SEPTEMBER 2020 #2

Moved the tender over and set up and glued the 12m table. Tender seat verticals bonded in. Weighed it and was surprised it is only 205 kgs, with a bit more to add and some to remove. Not too bad for a 8.4m/28' solid fibreglass (almost, I used some old bits of Bucket List hulls to support the seats) power cat with a fair bit of tabbing where ideas and experiments did not work as expected. Cockpit boxes are in, foredeck bulkheads started, nose piece on foredeck (Rob R), table sealed with a mixture of cabosil and red pigment (Roan). Lots of discussion about the truss beam model, electric motors and the table set up, which was far nicer than filleting in the tender cockpit lockers.

Mould bent, vertical on, aligned (Rob R) filletted and coated. Bow reinforcing on tender (Rob R) which was a bit more difficult than i thought it would be, but worked out well.

The tender has the anchor slot cut in the foredeck, the sides cut and the stringers bonded on. We moved it outside on a couple of wheelbarrow wheel skates. Almost effortless. Hope the 12m and 24m hull are equally easy! Rob R beefed up the mould supports and started on a f'glass rack while Roan did some mould sealing, then we spent an hour or so discussing the boat and how the windward hull would be built. Most enjoyable.

The truss beam design is looking better with each iteration and discussion with the engineers. Rob R is making a jig this weekend so we can build a 1/5th model for testing.



Windward hull mould

SEPTEMBER 2020#3

Day 51

Rob R, Roan and I infused the 3rd 1/4 hull. It went smoothly, but not as fast as yesterday, possibly because we did not preheat the mould as it was a warm day.

Used 19 kgs/42 lbs of resin, the same as for the opposite half. ~3 of which is in the flow mesh, ~2 in the peel ply, foam and plumbing. The calculated cloth weight is ~26 kgs/57 lbs, so not far off 1:2

resin fibre ratio. It is about 20% of the total hull and decks area, so total panel weight of ~200 kgs/440 lbs. Plus 1m/40" of foam bows, a couple of ring frames, 2 stub masts, a wall of shelves/panel stiffening and joining the 6 components. Then hatches, steps, windows and paint and it is ready

to go. 😊 Some of the joins are conventional, some experimental. Hopefully they are more successful than the attempts to make the tender easier to assemble. If not, I have 2 x 7 x 12m of glass tabbing to look forward to.

Manhar and Sai turned up in the afternoon and cut the glass for bonding the hull halves together next week while I prepped the tender for the final bit of glassing, prior to a rough fair and paint.

Day 50

Demoulded the 1/4 hull and it is as good as it looked. The diagonal stringers with high density polystyrene formers are excellent. The panel is plenty stiff enough. About the same weight as 600 glass either side of 12mm foam, but tougher, cheaper and easier to build and repair. Laid up the next one with a couple of hours help from Roan. Tried a different layout for the stringers using less material and bigger angles.

Opened a new roll of Chinese vac bag material and it is much easier to use than the conventional AirTech nylon type. Less stretch allows long runs of crease free sealing. Conforms the same and is plenty strong enough to bridge gaps. It does not crease as much, so potentially reusable as a bag rather than as a mould liner. Maybe.

2 guys laying up and infusing a (near enough perfect, from a laminating point of view) 12m/40' half hull in a day and a half is pretty good going. I took the test rod (looks good, noticeably stiff for 2m/80" x 12mm/0.5" diameter) to Martin's after post curing it under black plastic (75C/167F for a couple of hours in the sun) and had a chat with him and Doug about trusses. Both are impressed with our solutions to the fastening problems and are looking forward to testing the model. Trusses are pretty well established structures, but once you start bending and tapering them, while applying loads in multiple directions like a cargo proa beam, analysis gets tricky. The most likely failure mode is buckling of the compression struts. Making them hollow would reduce this, but increase windage and, while easy enough to make, they are difficult to attach, given my aversion to bolts. We're looking at other solutions but they are difficult to model and analyse so the test model(s) become important.

Both Martin and Doug are now enthusiastic about a truss for the lee hull if the non truss problems can be solved.

Day 49

Infused the 1/4 hull. Went well, the stringers all appear to be well bedded and we used the same amount of resin as for the slightly larger, non stringer 1st piece, so it's probably a good one. It looks the same as the first piece which lost and regained vacuum, so maybe that one is better than we thought.

Rob R figured out a clever solution to the beam stabilisation problem and Brad and Teguh made a sample rod for testing, probably next week as we

will need the results to build the beams when the hull infusions are finished. One of the required tests is material compression strength. It will be interesting to see the jig which tests this accurately as it is notoriously difficult to align the loads so that the failure is not a result of buckling or uneven loading.

Day 48

Roan and I laid up the 2nd 1/4 12m/40' hull with plenty of time out to admire Rob R's 1/5th scale beam and discuss the next steps and the Opti wing rig.

