

Mini Cargo Proa Prototype

Building blog



FEBRUARY 2019

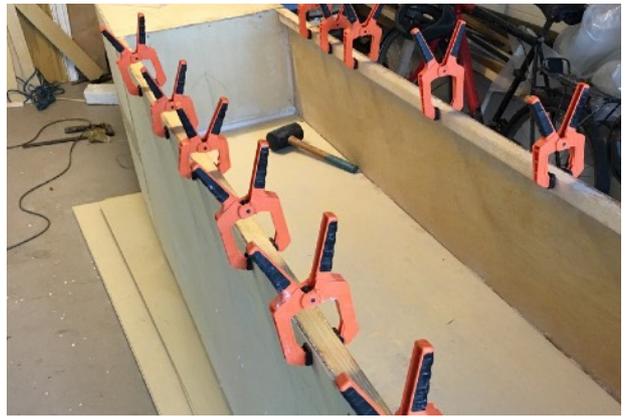
When I was asked to visit the Marshall Islands in September to teach the locals how to build and sail the mini cargo ferry, I thought it would be smart to build a prototype to ensure I didn't make a fool of myself and to test some ideas to make building them quicker and easier. One of the critical things with this boat is longevity and ease of build by unskilled workers. Ensuring everything had 3 coats of epoxy was critical. The best way to do this is to glass all components, then peel ply or baking paper the surface. This policy was carried through to the stringers, which were triangular in shape and included in the glassing. Cutting them was right on the limits of the \$100 table saw and undressed timber stock, but it managed. Triangular fillets are hard to clamp and time was short, so rather than adapt the clamps and limit the amount of joining per day, screws were used. Incorrectly prepared screws and poorly filled screw holes are by far the most common starting point of rot in sheathed ply

boats, both of which take up an extraordinary amount of time. In the Marshall's boats, they will not be used.

The ply is interesting. The veneers are medium/poor quality (Grade B and C, D is as bad as it gets) which are plenty strong, but have knots and flaws. These are covered with very thin (less than a millimeter) veneers on each side and it looks like high quality. It glues and glasses well, is stable (for plywood) and did not move when it got rained on and humidity skyrocketed. \$Aus50 per 6mm sheet, including cutting it to size. The sheets of ply were pre-cut into half width pieces for the bottom, deck and cockpit and 2/3 sheets for the sides. The bow curve was cut using a batten, then transferred to the other pieces, no measuring required. The full length pieces were then butt joined and a layer of glass applied on both sides to the join. The 1/3 pieces were joined lengthwise to make 2/3 sheets. The stringers were added and everything was glassed on one side.

The bulkheads were cut to length from the remaining part sheets, stringers and glass added and glued to the hull bottom.

Because everything is straight, alignment was simple. Eyeball and string line were fine. The sides were bent and glued into place and the cockpit glued in. All straightforward. The bows were joined, screw holes filled, deliberately exposed ply edges filled with glue and the exterior glassed, with extra layers on the joints, bows, chines and gunwales. It was then peel plied to protect it from the sun until it gets painted and to give a key for the paint.



The completed hull weighs 110 kgs, took 53 hours.

The next one will be quicker. Building a 7m hull in a 6m garage on rainy days is slow. As is insufficient floor space to glass all the sheets at the same time. There was a small screw up with panel alignment (easily fixed), and a problem with using the wrong screws rather than going to the shop and buying the right ones. This necessitated using a soldering iron to soften the epoxy so 30 of them could be removed. Drudgery. Especially when Rule #1 was: No screws! False economy all round, will not happen again.



The whole job was a bit of a blast from the past. Lots of fun, apart from the sticky/dusty and a great reminder of how much quicker, cheaper, simpler and cleaner Intelligent Infusion is. I will be packing a small vac pump and materials required for a demo along with my kite gear and sun hat in September.

The next step is to build the beams and the second hull. We have also found some easy use epoxy. 2:1 by volume, long open time for high temperatures (40 minutes at 35C), good solar resistance, different colored resin/hardener which combine to make a third color and cheap at \$Aus11/kg. Plus there is a video to film, showing beginners how to use epoxy in reliable and time efficient ways.

DECEMBER 2019

Some footage from the 2nd sail on the prototype Mini cargo proa. It worked pretty much as predicted, but there are a few problems still to resolve. The shunting set up is easier than perching on the bow, but the lines need some rearranging. The boat holds it's course exceptionally well and weight shifting is the easiest way to alter it. The paddle is hard work off the beam, much better off the stern.

The boat was built so there would be no surprises with the boats to be built in the Marshall Islands. I am visiting there in January to teach a select group of villagers how to build one. They will then return to their villages

to build their own. All going well, the concept will spread throughout the Pacific. These are not meant to replace the traditional canoes. They are an alternative to the outboard powered petrol guzzling skiffs that are expensive to run for fishing and commuting. The hope is that, as well as learning building skills, the villagers will relearn their sailing skills and overheads will be low enough to make near shore fishing viable.

The Mini Cargo Ferry is built from ply/glass/epoxy as that is what they wanted to build from. The lee hulls on the prototype are 2 and 3 sheets of ply long. The actual boats will be 3 and 4. All other dimensions are the same which is why it looks boxy.

JANUARY 2020

Arrived in the Marshall Islands a week ago to build the mini cargo proa. In the 5 days since arriving at an empty work space, right on the water's edge, with a bunch of mostly non english speaking, non sailing locals who have never heard of epoxy and rarely used power tools., we have got 1.5 beams finished, the ww hull is ready for the deck and we have 2 panels for a 20'6m stitch and glue cat ready to join. The guys are awesome. Tell/show them something once and they understand exactly what is required. Hard workers, usually smiling and laughing.



Photos by Patricia Lengua Hinojosa



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The WAM people who are organizing it and the GiZ guys paying for it are also good value. We are apparently the “realization of their dream” to get some zero emissions boats built. It’s a good feeling when a stranger comes up to you in the lunch queue at the “Wellness Centre” (low cost healthy restaurant run by the Canvasback medical volunteers), asks if you are the guys “building the canoes”, and says thanks.

Materials are all imported, wood for stringers etc is a problem. We spend more time scarphing to get a decent length than anything else. A lot of filletting coming up to replace it. The ply is good and the kiwi epoxy ok, but far too fast, so epoxy sessions tend to end up rushed and messy.

I am sharing an apartment with 3 German engineers, one of whom is designing a sail assist monohull to reduce the emissions of the inter island fleet. I think it should be a sailing cargo proa; we have had some interesting discussions.

Went for a sail on a 5.5m/18’ canoe. Deep assymmetric hull, crab claw sail, oar steering. Fun, but with 3 of us on board, and a leaky hull, it was not conclusive. Big race day in a

couple of weeks, we will put a speed puck on one of the hot boats and see how it goes.

WAM has a new boat ramp which makes water access easy (swim before and after work, and after lunch), the lagoon is a great place to sail, but all the beach sand has been used for concrete, so not much fun getting in and out over the coral. Added a keel to the mini cargo proa.

FEBRUARY 2020 #1

End of week three and the end of the build phase is in sight. The proa windward hull is ready for glassing, the lee hull has the bottom, stringers, bulkheads and one side assembled, the other side, cockpit and deck will go on as epoxy cures. The beams are complete, apart from planing the tapers and the lee board is glassed. The two cat hulls are ready for cabins and decks. Stitch and glue is almost as quick to build as box section frames and stringers, but more complicated. Not a problem once templates are made. The proa is on target for near 200 kgs/440 lbs ready to sail, the cat a little more.



Failed shortcut stringers



First side on



Frames on bottom



School kids visiting



Cockpit stringer



Glass clamping



Hull glassing



Glassing beams



Beam assembly



Bulkhead fillet



Beam assembly



Bow join



Beam test 300 kg



Sides on and cockpit stringers in

Photos by Patricia Lengua Hinojosa

A COUPLE OF STORIES:

Alson, the boss at WAM is a traditional canoe sailor, uses the waves and stars to navigate, has made many ocean crossings and is almost solely responsible for the revival of traditional building skills in Majuro. A lovely person. He had a look at one of the renderings of the cargo proa and said "Those rigs (unstayed with wishbones) are much better than ours (lateen/crabclaw), they can't fall down". I suggested we import some carbon tow to build a lightweight mast and he agreed, particularly as there is a shortage of breadfruit trees for traditional masts. Tow should be here in a week or two.

I was sitting on the beach watching Henrik kitesurf when an old bloke came and sat near me. I waved at the lagoon and the dozen ships scattered around it and said "beautiful, isn't it". He sneered and said "too many ships, we should be sailing". Turns out he was a lawyer for a land rights case, in town for the final hearing. He had lived through the good old days, reckoned there was a lot of interest in returning to sail, not least because of the cost of fuel.

There is a near non stop procession of vip's

and curious people through the shed. When they arrive during an epoxy session, they tend to get short shrift as everyone is flat out. This morning, we were putting the side on the lee hull, a 7.2m x 60mm glue job. 4 adults and 2 kids wandered in, said hi, how's it going. I politely asked them to come back later when things quietened down. They said "sure, where will we leave this?" 'This' was a bag of near new rope and about a grand's worth of blocks, cleats and fittings! Enormous thanks to the crew of Manna and Double Trouble. You are all invited for a proa sail in a couple of weeks.

Attended an expat dinner the other night. One of the guests was a Tongan education consultant. Told us how 10 years ago his village had 12 sailing boats, now 4 and what they wanted was a boat they could easily build, sail and maintain themselves to travel and take cargo to the the market. The people at the dinner who knew about the cargo proa smiled. A nice moment.

The 2 German ship designers we were sharing an apartment with went on one of the ships to an outer island. Saw one sailing canoe in the 10 days they were away. Spoke to the owner, a traditional builder taught by his father and heard how the cost and effort of maintenance was only a little less than the cost of fuel. Foam/glass and a durable alternative to sail cloth would make a big difference.



Went for another canoe sail, in 15-20 knots of breeze. Far more difficult to sail than the one we built. The spars are heavy, solid wood, the mast is further to leeward, there is no halyard, forestay or backstay, the mast is more vertical, the windward hull has less than 40 kg buoyancy, the one part sheet cannot be trimmed in without moving to leeward and the apex of the booms has to be untied, moved to the other end and retied. Which are all just excuses for us dropping the mast twice and struggling with the first few shunts!

A couple of days later, after work: 20-25, blasted out, me sitting near the ww hull. Have to point high to get enough sheet in to sail on a reach, then move outboard while bearing away. Too slow bearing away, the hull sinks. Too fast, it flies, ease the sheet and start again. Shunted (I nearly stuffed it up, not as agile as I once was), I steered and Henrik was ballast. Pretty quick, could not see a thing, then we pitchpoled. Contrary to internet opinion, the crab claw is not a lifting rig! Took us a while to figure out how to right it by pushing the windward hull under the leeward one after rotating the boat, removing the rig and tying the stay under the hull so we had something to push against. Not the way the locals do it, apparently. They stand on the long hull and pull the short one over the top.

We could probably have got the rig up but a Police boat had come out and there was only a bit more daylight so we got a tow in using VB cord as the tow line. Huge fun, apart from needing to be rescued.

FEBRUARY 2020 #2

First sail yesterday, 1 month after I arrived. 20-25 knots, 1 mile fetch. Used the smallest sail I could find that did not have big holes in it. Sewing new sails is part of the project. The lee board string was nowhere near strong enough. Not surprising, but we have either 2mm black net rope (remarkably strong, it is what was used to tow Henrik and me in when the canoe capsized) or donated 18mm sheet rope. Will sort out something with the 18mm and a tensioner.

Me, Sealand and Isocker (both highly accomplished canoe sailors and all round nice guys. Isoka is also one of the best craftsmen I have met) were getting along ok with the lee board severely canted due to the line stretch. Then it broke. We bore away onto a

reach, the bows lifted and we got along very nicely. No pics of this, and the speed puck was in my bag in the workshop, but those who saw it were impressed.

We shunted with relative ease, the system worked, but because the pulling line was too long, it got caught under the hull, an easy fix with a shorter line.

Without the leeboard, it pointed high, sailed fast, but leeway was too much. We did another shunt, but we were not going to make it home so asked the camera boat for a tow. They had control issues, we got the wrong side to the wind, so dropped the mast over the stern before it fell over the short hull. I will put the step further to windward. Both Sealand and Isocker are impressed with the set up, strength, shunting and the steering (better than a traditional canoe). We will add a trampoline, do some modifications and try again on Monday.





Test sail 3.

Still messy, but getting better. Changes since the video was shot: Shrouds are now attached to the beam ends. Mainsheet is 3:1, not 2:1 and leads sensibly. Rudder hold down on the top edge is still a problem, mainly due to the size of the rope. Next size down is 2mm polyprop. Bought some prepackaged 'nylon' rope today. Burnt the ends, nothing melted. Smaller (15' long vs 18'), lighter (less than half the weight) mast, stepped closer to the hull. The

shunting line is operated from the windward hull to get the spaghetti out of the leeward hull. Should mean the crew can pull the line, the mainsheet person 'only' has to guide it past the beams.

Test sail 4.

Sail was short. Broke the bottom boom after 100m. Was getting along nicely. All the changes worked, except the daggerboard still need work.

MARCH 2020 #1

Last week we spent the time prepping the hulls and beams for paint, adding a bit more tow to the beam stirrups, making a quick release arrangement for the trampoline, fibreglassing an extension on a boom to replace the busted one and thinking about/ making a pair of kick up rudders so we can eliminate the lee board and the paddle. The paddle is actually great to steer with, but pretty draggy as it is a big chunk of timber. It would also be nice to not have to perch on the end of the hull to steer.

I made the mistake of asking the guys what colour they wanted the boats to be and they chose bright yellow, with red highlights. Looks like a DHL advertisement, but will be hard to miss. The only yellow paint available was from the Taiwanese hardware, but no one in the shop could translate the instructions. The only red available was for use on steel. We applied a second coat when the first was tacky, and 6 hours later, both are dry to touch. And bright! And turps based. Brushes cleaned up in acetone, the rollers, which shed most of their fluff on the job, not so much. Will see if it is hard and adhered tomorrow. If so, we will assemble the hulls and set up the new rig, which has longer spars than the old one, so a fair bit more sail.

Next day: Yellow paint is still soft. Decided to paint the cockpit red as it dries quicker. Spent an hour tying the sail onto the extended boom after learning a new locking knot for nylon fishing line. 2 days later, we are very busy, waiting for paint to dry! Still soft, will leave it for the weekend and see how it feels on Monday. Got the guys building a rudder yesterday, looks ok.

Went for a sail in a canoe with a gps. Tacked through 115 degrees at 5 knots in about 10 knots of breeze. Max speed about 8 knots in a puff. Not bad with a tarpaulin sail, which, to me, looks better than the blown out dacron ones on the other boats. Then we broke the mast during a shunt. We are a lot rougher on the gear than the locals, who make shunting look like ballet. Repairing the mast today, try again tomorrow. Sailing the Mini cargo Ferry on Monday, whether the paint is hard, or not.





MARCH #2

Sail #6 Got Isocker and Frederick to give me lesson. 10-15 knots, max speed 11. Seems to shunt through 90 degrees but the SpeedPuck course ironed out all the course changes, presumably the averaging was too high. Most of the time no paddle was required but for hard on the wind and deep running it was needed. Pretty low loads if it was rotated rather than swept. Shunting dead easy, could not repeat my problems. Apparently light air is more difficult than heavy. Big smiles the guys seemed impressed. I decided to leave while I could. I'm now back in Brisbane preparing to build the 80'ter. More on this as it happens.

Huge thank you to Alson, Henrik, the WAM girls and boys and the trainees. I learnt as much as I taught, had a great time and some lovely memories. Hope to see them all again when the 80'ter is sailing.

Huge thanks to Gary Ehram for the movie and escort duty. Pity about the water in the lens!

