

Cargo Proa Prototype

Building blog



Canoes visit

AUGUST 2023

We knew I was going to be spread a bit thin with the teaching commitments but did not realise just how time consuming it would be setting up and running a "Sustainable Boat Building" course. Nor how tiring. Nor how enjoyable.

I came back from Sydney in February, and spent a few months preparing for and teaching the CATD students how to build a mini cargo proa, similar to the one I taught in the Marshall Islands. The big difference is the Fiji version has no plywood or timber in it as it is built from recycled PET (the same stuff soda bottles are made from) foam, epoxy and fibreglass. Consequently, there is nothing to rot and very little to maintain. We also built it without the use of power tools, both for safety and cost to eventual builders reasons. The first part of the course was a bit shambolic due to lack of space and shelter, late arrival of

materials, too many students and inflated expectations of and by the teacher (me). Despite this, the students built the 2 hulls and the crossbeams in 5 weeks.

I then devised an island suitable technique for building carbon spars and rudder blades. Not Americas Cup standard, but still half the weight of equivalent timber spars. And remarkably stiff. The end result is a boat which is half the weight of the Marshalls ply version, cheaper to build and more suitable for building and using in the tropics.



Fijian boat transport



1st Mini cargo proa launch

The traditional crab claw rig has the overwhelming advantage that it is cheap and easy to build with a domestic sewing machine. The cloth sees low loads, so lasts a lot longer than western sails. The multi colored sail on the [Marshalls boat in the video](#) (scroll to Aug 5) is reputedly 30+ years old. On the down side, the rig is not wonderful up or down wind, cannot be easily reefed and falls down if caught aback.

To see if we could overcome these drawbacks, I went with a large sail (30 sq m vs 18 for the Marshalls boat), an adjustable rig and efficient rudders large enough to act as leeway preventers. It's early days, but it appears we may be on the right track. The boat shunts and steers well, is well balanced and gets along quickly. I had to change the tiller set up (silly mistake, easily fixed) and the beam under the mast was no match for 115 kgs of Fijian youth hauling on a 3:1 purchase for the fore/back stay adjuster (island suitability!) but the rest of it is ready for instrumentation and testing.



1st Mini cargo proa sailing

Fishing canoe workshop

After the mini cargo proa build we organised and ran a 5 day workshop for 10 village women, showing them how to build a fishing canoe. A lot better organised, with a smaller group who built it in 4 days. The requirement for the boat was that one woman could carry it to the water, rather than relying on a bunch of friends to drag the fibreglass pangas, hardwood skiffs or bili-bili (a bunch of bamboo lashed together to make a raft) down the beach. We achieved the target, but the boat was a bit tippy (small outrigger) and a bit small for some of the women. Both were easily adjusted for, but talking to the women, it was obvious that fishing was a social activity and the boat should carry more than one. Consequently, we turned it into a catamaran, which 4 people could use, but was still light enough (25 kgs/55 lbs) for 2 to easily carry down the beach.



Canoe builders



Canoe builders

One of the women (Salote) from the course then asked if she could build one and requested that I watch, but not help so she could see if she could build it on her own. Which she did. Maybe not a huge achievement on it's own, but Salote has to walk 2.5 kms along a gravel road and then get 2 buses to get to CATD. Takes about 2 hours each way. Plus, she has 6 kids! This was a real eye opener for us re the importance the villagers place on getting boats they can use. The interest in the boats is such that we are running another workshop (Salote is teaching it) at the end of August, with several more in the pipeline.



Canoe women

Canoe delivery

After testing on the river, we delivered the 2 boats to Salote's village (5 miles up the coast, quicker to paddle than to walk and get the bus!) for real life testing and on the way stopped at 3 small villages. A dozen women waded out from each to greet us, ask if they could buy the boat and when they could have a workshop. If that is typical of the many Fijian maritime villages, there will be a lot of these built. There has also been interest from other Pacific countries.



Canoe launch



Canoes handover



Canoes delivery



Rewa water taxis

Rewa water taxis

The plan was to build a second mini cargo proa as the second part of the CATD boat building course. Then the UNDP and the Fiji Development Bank asked us to look at a 'green' alternative to the Rewa water taxis which operate on one of Fiji's many inland waterways.



Happy boat building students

The current boats are hardwood planked, some with polyester resin and chopped strand mat on the exterior and powered by 15 hp 2 stroke outboards. The hulls last between 3 and 10 years depending on how they are treated and maintained. I went down and had a chat to the drivers and a ride to see what was required and came up with a very simple landing craft style boat with fore and aft seating rather than the athwartship seats on the current boats. However, the hulls are the small part of the requirement. The big part is replacing the petrol burning, oil depositing 2 strokes. Not just because petrol is becoming prohibitively expensive and Fiji wants to lead the way in options to slow climate change,

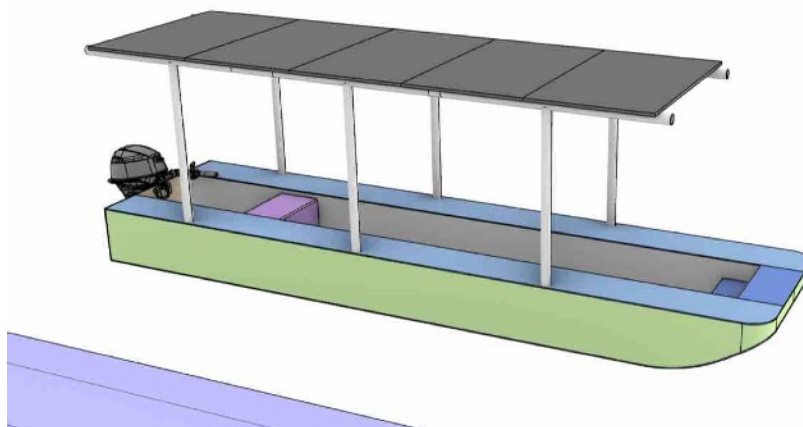
but because, in the words of one of the village elders "When I was a boy, we caught fish as long as your arm. Now we are lucky to find them as long as your finger".

We are looking for collaborators in the project to do some long term water testing to see if the fish situation is improved with the new motors. We have acquired a 40 hp Yamaha motor, removed the petrol power head and freed up the gearbox. The students will install a replacement 10 kw electric motor. The boat has a roof on which will be mounted 7.5 sq m of solar panels. It will be interesting to see what speed it achieves under sunlight alone.



Water taxi build

The second part of the course is running a lot smoother. Only 9 students, 3 laminating tables and a more or less rain proof build space. Much more enjoyable for all concerned and the boat in the photos is the result of 6 x 6 hour days work.



Water taxi rendering

Sustainable boat building

Based on what we have learnt from the pilot courses and thanks to a lot of work by the

CATD staff and Sue (my wife), CATD will next year offer an accredited course in “Sustainable Boat Building”, the first of it’s kind in the Pacific. We will also run supplementary courses and workshops for non CATD students during the school holidays. ‘Sustainable’ in this instance is not about building boats that will return to the environment as compost. It is about building boats which will out last their builders and can be built and used by anyone who needs lightweight, low cost, minimal maintenance boats for transport, fishing or fun but be totally recycled if required.

The cargo proa is still happening, but the brief has changed somewhat. The initial idea was a boat that was primarily a sail boat with a lot of sail area and electric drive on the tender when there was no wind. This premise presumed reliable, moderate trade wind breezes which experience has shown are not always the norm. Plus, the E motor would have required a large solar array and batteries to be reliable. If we had that power available, it made sense to use it in light winds so the propulsion has morphed into a pod motor on a pole which can be used in both directions, and sideways. This may mean that the sail requirement and crew effort can be reduced.

Half the solar panels are mounted and we are waiting for the delivery of the pod motor. The students applied some practical analysis and muscle to the washing away of the ramp problem, and we may be able to launch the boat when my teaching commitments end.

Apart from the boats, there is a lot of exciting stuff happening at CATD, starting with the construction of a new 100 bed student dormitory, 3 new classrooms, the setting up of an Innovation Hub to showcase new green technologies and the registration of the student cooperative so that graduates can return to CATD and put their skills to use while learning the finer points of running a business. It is expected that a boat building yard will be a part of this, building canoes, mini and full size cargo proas and perhaps some Harryproa cruisers. In 3 days last week we had visits from the British High Commissioner, the Minister for iTaukei Affairs, the Japanese Ambassador and the Deputy Prime Minister, who I chatted to for 20 minutes about the work we are doing. More importantly to the rugby mad students, CATD hosted the wedding of the Director’s sister to one of the Fijian national rugby team.