AMATEUR BOAT BUILDERS' ASSOCIATION

JAN/FEB '04

ABBA COMMITTEE

Geoff Leggatt,	**President,**	ph 9494 9999 (Wk)	9316 8624 (Hm)
John McKillop,	**Secretary,**	ph 9437 6666 (Wk)	9313 7442 (Hm)
Chris Davis,	**Treasurer,**	ph 9440 2317 (Wk)	9387 5042 (Hm)
Mike Beilby,	**Newsletter,**	ph 9397 6209 (Hm)	

Contact any of these four people for clarification of association activities.

GETTING THE MOST WITH MASTS

On Tuesday, December 2nd Ray Miller, the renowned rigger and sparmaker, spoke to us about the design and construction of wooden spars (which include masts, gaffs, yards, spinnaker poles, etc). Ray had with him a longish, portable bench on which he displayed a good collection of traditional wood-working tools including timber planes, saws, draw knives, spokeshaves and a whole range of marking gauges, dividers and so on. In the upshot, Ray had no time to demonstrate spar-shaping on it, and the results wouldn't have agreed with the carpeted floor, anyway, but it made a fine podium for him to speak from. It was a very well prepared and presented talk, (and far from being his first time, one suspects), so well prepared, in fact, that it's hard to go past his own notes, so we'll change ponies in mid-stream and give you Ray's notes verbatim:

"INTRODUCTION
Spar making is not of itself a separate trade, but is one of the skills within the trades of Shipwrighting and Boat Building. In Captain Cook's time in Britain, for example, the Navy's Mast and Sparmakers were still known as Shipwrights, even though they may have specialised in mast and spar work almost all the time.

MATERIALS THEY USED
The Whitby Cats, like the "Earl of Pembroke", later to be renamed "HM Bark, Endeavour", was one of a whole fleet of colliers transporting coal to the Baltic and returning with loads of Baltic Pine and European Redwood (or Scots Pine), probably the most commonly used commercial woods. Also imported for mast and spar making was Pinus Pinasta from Spain, European Larch, Fir, Hemlock and Spruce or Whitewood, as it was commonly known.

Nowadays the preferred timber for masts and spars is Douglas Fir (or Oregon or Columbian Pine as it is known in some places), then Hemlock, then Spruce for very light masts. These three species all combine length, light weight and stiffness. Spruce certainly combines length and lightness but is sometimes prone to compression failure.

DIFFERENT TYPES OF MASTS
Depending mostly on rig and size of vessel, such as large yachts like the J-Boats, or square

riggers, or commercial fishing boats with gaff rigs, or small pleasure boats such as I imagine you are most interested in,
(a) First there are Pole masts or Single Tree masts which are of one piece and, of course, most Spars fall into this same category.

(b) Then there are what are called Made Masts where five or more pieces are "cogged" and tabled together with white or red lead paste applied to all faying or mating surfaces and then bound tightly together with rope "wooldings". These wooldings are of thirteen turns of about 2" to 3" circumference manilla rope stretched on with wooden levers and copper nailed in place, thirteen 2" by 11 gauge nails per turn. These wooldings were then protected from above and below with 1.5" by 0.75" Ash, Oak or Elm hoops bent round and nailed to the mast. These hoops and wooldings were then covered with tar to exclude all possibility of water, especially rain water, getting in.

(c) MODERN GLUE-LAMINATED MASTS
This type of construction has come into use for several reasons; one is the increasing shortage of large enough trees. Another, since WWII, is the advent of superior marine-grade glues which are tested to be capable of withstanding 72 hours of continuous boiling in water without degrading. Another reason is the much greater economy of material made possible by machining many small sections of timber to a common dimension even if they have to be end-jointed to make sufficient length. These laminations, once they are long enough, are edge jointed to make up sufficient width. These long, wide boards can then be put through glue spreading rollers quite quickly. Then they can be stood on edge against a dead straight line of steel uprights, each with its own dead level bed rail. When the full number of laminations are ready they are then clamped together horizontally by hydraulic jacks at every post and bed rail at whatever spacing is appropriate for the thickness of laminations being used. Then canvas curtains, the full length of the job in question, are dropped down all round, the air temperature is raised to about 50 degrees Celsius or more and circulated around the job, so that the temperature is uniform throughout and the glue sets hard in about 3/4 hour. The job is done! Now you have got one single, very heavy stick of wood to move out of the way so the next mast or spar can be begun. Masts like this can be over 100' (30 - 40m) long and up to one metre square in section. Then all you have to do is make it round at the required places! This brings us to the main point of our discussion - shaping.

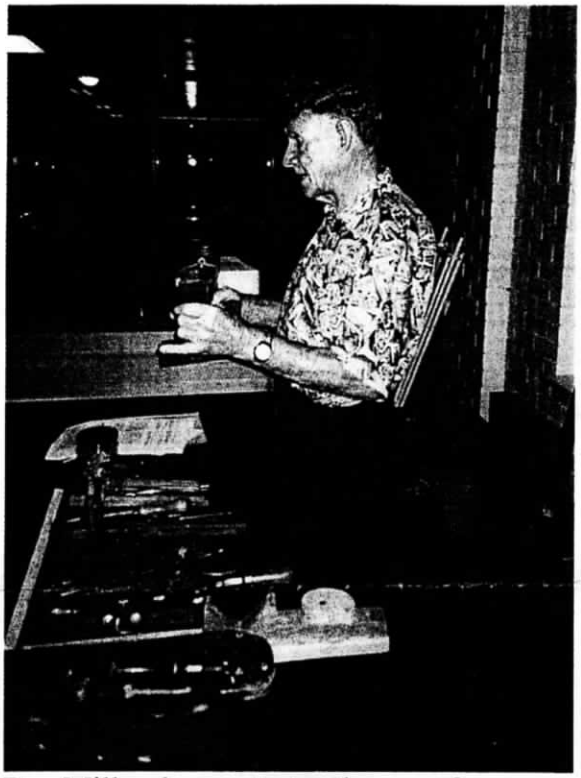
SHAPING
There are two different kinds of shape required in mast/spar making. The first, and it must always be dealt with first, is Longitudinal Shape as to the dimensions of length and width and thickness or a combination of width and thickness. Once longitudinal shape is established, then comes the more time consuming and exacting part of the job and that is Cross-sectional Shape.

(a) Longitudinal Shape - as we said, it must be done first,(unless you are making a blind roller in which case your mast/spar is parallel!) Is your stick tapered? Or is it cigar-shaped, with a thing called "entasis" - a Greek word meaning "swelling". And now we are entering the realm of aesthetics or good looks, and of course, in boat building, if it looks right it must be right! Also it must be said that the lamination glue lines are kept in fore and aft orientation in masts and in the vertical for yards, booms, etc.

(b) Cross-sectional shape - The question is, is your mast/spar to be square, circular, oval or a combination of some or all of these in cross section? In some masts, for instance there can be a transition from square at the heel to eight sided, then to round for most of the way up, then out to square again under the hounds with cheeks or bibs added to the sides to carry trestle trees and cross-trees supporting a top platform and square doubling to take a topmast. Or your little 15' sailing dinghy may require a simple one-piece Pole mast, nicely tapered from its heel at the mast step, swelled out to its maximum diameter of 3" at the forward thwart and then nicely tapered to its hounds and halyard sheave."

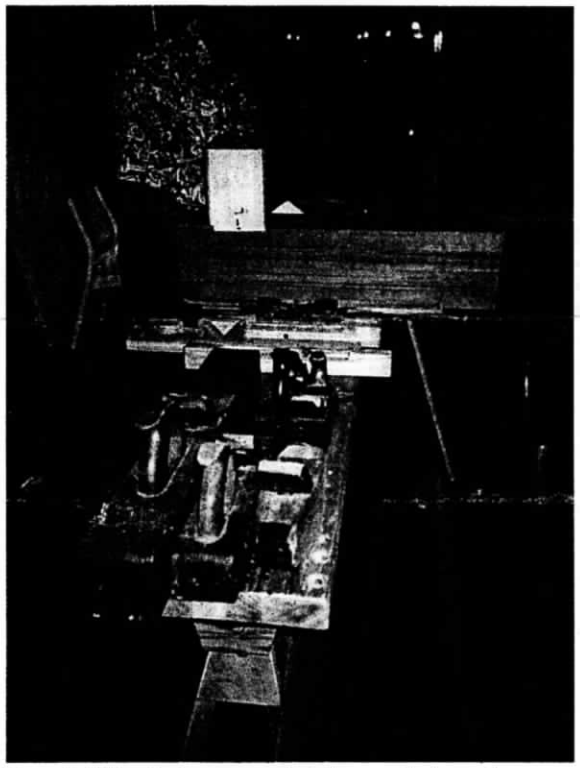
Although Ray didn't have time or space to demonstrate actual mast shaping, he spent a lot of time on marking out the timber, both longitudinally and in cross section, passing around several ply boards he had made up with

Ray Millar explains the uses for his collection of planes



Ray Miller demonstrates the use of a marking guage

Ray Miller discussing the process of spar shaping



Ray Miller's transportable work bench

all relevant instructions on them. It seems a straight taper is "out" because it will actually look wasted in the middle. The necessary elliptical correction (entasis) is determined by a simple fractional formula for marking out the timber and then shaping it while maintaining a square cross section. Then, and only then, can the four sides be marked out for shaping, in the first place, to eight sides, then 16, then 32 and sometimes 64, before rounding with sandpaper.

Ray gave a lot of time to the application of the Pythagorean theorem (Theorem 29 in my book at school, I can still remember it) so that the cross sectional square can be marked and cut down to eight sides. Pythagoras applied to a 45 degree triangle results in sides in the ratio of 1 : 1.4142 : 1. If these ratios are observed in making up a double ended marking gauge with two scribing points fitted (giving gap intervals of 1, 1.4142 and 1 again, in that order), and if the space over all three is no less than the maximum width of the spar, the gauge can be traced over the length of the spar, increasingly twisting it as the spar narrows. Do it to all four sides and the corners can be planed (or sawn if a special band saw is available) off to create eight sides. Strictly speaking, the gauge needs to be passed down twice, twisted once in each direction, and the two lines split, to overcome an error built in with the taper. As a solution to this problem, Ray had made an expanding pantograph model in steel, which is run square along the entire mast without any twisting, just closing it up as you go along - a difficult bit of engineering and scarcely justified for a one off job. I must admit that I'm still a bit mystified about the procedure for marking the eight sides to create 16, etc, but no doubt Pythagoras has the solution to that one, as well as 32 sides. It's just that I've never heard of marking gauges for these exercises and Ray certainly had none to display.

Be that as it may, Ray proved to be an extremely accomplished speaker while maintaining a low key and informal approach. He clearly described all the detail and background to a basic exercise that every builder of traditional boats needs to be able to master. Many thanks, Ray.

A TRADITIONAL MAHOGANY SKI BOAT

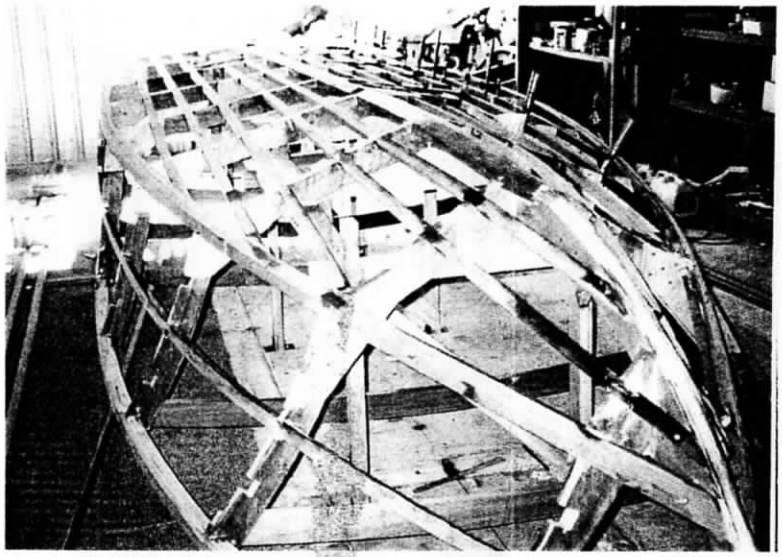
On Saturday, 6th December we were able to visit Andrew Tainsh's present project at his home in Bicton. I say "present" because we've already seen his light aircraft at the Serpentine Airfield and it turns out he's even got a third string to his hobby bow - he restores old motor bikes. I guess the man doesn't watch much TV, and that may be a good thing, too.

The boat in question is a mahogany run about or ski boat, 20' or 6m long, straight out of the 1930's; two cockpits with a V-8 between them and all the fruit - it's going to look beautiful and have a performance to match. It's a "Riviera" from Glen-L plans in the US but I didn't ascertain when the plans were originally drawn. I don't think they're pre-war, but they've been around a fair while.

Andrew's a fair way down the track with this building project, but still has a way to go. When we got there the boat was still upside down on its building jig, which itself was on castor wheels for easy movement around the building area. It was complete and fully painted externally, just waiting for a buff-up, including buffing out a few (but not many) runs. It turned out to be turning-over day, with all our visitors and a few neighbours roped in (and needed) to help. Consequently we got to see it, both inside and out, very well.

The boat is painted navy blue below the waterline with clear mahogany above, the two separated by a gold boot-topping and the lot finished with clear lacquer over. The blue and gold set the mahogany off beautifully.

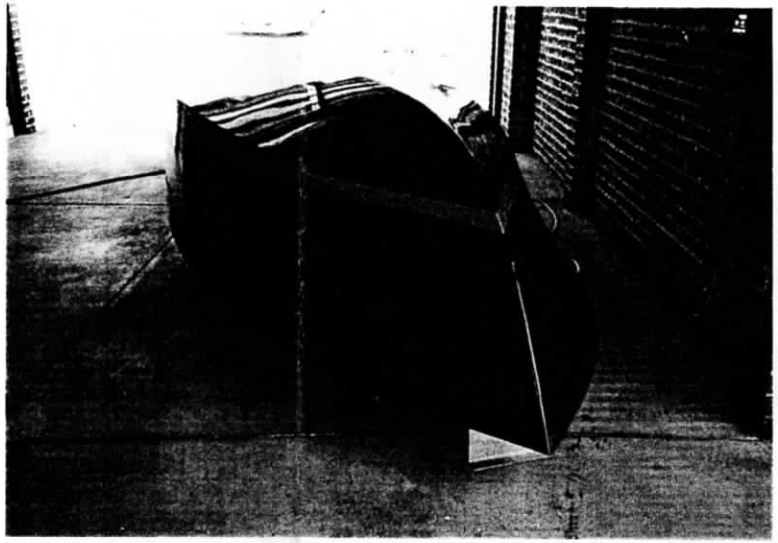
The construction is a triple glued skin over a very substantial mix of frames and stringers (see photo #1, taken by Andrew himself, some time ago). The substantial framing is needed because this boat will be pounded over waves, very fast, by a 5.7 litre Mer-Cruiser V-8. It was sufficiently heavy that we needed about ten blokes, quite a few mattresses and lots of coordination to effect the turn over. Fortunately Andrew, the perfect host, had purchased new, H/D gardening gloves for all of us so we didn't cut ourselves on the rough glue edges which still awaited trimming around the deck line.



Andrew Tainsh's vessel prior to skin fitting

Andrew demonstrates device used for holding external skin strips in place when glued

Martin Grim, Andrew Tainsh, and Geoff Leggatt admire the gloss on the hull bottom



Hull in position in Andrews garage on trolley building jig

Ten pairs of gloves for about ten minute's work - thanks, Andrew. You now own a lifetime supply of gardening gloves - if you ever have time for gardening. The stand Andrew had made to hold the upright hull seemed a bit on the light side but should do the job with a bit of beefing up.

The skin, as I said, is three layers - two double diagonal skins of 4mm hoop pine ply, topped with a third, horizontally laid skin of 4mm solid mahogany, all stuck to each other with West System epoxy. I was interested to compare this with the nearly identical skin I used on my riverboat, "Isis", about ten years ago. There, I used three skins of 4mm Gaboon ply in a boat of the same length. It came off the building jig in the process of turning over so we only had the weight of the bare shell to lift and although we had, I think, six lifters, we could have got by with about four, yet we needed ten to lift Andrew's. The difference, I guess, lay partly in the greater weight of hoop pine ply as opposed to Gaboon, but more so to the permanent internal framing needed to withstand the pounding metered out by about 200 horses in that V-8. "Isis" had a 3hp putt-putt.

Andrew had made an interesting gadget to allow him to glue on the last skin with no fastenings, permanent or temporary, whatsoever, and hence, no unsightly staple holes to be filled. It was based on about 2.4m of three inch T-section aluminium, all about 6mm thick. Into this were threaded pairs of 10mm bolts every 75mm or so - anyway, there were lots of them. In a dry run this gadget was offered up to the plank to be glued on (braced against a wall) and the bolts all adjusted to fit the curve and twist of the plank in question. Between each bolt-end and the mahogany was a curved ply pressure plate. When it was all adjusted correctly, and this must have been very fiddly, it was removed, glue applied to the plank and then it was all put back in place. This would have been done three times down the length of the hull for each plank run. Since the bottom was painted, not clear finished, those planks were probably stapled down in the usual way, but still, what a job! I have seen the same thing achieved with just wooden props wedged against the workshop wall but it's anybody's guess how many props would be needed to achieve the uniformity of pressure of Andrew's jig.

Fastidious is the adjective which comes to mind about Andrew's whole approach to this project and is nowhere better illustrated than in his construction of the two-piece stem cap. It's in two pieces to fit around the trailer eye, and is a varying angle section in stainless steel, all curved to match the stem. It looks simple, welded up and ready for polishing, but must have taken hours of offering-up and re-bending until it was all ready to go to the welder.

All in all, he's doing a meticulous job and we look forward to seeing it when finished. Many thanks for letting us see it, Andrew.

FORTHCOMING EVENTS

Tuesday, 27th January – Evening Meeting
Members Les Simpson and Peter Leggatt will be presenting videos of the Goolwa Wooden Boat Festival and Tasmanian Wooden Boat Show respectively.

Saturday, 7th February, Toolbox Visit
Brad Miosovic has kindly agreed to give us a tour around Veem Engineering. The tour will include aspects of propeller design, selection, pattern making, casting, and finishing. Brad will also discuss the various marine grade alloys Veem can cast and will cover the machining capabilities of Veem.

CALENDAR

<u>TUESDAY, 27TH JAN</u> – Evening Meeting.
Les Simpson and Peter Leggatt display Goolwa and Tasmanian wooden boat festival videos.
RPYC Junior Clubhouse, 7.30pm for 8.00pm

<u>SATURDAY, 7TH FEB</u> – Toolbox Visit
Veem Engineering tour
22 Baile Road, Canning Vale, 2.00pm

<u>WED, 18th FEB</u> – Committee Meeting

Best wishes to Mike Beilby for a fast recovery after his recent car accident - GL