

Building of two 16m wood masts in two steps

By Bertrand Fercot Version V1.0 January 2012

After a lot of searches and drawings I decided to build the masts for my catamaran Tiki46 "Grand PHA" in two steps in order to be able to adjust and to glue easier the mast to collars which will be bolt on the deck and hull floor.

I experienced this type of fixation on the hull with the masts of my previous Tiki30 "PHA" with the advantages of a god maintain of the masts even in heavy seas with the stresses spread on a large area. And one another good point in adding a thick rubber collar of 6mm on the deck and on the hull floor is to absorb the micro movements of the hull and to get a very good waterproof connection without to put additional waterproof system.

My Swing Wing rig has been designed by Sunbird Marine and the sail plan which is in fact designed by Alan Boswell gives a diameter of 270mm at the deck level and 100mm at the foot and top mast for a hollow mast. But in taking in consideration the bad experiences of our friends who own a Tiki46 rigged with a twin side by side classical junk rig with undersized masts generating permanent deformations on their aluminium masts I decided to oversized my wood masts.

On a catamaran the abrupt extra power of a strong gust can't be absorbed by the heeling and it is necessary to have a strong and supple mast able to absorb a large part of this extra power in bending. At my eyes a catamaran rig with free masts is more safe than with masts hold by shrouds.

For the building of the masts I used as on "PHA" light white Nordic wood (cheap spruce with a few knots) in sizes of 50x150x4800mm.

The bottom of the mast is full from the foot until 450mm above the deck level. The foot has a square section of 130x130mm and at deck level the mast has an octagonal section of 300mm. The thickness of the wall is 100mm from 450mm until 1700mm above the deck and is 50mm after until the top of the mast with a round section of 100mm. In fact if I have reduced the thickness until the top I could save only 15kg with a lot of extra work, so I maintain the 50mm wall until the top. The mast is rounded about from 1.7m above the deck until the top

As the top of the mast receives all the vertical components of the sheets it is important to don't undersized the top section.

To generate the hull section I put an octagonal piece all each meter which will avoid the mast to be ovalised when bending.

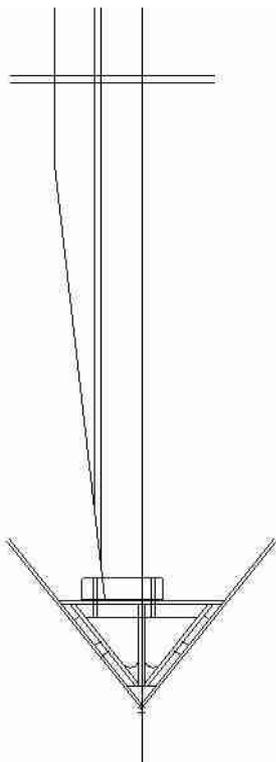
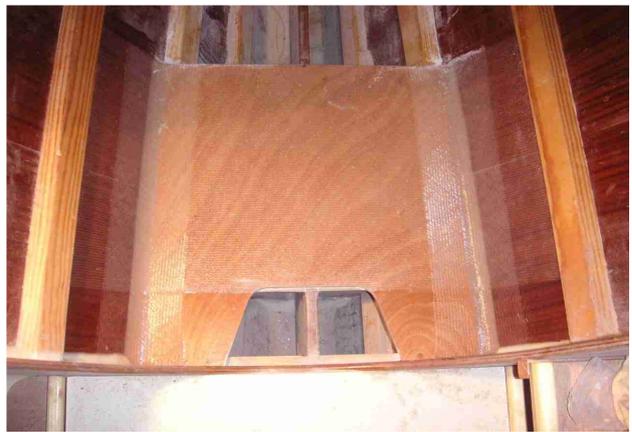
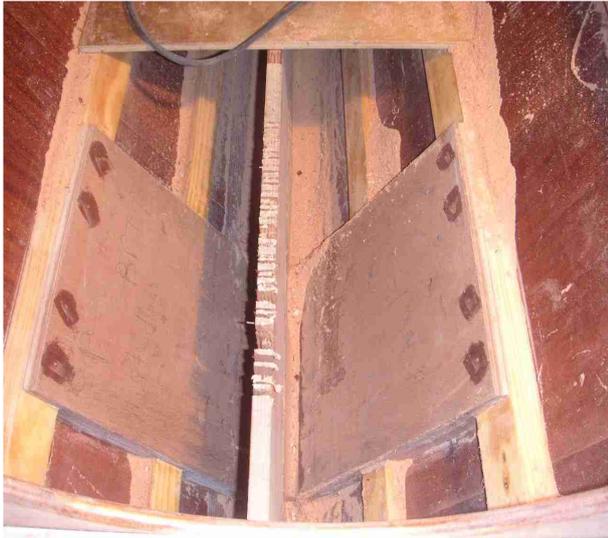
To resume the datas :

- total length from foot to top : 15.9m
- length from foot to deck : 1.95m
- length from deck to top : 13.95m
- section at foot : square 130x130mm full
- section at deck : octagonal 300mm full
- section at top : round 100mm full
- total weight of one mast : 275kg including 450g/m² glass cloth all over and more around the 2 first meter above the deck
- the center of gravity of the mast is 5.7m from the foot or 3.75m above the deck

To be able to adjust the mast with the deck shape and the keel floor in the hangar, the masts will be build in two steps : the first step is to built it from the foot until 1.70m above the deck level and during the second step stringers will be added to the bottom part of the mast to get its total length.

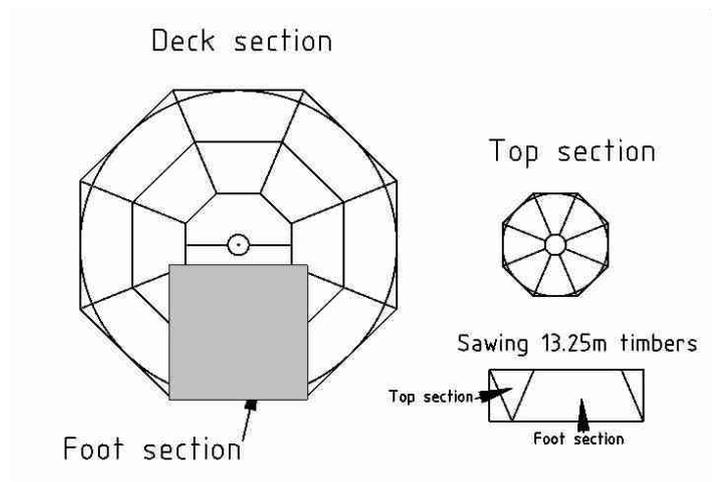
All the work has been made with one person for the preparation (me) and two persons (with my wife) to glue the stringers.

The first work is to reinforce the hull sides, the keel and to make a thick laminated floor.



According to the triangular shape of the hulls the mast center line is 150mm outside of the hull center line

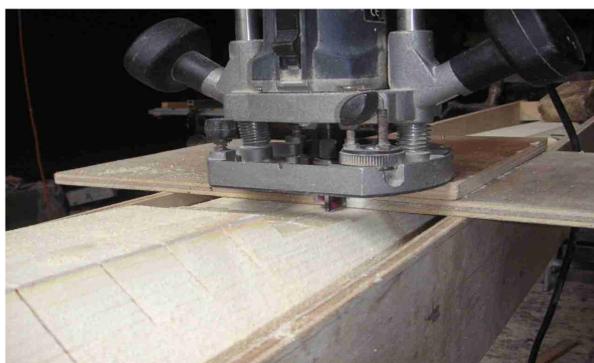
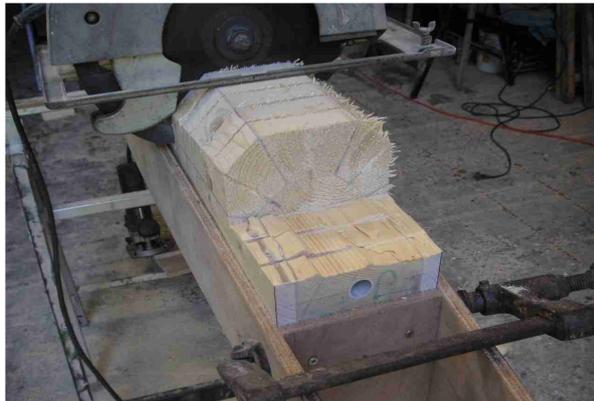
Here are the different sections of the mast at foot, deck and top and a section of the timber showing how from a 50x150mm timber of 13.25m length I get 2 stringers.



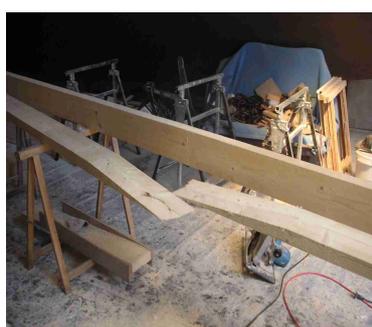
The core of the masts is made with two 50x100x2400mm timbers glued together with an electric tube in the center. After the angles have been planed to get 8 faces. A second layer of 3.7m is glued around the octagonal core and around the first octagonal disk.



To reduce the foot section I used lateral guides and I put off the maximum of wood with a saw and a chisel before to use a grinder to get a good surface.



The scarfs are cut roughly with a circular saw before to use a scarf box with a grinder



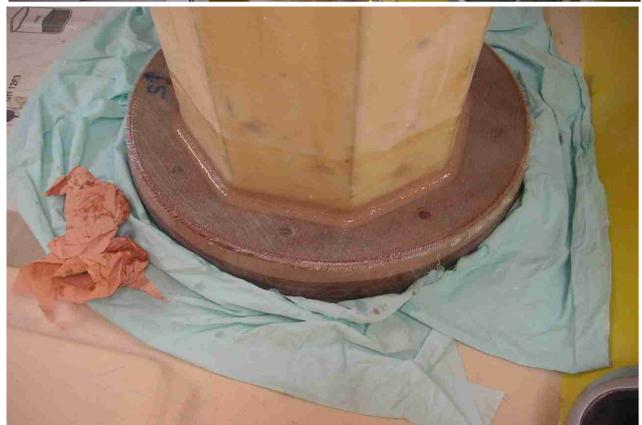
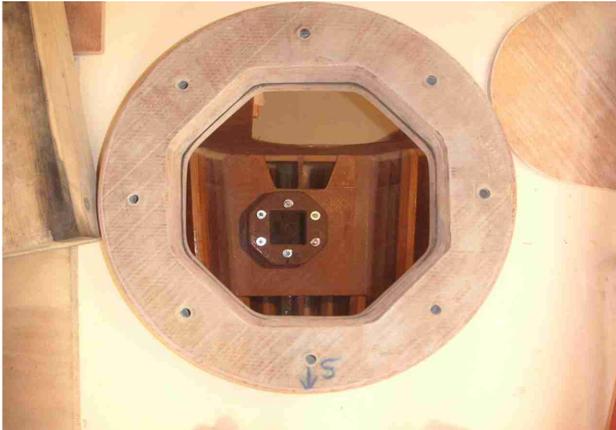
To get a 300mm octagonal section, a third layer of 50mm is glued and shaped around the bottom part of the mast before to receive a glass cloth of 450g/m².



Plywood collars are made directly on the deck to wed exactly the deck shape. After the pieces get from the circular hatches cutted in the deck is added to get a total thickness of 80mm. And the same is made to get the foot collars which will be bolt through the keel floor.



The collars are bolted through the deck which has a thickness of 36mm laminated plywood + a 6mm rubber collar and so through the keel floor. After we've had to put off a part of the hangar roof to descent this bottom part of the mats through the collars to glue them on the collars.



A lot of scarfs were made to get 8 timbers of 13.25m . After the more difficult was to cut diagonally them in two, to get 16 stringers with an angle of 67.5°. For that I used plywood guide lines and I burned my old big electric saw. Scarfs are needed so at the foot of each stringer.



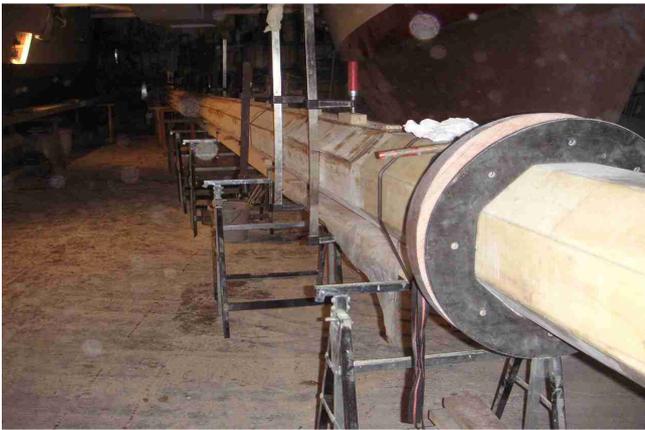
With a thin line very well tensioned, the mast bottom, the octagonal disks and the top mast have to be very well aligned, fixed on a timber with screws or belts. The core of the mast top is a stainless steel tube which receives the plastic electric tube of 20mm.



With this method it is not necessary to glue all the stringers at the same time. We were two people with a slow epoxy hardener, and after a dry check we glued the two lateral opposite faces with temporary screws and clamps in using a thick epoxy glue as all the adjustments were not enough perfect. Next day after a dry check we glued the two next one and the next day the top stringer.



After to have turned over the mast in checking its good alignment the 6th and 7th stringers are glued and the next day after to have adjust the last one the mast is completely glued.



Before to finish with a big sand belt, I made 16 faces and after 32 faces with a planer. To have a good grip I put an old chamber tyre around the plastic bobbin.



After to have get a good rounded finish the masts received a 450g/m² glass cloth in proceeding in twice operations : one day one half on all the length and the tomorrow the other half.



To hang the pulleys and lines at the top of the masts I made laminated collars glued at the top.



Now the masts are ready to be bolt on each hull, waiting below the deck of our Tiki 46 .



Bertrand Fercot (building at Sizun, France, from the 10th August to the 10th November 2011)