

KITES FOR CONNOISSEURS

YANGTZE 30M

ANDREAS ÅGREN
andreas@windman.se

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Kites for Connoisseurs is a collection of plans for kites designed by Andreas Ågren. These kites often have a unique technical twist. The plans can be found at <http://windman.se/kite-plans> and they may not be used for commercial purpose without written consent.



Bali has the strongest kite culture in the world with several unique kites, one of them is the *Janggan* which has a tail that usually is 20 times the wingspan. Janggans with wingspans of 3 - 5 m are considered medium size; an 8 m Janggan is large and has thus a 160 m long tail. However, it is not only the length of the tail that is remarkable: it is also the rippling movement of the tail, like waves flowing from the wings down to the end of the tail.

The secret of the rippling movement in the tail is to make the edges shorter so there is "excess" material in the middle.

The YangTze kite is inspired by the Janggan kite, and the name is both a homage to the origin (Janggan) and a reference to the Chinese river for the riverlike flow of the tail.

The skin of the YangTze 30 m is 1.5 m wide and 30 m long. The top 1 m is the kite, or the head (the Eye Phi frame), and the rest is a tail.

YangTze is a high wind kite; the wind range for a YangTze 30 m is 2.5 - 10 m/s.

Material

- 30 m of 150 cm wide soft ripstop or tafeta
- 60 m edge binding
- 2 pcs 6/6 mm T connector
- 4 pcs 6 mm aluminium ferrules with internal central stopper
- 2 pcs 6 mm solid carbon rod, each 56 cm long
- 4 pcs 6 mm carbon tube, each 96 cm long
- 1 pcs 6 mm carbon rod, 99 cm long
- 4 pcs 4 mm carbon rod, each 10 cm long
- 4 pcs 6 mm stopper clips
- Dacron 145 x 8 cm
- Dacron 20 x 6 cm
- Dacron 145 x 4 cm
- 2 pcs 6 mm reinforced braided plastic tube, each 8 cm long
- 4 pcs 4 mm bungee string, each 15 cm long
- Power string (~150 kg) for edge loops and bridle, ~4 m
- Thin string (~50 kg) for wing tip connectors, ~3 m

As an alternative material for the frame 8 mm fiberglass can be used but then of course all frame items must be changed accordingly.

The main steps for making a 30 m YangTze.

- Create the folds and darts absolutely symmetrical on both sides along the length of the ripstop.
- Sew the 1 cm edge bindings onto the ripstop.
- Sew the reinforcement on the tail end.
- Sew the reinforcements and the sleeves on the Eye Phi part.
- Make the frame.

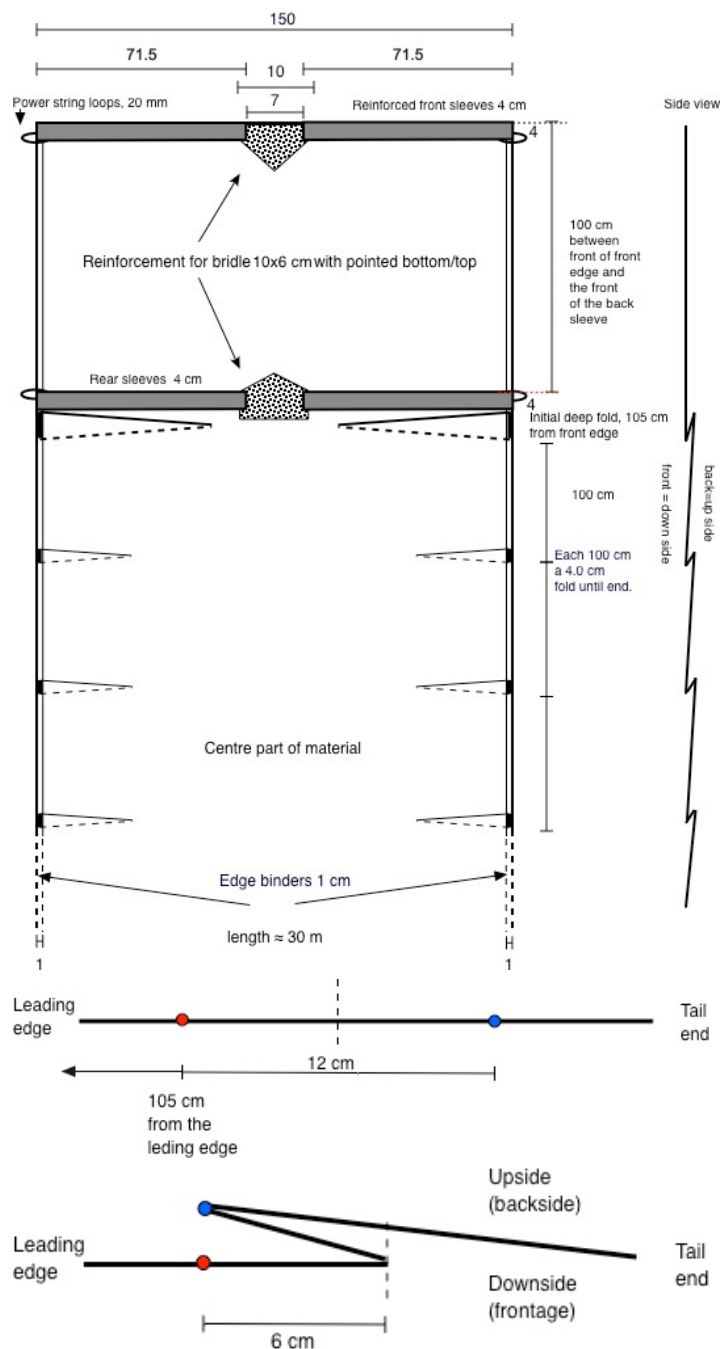
Detailed steps for making a YangTze 30 m.

- Hem the leading edge.
- Mark the position of all folds on the tail. To get the folds symmetrical on both sides: fold the tail double in its length and make the marks on both edges pairwise.

The initial fold is 105 cm from the front edge. Then the other folds come with 100 cm gaps.

- Make the initial folds.
 - 105 cm from the front/top of the material measure 12 cm on the edge.
 - Make the fold (6 + 6 cm) of the edge.

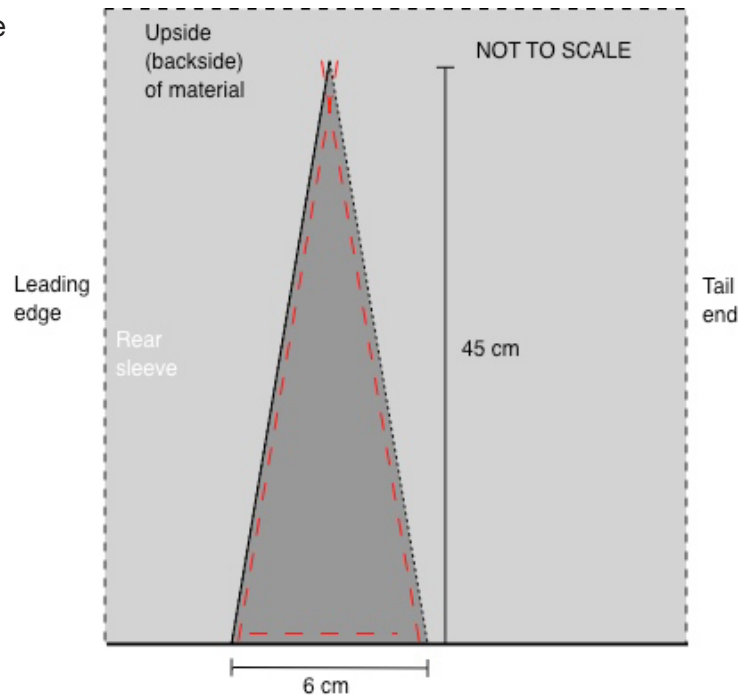
General layout of the 30 m YangTze skin, backside view.



Side view (left side) of the sail.

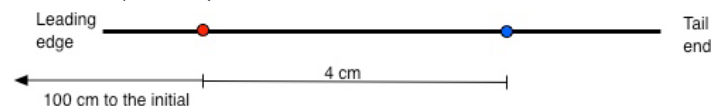
4. Sew the dart with three seams: at the base and near the dart edges (dashed red lines in the figure).

A photo of the initial dart is at step 8 below.

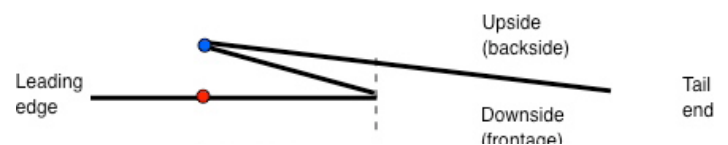


5. Make the small folds.
 - a. Measure 4 cm on the edge, 100 cm from the initial fold.

Side view (left side) of the tail.

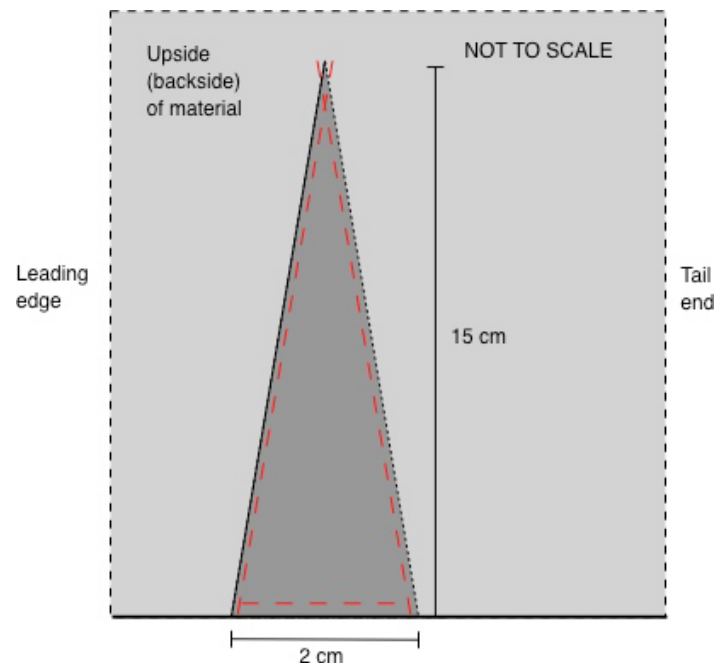


- b. Make the fold (2 + 2 cm) of the edge.



- c. Sew the dart with three seams: at the base and near the dart edges (dashed red lines in the figure).

A photo of a small dart is at step 8 below.



6. Sew the 2 cm darts until the very end of the tail.

7. Sew the edge binding.

As a reinforcement and protection of the darts an edge binding needs to be sewn on both sides. The binding should be 1 cm wide on the tail and sewn as the figure indicates.

It is of course possible to instead make a hem or double hem, but that would decrease the width of the tail which in turn would have a small negative influence of the smooth rippling of the tail (unless the width is cut with allowance for this).

8. Make the tail end reinforcement.

The tail end needs to be heavily reinforced so it is not ripped apart when fluttering in the wind.

A 1 cm wide webbing should be sewn on the end edge and this should then be folded twice onto the tail and secured with 3 seams.

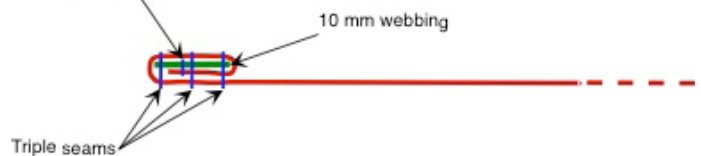
Edge binding



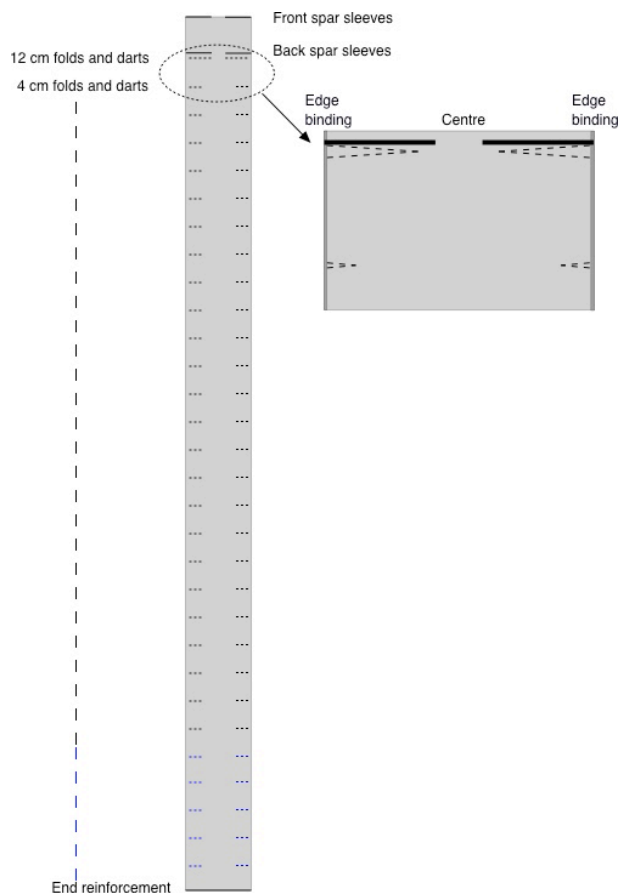
The figure shows double folded edge binding. Of course a single folded bider can also be used provided that its edges are not prone to fraying.

(View from front edge of skin.)

Initial seam to secure the webbing strip to the sail end



The edge binding is the red line in this view. Note that the view in this figure is different than from the one above; it's from the side.



The complete skin with darts, edge bindings and tail end reinforcement.

There will be a small indentation of the edge right at the base of the dart.



Initial wide dart just below the sleeve.



Small darts all the way down to the tail end.

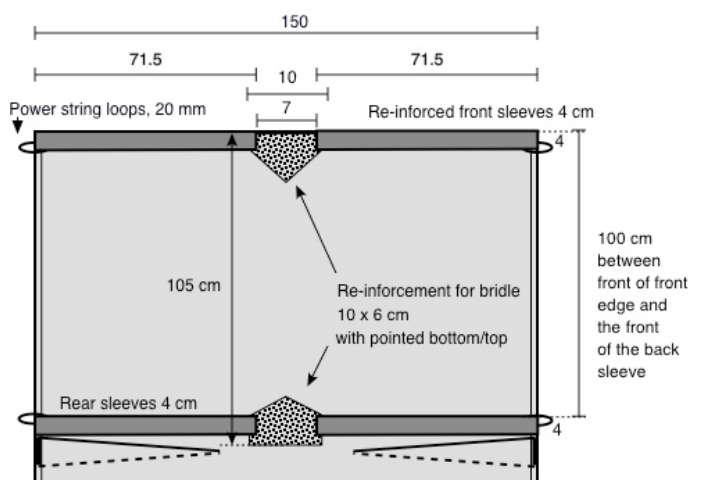
9. Sew dacron reinforcements, 10 x 6 cm, in the middle of the sail. The reinforcements should have a pointed top, like a house gable silhouette.

The back edge of the rear reinforcement should be 105 cm from the front edge, in line with the initial darts.

10. Sew the front sleeves for the cross spars using 71.5 x 8 cm wide dacron tapes which are folded over (around) the leading edge with 4 cm on each side. The sleeve should overlap the dacron reinforcement in the middle and have loops of power string; 2 cm long loops at the outer end of the sleeves. The loops should be on the rear edge of the sleeves, as the figure indicates.

The sleeves for the cross spars should have a 3 cm opening to allow the ferrule going through.

11. Using 71.5 x 4 cm wide dacron tapes sew the rear sleeves with their front edge exactly 100 cm from the front edge. Also these sleeves should have a 3 cm opening. Sew in 2 cm long power string loops in the outer front edge of the sleeves as the figure indicates.



Frame material.

For the frame the following items are used:

- 2 pcs 6/6 mm T connector
- 4 pcs 6 mm aluminium ferrules, preferably with centre divider
- 2 pcs 6 mm solid carbon rod, each 56 cm long
- 4 pcs 6 mm carbon tube, each 96 cm long
- 1 pcs 6 mm carbon rod, 99 cm long
- 4 pcs 4 mm carbon rod, each 10 cm long
- 4 pcs 6 mm stopper clips
- 2 pcs 6 mm reinforced braided plastic tube, each 8 cm long
- 4 pcs 4 mm bungee string, each 15 cm long
- String (50 kg) for tensioning, 2.6 m

12. Prepare one 6 mm **T** connector for the trailing edge by cutting away half of the long part (to make it easier to insert the spine).

13. Make two wing tip connectors of reinforced braided plastic tube.

Cut 2 pcs, 8 cm long, of reinforced plastic tube, 6 mm inner diameter.

Cut 2 pcs, 210 cm long, of 50 kg string.

Tie the centre of a string to the centre of a plastic tube using a wide knot leaving two 70 (approx.) cm long string ends from the centre of the knot.

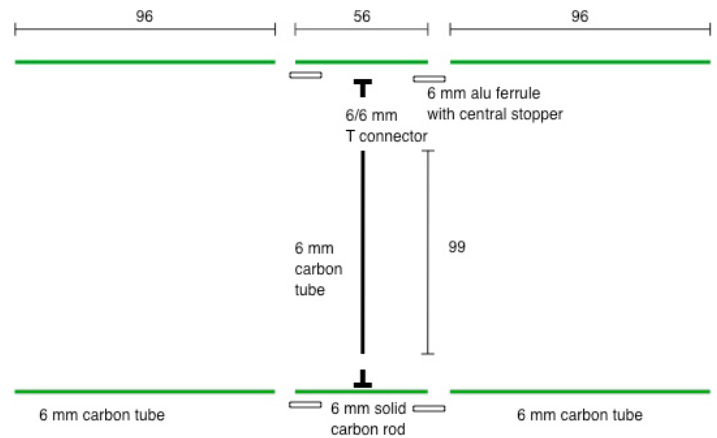
The best knot is 'American Whipping'; see instruction as an appendix in this plan for tying an 'American Whipping'. Other wide knots that leave two strands in the middle might also do, as long as they have several turns on the tube to distribute the pull.

The two strings from the plastic tube have the double function of tensioning the sail and keeping the tube in place.

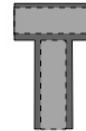
14. Make three marks on each of the two strings at 36, 44 and 48 cm from the plastic tube.

15. Hold on the 48 cm mark with thumb and index finger and tie the first overhand knot over the 44 cm mark.

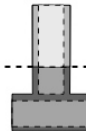
This short outer loop will be used as a strap when disassembling the frame.



Leading edge T connector



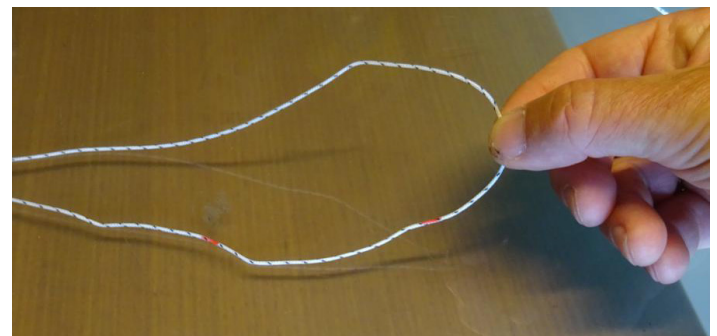
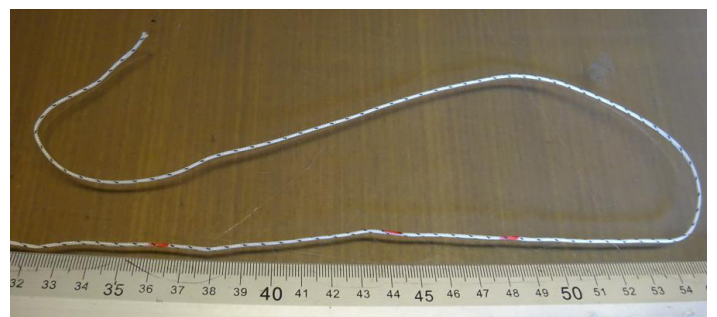
Trailing edge T connector
Cut off 25 mm to make it easier to insert the spine spar



T connector as delivered and after cut.



Note: Only one T connector should be cut. The one used in the leading edge should remain in full length. In the photo the left connector is cut for the trailing (rear) edge and the right connector is for the leading (front) edge.

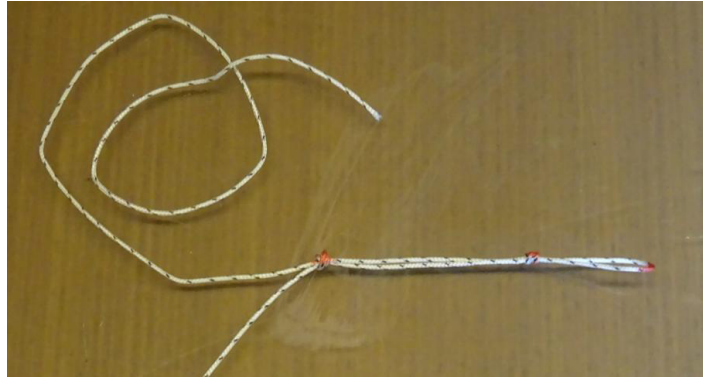


Thumb and index finger at 48 cm mark.

16. Tie a second overhand knot over the 36 cm mark. Trim the loose end of the string.

This longer inner loop is where the bungee knot should go when tensioning the string.

17. Repeat for the other strings.

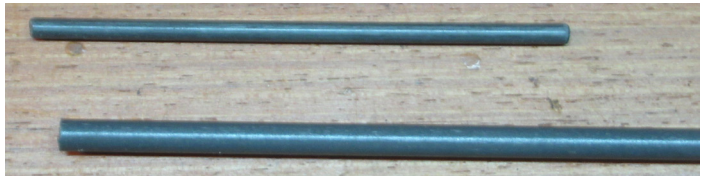


The two knots tied at the 36 and 44 cm marks.

18. Prepare the spars according to the list of frame material above.

19. The four side spars need to be reinforced in the end that go into the centre spar ferrule:

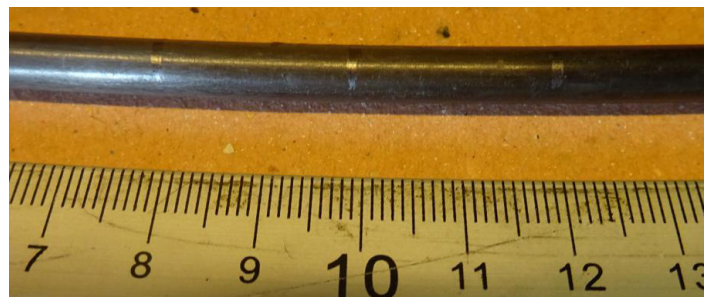
Slide a 10 cm long 4 mm carbon rod half-way into a 96 cm side spar tube. Put some glue on the 4 mm rod and slide the whole rod into the 6 mm tube. Put a mark on that end to distinguish it from the non-reinforced end.



20. Repeat for the other three 96 cm side spars.

21. Mark the centre of the two 56 cm carbon rods by using a pencil. Then make additional marks on each side of this centre mark, 2 cm from the centre.

If this doesn't work because the carbon is too black, then tape one round of brown packing tape around the centre before making the centre mark. Then make additional marks on each side of this centre mark, 2 cm from the centre.



22. Mark the exact middle of the sail (75 cm) by folding the sail in half and make a crease. Make the crease both at the front dacron piece and the rear dacron piece.

23. Insert the 56 cm centre top rod into the top sleeve until the opening at the centre. Then slide the T connector onto the rod.



Note: For clarity the top sleeves not shown in the picture, just the bare rod.

24. Continue to insert the rod through the rest of the top sleeve and make sure the T connector will end up between the centre marks made at point 21 above.



25. Glue 'Stopper clips' at each side of the T connector.

26. Push out the ends of the carbon rod through the sleeve openings and glue the aluminium ferrules to each of the ends of the rod.

If there is no central inside stopper in the ferrule make sure the rod comes exactly halfway through the ferrule.



27. Insert the bottom rod like the top rod, make sure the T connector (the one that has been cut) ends up between the marks made at point 21.

28. Glue 'Stopper clips' at each side of the cut off T connector.

29. Glue the aluminium ferrules to each of the ends of the carbon rod, same as for the top rod.

30. Tie a loop (using a simple overhand knot) of 15 cm bungee, 4 mm thick) in each of the four string loops in the sail at the end of the sleeves.

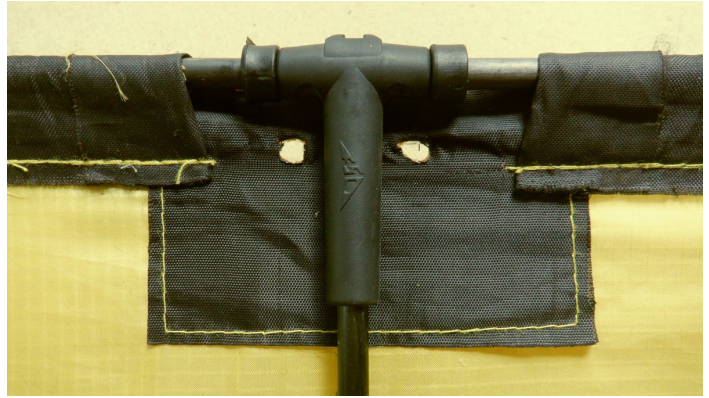


31. Make a kite bag.
Sew a bag of nylon cloth. Size ~120 x 35 cm.

Bridling

The YangTze has a two-point bridle tied around the T connectors with loose loops.

32. For the front cross spar: make sure the T connector is exactly in the middle of the sail on the crease made at point 22 above. Punch or burn two holes just beside the T connector.



33. Cut ~6.5 m of 100 kg string. Tie a loose loop around the T connector.

From the front: pull a string through one hole and make it loop around both the spine and the cross spar on both sides of the T connectors. Pull the end of the string through the second hole and tie the loop with an overhand knot.



The lower picture is just to show how the loop is tied around the T connector (not showing the string going through the skin).

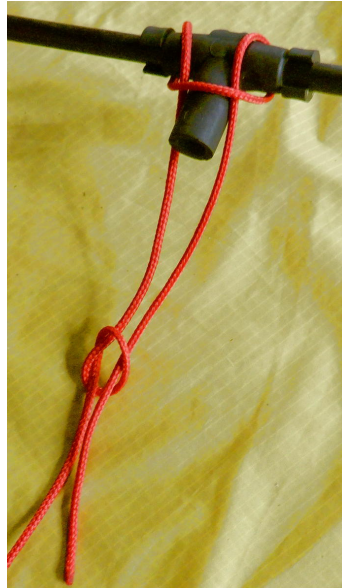
Using this kind of loose loop the knot can be easily adjusted to be exactly under the middle of the T connector.

34. Repeat for the rear spars:
Make sure the rear T connector is exactly in the middle of the sail on the crease made at point 22 above. Punch or burn two holes just beside the T connector.

35. Prepare the loop for the rear T connector by tying an overhand knot 30 cm from the string end.



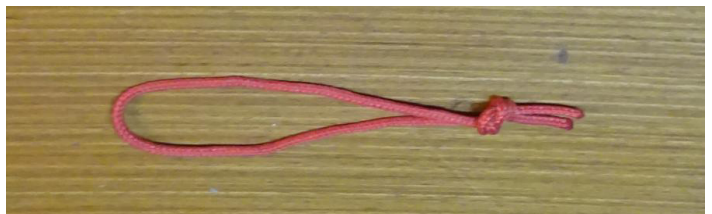
36. Tie a loose loop around rear T connector.



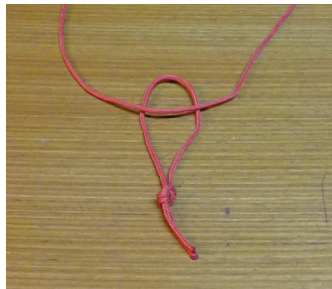
For clarity of showing the complete knot the loop is not going through the sail in the picture.

How to tie the loop overhand knot.

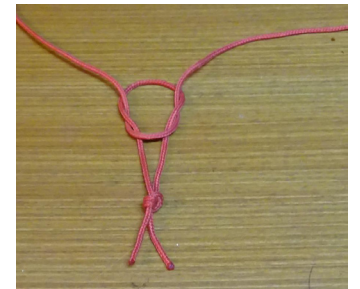
37. For the towing loop cut 40 cm of the same type of line as the bridle line, make a loop and tie an overhand knot in the end.



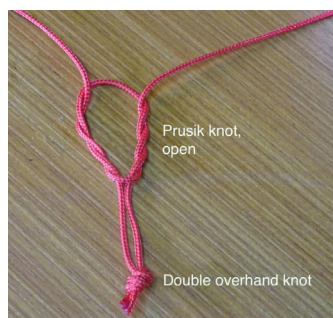
38. Tie the towing loop around the bridle string using a Prusik knot.



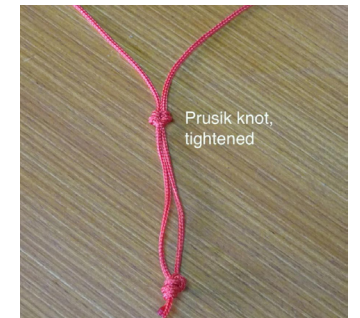
1. Place the loop under the string.



2. Pull the knot over the string through the loop.

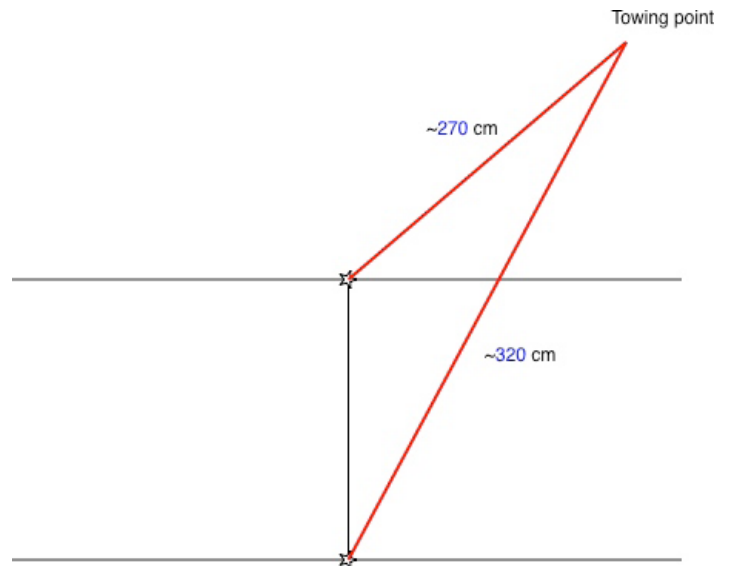


3. Pull the knot one more time over the string and through the loop.



4. Tighten.

39. The towing point should be about 45 % from the leading edge.



Verification of frame.

Verify that the sleeves are correctly sewn and that the spars are of correct length by assembling the frame.

40. Insert the 99 cm long carbon rod spine first in the leading edge T connector.
41. Insert the rod in the rear T connector (with the cut off shaft).

The rear end of the rod should fit in precisely to the cut off connector with the sail under slight tension...

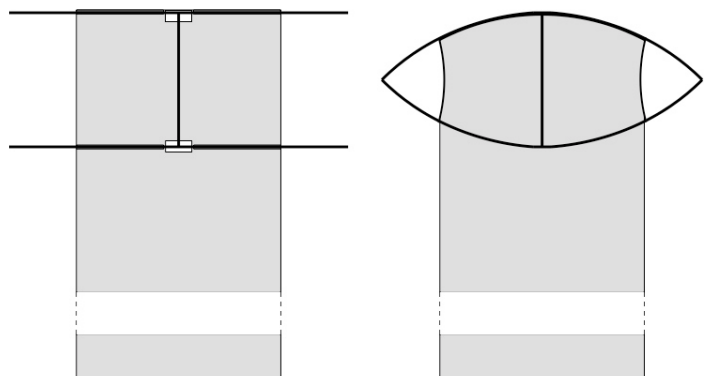


...and slide in nicely in the connector.

42. To assemble the frame, slide the four carbon tubes into the top and the bottom sleeves and into the centre rod ferrules. Make sure that it is the reinforced end of the tubes that go into the ferrules.

The left figure shows the frame when the spine and four carbon tubes are assembled.

The right figure shows the frame when the tube ends have been joined in next step. (The Eye Phi [Eye Φ] frame)



43. Bend the carbon tubes on one side together and join them with the reinforced plastic tube.



44. Slip the tension lines two rounds (or more if required for sufficient tension) around the spars before sliding the inner loop over the bungee knot.



Complete wing tip with tension strings wrapped around the spars

45. Slide the inner loop of the tension line over the bungee knot. Note that the bungee knot should be inside the longer inner loop; the outer loop is just a strap for easier disassembly.



46. Repeat on other side.

The kite is complete, ready to fly.

Support.

There is some online support for the YangTze kite at: <http://windman.se> - Menu **Support/YangTze**

- Assembling - <http://windman.se/yangtze-assembling/>
- Launching - <http://windman.se/yangtze-launching/>
- Packing up (after flight) - <http://windman.se/yangtze-packing-up/>
- Stacking YangTze - <http://windman.se/yangtze-stacking/>
- Wing spar connector - <http://windman.se/yangtze-plastic-tube-connector/>

Background.

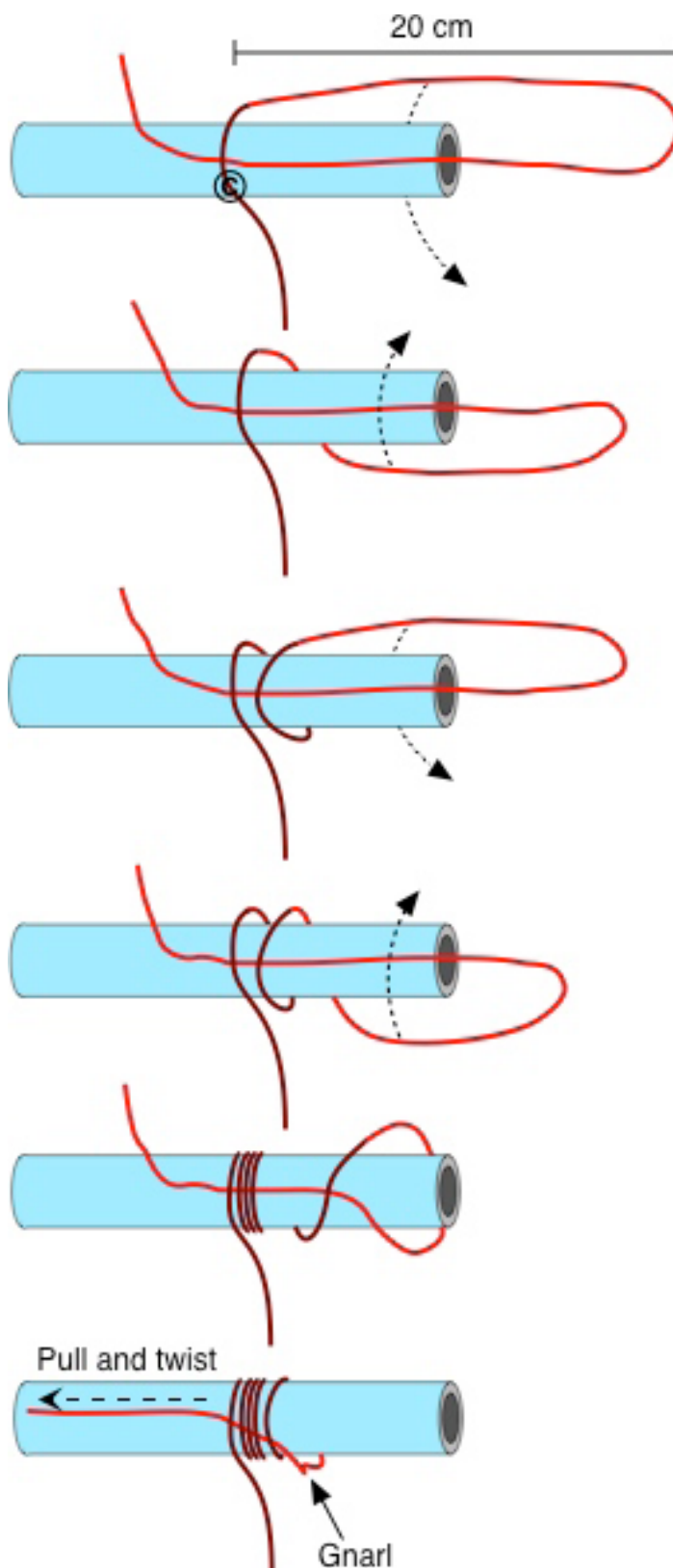
A few years ago we, an Australian kite friend visiting Bali and me, talked about how to use the Janggan kind of tail, with the rippling effect, in a western style kite. The idea challenged me: I wanted to make a kite where the lifting part is as invisible as possible (in contrast to the Janggan where the lifting part is very elaborated, especially the head that is richly decorated).

It took me half a year before the solution dawned on me: A simple vented wing where the sail continues directly as the tail. The Eye Phi (Eye Φ) frame was born (picture at step 42).

*I initially gave the kite the name Canterbury. Now, the name Canterbury seemed to be too a far fetched pun (you had to remember from your classes on English medieval literature and Chaucer who wrote The Canterbury Tales), so when I changed from 3 + 3 point bridle to 2 point bridle I also changed the name to **Yang-Tze**, which both is a homage to the origin (Janggan) and a reference to the Chinese river for the riverlike flow of the tail.*

Tying an American Whipping

1. Cut a string of ~50 kg strength with length according to the kite manual. Mark the centre of the string and put the string with a 20 cm loop on the tube with the centre (©) as the picture shows.
(The dark coloured part always runs on top of the lighter coloured part)
2. Pull the loop down behind the tube as the arrow in picture 1 shows, and then pull the loop up in front of the tube as the arrow in picture 2 shows.
3. Pull the loop down behind the tube as the arrow in picture 3 shows.
4. Pull the loop up in front of the tube as the arrow in picture 4 shows.
5. Repeat steps 3 and 4 until there are 5 rounds around the tube.
6. After making the 5 rounds there is a small gnarl in the last loop. Release this by twisting the twine that runs under the rounds anti clockwise at the same time as tightening the last loop by pulling the twine to the left.



7. Turn the tube so the five rounds come on the left side and the loose ends to the right and make a new 20 cm loop with the string on the tube.

8. Pull the loop down behind the tube as the arrow in picture 7 shows, and then pull the loop up in front of the tube as the arrow in picture 8 shows.

9. Make 5 rounds like previously on the left side.

10. After making the 5 rounds there is a small gnarl in the last loop. Release this by twisting the twine that runs under the rounds anti clockwise at the same time as tightening the last loop by pulling the twine upwards.

11. Tighten the whipping by pulling the loose ends. The loose ends are maybe now on different sides of the round in the middle. Bring the string ends to the opposite side [back side] of the tube.

12. Secure the whipping by tying a reef knot.

