

KITES FOR CONNOISSEURS

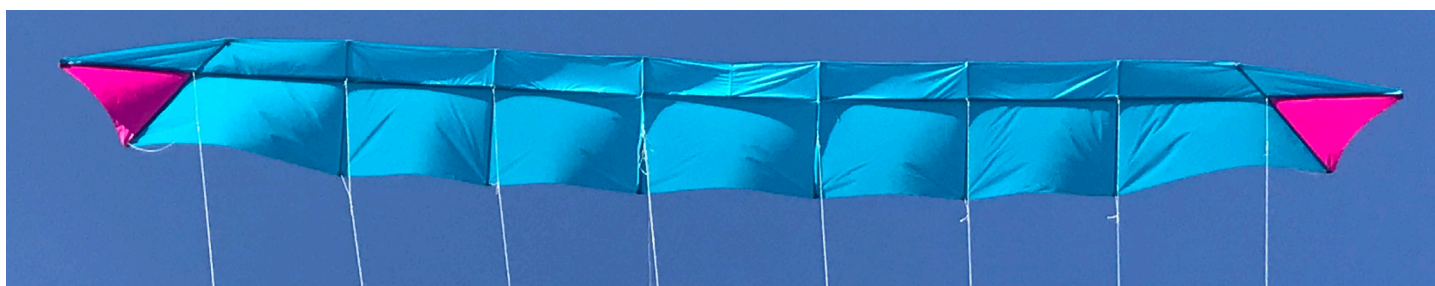
NIËLJE

ANDREAS ÅGREN
andreas@windman.se



This plan may be used for personal use only

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.



Niëlje is a SHARK - Super High Aspect Ratio Kite (AR 9.85)- that uses an in-sail dihedral plus a kick-up front to maintain stability. The in-sail dihedral is created by the Wipe shape of the rear part of the wing sail (seen best in the center section). Niëlje is somewhat time consuming to tune for the perfect flight.

Material

- 1 m ripstop of 150 cm width
- 30 x 60 cm ripstop of any other colour
- 4 pcs of SkyShark tubes, the stiffer the better
- 2 pcs 6 mm endcaps
- 2 pcs of 150 cm/ 2mm carbon rod
- 16 pcs 2 mm endcaps
- 4 pcs ferrules, 2 – 3 mm
- Dacron tape for pockets and reinforcement

Please note!

Due to different light sources the aqua coloured ripstop sometimes appear more blue and sometimes more green in the pictures below.

General.

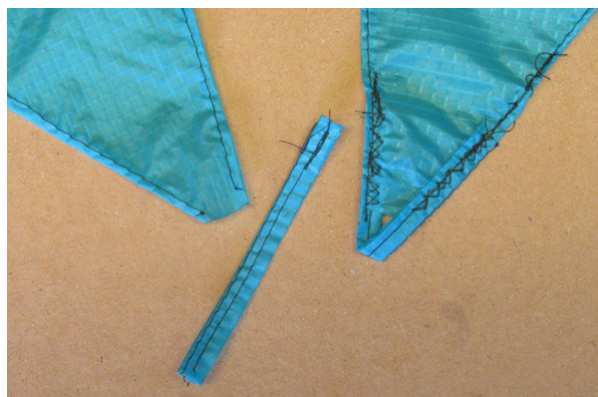
The templates are in full scale to be printed out on a plotter or similar. The templates include 0.5 cm hem and 1 cm overlap. The sewing description is for double seams with fold-over.

Prepare the the templates and cut out the pieces. There are two centre parts that should only be cut out once. The rest are side parts that should be cut out twice; one for each side.

How to make it.

All hems are 5 mm!

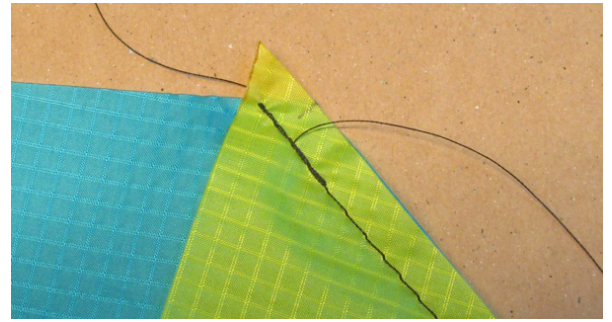
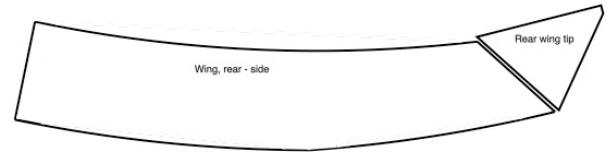
1. Hem the front edge and rear edge of both keels.
Sew a loop of double folded ripstop (10 cm long) on the tip of the keel for bridle attachment.



2. Sew together one rear wing tip and one rear side wing part.

Allow the corner of the tip to protrude 15 mm above the wing part.

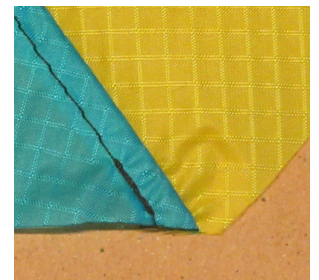
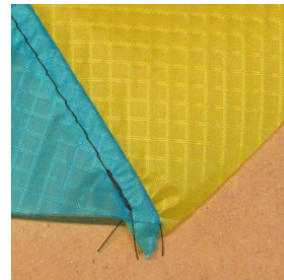
Sew the seam 7 mm from the edge (needle in centre, use edge of foot as guide).



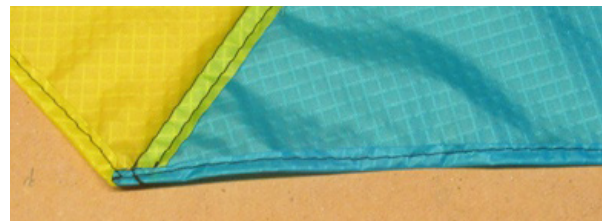
3. Fold the overlapping 7 mm seam bit onto the wing part and sew the second seam. Note that the front of the wing tip will come in a slight angle with the curved front of the rest of the wing part.



4. Trim the material at the rear corner.



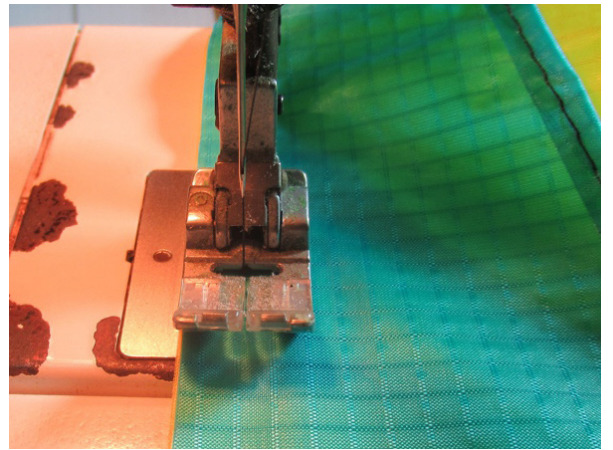
5. Hem the rear edge of these two rear wing parts. (Do NOT hem the rear of the centre part yet. It will be hemmed after the wing is complete.)



6. Repeat steps 2 - 5 for the other rear wing parts.
7. Hem the leading edge of all of the three front wing parts: the two outer parts and the centre part. The centre part is a rectangle so any of the long sides will do as the leading edge.

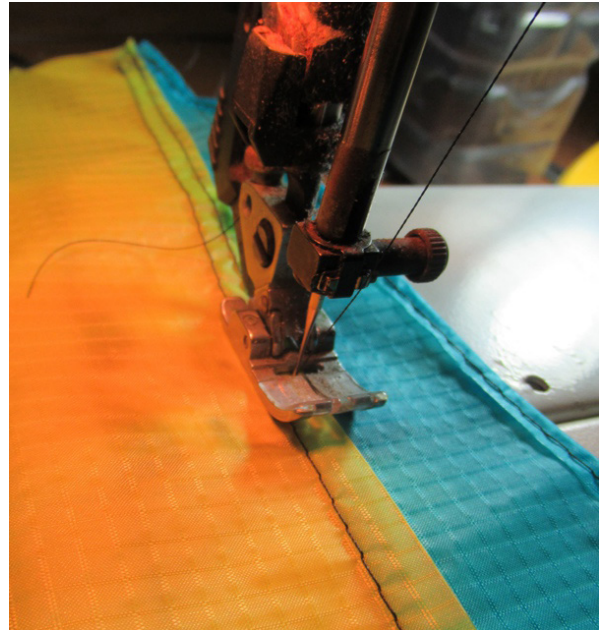


8. Starting from the wing tip sew the rear and front of one outer wing parts together. Sew the seam 7 mm from the edge as before.

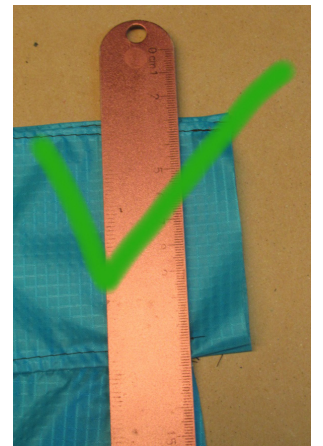


9. Fold the overlapping 7 mm seam bit onto the front wing part and sew the second seam.

Repeat for the other wing side.



10. Put the two wing parts on top of each other and check that they are exactly the same and that the front and rear part edges align. Trimming of the front part is probably required: trim in parallel with the edge of the front part and NOT as an extrapolation of the edge of the rear part.



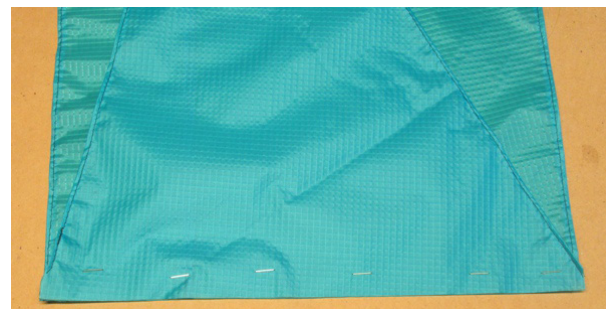
11. Sew the front and the rear parts of the centre wing part together. Sew the seam 7 mm from the edge as before. Fold the overlapping 7 mm seam bit onto the front wing part, and sew the second seam.

Trim if necessary the same way as above.

Now there are three complete separate wing sections.



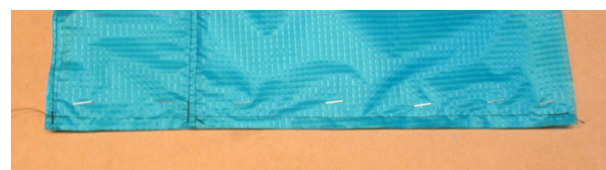
In order to get three pieces of fabric (outer wing, keel and center wing) perfectly aligned for the first seam stapling can be used.



12. Put one keel on top of one outer wing section (front side of section facing keel), aligning the edges so the leading edge of the keel is aligned with the leading edge of the wing and the 'root' of the keel is perfectly aligned with the inner edge of the wing. Note that while the 'root' of the keel is straight there is a knee in the wing section where the front and rear parts join. Start stapling from the leading edge. Staple the pieces together, 20 mm from the edge.
13. Put the centre wing section on top of the already together-stapled parts, front side of the section facing the keel and aligning the edges so the front of the centre part is at the front edge of the wing and the side edge is aligned with the two other edges. Staple all pieces together, 20 mm from the edge.



14. Sew one seam 7 mm from the stapled edge.



15. Remove all staples, fold the overlapping part outside the seam towards the centre part and the keel towards the outer part so it is clear of the next seam. Sew the second seam, taking care not to sew on the keel.



16. Do likewise for the second keel: Put the second keel on the free edge of the centre section (front side of section facing keel), aligning the edges so the leading edge of the keel is aligned with the leading edge of the centre part and of course the 'root' of the keel is perfectly aligned with the inner edge of the wing. Starting from the leading edge staple the pieces together, 20 mm from the edge.
17. Put the second outer wing section on top of the keel, front side of the section facing the front side of the other sections; front edge aligned with the others, and the side edge aligned with the root of the keel. Staple the pieces together, 20 mm from the edge.
18. Sew one seam 7 mm from the stapled edge.

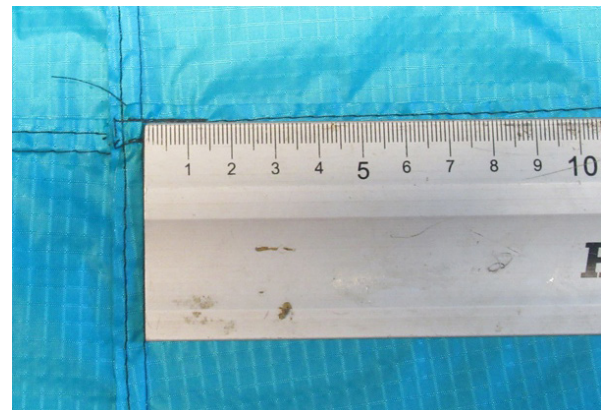
Remove all staples, fold the overlapping part outside the seam towards the centre part and the keel towards the outer section to be clear of next seam. Sew the second seam.

19. Finally, hem the rear of the centre part. Trim if necessary to making it aligned with both wing sides.

Pockets and reinforcements

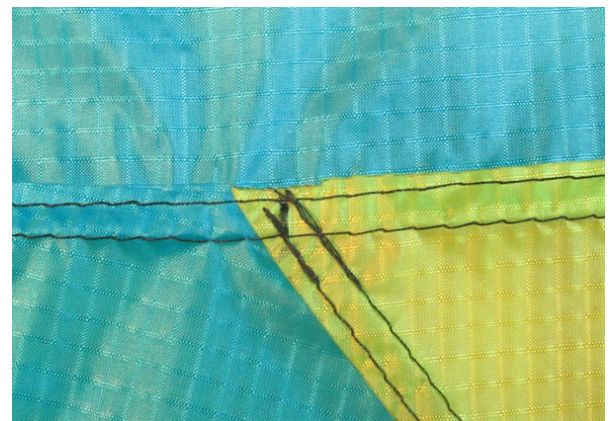
Prepare

- 16 dacron pieces 15 x 35 mm for the spar pockets.
 - 6 dacron pieces 20 x 20 mm for bridle point reinforcement.
 - 2 dacron piece 25 x 55 mm for wing tip pockets (for SkyShark tubes).
 - 2 pcs of double sided Velcro tape, 10 mm wide and 70 mm long.
20. Mark the position of the centre of the bridle point reinforcements on the seam joining front and rear wing parts: measure 37 and 74 cm from the keel (the first seam) [The centre part is to the left in the picture]



From first seam of keel

21. The position of the bridle point reinforcements for the wing tip: directly on the first seam from the coloured wing tip.



22. Mark the position of the spar pockets on the leading edge by measuring 37 and 74 cm from the keel as for the reinforcements.

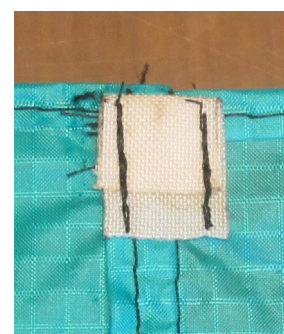
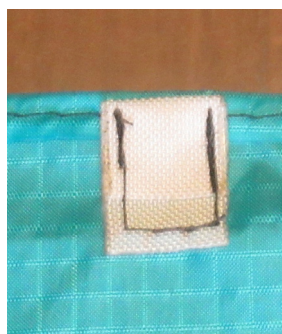
The position of the spar pockets for the keels are in each end of the first seam (the “inner” seam) for the keels. The position of the spar pockets for the wing tip is in just inside the knee of the leading edge.

23. Mark the position of the spar pockets on the trailing edge by stretching out the sail and measuring 39.5 and 79 cm from the first seam at the keel.

The spar pocket on the trailing edge for the wing tip is in the bottom of the first seam.

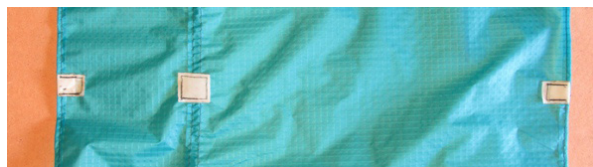
24. Check that the marks for the spar pockets are symmetric on both sides. If not: measure again and correct!

25. Sew the spar pockets. At the keels sew just two parallel seams and be careful not to put the pocket seam through the keel. The pocket centre should be on the first keel seam.



Keel pocket.

26. Sew the bridle point reinforcements (not at the keels).



27. At the keels, sew the double sided Velcro tape diagonally across the keel seams. Sew with just one seam in the middle of the Velcro, avoiding to sew into the keel.



28. Sew the pockets for the Skyshark tube onto the wing tips. The pocket should be centered over the double seam.



Spars

Prepare

- 6 pcs of 33 cm carbon rod, 2 mm
- 2 pcs of 37.5 cm carbon rod, 2 mm

The rod lengths are “plus” to allow variations of sewing accuracy. Each rod maybe has to be adjusted individually.

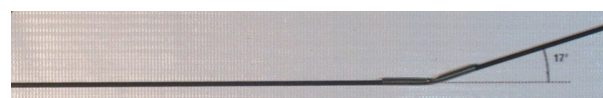
29. Put endcaps on one end of the longer rods.
30. Insert the capped end of one longer rod in one wing tip front pocket. Check the length of the rod at the rear pocket and cut off what is too much. The sail should not be overly taut. After adjusting the length put on an end cap and insert the rod end in the rear pocket. Repeat for other wing tip.
31. Put endcaps on one end of two of the shorter rods.
32. Insert the capped end of one shorter rod in one keel front pocket. Check the length of the rod at the rear pocket and cut off what is too much. The sail should not be overly taut. After adjusting the length put on an end cap and insert the rod end in the rear pocket. Repeat for the other keel.
33. For the remaining four shorter rods: Insert one 33 cm carbon rod in a 2 - 3 mm metal tube/ferrule. Fixate the tube so the centre of it is 9 cm from one end of the rod. Make a mark on 9 cm.
34. Create a c:a 17° knee on the mark (this is the kick-up front).

The 17° is included in the drawing.

There are many ways to create that knee (which should have a soft rather than sharp bend). Use whatever tools that are available.



“Soft” bent knee.

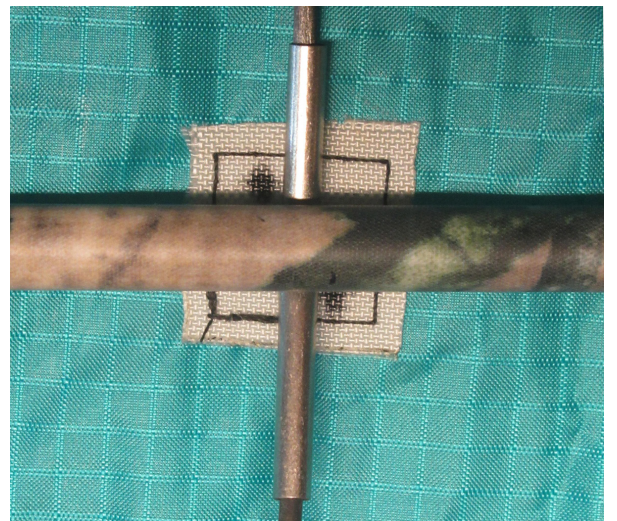


The 17° knee.

35. Repeat for the remaining 3 pcs of 33 cm rods.
36. Put endcaps on the short end of the rods and insert the rods in the front pockets. Check if the rod length has to be adjusted at the rear pocket. If so: do it and then put end cap on the rod and insert in the pocket. The sail must not be taut at the rods: the rod needs to rotate freely so that the knee on the rod easily comes in correct position when the bridle line is pulled.
37. Prepare the 4 SkyShark tubes (internal joiners and end caps in the ends) and insert the joined tubes in the wing pockets.
38. Lock the SkyShark tube at the keel with the velcro. If necessary cut the velcro strips so they lock diagonally over carbon rod and Skyshark tube perfectly without any excess material.



39. Mark the position of the holes for bridle attachment around each tube/spar intersection, except where the keels are.



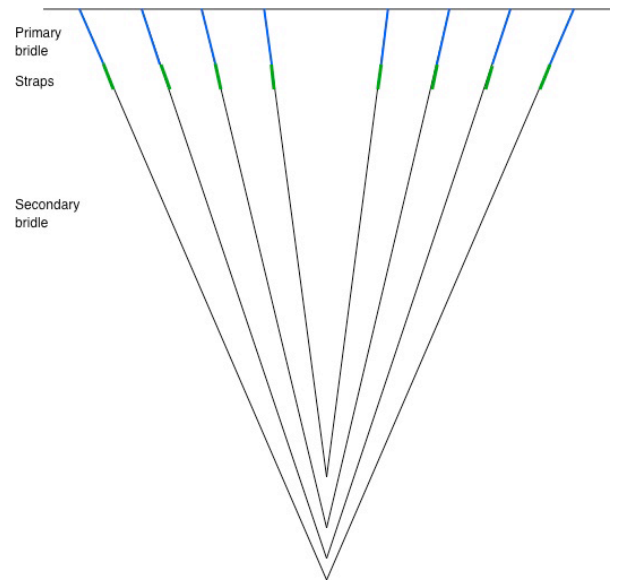
40. Also mark the bridle attachment holes at the pockets in the trailing edge except where the keels are.
41. Burn/punch holes for the bridles at bridle point reinforcement and rear edge pockets.



Bridle system

The bridle system consists of three parts:

- A. The primary bridles which are 6 six equally long 2-point bridles.
- B. The length tuning straps.
- C. The secondary bridle lines; 4 equally long (12 m) to form a 6 m long bridle.



42. Prepare strings for primary bridle and straps:

- 6 pcs of 200 cm primary bridle strings
- 2 pcs of 60 cm for wing tip bridle straps
- 2 pcs of 50 cm for middle bridle straps
- 2 pcs of 35 cm for inner bridle straps
- 2 pcs of 120 cm for bridle straps on the keels

43. Make a mark 20 cm from one end on each of the 200 cm strings.



44. Insert that end through the front bridle point reinforcement, around the spar and back. Align the end with the mark and tie a loop with an overhand knot. This loop is required to let the Skyshark tube bend when assembling.



45. Tie the other end over the rear pocket, over the spar.



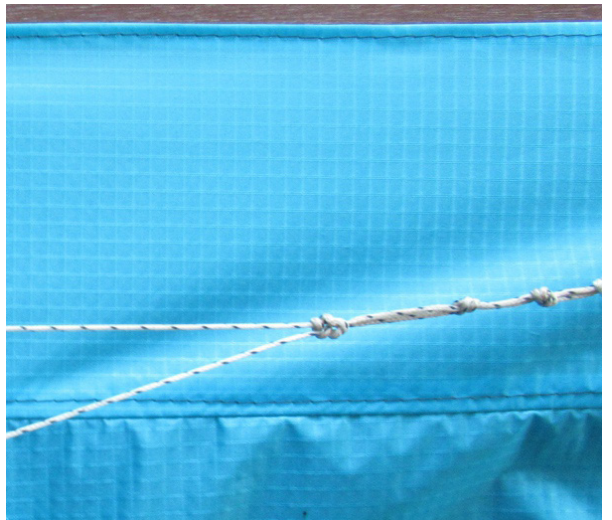
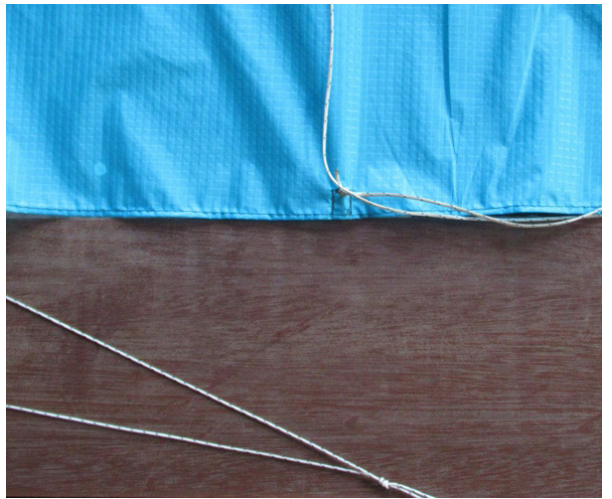
46. For each of the bridle straps: Tie a loop using an overhand knot at the string ends. Inside that knot tie 4 more overhand knots with a 15 mm distance between each. These knots are to make the tuning of the length of the secondary bridle easier.



47. Tie the straps to the primary bridles:

- a. Using a Prusik knot tie the 75 cm straps over wing tip bridles.
- b. Using a Prusik knot tie the 50 cm straps over middle bridles.
- c. Using a Prusik knot tie the 35 cm straps over inner bridles.
- d. Tie the 125 cm straps over keel loops

The towing point on the primary bridle is approximately 15 cm below the rear edge for the wing tip bridle and 3 – 4 cm above the seam for the other primary bridles.



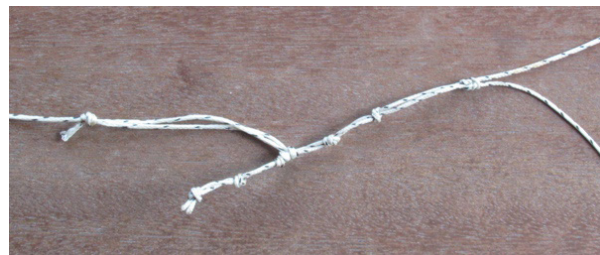
48. Prepare the secondary bridle strings:

- 4 pcs of 12 m
 - Tie loops in both ends of all strings.
- Check that all strings are of exactly the same length, including the loops.

49. Mark the exact middle (6 m) of all strings.



50. Using the loops, tie one bridle string at a time symmetrically to the bridle straps (see picture above), preferably on the knot in the middle.



51. Prepare towing loop of more coarse string.

52. Starting from the wing tip bridle pair:
Insert the middle of the string into the towing loop and tie it with a Prusik knot, checking that the middle mark remains exactly on the towing loop.



53. Continue inwards with the other bridle strings in the same way.



54. When all four lines are tied into the towing loop tighten the ties.

If there are any unbalances in string length these will be adjusted using the overhand knots at the bridle loop strings.



Tuning before first flight.

Check that the towing point on the wing tip bridles is about 15 - 30 cm behind the trailing edge of the kite and that it is symmetric on both sides. When flying the rear part of the bridle must always be taut.

Check that the towing point of the rest of the bridles are equal on all bridles, 3 - 4 cm in front of the seam. The towing point can be moved forward for flight in lighter winds, but avoid moving it too much forward: that might cause instability when the kite flies in zenith.

Check secondary bridle length: Secure the kite where there is at least 7 m open space in front of it. Stretch the bridle lines and adjust (on the straps) so every line has the same tension. This includes checking that the towing points on the four kick-up bridles are at the same horizontal level.

Flying Niëlje

Niëlje needs a wind speed of about 3 m/s. The wind range is not so big; 2.5 - 5 m/s.

Sometimes the kite is hard to tune for a balanced flight. It is the bridle point of the wing tips that controls the balance by adding more or less 'brake' on the wing tips. If the kite tends to go to the right then more brake is required on the left wing tip: move the towing point slightly backwards. This is often a question of one millimeter or two.