## KITES FOR CONNOISSEURS



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.


The Ronbus $5 \mathbf{- 3}$ kite is a single point soaring diamond for very light winds. It is not an original design by me, rather is it a tweak of a tweak: My friend Ron Spaulding is often flying a white high aspect ratio diamond kite when the wind is very light. In 2018 he tweaked it to become single point, but for some reason he was not altogether happy with the result. I asked him then if I could have a go at it. Later it emerged that the original design was by Peter Rieleit already in 2010. Ron's previous tweaks were to split the sail halves into four panels each and changing the fringe along the trailing edge to wider pieces. My tweak consist mainly of adding a rear in-sail dihedral, two versions of kick-up front and colours. And naming it Ronbus. 5-3 means it is optimized for $5+3$ Skyshark tubes.

Ronbus $5-3$ is a large $(3.8 \times 2.4 \mathrm{~m})$ light wind kite with a wind range of $1.5-3.5 \mathrm{~ms}$.

## Material

- $200 \times 145$ cm ripstop, colour 1
- $240 \times 145 \mathrm{~cm}$ ripstop, colour 2
$-1.5 \times 25 \mathrm{~cm}$ dacron
$-2.5 \times 20 \mathrm{~cm}$ dacron
$-4 \times 12 \mathrm{~cm}$ dacron
$-6 \times 8 \mathrm{~cm}$ dacron
$-8 \times 40 \mathrm{~cm}$ dacron
- $2.5 \times 8 \mathrm{~cm}$ velcro
- 8 Skyshark tubes, P4X/P400/P3X/P300/P1x/P100
- 6 pcs long internal ferrules
- 1 pcs aluminium tube for Skyshark tube
- Carbon fibre or fibreglass rod, 2 mm :
- 2 pcs 50 cm
- 2 pcs 40 cm
- 8 mm plastic tube, 5 cm
- 1 pcs rubber O-ring, 10-20 mm
- 3 pcs 7 mm end cap
- 8 pcs 2 mm endcaps
- For softly bent kick-up:
- 1 Skyshark round end nock with insert
- 1 pcs lobster claw snaplock swivel
- 1 pcs 15 mm alu ring


## Overview

The Ronbus diamond kite consists of 4 panels on each side, A and B. One reason to split up one side into four panels ( $B, A, A$ and $B$ ) is, according to Ron Spaulding, to retain the grain direction of the ripstop along the leading (and trailing) edge as well as along the horizontal diagonal. A good thinking, in my opinion.

In the rear part an in-sail dihedral is built in by cutting away a wedge of the panels, and the front has a kick-up that can be either a soft bend or a knee.

## Templates

Both the full size templates for panels $A$ and $B$ include an outside single hem and seam allowances between all panels.

Using the templates the panels will fit in ripstop of 150 cm width; 200 cm for colour A and 240 cm for colour B.

This version is optimized for five Skyshark tubes for the cross bow and three Skyshark tubes for the spine, hence the name Ronbus 5-3.

## How to make it

1. Sew together the four panels on one side. It is probably best to first join one $A$ and $B$, then one $B$ and $A$ and then join these two pieces, $B / A$ and $A / B$.
2. Repeat for the other side.
3. Put the halves on top of each other and check that they are symmetrical. Trim any excess material.
4. Staple (or fixate your prefered way) the two halves together so they don't slide apart during the cutting in following steps. It is enough with staples over the panel joints and in both ends at the spine edge.
(All staples but one will be cut away.)

The sail at the spine edge is to be cut in two steps to create first the in-sail dihedral and then the kick-up front. It is cut differently depending of the type of the kick-up front:

In the Ronbus 5-3 the front part is bent upwards; a kickup front. There are two ways to make the kick-up front:
A. A softly bent kick-up that requires a tensioning string.
B. A knee kick-up, where the knee is a dented ferrule.

Both include some metal work on a piece of aluminium tube.


Overview of Ronbus 5-3 with actual kite measures in cm. and template measures within parenthesis.


Example of calculation of ripstop usage when making a "Double Diamond" layout:
Colour A: $145 \times 200 \mathrm{~cm}$
Colour B: $145 \times 240 \mathrm{~cm}$


The blue dashed line shows the principle of what part of the sail is cut to create the in-sail dihedral and the red dashed line shows the cut for the kickup front (which can either be a soft bend or a knee).
A. The softly bent kick-up front has a short alu tube at the middle of the spine which holds an anchor ring for the tensioning string and a softer tube in the front that allows for the bending.
B. The knee kick-up front has a short alu tube at the start of the top panel. The alu ferrule is bent about $20^{\circ}$.

The included full size kick-up template can be used for for type A, the softly bent kick-up. Following are first the steps for the softly bent kick-up described. The steps for knee kick-up will appear at step 23.

## A. The softly bent kick-up.

At the rear part from the middle prepare for the cut away for the in-sail dihedral:
5. On the horizontal centre line (in picture oriented vertically) mark a point 3 cm from the vertical edge: $\mathbf{A}$.
6. From point $\mathbf{A}$ cut to the rear corner of the sail.
7. Put a mark C 5.5 cm from the top corner.

A. Softly bent kick up front.

B. Knee kick-up front.


For the softly bent kick-up front and in-sail dihedral two marks are required: $A$ and $C$.


The halves turned $90^{\circ}$ : Horizontal centre line here vertical.

8. The kick-up template, marked

## For softly bent kick-up

has one corner marked $A$ at the beginning of a curve and $\mathrm{a} C$ at the end of the curve. Place the template with these corners at the corresponding marks of the sail, $\mathbf{A}$ and $\mathbf{C}$.

The edge of the curve should more or less end at (or go through) the mark $\mathbf{C}$.
9. Check that the spine edges of the material as well as the leading edges on both halves are still perfectly aligned. Trim any excess material.
10. Cut along the curve of the template.
11. Remove the remaining staple.
12. Prepare a $6 \times 8 \mathrm{~cm}$ piece of dacron and fold it double so it becomes $6 \times 4 \mathrm{~cm}$. This will be a combined tow point as well as a sleeve for the spine.
13. Sew a piece of strong cord (flat) just inside the open edges of the folded dacron for extra reinforcement.
14. Burn or punch three holes for alternative towing points just inside the cord with $15-20 \mathrm{~mm}$ space between them.
15. Draw with a pencil a guide line 8 mm from the folded edge of the dacron.

The section on the sail where the dacron is sewed must be sewed differently than the rest of the seams joining the two sail halves. The dacron sleeve/towing piece has to be sewn to both sail halves before the entire sail halves are sewn together.
16. Put one half of the sail with front side (down side) up.
17. Place the dacron piece 70 cm from the leading corner with the pencil guide line aligned with the curved edge, (assuming you have an overlap between the sails of 8-10 mm) and the side with the cord reinforcement and holes over the sail.
18. Fixate the dacron piece to this sail half with a single seam, with the edge of the sail aligned to the guide line. This seam should be about 17 mm from the folded edge of the dacron piece.
19. Place the other sail half on top of the first so front sides (down sides) are facing each other and the dacron towing part is sandwiched between the sail halves. Sew a second seam over the dacron towing part. This seam should be about 15 mm from the folded edge of the dacron piece to allow a Skyshark tube to pass through.


Fixate the dacron piece with a seam (not yet sewn in the picture) about 17 mm from the folded edge of the dacron piece.


Dacron sleeve/towpoint sandwiched between the two sail halves with the front/down parts sides of the sail halves are facing each other. The second seam is 15 mm from the folded edge of the dacron sleeve.
20. Cut slits as deep as the overlap on both sides of the dacron.
21. Sew the entire sail halves together. It might be best to start from the dacron piece and sew one seam at a time towards the top and bottom corners.
22. Hem all the sides.

End of $A$. Softly bent kick-up. Next step is 34 .


The two sail halves sewn together with the dacron sleeve on back/upside.


After the two sail halves are sewn together the towing holes are on the front/down side of the sail.


The mark B.


The mark C (sail turned $\sim 45^{\circ}$ anti clockwise).


Cut from rear corner till mark B.


Cut from $B$ to $C$.


Dacron reinforcement with middle over mark B.


Make marks for three hole pairs, 2 cm apart.


Holes for alternative tow points.

## B. The knee kick-up.

23. Check that the spine edges of the material as well as the leading edges on both halves is still perfectly aligned. Trim any excess material.
24. Put a mark $\mathbf{B}$ on the seam joining the two front panels $B$ and $A, 3 \mathrm{~cm}$ from the edge.
25. Put a mark $\mathbf{C} 7 \mathrm{~cm}$ from the top corner.

Cut along the straight lines first from $\mathbf{B}$ to the rear corner of the sail and then from $\mathbf{B}$ to $\mathbf{C}$.

If you don't have a ruler long enougt to guide the cutting from $B$ to the rear corner, you can put a mark, like in step 5, but 2 cm from the edge and cut from the rear corner to this mark first and then continue to mark B.
26. Remove the remaining staple.
27. Sew the halves together.
28. Hem all the sides.
29. Prepare a $6 \times 3 \mathrm{~cm}$ piece of dacron. This will be a reinforcement for the tow point.
30. Sew the dacron piece over the seam joining the two front panel pairs $A$ and $B$ and on the vertical centre seam. The middle of the dacron should be over the B mark.
31. Put a Skyshark tube in the middle of the dacron piece as a guide and make three marks on each side of the tube, pairwise, with 2 cm intervals and the pair in the middle over the $\mathbf{B}$ mark.
32. Burn or punch the three pairs of holes for alternative towing points in the dacron.

End of B. Knee kick-up.

## Resumed common description.

33. Prepare dacron and velcro pieces for reinforcements and spar pockets:
Dacron
a. Two diamond shaped pieces: This diamond is two like sided triangles with two sides 60 mm and the base 70 mm . In the diamond the triangles are mirrored side by side; where the short diagonal is a common side; 60 mm .
b. Two circle sector pieces with $\sim 80 \mathrm{~mm}$ radius as sides, for top and bottom corner reinforcement. The sector angle is approximately $112^{\circ}$ for the bottom corner. The top corner angle is, after cutting off the kick-up front, slightly larger. Prepare both sectors with same angle $120^{\circ}$ and adjust to actual angle after sewing.
c. One rectangular piece $25 \times 60 \mathrm{~mm}$.
d. One rectangular piece $25 \times 130 \mathrm{~mm}$.
e. Eight rectangular pieces $15 \times 30 \mathrm{~mm}$.

## Velcro

f. A piece of velcro, $25 \times 80 \mathrm{~mm}$.
34. Fold one diamond dacron piece along the short diagonal. Place the diamond piece at one side corner of the sail with this diagonal aligned with the leading edge and with the corner marked C at the corner of the sail.
35. Start from the corner of the sail and sew a seam along the leading edge plus across.
36. Fold over the other half of the dacron and sew a seam that closes the second side of the triangle, along the rear edge.
37. Repeat for the other corner.
38. Trim edge and outer tip of both triangles.
39. Sew the corner reinforcements circle sectors onto both the top and bottom corners.

The angle at the bottom corner is slightly smaller than at the top.

Trim the edges of the sectors.
40. Sew the shorter 25 mm rectangular piece $(25 \times 60)$ as pocket for the spine at the top corner.


The angle of the circle sector is about $120^{\circ}$ for the top corner and about $110^{\circ}$ for the bottom corner. The diamond pattern is a little bit oversized to allow for differencies when sewing.


Pocket for right side (seen from back). The purpose of the wide opening of the pocket is to make it easier to slide in the cross spar.


Dacron reinforcement on top (and bottom) corner.


Prepare an adjustable pocket in the bottom corner.
41. Cut 40 mm of the hook (hard) part of the 25 mm wide velcro strip.
42. Sew this as a sleeve onto the reinforcement at the rear corner. The width should allow the spine tube to go inside.
43. Fold over 5 mm at one end of the longer dacron tape $(25 \times 130)$ and fasten it with a seam as a strap.
44. Take 80 mm of the loop (soft) part of 25 mm velcro.
45. Sew the velcro loop part onto the dacron tape starting just at the strap.
46. Sew 5 mm of the other end of the dacron tape onto the corner reinforcement, edge to edge with the hook velcro, with short seams. The loop velcro on the dacron tape should face upwards.



Dacron tape with end as strap.


Dacron tape with loop velcro.


Sew the eight smaller rectangular pieces ( $15 \times 30$ ) as pockets for the battens as well as sleeves for cross spar and spine:
47. Sew two pockets along the leading edge, first one 40 cm from the spine edge and next one 40 cm from the first.
48. Sew two pockets on the seam joining the two upper panels, opposite the corresponding pockets on the leading edge and oriented towards those pockets, the first 30 cm from the spine edge and the second 31 cm from the first.
49. Repeat steps 48-49 on the other half of the sail.
50. Cut two tapes of ripstop in the same colour as the front panel, $6 \times 65 \mathrm{~cm}$.
51. Fold one tape in half along the length and sew one side to the leading edge along the fold starting 18 cm from the side corner. Sew also seams on both short ends.
52. Fold over and close the long side with a seam.
53. Repeat steps $52-53$ for the other half of the sail.


Pockets and sleeves.

54. Prepare the spine sleeves: Cut from dacron three 4 x 4 cm pieces.
55. Sew one sleeve in the centre of the kite, across the exact middle from top corner to bottom corner. The sleeve should be rather tight, with a diameter of approximately 8 mm .
56. Sew the second sleeve 25 cm from the top corner in the same way.
57. Sew a third sleeve in the rear part of the kite, just where the four rear panels meet.

## Frame

The frame consists of a horizontally bent cross bow, a spine and some support spars; battens.

The spine is prepared differently depending on kick-up front type, but the cross bow and the battens are the same for both types. The cross bow and the battens are described further down in the description. First are the two versions of spine described.

Both spine types need a plastic cross connector for the cross bow:
58. Prepare one 8 mm plastic tubes, 5 cm long as cross connector. Cut out 30 mm in the middle.

This will later on be put onto the anterior spine tube (step 74 resp. 88).

As already mentioned there are two versions of the kickup front:
A. Softly bent kick-up.
B. Kick-up front with knee

The anterior part of the spine will thus be made differently. Firstly is described one way of doing A, the softly bent kick-up.


## A. Spine with softly bent kick-up and tensioning system.

There probably are many ways to make the tensioning system, but here is one suggestion which includes drilling a hole through the spine tube:

The spine consist of three Skyshark tubes. The exact tube types of these are not so important, except:

- For the softly bent kick-up the tube used in the front should be softer. i.e. more easy to bend, like P90 or P100.
- The tube in the middle will have an aluminium tube around it, and it is more important to find a combination of the outer diameter of a Skyshark tube and the inner diameter of an aluminium tube where the Skyshark tube fits as snugly as possible inside the aluminium tube.
The purpose of the aluminium tube is to reinforce a hole drilled horizontally through the Skyshark tube for an anchor point of the tensioning string.
- The tube in the rear could be any dimension, probably preferably around P300.

59. Find an aluminium tube which has such an inner diameter that it fits snugly over a Skyshark tube. Cut $4-5 \mathrm{~cm}$ of this aluminium tube.
60. Drill a 2 mm hole straight through the aluminium tube, in the middle of of it.
61. Put the aluminium tube over the selected Skyshark tube with the rear end of the aluminium tube 34 cm from the top of the Skyshark tube and fixate it with glue.
62. Use the holes in the alu tube as guide for drilling a 2 mm hole straight through the Skyshark tube.
63. Pull a 20 cm long string of non-stretching material, such as kevlar, through the holes and tie a 15 mm alu ring in a short loop. Secure the alu ring with as short a loop as possible.
64. Trim the excess parts of the loop string.

65. Glue long internal ferrules in the rear and middle Skyshark tubes and reinforce both ends of all three tubes, except the bottom end of the rear tube, by winding a thin string around them.
66. Glue an end cap to the rear tube for spine.
67. On the pocket at the front corner: burn two small holes for the tensioning string, 10 mm from the bottom of the pocket and 10 mm apart. Be careful not to burn straight through the pocket. It is probably easiest to avoid this by inserting something in the pocket to lift up the top where the holes should be burnt.
68. Cut 1.5 m of the non-stretching string and insert one end in and out of the top pocket through the burnt holes, with a loop coming out of the pocket.

A split end nock and a lobster claw snap hook will be used for the tension string. The lobster claw hook should be opening symmeytrically at the bottom and not at the side; this to make it easier when tensioning the bow.

[^0]* Lobster claw snap lock: http://nww.usalanyards.com/
small-lobster-claw-bolt-snap-hook-hm-8013a.aspx

69. Wrap the string loop that comes out of the pocket through the nock insert and the underside of the nock with both sides of the loop.
70. Secure the double loop around the knock with glue. Let the glue cure.


Skyshark tubes with long internal ferrule and end reinforcement.


Spar inserted in the pocket to prevent through-burning.


A round end nock with insert for Skyshark tubes is used for anchoring the tensioning string in the top of the spine and a lobster claw snap hook swivel for hooking the tensioning string to the aluminium ring. Don't use lobster claw hook with side opening

71. Gently insert the nock in the pocket while simultaneously pulling the string ends out of the pocket holes. The string wrapping must be at the underside of the nock.
72. When the nock is fully inserted and the string ends pulled out: tie a knot to secure the nock, making sure that both parts to the nock are equally taut. Trim the short loose end of the string.

The nock will thus remain in the pocket when the kite is disassembled.
73. Slide the plastic tube connector onto the top spine tube.
74. Mount the spine tubes onto the kite, starting with the middle tube, then the top tube and last the rear tube.
A. The middle tube should be mounted with the alu tube reinforcement on the top side of the centre sleeve.
B. The plastic cross connector tube should be on the lower side of the top sleeve, and the top end of the tube should go over the nock shaft.
C. Insert the rear tube through the velcro sleeve and tighten the spine pocket with the velcro strap.
75. Hook the lobster claw snap lock swivel to the alu ring on the middle tube and pull the tensioning string through the swivel hank.
76. While pulling the tensioning string gently bend the front of the kite till the top corner is raised about 20 cm . Make a small mark on the string right at the swivel hank.
77. Release the snap lock from the alu ring and tie a knot at the mark. Tie only a temporary knot the first time since the tensioning of the string probably needs to be repeated a few times before the correct length is determined.
78. Bend the top again and rehook the snap lock to the alu ring. Check that the top of the kite is raised about 20 cm . If not, adjust the length of the tensioning string.
79. Keep the spine under tension for a couple of days to make sure the string doesn't stretch.
80. When the kick-up height is ok, make the knot at the swivel hank permanent.


Pull both string ends while pushing the nock inside the pocket till the bottom of the pocket.


The plastic cross connector on the down side of upper top sleeve. (Top corner to the left.)

B. Top tube end over end nock shaft.

C. Spine tightened with velcro pocket.


Make a mark on the string just at the hank.


Temporary knot tied at the mark.

End of A. Spine with softly bent kick-up.


The up-angle of the knee is $\sim 20^{\circ}$.


Skyshark tubes with long internal ferrule and end reinforcement.


Reinforced Skyshark tubes ends for the dented alu tube.


Dented alu tube with reinforced ends of Skyshark tubes inserted and glued.

## B. Spine with knee kickup

The spine consist of three Skyshark tubes. The exact tube types of these are not so important, except:

- The knee kick-up on the tube used in the front will have an aluminium tube around it , and it is more important to find a combination of the outer diameter of a Skyshark tube and the inner diameter of an aluminium tube where the Skyshark tube fits as snugly as possible inside the aluminium tube.
The purpose of the aluminium tube is to make a dent in it: a knee with an angle of $\sim 20^{\circ}$.
- The other two tubes could be of any dimension, probably preferably around P300.

81. Find an aluminium tube which has such an inner diameter that it fits snugly over a Skyshark tube. Using a thin hot shrink tube on the Skyshark tube might help finding a suitable combination. Cut 8 cm of this aluminium tube.
82. Make a blunt dent in the middle of the tube and bend to a knee of approximately $20^{\circ}$.
83. Glue internal ferrules in the rear and middle Skyshark tubes and reinforce both ends of all three tubes by winding a thin string around them.
84. Cut the top tube 59.5 cm (check length from middle hole pair, step 32, to bottom of top pocket) from the top.
85. Reinforce one end of each cut tube part with a short internal ferrule, fully inserted in the tube part, for reinforcement when inserted in the alu tube.
86. Insert the two parts of the tube with internal ferrules in the bent aluminium tube. Glue the parts so they don't come separated but well fixed to the aluminium tube.
87. Slide the plastic tube connector onto the longer part.
88. Glue an end cap to the longer part (top part).
89. Mount the spine tubes onto the kite, starting with the top tube with the dented alu tube.
A. The plastic cross connector tube should be on the lower side of the top sleeve (see step 73).
B. Insert the rear tube through the velcro sleeve and tighten the spine pocket with the velcro strap.

End of B. Spine with knee kick-up.

## Preparing the cross bow and battens

The cross bow consists of five Skyshark tubes with one PX4/P400 in the middle and two PX3/P300 on each side. For the five Skyshark tubes in the cross bow it is suggested that the four side tubes take the internal ferrules and the middle tube remains open in both ends.
90. Prepare the five Skyshark tubes for the cross bow with long internal ferrules (long ferrules since there is a considerable bend on the tubes).
91. The ends of the tubes should be reinforced by winding a thin string around them since there is a significant bow on the tubes.
92. Glue end caps to two of the side tubes (PX3/P300) for the bow.


Skyshark tubes with long internal ferrule and end reinforcement.
93. Prepare two longer battens of 2 mm carbon fibre or fibreglass rod: $\sim 47 \mathrm{~cm}$ (check actual required length before cutting). Glue end caps in both ends.
94. Prepare two short battens; leading edge support sticks, of 2 mm carbon fibre or fibreglass rod, both $\sim 36 \mathrm{~cm}$ (check actual required length before cutting). Glue end caps in both ends.
95. Insert the two longer battens in the pockets nearest to the spine, on each side of it, and the shorter side battens in the outer pockets.

The battens should cross the cross bow in a nearly right angle.

Mounting the four battens is a one-time procedure: they may all well stay in place when the kite is disassembled.

96. Mount the cross bow by first inserting the center tube through the plastic cross connector, which should be approximately $30-35 \mathrm{~cm}$ from the top corner to allow the complete cross spar to be inserted in a comfortable way. The plastic cross connector can then be pushed down slightly if more tension on the sail is desired.
97. Then join the two side tubes on one side, slide them into the front edge sleeve and place the capped end in the side corner pocket.
98. Connect the side tubes to the centre tube.
99. Join the other two side tubes and slide them into the front edge sleeve but not into the corner pocket yet.
100. Connect these second side tubes to the centre tube. The side tubes will extend well outside the kite.
101. Push the side tubes gently upwards/inwards so the whole cross bow bends more, until the free capped end of the tube can be slipped into the corner pocket.
102. Push the plastic cross connector downwards on the spine so the leading edges become properly taut. The cross point between spine and cross spar should be about 35-45 cm from top corner, depending on kick-up type. If the plastic connector tend to slide upwards a rubber O-ring (double or triple folded) will hold it in place and keep the leading edges taut.

Tie alternative towing points in the prepared holes.
103. For softly bent kick-up:

Cut three pieces of $\sim 100 \mathrm{~kg}$ string, $15-20 \mathrm{~cm}$ and tie in the three prepared holes with a simple overhand knot.

Trim the strings outside the knots.
104. For knee kick-up:

Cut three pieces of $\sim 100 \mathrm{~kg}$ string, 25 cm and insert in the three prepared hole pairs with a loop around the dented alu tube. The loop in the middle should be exactly at the dent in the aluminium tube.
105. Tie each loop with a simple overhand knot close to the spine to fixate the spine in location.
106. Tie a second overhand knot a few mm outside the first knot for the flying line.

Trim the strings outside the knots.


Alternative tow points at softly bent kick-up Ronbus.


Alternative tow points at knee kick-up Ronbus. Each loop goes around the spine. The loop in the middle should be exactly where the dent is in the aluminium tube.


Two Ronbus 5-3 next to each other: with soft kick-up to the left and knee kick-up to the right. Height 2.4 m, width 3.8 m . Aspect ration 1.6.


[^0]:    * Round endnock: https://kitesandfunthings.com/Products/ round-end-nocks-with-insert__2091.aspx

