

Keystone Kites Summer Workshop 2011
GIZMO
Presented by: Simon Crafts

Instructions

1. Layout and inspect kit contents
2. Assemble Wings (if required)
3. Apply Reinforcements
4. Edge bind all pieces as required
5. Apply spar-to-sail grosgrain attachment loops
6. Panel Assembly
7. Final pass-through trimming
8. Final Keel Bridging
9. Framing
10. Rigging
11. Adjustments and Flight

1. Layout and Inspect Kit Contents

- a. Each kit should contain the following parts

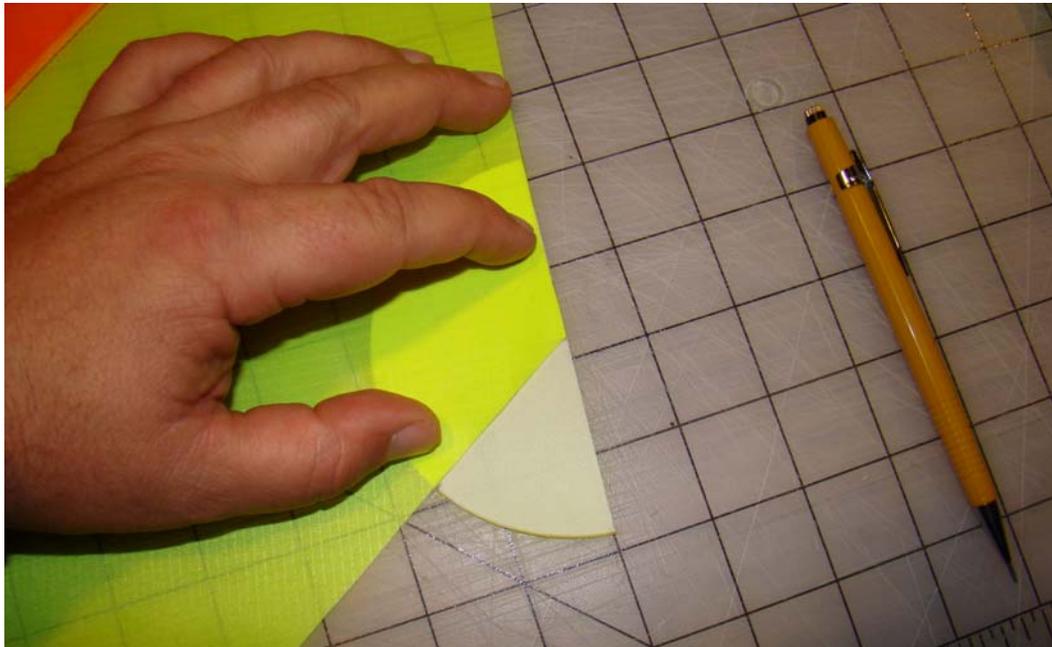
- i. 9 wrapped spars, 32.5" long
- ii. 2 wrapped spars 17" long – upper spreader
- iii. 2 wrapped spars 4.25" long – shorter longerons
- iv. 1 wrapped spar 14" long - longer spine
- v. 5 x 3" internal ferrules (.2400")
- vi. 2 x 4" internal ferrules (.2400") – for center of spreaders
- vii. 2 x "Beman" style center T's, pre drilled
- viii. 4 x ¼" aluminum rings
- ix. 3 x FSD "side slot" nocks
- x. 2 x Custom MKS fittings
- xi. 4 x C-Clip "do-hickey" stoppers
- xii. 5 x 1 ¼" .2400 Carbon tube for nock inserts
- xiii. 9 x push-in "arrow" nocks
- xiv. 8 x triangular shaped Dacron reinforcement patches
- xv. 10 x rectangular shaped Dacron reinforcement strips
- xvi. 2 x ~4" Dacron circles
- xvii. 6 x ¼" grosgrain strips, 4" long
- xviii. 4 x ¼" grosgrain strips, 4.5" long
- xix. 8 x ¼" grosgrain strips, 3.5" long
- xx. Pre-folded (1/4" doubled) 0.75 oz RSN edge binding
- xxi. Fabric (if ordered)
 1. 2 upper keel panels
 2. 2 lower keel panels
 3. 2 large back panels
 4. 2 upper wing panels
 5. 2 center wing inserts
 6. 2 lower wing panels

2. Assemble Wings (if required)

- a. Locate the 6 wing panels, separating them into 2 sets of 3 (right and left)
- b. Assemble the two groups into a pair of complete wings.
 - i. Line up sew lines of upper wing panel and center wing insert.
 - ii. Hot cut a strip off the seam allowance, leaving $\frac{1}{2}$ " or more. This is the "weld" to secure the pieces while sewing
 - iii. Straight stitch on the sew line
 - iv. Fold open and crease flat the seam allowance to the "dark" side, or to the center if there is no difference
 - v. Top stitch with an appliqué-sized zig zag stitch close to the straight join stitch.
 - vi. Back – cut the seam allowance to trim to final size.
 - vii. Repeat for the lower wing panel, joining to the center insert as above.
 - viii. Repeat for second wing

3. Apply Dacron Reinforcements

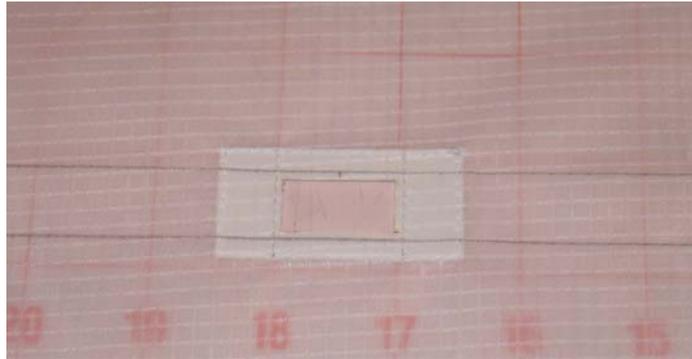
- a. Wing tip and Keel Tip reinforcements
 - i. Locate the 2 x ~4" Dacron circles
 - ii. Using a pencil and straight edge between the 4 tic marks on the perimeter of the circle, mark the center of the circle
 - iii. Lay a Keel on the table in front of you
 - iv. Align the circle under the keel with the tip of the keel on the center cross mark on the circle, and one edge of the keel on one of the "tic" marks on the perimeter of the circle.
 - v. Using a pencil, and the keel as your template/guide, make a tic mark on the circle at the other edge of the keel on the perimeter of the circle.



- vi. Cut a Pie-shaped wedge from the circle, between the two alignment tic marks and the center point. *This can be cold cut as the raw edge will be bound.
 - vii. Check the cut wedge against your keel tip to verify accuracy
 - viii. Spritz the Dacron wedge with spray adhesive and apply to the keel tip on the BACK SIDE of the fabric, aligning the points and edges.
 - ix. Sew down around the curved perimeter with a 3-step zig zag stitch. *Note: the straight edges do not need to be sewn down as they will be secured when the binding and spar-to-sail grosgrain loops are sewn on later. *Note 2: If your sewing machine yields results like mine does when sewing through Dacron, it is advisable to turn the piece over and sew with the fabric on TOP and the Dacron on Bottom when running it through the machine.
 - x. Repeat as required. When completed, there will be 8 pie/wedges applied (4 x keel tips, 4 x wing tips)
- b. Spar Pass-Through Patches - Center Panels
- i. Locate the 8 x triangular shaped Dacron patches
 - ii. Start with one of the long, back panels. The one that you will roll the spine sleeve in is best. IMPORTANT NOTE: You will be working with and aligning patches with the sew lines for the tunnels that are closest to the CENTER of the panel.
 - iii. Lay the panel so it is face down and you are looking at/working on the “back side” of the panel.
 - iv. Locate the two tic marks that mark the center of the mast pass-through patches on the inside sew line for the spine tunnel. Compare to the Template if necessary.
 - v. Using a ruler or quilters guide, measure out and make 2 tic marks at 1.5” from the center mark (2 times)
 - vi. Spritz two patches with spray adhesive and apply to the sail, aligning the sew line marked on the patch with the inside sew line for the tunnel, and centered between the 2 tic marks you made in sub-step “v” above.
 - vii. Sew around the perimeter of the patch with a three-step zig zag. Do this on the 3 “long” straight sides. *Note: If your sewing machine yields results like mine does when sewing through Dacron, it is advisable to turn the piece over and sew with the fabric on TOP and the Dacron on Bottom when running it through the machine.
 - viii. Repeat for the two patches on the shorter longeron tunnel for the same panel.
 - ix. Repeat on the second back panel, doing 2 patches on the SHORT LONGERON side ONLY.
 - x. Locate the paper templates for the pass through patches with the Triangular shaped hole.

tunnel (eyeball it, leaving a small gap between the long edges of the strip and the sew lines for the tunnel) and centered on the tic marks.

- vi. Sew around the perimeter of the patch with a straight stitch (4 times)
- vii. Using a quilter's rule, mark 4 additional lines on each patch. Mark a line $\frac{1}{4}$ " from each side of the patch parallel to the LONG sides, and mark a line $\frac{1}{2}$ " from each of the short ends (effectively drawing a rectangle that is $\frac{1}{2}$ " x 1", centered on the patch, with the lines extending all the way to the edges of the patch.
- viii. Take back to the machine and sew on each of the 4 lines on each patch with a straight stitch.
- ix. After sewing, take to the cutting table and using the soldering iron and a small straight edge, trim out the interior rectangle, staying INSIDE OF and NOT DISTURBING your stitch lines. The finished patch will look something like this:



- e. Longeron / spine end patches
 - i. Locate the six remaining 1" x 2" Dacron strips.
 - ii. Lay one of your back panels on the table in front of you FACE UP. Make sure that the reinforcements previously applied are on the UNDER-SIDE of the fabric as you work with it now.
 - iii. Give a strip a spritz of spray adhesive and apply to the end of one of the tunnels. Align one of the short ends of the strips with the edge of the fabric, and eyeball the long sides to be centered between the sew lines of the tunnel (there will be a small gap on each side.)
 - iv. Take to the machine and sew around 3 of the 4 sides with a straight stitch. It is not necessary to sew the short side that is matched to the edge of the fabric.
 - v. Repeat as required to have all six remaining patches applied.
- f. WHEW!

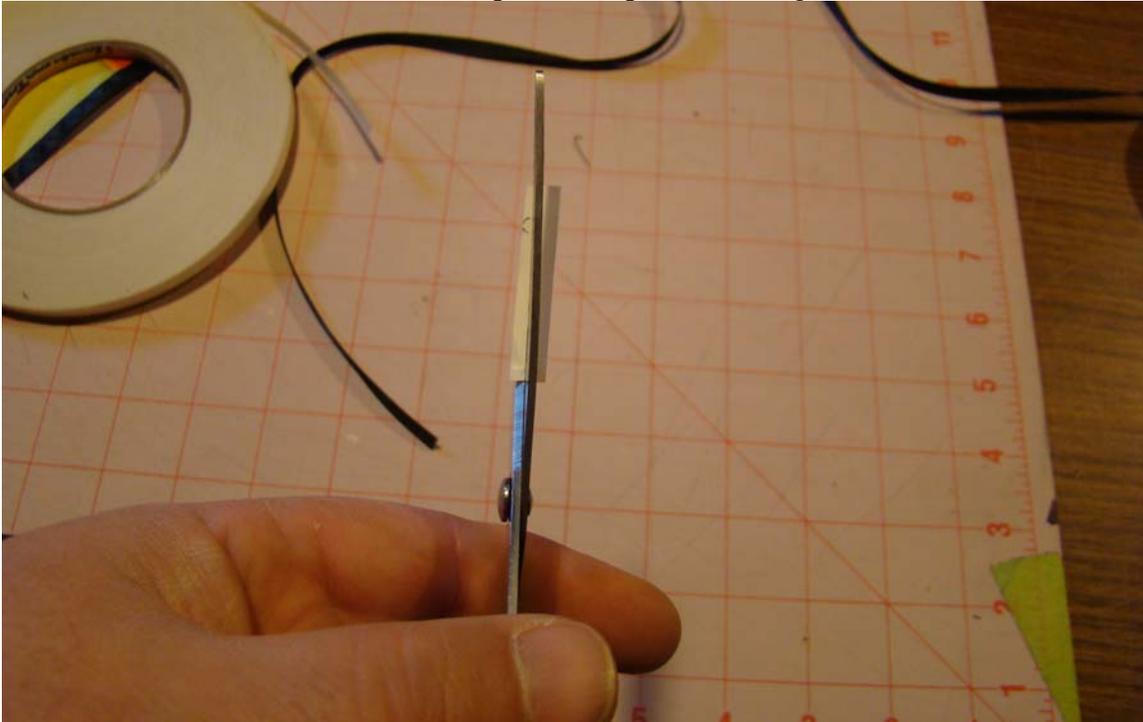
4. Edge Binding

- a. Locate the pre-folded edge binding material
- b. Start by edge binding the ends of the rolled tunnels. Cut 6 pieces 2-3 inches long.

- c. Apply these strips to the straight ends of the rolled tunnels, over the patches applied in step “3.e” above. Align one end of the strip even with the inside sew line of the tunnel.
- d. Continue edge binding the remainder of the pieces, trimming tags as you go. I strongly suggest sewing overlapping binding on all points or tips and hot trimming to size after sewing.

5. Apply Spar-to-Sail Grosgrain Attachment Loops

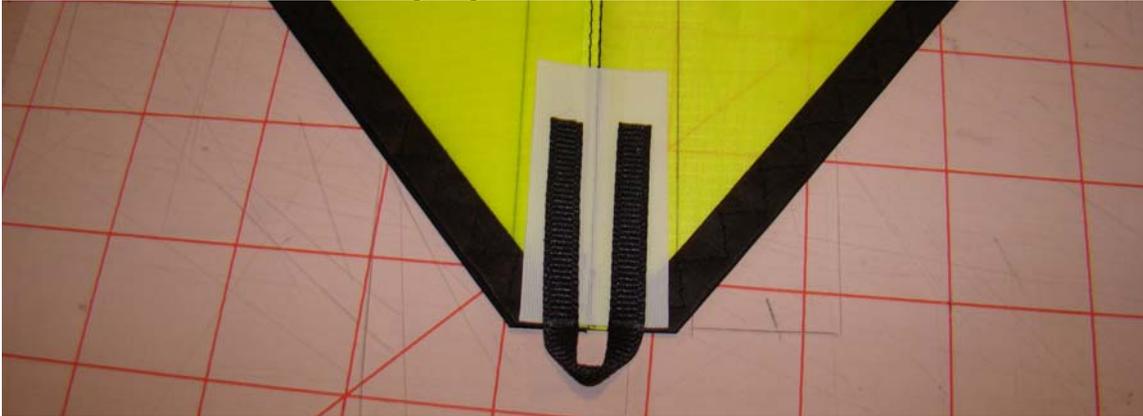
- a. Longeron / Spine Tunnel Ends
 - i. Locate the six 4” long grosgrain strips. There will be 2 marks centered, 1” apart, on each strip.
 - ii. Apply double-sided tape to each 1 ½” end of each strip as follows:
 - 1. Use the marked strip as a guide
 - 2. Cut a 1 ½” long piece of tape from the roll
 - 3. Cut that piece of tape in half lengthwise like so:



- 4. Apply the narrow strips to the back side of each strip (with the tic marks on the opposite side from the tape) like so:



- iii. Remove the tape backing and tape down to the longeron/spine tunnel end patches, evenly spacing the strips and the edges (eyeball it) and aligning the tic marks with the end of the fabric:



- iv. Sew down each strip. I like to use a 3-step zig zag, or a pair of parallel straight stitches works well too.
 - v. Repeat for all 6 tunnel ends.
- b. Wing Tip Loops
- i. Locate 4 strips x 3.5" long and 4 strips x 4.5" long
 - ii. Apply DS Tape to the ends of each strip as described and shown in (5.a.ii) above
 - iii. Locate a wing, and lay it on the table face DOWN, so the Dacron patches are UP.
 - iv. Take a 3.5" strip and tape it along the edge (on the binding) of a wing tip, aligning the tic mark about 1/4" back/away from the tip or opposite edge.
 - v. Take a 4.5" strip and tape it directly on top of the 3.5" strip you just put down, aligning the tic marks of the two pieces.
 - vi. Take to the machine and sew down (from the end of the strip to the tic mark, STOPPING at the tic mark)
 - vii. Take the 3.5" piece from the underside, remove the tape backing, and apply to the other side of the wing tip along the edge binding, aligning the tic mark on this leg with the tic mark of the leg you just sewed down. There will be a 1/2" loop in the middle.
 - viii. Take the 4.5" piece and remove the tape backing, and apply directly over the 3.5" piece you just put down, aligning the tic marks. There should be a larger, 1.5" loop above the first one.
 - ix. Sew down.
 - x. Repeat for all 4 wing tips.
- c. Keel Bridges
- i. Locate the remaining 3.5" strips of grosgrain
 - ii. Apply DS Tape to the ends of each strip as described and shown in (5.a.ii) above
 - iii. Locate an Upper and a Lower Keel panel (doesn't matter which ones, but it's easier to keep track of things if you take both of them from the same side – right or left.)

- iv. Lay the two panels on the table FACE DOWN, so the Dacron patches are UP.
- v. Remove the backing from one end of one strip, and apply along the binding of a keel tip on the BACK SIDE (reinforcing patch UP.) Align the tic mark so that it is even with the very tip of the keel panel.
- vi. Remove the backing from one end of a second strip, and apply along the binding to the other side of the keel tip, aligning the tic mark with the very tip of the keel panel. The strips will be overlapped.
- vii. Take to the machine and sew down each leg to secure. Leave the tape backing on the other ends of the grosgrain strips for now. Set aside and repeat for the other keel panel. Again MAKE SURE you are doing this to (1) upper keel and (1) lower keel.

6. PANEL ASSEMBLY

- a. Back Panel Join and Spine tunnel
 - i. Locate your two back panels. Lay them on top of each other FACE-to-FACE with triangular Dacron patches OUT. We will be working with the long, spine tunnel side.
 - ii. One of your two pieces has two parallel lines for the spine tunnel and multiple reinforcement patches sewn along the tunnel. We are first working with the sew line to the OUTSIDE, Furthest from the center of the panel, and closest to the edge.
 - iii. Take the second back panel, the one without the Dacron patches on the spine tunnel, and align the CENTER sew line (if you drew them both on both pieces) with the OUTSIDE sew line of the panel with patches. Use the light table if necessary and do your best to align the two sew lines down the entire length.
 - iv. Use straight edges and fabric weights as necessary to keep them aligned.
 - v. Once you are SURE they are properly aligned, use the hot knife to trim off a small strip, well outside of the matched sew line on the seam allowance. This serves to “weld” the two pieces together and keep them that way as we move to the next step.
 - vi. After trimming and welding, Start to fold over the tunnel with the patches in it, carefully aligning the two sew lines. Do this by starting with folding over and creasing the 6 dacron patches, moving down the length of the tunnel, putting a good crease and matching the sew lines as you go.
 - vii. If necessary, flip the panels over so that the seam allowance (outside the sew lines) is UP after you have completed the pre-fold and crease. You may find it easier to do the fold and crease with the seam allowance on the underside (your preference)
 - viii. Using bits of masking tape, tape the seam allowance down to the panel it is folded towards, carefully double-checking your

alignment of the sew lines as you go. You are applying tape to the seam allowance only, leaving the sew line visually exposed.

- ix. Visually inspect the sew/join line before taking to the machine. You may need to “extend” the sew line over the edge binding, or darken it in a place or two so that you can SEE it and SEW ON IT in the next step.
 - x. Take to the machine and sew down the sew line with a straight stitch. I recommend using a back-tacked lock stitch on each end for security. Go slowly and pay careful attention to your accuracy of sewing ON the line as you go, particularly within an inch or two of each end.
 - xi. After completing the straight stitch, remove the masking tape.
 - xii. Take the assembly back to the machine and top stitch the seam allowance. I use an appliqué sized zig zag close and tight to the straight join stitch
 - xiii. Take back to the table, and using appliqué scissors, cut away the remaining seam allowance close and tight to the top stitch along its length for a clean finished seam.
- b. Keel / Wing Join and Longeron Tunnels
- i. Lay the back panel assembly on the table FACE DOWN, with the triangular Dacron patches UP
 - ii. Locate an upper keel, lower keel, and the wing for the side you have nearest you (right or left, doesn't matter what you start with, as long as you match to your back panel.) **NOTICE:** If necessary, use the back panel template to verify which side of the back panel assembly you are working with!! There is a difference (right-to-left). The trailing edge of the assembly at the spine extends further past the ends of the longerons than the leading edge does.
 - iii. We will first be working with the OUTSIDE sew line for the longeron tunnel (the one closest to the EDGE of the panel.)
 - iv. Lay the keels on the sew line, carefully matching the lines, with the keels FACE UP.
 - v. Use straight edges and fabric weights as necessary to keep them aligned.
 - vi. Once you are SURE they are properly aligned, use the hot knife to trim off a small strip, well outside of the matched sew line on the seam allowance. Trim as little as possible leaving enough for a second trim (below.) This serves to “weld” the pieces together and keep them that way as we move to the next step.
 - vii. Bring the wing over and lay it on the sew line Face DOWN, aligning the wing sew line with the same line you matched above with the keels and back panel.
 - viii. Use straight edges and fabric weights as necessary to keep them aligned.

- ix. Once you are SURE they are properly aligned, use the hot knife to trim off a small strip, outside of the matched sew lines on the seam allowance.
- x. After trimming and welding, Start to fold over the tunnel with the patches in it, carefully aligning the two sew lines. Do this by starting with folding over and creasing the 2 dacron patches, moving down the length of the tunnel, putting a good crease and matching the sew lines as you go. NOTE: You are folding the tunnel over AWAY from the keels and wings that are now attached to it (so you are turning the edge of the fabric under, towards the table, from where it just was for the welding above.)
- xi. If necessary, flip the panels over so that the seam allowance (outside the sew lines) is UP after you have completed the pre-fold and crease. You may find it easier to do the fold and crease with the seam allowance on the underside (your preference)
- xii. Using bits of masking tape, tape the seam allowance down to the Back panel it is folded towards, carefully double-checking your alignment of the sew lines as you go. You are applying tape to the seam allowance only, leaving the sew line visually exposed.
- xiii. Visually inspect the sew/join line before taking to the machine. You may need to “extend” the sew line over the edge binding, or darken it in a place or two so that you can SEE it and SEW ON IT in the next step.
- xiv. Take to the machine and sew down the sew line with a straight stitch. I recommend using a back-tacked lock stitch on each end for security. Go slowly and pay careful attention to your accuracy of sewing ON the line as you go, particularly within an inch or two of each end.
- xv. After completing the straight stitch, remove the masking tape.
- xvi. Take the assembly back to the machine and top stitch the seam allowance. I use an appliqué sized zig zag close and tight to the straight join stitch
- xvii. Take back to the table, and using appliqué scissors, cut away the remaining seam allowance close and tight to the top stitch along its length for a clean finished seam.
- xviii. Repeat this process for the other side
- xix. NOTES: Masking tape can be your friend, and it’s cheap. Use as much as you need for whatever you think will help. Fabric management when taking large assemblies to the machine can be challenging, and if not handled well, will affect your sewing accuracy as things twist, pull, and get crowded. You may find it helpful to roll up the fabric not being sewn and tape secure it with masking tape to help with fabric management.
- xx. Have a look at your work! Almost There!

7. Final pass-through trimming

- a. Surely you noticed that your top-stitched allowances for your tunnel seams went over the triangular shaped spar pass-through patches. Time to cut them out!
- b. Using the soldering iron and a short straight edge, CAREFULLY cut out the triangular shaped holes of your 6 spar pass throughs. Be careful to stay INSIDE OF and NOT DISTURB the straight stitching that you put around the final hole way back when those patches were first applied!

8. Final Keel Bridging

- a. Now for the Kung Fu. ☺
- b. Lay the kite skin on the table face up. It's helpful to "bunch" the longeron tunnels / wings towards the center of the assembly so that you have some slack in the keels as you bring their tips together.
- c. Locate the Upper Keel with the bridging strips already sewn to it.
- d. Note that the free end of the strip sewn to the leading edge of the keel is pointed towards the trailing edge of the kite, and the free end of the strip on the trailing edge of the keel is pointed towards the nose of the kite.
- e. Bring the matching upper keel tip over to the one with the strips on it.
- f. Twisting the fabric as required, turn the keel tips over so that you are looking at the back side of the panel (Dacron and Strips UP) – making sure that you have leading and trailing edges mirrored.
- g. Remove the backing on the strip coming off the leading edge, and bend it as required and apply to the LEADING edge of the opposing keel. Align the tic mark on the strip with the very tip of the opposing keel in the same way that you lined up the strip on the keel already sewn.
- h. Repeat for the other strip, applying the trailing edge strip to the trailing edge of the opposing keel. The grosgrain strips should overlap after taping down.
- i. Take to the machine and sew down each leg.
- j. Repeat this process for the lower keels.

9. Framing

- a. Assemble fittings
 - i. Locate the 3 x FSD fittings, 2 x MKS fittings, and 5 x .2400 carbon inserts
 - ii. Using super glue, glue one insert into each of the 5 (total) fittings.
 - iii. Set aside.
- b. Assemble the longerons
 - i. Locate two of the 5 x 3" internal ferrules
 - ii. Locate two of the 32.5" spars and the two 4 1/4" spars
 - iii. Make a pencil mark at the half- or mid-point of each of the 5 x 3" ferrules

- iv. Using super glue, glue a ferrule into one end of each of those two 32.5" spars, inserting the ferrule to the half- or mid-point that you marked above
 - v. Using super glue, glue an FSD (side-slot) nock into one end of each of the two 4 1/4" spars
 - vi. When the glue for those two steps has dried enough to proceed, glue the 4 1/4" spar (with fitting attached) to the ferruled 32.5" spar
 - vii. Locate two of the 9 x Push-In Arrow Nocks
 - viii. Insert a nock into the open end of both of those assembled longerons. Try to align the slot on the nock with hole on the FSD fitting on the other end. NOTE: Glue is optional here; the longerons are cut a tad long, and you may want to trim an inch or so later.
 - ix. Set aside.
- c. Assemble the Spine
- i. Locate one of the 3" internal ferrules
 - ii. Make a pencil mark at the half- or mid-point of the ferrule
 - iii. Locate one of the 32.5" wrapped spars
 - iv. Glue the ferrule into the spar, inserting it to the halfway point that you marked on the ferrule
 - v. Locate the 14" long wrapped spar
 - vi. Glue the remaining FSD (side-slot) nock into one end of the 14" spar
 - vii. When the glue has set enough to proceed, glue the other end of the 14" spar to the ferruled end of the 32.5" spar.
 - viii. Locate a push-in Arrow Nock
 - ix. Insert the Nock into the remaining open end of the spine. NOTE: Glue is optional here; the longerons are cut a tad long, and you may want to trim an inch or so later.
 - x. Set the assembled spine aside
- d. Assemble the Upper Spreaders
- i. Locate the remaining 3" internal ferrules
 - ii. Locate one 4" internal ferrule
 - iii. Locate two push-in Arrow nocks
 - iv. Locate two 32.5" spars
 - v. Locate the two 17" spars
 - vi. Make a pencil mark at the half- or mid-point of the two 3" ferrules
 - vii. Glue a 3" ferrule into one end of both of the 17" long spars, inserting the ferrule to the halfway point marked on it
 - viii. Glue an Arrow Nock into the other end of both of the 17" long spars
 - ix. When the glue has dried enough to proceed, glue a 32.5" spar to the ferruled end of both of the 17" spars (resulting in two spars that are 49.5" long with an arrow nock on the end. NOTE: Gluing on this step is OPTIONAL; this will be your longest spar when the

kite is rolled up if you glue it. I prefer it glued, but to each their own.

- x. Measure and make a pencil mark 1 ½” from one end of the 4” ferrule
 - xi. Take one of the two assembled 49.5” spreaders, and glue the 4” ferrule into the open end, inserting it to the 1 ½” mark.
IMPORTANT: You will have 1 ½” of ferrule “inside” the spreader, and 2 ½” **exposed**.
 - xii. Set aside
- e. Assemble the Lower Spreaders
- i. Locate two 32.5” spars
 - ii. Locate the remaining 4” ferrule
 - iii. Locate two push-in Arrow nocks
 - iv. Glue an arrow nock into one end of each of the two spars
 - v. Measure and make a pencil mark 1 ½” from one end of the 4” ferrule
 - vi. Glue the 4” ferrule into the open end of one of the two spars, inserting it to the 1 ½” mark. **IMPORTANT:** You will have 1 ½” of ferrule “inside” the spreader, and 2 ½” **exposed**.
 - vii. Set Aside
- f. Assemble the Masts (vertical spreaders)
- i. Locate the two remaining 32.5” spars
 - ii. Locate the two remaining push-in arrow nocks
 - iii. Locate the two “Beman” center T’s
 - iv. Glue an arrow nock into one end of each of the two spars
 - v. Examine the Beman T’s to determine which of the two holes on it is larger. This is the hole that the spar slides into.
 - vi. Push one T onto each of the two Masts, inserting the open end of the spar into the larger hole of the T. Slide the T to the approximate mid-point of the spar. Rotate the T so that the cross hole is parallel to the slot in the nock on the end of the spar.
 - vii. Set aside
- g. Insert the shorter outer longerons
- i. Cut a pair of strings from the roll of heavier (white) rigging line. Give yourself plenty of line to work with (a foot or so) – it can be trimmed later.
 - ii. Tie a bulky stopper knot near the end of the line. A variety of knots can be used. A figure-8 loop knot was used on the “show-and-tell” kite.

- iii. Larkshead a line to the grosgrain loop on the LEADING EDGE of one of the two shorter longeron tunnels, similar to this:



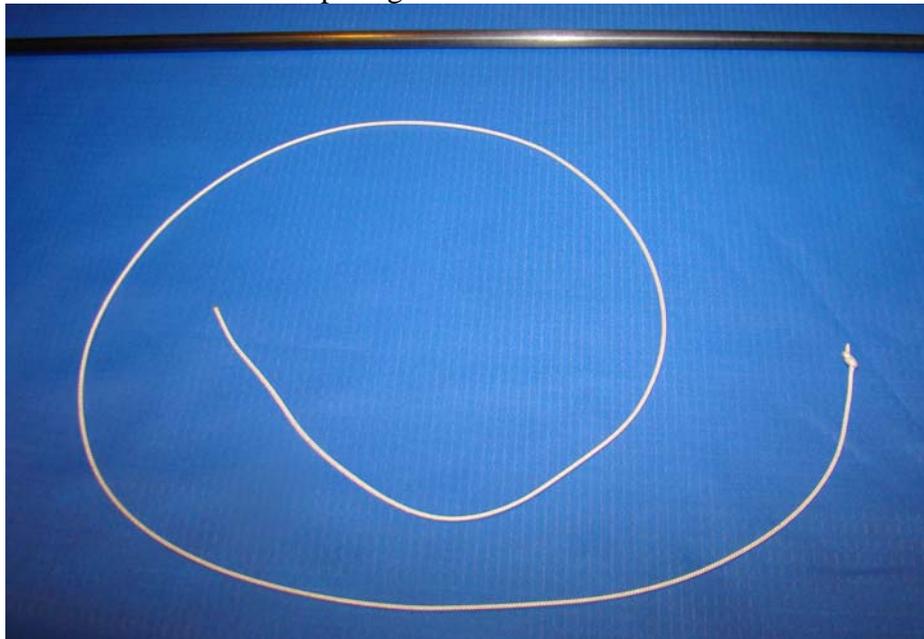
- iv. **IMPORTANT:** Do **NOT** pull the larkshead very tight right now!
- v. Locate one of the assembled longerons (about 37" long total)
- vi. Push the grosgrain loop with string to the **FRONT** or **FACE** of the kite, and insert the FSD nock – end of the longeron into the tunnel. Push it all the way down to the bottom end.
- vii. At the other end, you will need to push the grosgrain loop on the bottom of the tunnel to the side to completely get the longeron in.
- viii. What you do at the bottom is get the FSD end nock pushed in to be parallel with the bridge of that grosgrain loop, and then slide the grosgrain into the side-slot of the FSD. When complete, it should look something like this:



- ix. After getting the grosgrain into the slot on the FSD, go back to the other end and make sure the longeron is inserted fully by pulling “up” on the leading edge of the tunnel
- x. Pull the larks-headed adjustment line up and pull the knot over the arrow nock in the end of the longeron to secure. **IMPORTANT:** You want this adjustment/tension line to pull a good amount of sail

tension along the longeron to tighten the sail. Adjust the larkhead at the grosgrain loop as necessary to shorten or lengthen the line to the stopper knot as required. You want there to be enough tension that it's a little difficult to pull the knot up and over the nock.

- xi. Repeat this process for the other side (the second longeron)
- h. Insert the Spine
 - i. Doing the Spine is just like the longerons, with a couple of extra steps.
 - ii. First, cut and assemble the tension line for the top of the tunnel as you did for the longerons. Larkhead it to the grosgrain loop on the leading edge of the tunnel.
 - iii. Now we will cut 4 lines for the spine/mast tensioners. I use the smaller 100# line for this. Cut yourself 4 lines from the roll, and don't be stingy. Give yourself 2-3 feet each.
 - iv. On each of those 4 lines, tie a simple stopper knot near the end. I like a simple figure-8.



- v. Now, bring the end with the stopper knot around and tie an overhand slip/loop knot.

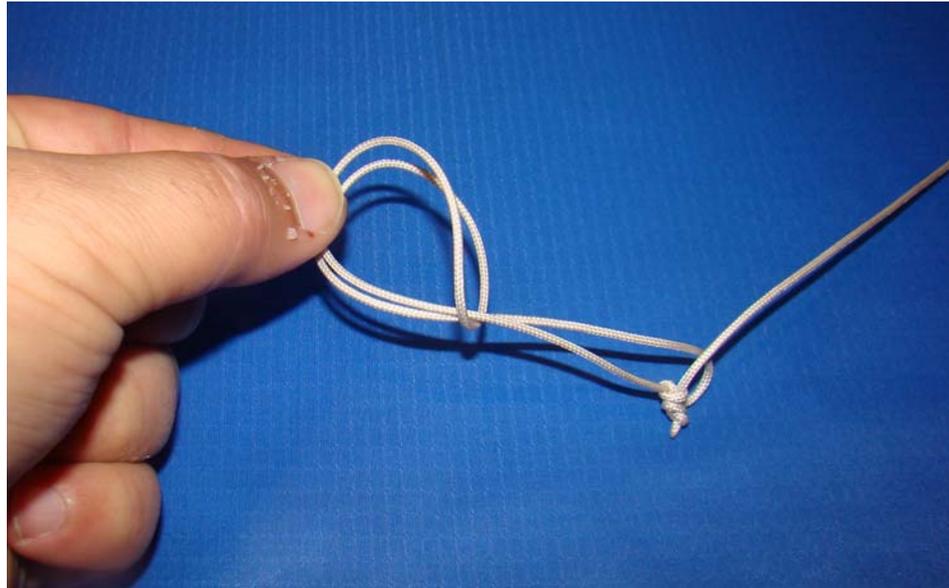


- vi. Pull the overhand knot tight to form a large, adjustable loop



- vii. Do this for all four lines and set them at the ready
- viii. Now we start to insert the spine as we did the longerons. Push the grosgrain loop towards the FRONT or FACE of the kite and insert the spine, FSD (side-slot) fitting first into the TOP of the tunnel.
- ix. Push the spine in until the FSD nock emerges into the first rectangular cutout

- x. Now, take one of your 4 prepared lines, and form a larkshead “in hand” like this:



- xii. Slip the larkshead over the FSD and end of the spine while it's exposed in that rectangular cutout, like so



- xii. Continue inserting the spine without pulling the larkshead tight (leave loose.) At each cutout in the spine tunnel, similarly larkshead an adjustment line to the spine as it passes each hole (four times total.)
- xiii. When the spine bottoms out, seat the grosgrain loop in the FSD nock and tighten the spine as you did with the longerons.
- xiv. Now, locate the 4 x C-Clip “do-hickey” stoppers.

- xv. At each cutout in the spine tunnel, “spread” the still-loose larkshead and snap the clip to the spine. Then rotate the clip on the spine so that the opening in the clip is “up”. It will look like this:



- xvi. Now pull the larkshead tight. Slide the slip knot as you tighten the larkshead to seat the knot firmly against the spar in the gap on the C-clip. When tightened, it will look like this:



- xvii. Repeat for all four tension lines
- xviii. Locate two of the 4 x 1/4” aluminum rings
- xix. Addressing the two tension lines closest to the ENDS of the spine, tie a ring to each of those two lines. Tie the ring as close to the fully tightened larkshead/slip knot on the spine as you can comfortably. You will have lots of extra line; Trim it off after setting the rings.
- xx. Locate the 2 x MKS fittings with inserts already glued in place
- xxi. Take one of the two other tension lines tied to the spine, and pass the line through the END (lock-able) hole in the fitting. Slide the fitting up the line until it is against the spar and larkshead and lock the adjustment screw for now to keep it out of the way.
- xxii. Take the standing end of the adjustment line and pass it through the nearest 1/4” aluminum ring already tied to the spine.

- xxiii. Pull the line through the ring so that the total length of line, from where it is tied to the spine to the bend through the ring, is ~17" (measure it. Close is close enough.)
- xxiv. Coming back a couple of inches from the bend through the ring, tie an Adjustable Grip Hitch knot with three turns. Pull the knot tight. The "loop" in the grip hitch should be about 2" long.
- xxv. Loosen the thumb screw on the MKS fitting and roughly center it on the now completed adjustment line that is anchored to the spine on each end.
- xxvi. Repeat for the second adjustment line.

10. Rigging

We still have spars to insert, but the now we really get into the rigging as well.

- a. Tie the adjustment lines to the wing tips
 - i. Sail tension lines
 - 1. Cut 4 pieces of the heavier rigging line from the roll. Make 4 adjustment lines like you did at the tops of the longeron and spine tunnels.
 - 2. I recommend using a loop knot tied with a figure 8 for the stopper knot here. Adjust the size of the loop so you can just fit your finger through it to pull the line when tightening the sail.
 - 3. At each of the 4 wing tips, larkshead an adjustment line to the LARGE, 1 1/2" grosgrain loop. Leave the larkshead somewhat loose, but tight enough to not come completely undone.
 - ii. Bow lines
 - 1. Cut two pieces of the lighter rigging line about a foot long.
 - 2. Working with ONE side of the sail (left or right, doesn't matter) tie the end of this short line to the SMALL (1/2") grosgrain loop on both of the wing tips on that side
 - 3. Locate the two remaining 1/4" aluminum rings
 - 4. Tie a ring securely to the standing end of each of the two lines you just tied on (above)
 - 5. For the lower spreader bow line, cut a piece of lighter rigging line from the roll ~ 7' long (approximate.)
 - 6. Tie a standing end of that line to the SMALL (1/4") grosgrain loop on the lower wing tip opposite the one that already has the string-and-ring attached to it.
 - 7. Repeat this for the upper spreader bow line, but you will need a piece of line from the roll that is ~10' long (approximately.)
- b. Insert masts, spreaders, and adjust bow and tension lines

Here's where things get a little interesting.

 - i. Locate the two masts (that have the T's on them)

- ii. Put the arrow nock over the grosgrain bridge between a pair of keels. Make sure you have the mast rotated so that the cross hole on the T is towards the LEADING EDGE of the kite. Put a piece of masking tape over the bridge and nock to hold it in place.
- iii. Pass the other end of the spar through the pass-through hole in the back/top sail, and insert the MKS fitting into the end of the mast. Secure with a piece of masking tape to hold it in place.
- iv. Repeat for the other mast.
- v. Locate the two lower spreaders
- vi. Starting with the one that has the ferrule glued in the end, find a lower sail corner, and, starting outside the sail, pass the ferruled end of the spreader THROUGH the 1 1/2" grosgrain loop that has the sail tension line larksheaded to it. Slide the spreader through, passing through the patch/hole in the top sail, and insert the ferrule into the cross hole on the center T on the mast.
- vii. Take the other lower spreader, and, going to the other lower sail corner and working from outside-in, pass the open end of the spreader through the larger grosgrain loop, push it in through the hole in the back sail, and seat it on the ferrule of the other half of the spreader with the T ending up in the middle.
- viii. Pull the line with with ring up and through the arrow nock on the end of the spreader
- ix. Pull the LONG line up and through/over the arrow nock on the other end of the spreader
- x. Pass the standing end of the long line through the LOWER (non-adjustment) hole on the MKS fitting on the mast at the end you are working with.
- xi. Continue pulling the long line and pass the standing end through the 1/4" ring that is coming up and over the other end of the spreader.
- xii. Pull on the standing end back towards the spine and the sail will begin to tighten and take shape.
- xiii. Keeping reasonable tension on the sail, tie an Adjustable Grip Hitch Knot on the long line, leaving a loop a few inches long between the 1/4" ring and the knot
- xiv. After setting the knot, adjust (slide) it as required to put a bit of tension on the sail, WITHOUT putting a big bow in the spreader (just enough to keep some sail tension.) Now we adjust.
- xv. Slide the center T on the mast as necessary so that the spreaders are passing through the holes in the sail, loosely against the longerons.
- xvi. Looking at the face of the kite, use a ruler or tape measure to measure the distance along the spine between where it passes through the top skin and the arrow nock at the keel bridge. This distance should be about 25 1/4".

- xvii. Assuming that you need to adjust at this point, go around to the back (spine) side of the kite and slide the adjustable grip hitch on the triangulated spine tension line to loosen or tighten as needed to adjust the distance measured above.
 - xviii. Make sure the thumb screw on the end of the MKS fitting is loose at this point. You may need to “nudge” the mast to slide it on the adjustment line as required to keep it centered in its pass-through hole.
 - xix. When you are comfortable with where you have it set, repeat the process for the upper spreader.
 - xx. TA-DA! Looking like a kite now!
- c. Tighten up the sail and fine tune
- i. In a process similar to what you did at the tops of the longerons, now it’s time to tighten up the adjustment lines at the end of each spreader. Start by tightening the lower spreader completely, then the upper.
 - ii. You need to “guesstimate” the length of the first adjustment line.
 - iii. With the bow line in place, pull the knot up and over the nock on one side.
 - iv. Repeat on the other. When doing the second one, it should be a “hard” pull to crank some tension into the sail.
 - v. After doing this, look at the front of the kite. The mast should not be “pushed” or “bent” to one side or the other; if it is, your lines are not set evenly. Loosen whichever side the bow is pushing “away” from and tighten the other, re-set, and re-inspect. Repeat as needed until the sail is good and tight and the mast is centered.
 - vi. Repeat this process for the upper spreader.
 - vii. Now, go to the back of the kite and adjust the grip hitch knots on the spine tension lines by sliding them towards the MKS fitting just a wee bit more to put one last good measure of tension on the sail.
 - viii. If the spars just start to deform/bend under compression at any time during this, you’re doing it right.
- d. Bridling
- i. Cut two pieces of bridle line, fairly short.
 - ii. Tie a figure-8 loop knot with each one, trying to make the length of each loop as equal as possible. Make the length of the loop about 3”.
 - iii. Larkshead the loops to the lower spreader, passing them through the reinforced holes in the sail (one on each wing.)
 - iv. Cut two pieces of bridle line about 12’ long. Not a critical dimension, but I like long(ish) bridles. A good measuring stick is to pull the line the length of a work table and double it back (so the lines are twice the length of the work table.)
 - v. Now, tie each end of one of the lines to the tops of the two outer longerons. I like to use a larkshead/slip knot (the same knot you

used to tie the tension lines to the spine.) Set the knot so the line is “grabbing” around the grosgrain loop at the top of the spine tunnel, below larkshead for the spine tunnel tension line.

- vi. Tie a figure-8 loop knot on each end of the other long bridle line. Here, we want to differentiate between what will be “right” and “left” for the future. A good way to do this is to make the sizes of the loops unequal. Since “left” is a shorter word than “right”, you could use the “shorter” loop for the “left.” (or choose your own method.)
- vii. Larkshead the loops on each end of the long bridle line to the loops already larksheaded to the lower spreader.
- viii. Now, locate the center point of the upper and lower bridles. Larkshead a ring to the center point of each one.
- ix. Now cut a piece of bridle line about 6’ long (so a single length of a work table, let’s say.)
 - x. Securely tie the two standing ends of this line to the two rings in the bridle. This is your angle-of-attack and tow line.
 - xi. To “shop set” the tow point, stand the assembled kite up on its longerons. Due to the length of the spine, the kite will lean forward, resting the lower mast and keel points on the floor.
 - xii. Now, pull the bridles out, holding the tow line, and find the point where the top of the tow line and the top bridle legs are parallel with the floor. That’s the initial tow point set – larkshead a tow ring.

11. Adjustment and Flight

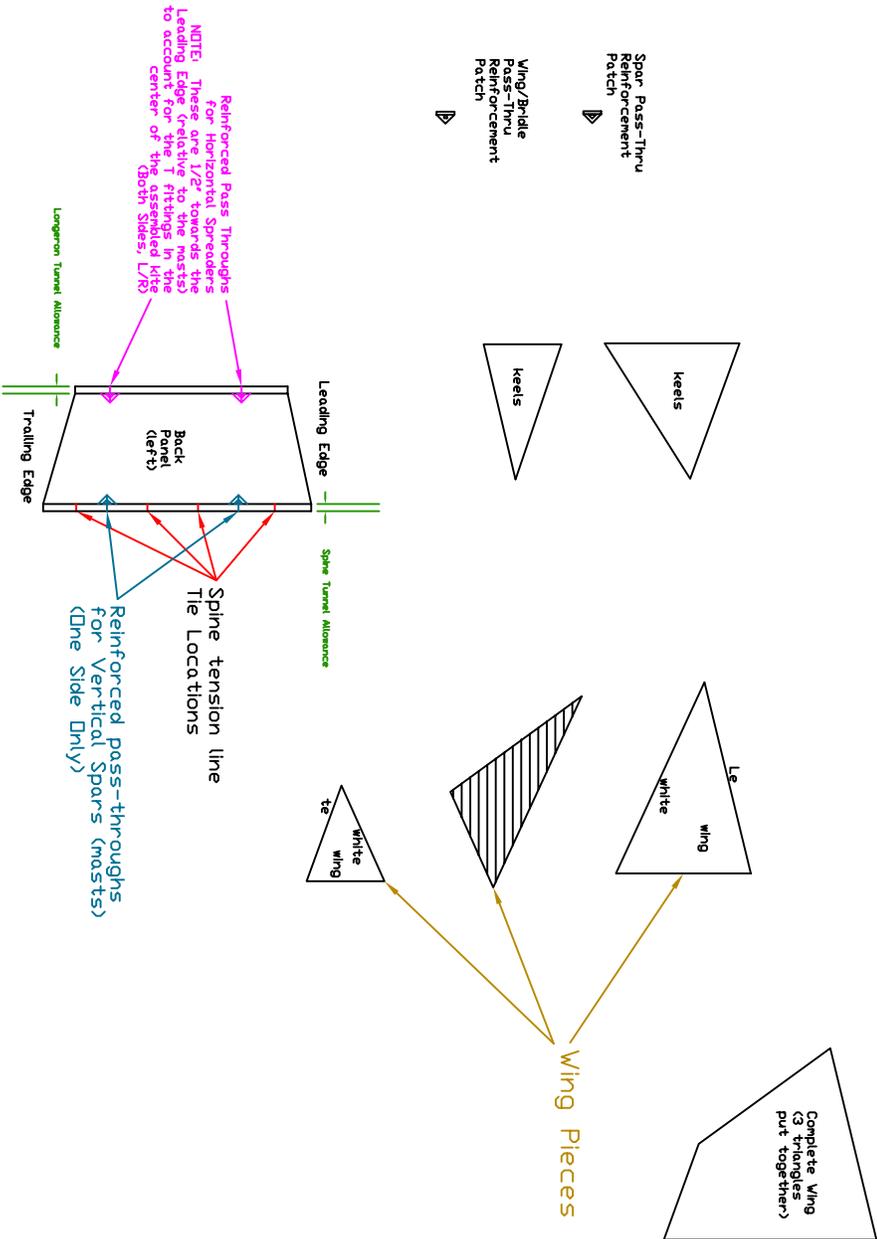
- a. When properly adjusted, the Gizmo doesn’t have a lot of pull, so 100# flying line is plenty. You *can* adjust the kite to provide more pull depending on what you are using it for (it has been suggested that it is a good candidate to hoist KAP rigs.)
- b. When field assembling the kite, insert the masts, insert the spreaders, set the bow lines, and then set the tension lines.
- c. Adjust the bow of the kite by sliding the adjustable grip hitch knot on the bow lines.
- d. When you have the bow set where you want it, inspect the location of the center T for that spreader on the mast. You will likely need to slide the T so that the spreaders rest comfortably/lightly against the longerons where they pass through the sail. NOTE: You will also find that moving the T around can “fine tune” or at least affect the sail tension; there is a sweet spot for the location of the T on the mast for however you have the bow set that yields the most sail tension.
- e. If the sail is a bit too loose in the field (humidity expansion of the sail, etc.) the quickest easiest fix is to adjust the grip hitch knots on the spine tension lines. If you run out of adjustment room on those grip hitches to fully tighten it, you’ll have to tighten the larksheaded tension lines at the wing tips.

- f. Always double check the location of the mast passing through the back of the sail by loosening the MKS fitting, sliding the adjustment line through one way or the other, and then locking it in the center again.
- g. The Gizmo is a very well behaved kite that flies in a pretty good range of winds; however, it does need to be adjusted properly.
- h. In light winds, set the angle of attack fairly aggressive and the bow lines fairly flat.
- i. Add bow depth and decrease the angle of attack if the wind picks up.
- j. As a rule of thumb, once you are sure you have your bridle square and true after the first flights, if your Gizmo begins to lean to one side or the other in a stronger wind, you have the AOA set too high for those conditions. I have flown my Gizmos comfortably from the TOP LEGS ONLY in a 15 mph breeze. I do not recommend top-only bridling in nicer, more perfect wind (4 point is more secure flying and control) but it won't hurt it (just won't fly as well.)
- k. For dis-assembly, loosen the bow lines by sliding the grip hitches, then remove the tension lines from the ends of the spreaders. Remove the spreaders and masts. The MKS fittings on the spine tension lines stay with the kite when rolled up.

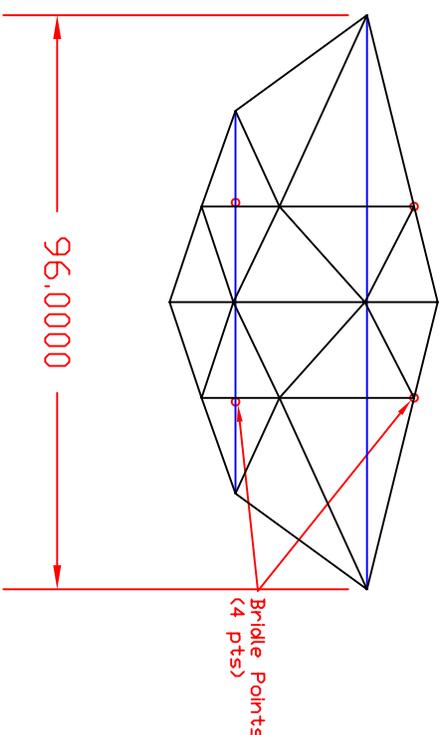
HAVE FUN AND FLY IT OFTEN!!!

No Seam Allowances are Shown on the Templates

NOTE:



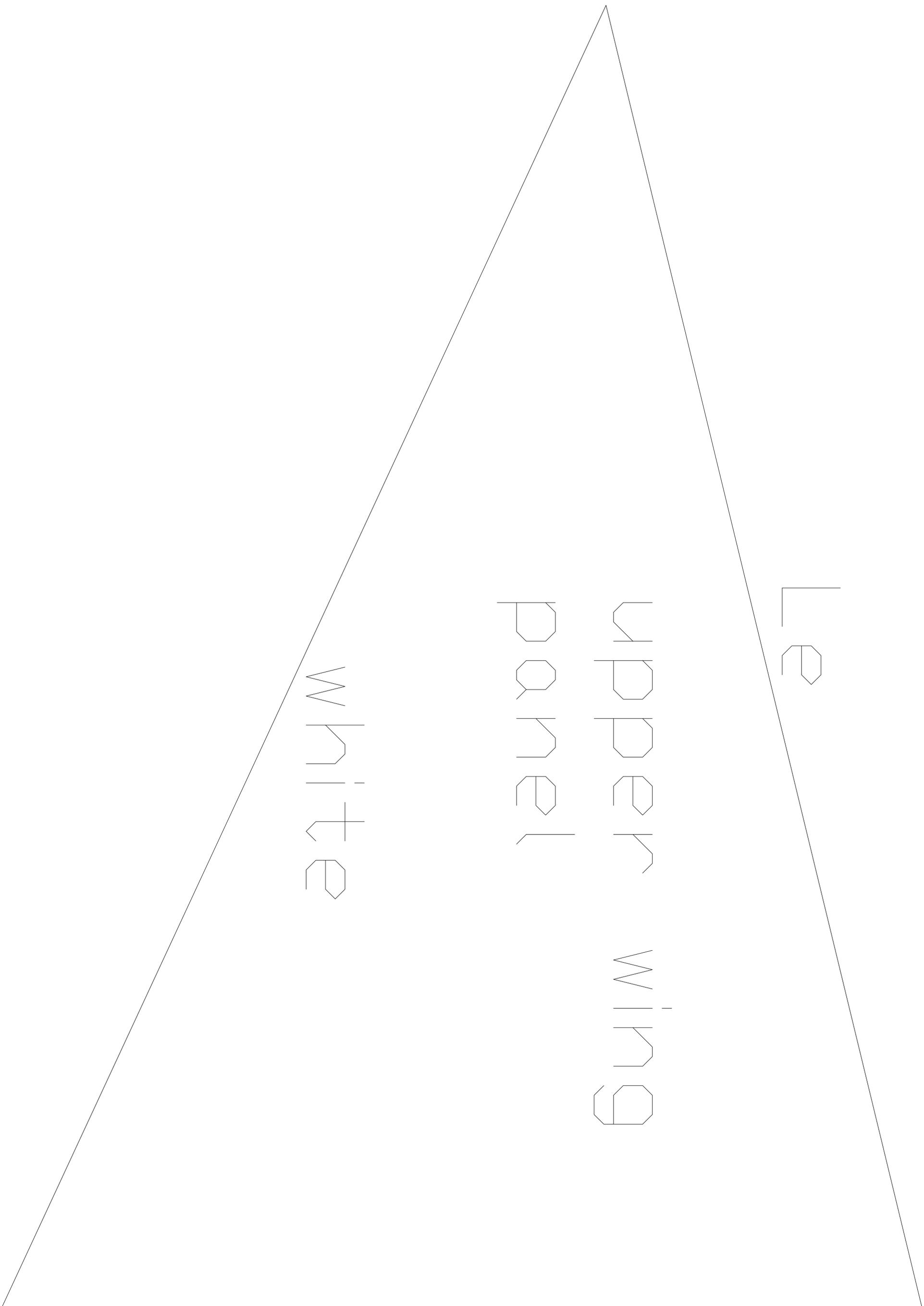
LINE DRAWING



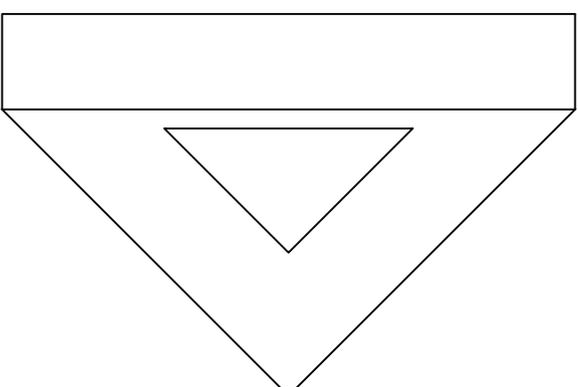
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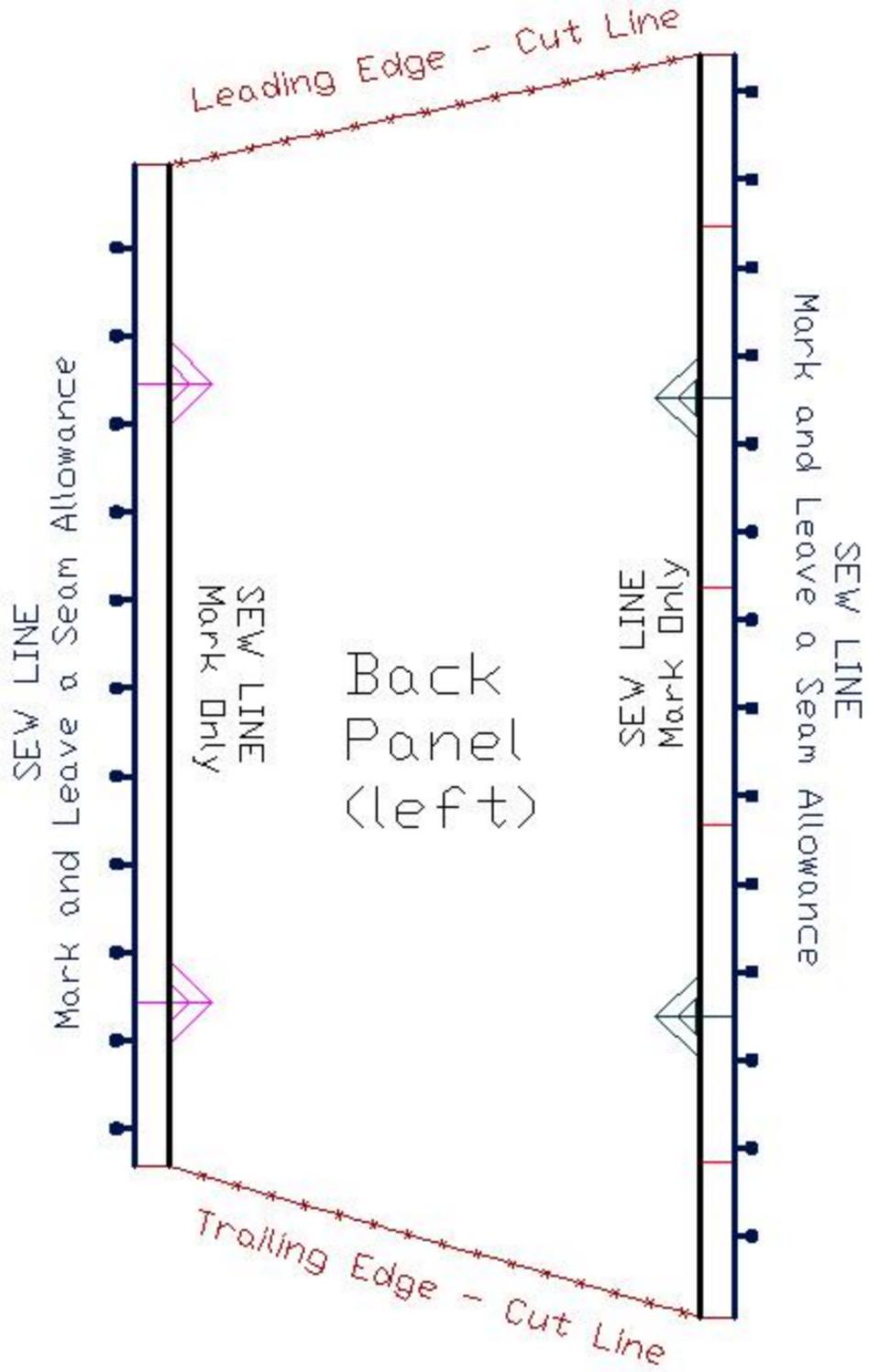
UPPER WING
panel

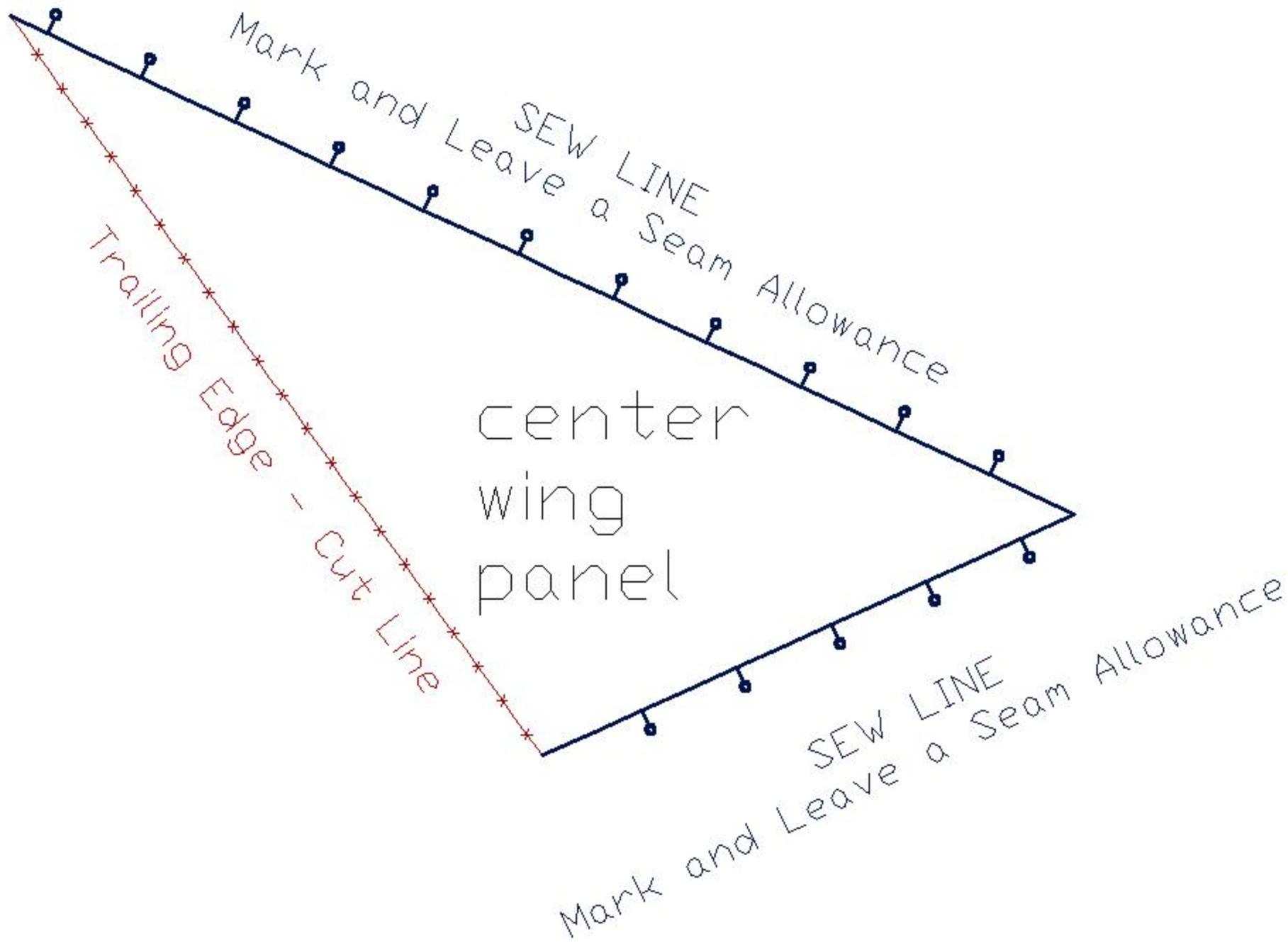
White



Spar Pass-Thru
Reinforcement
Patch







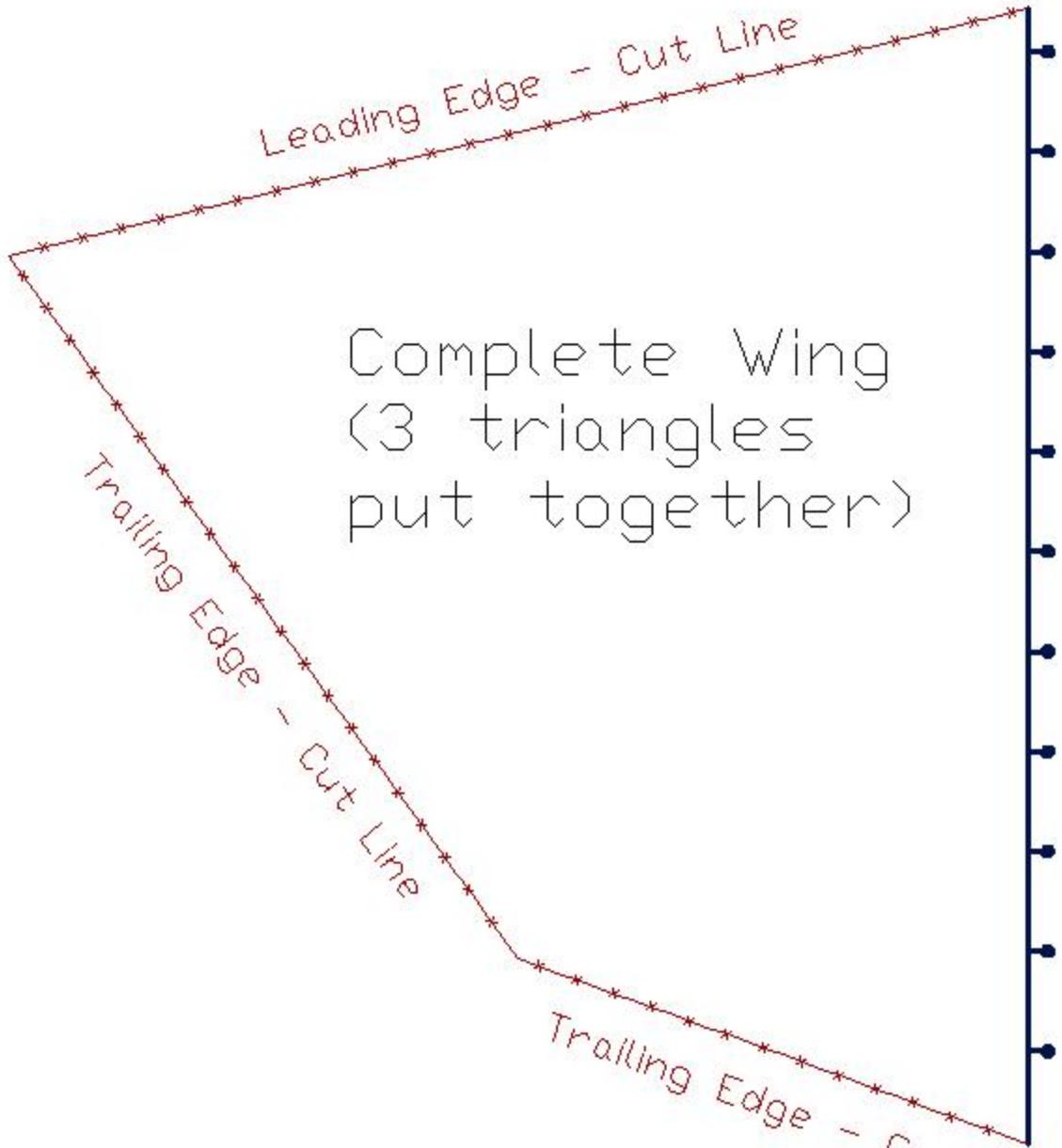
Complete Wing
(3 triangles
put together)

Leading Edge - Cut Line

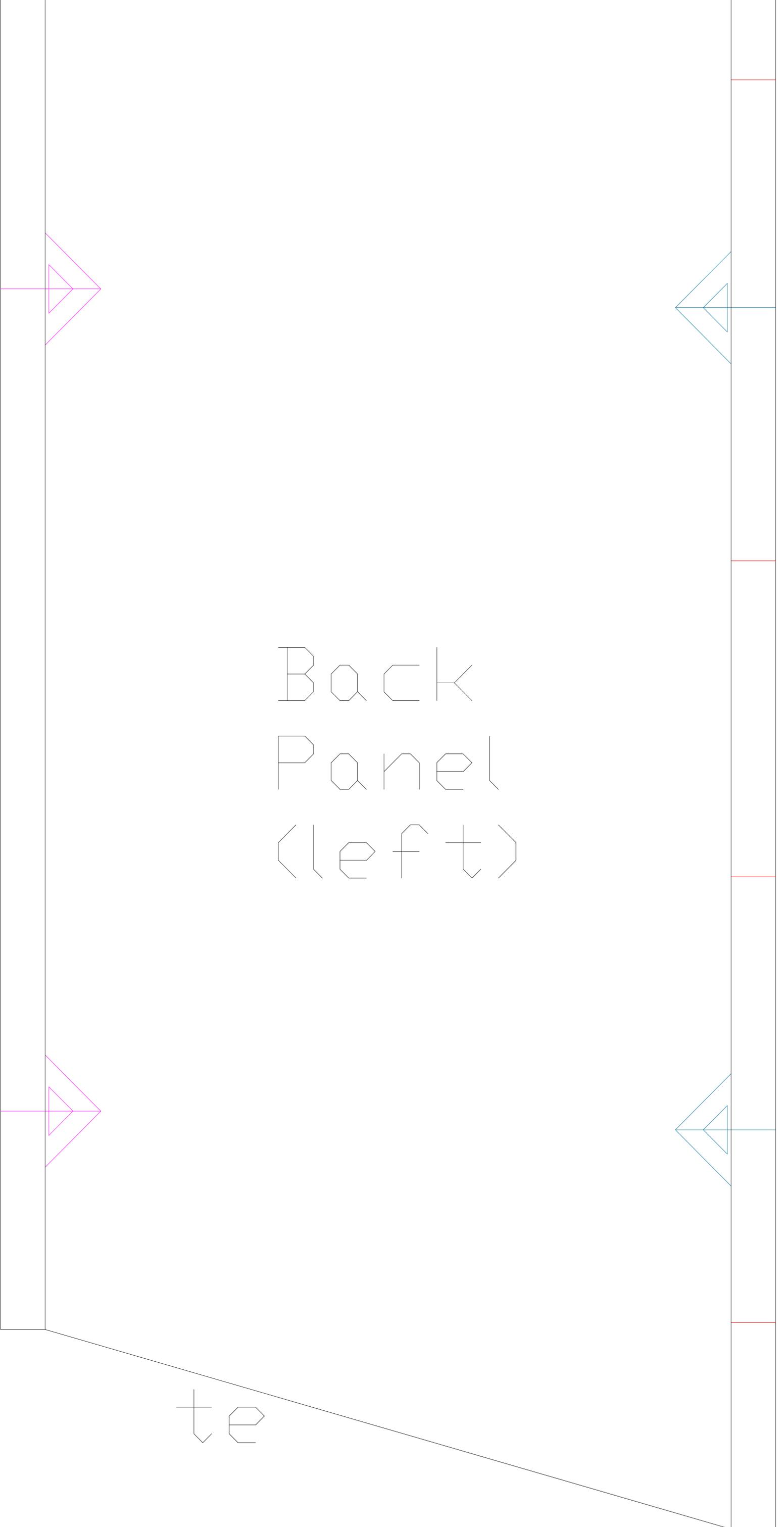
Trailing Edge - Cut Line

Trailing Edge - Cut Line

SEW LINE
Mark and Leave a Seam Allowance

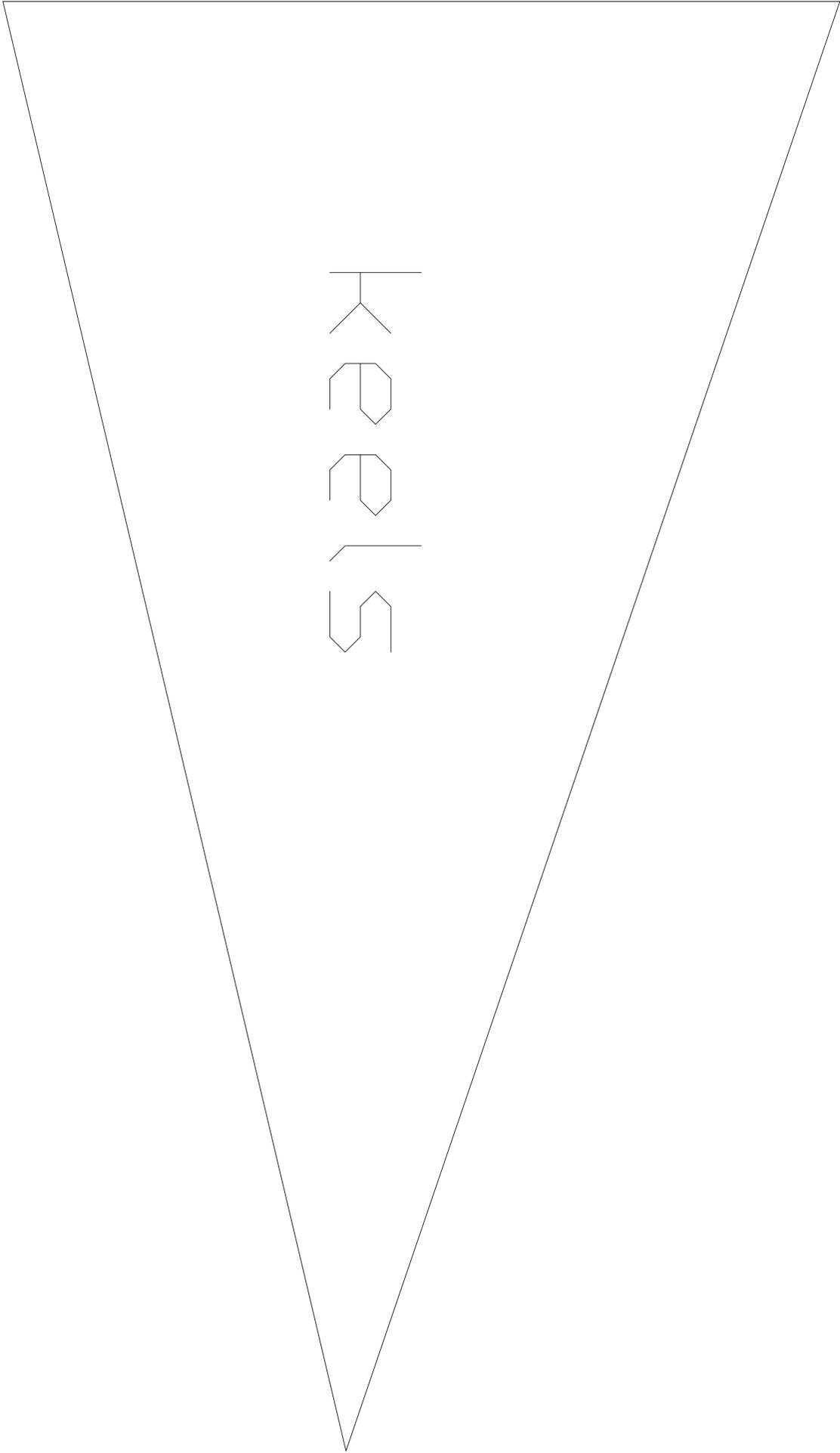


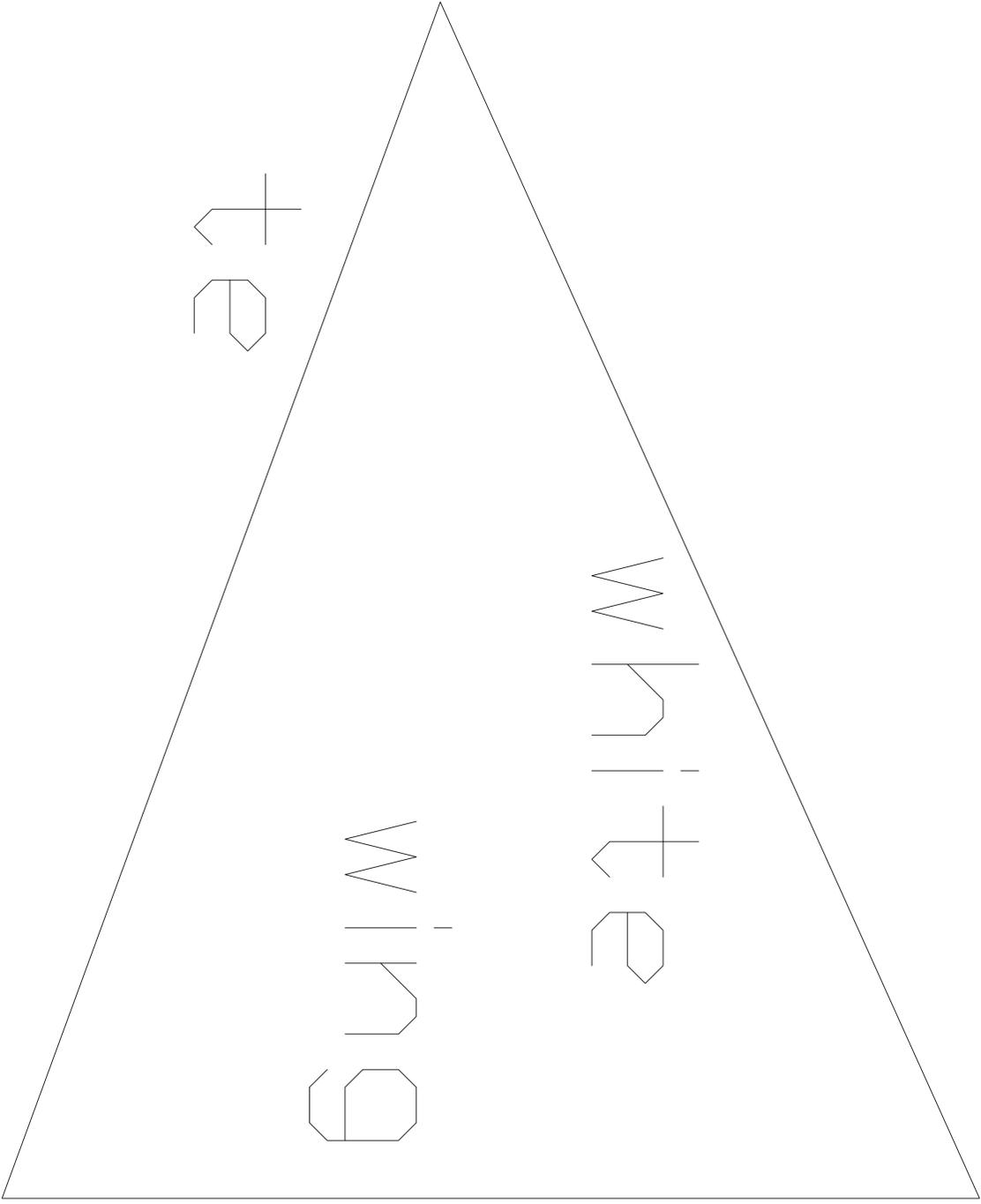
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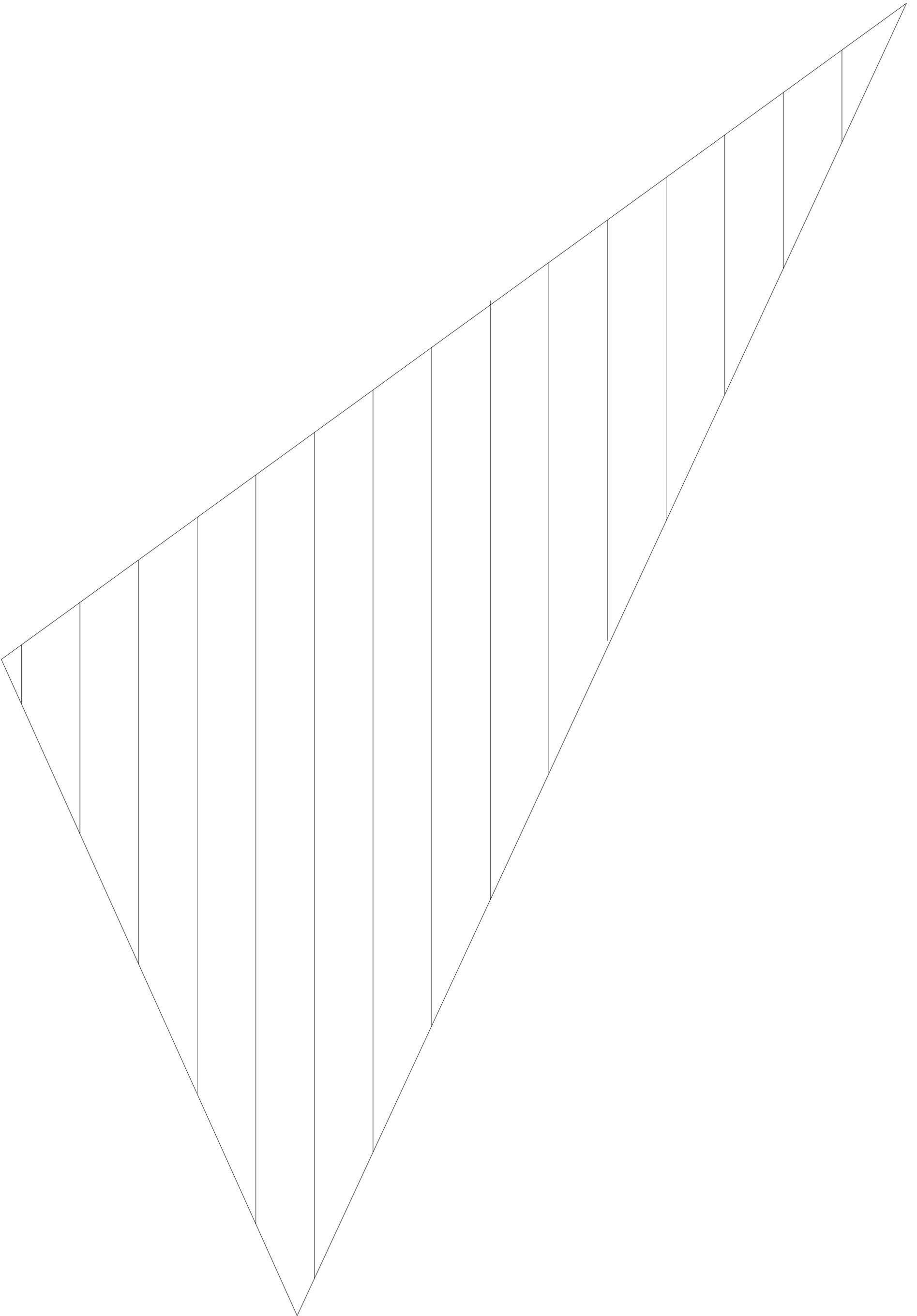


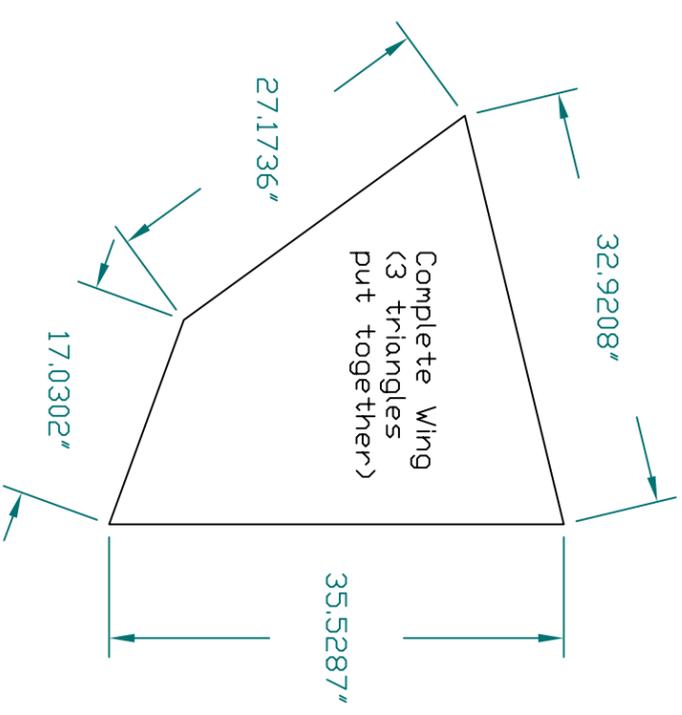
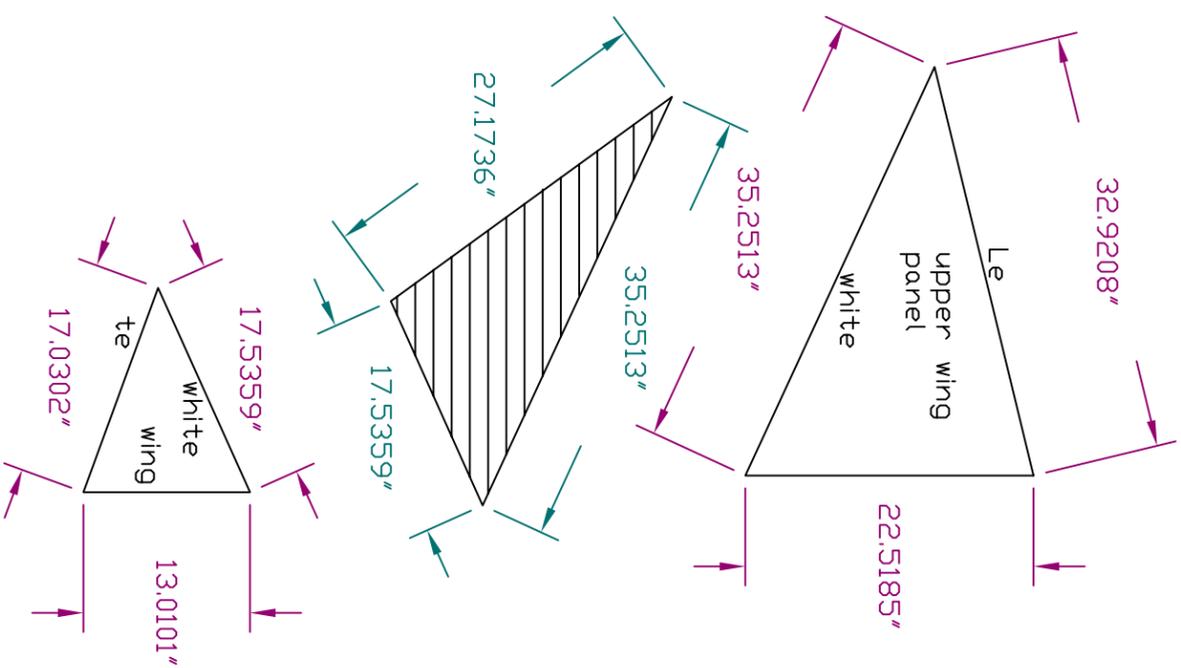
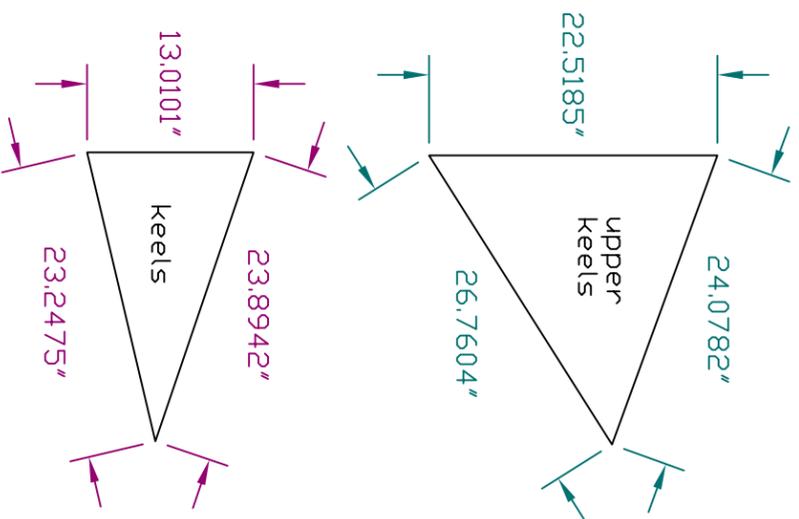
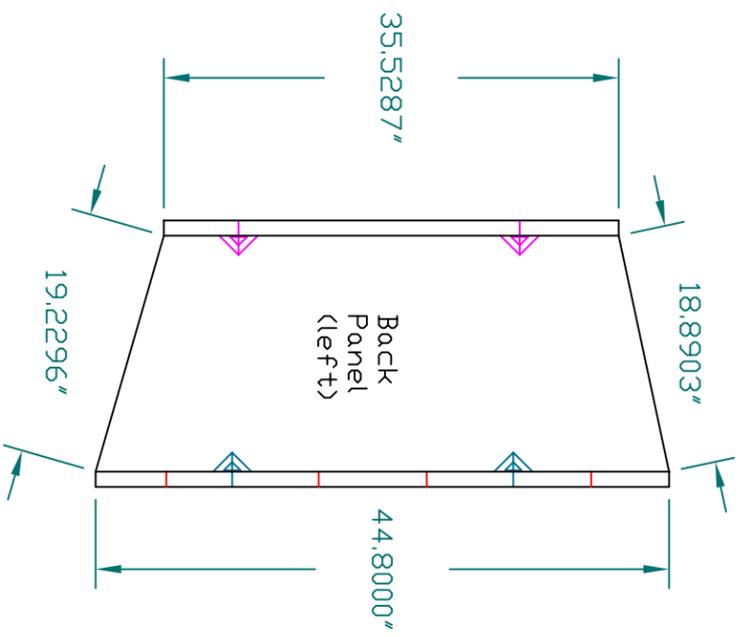
Back
Panel
(left)

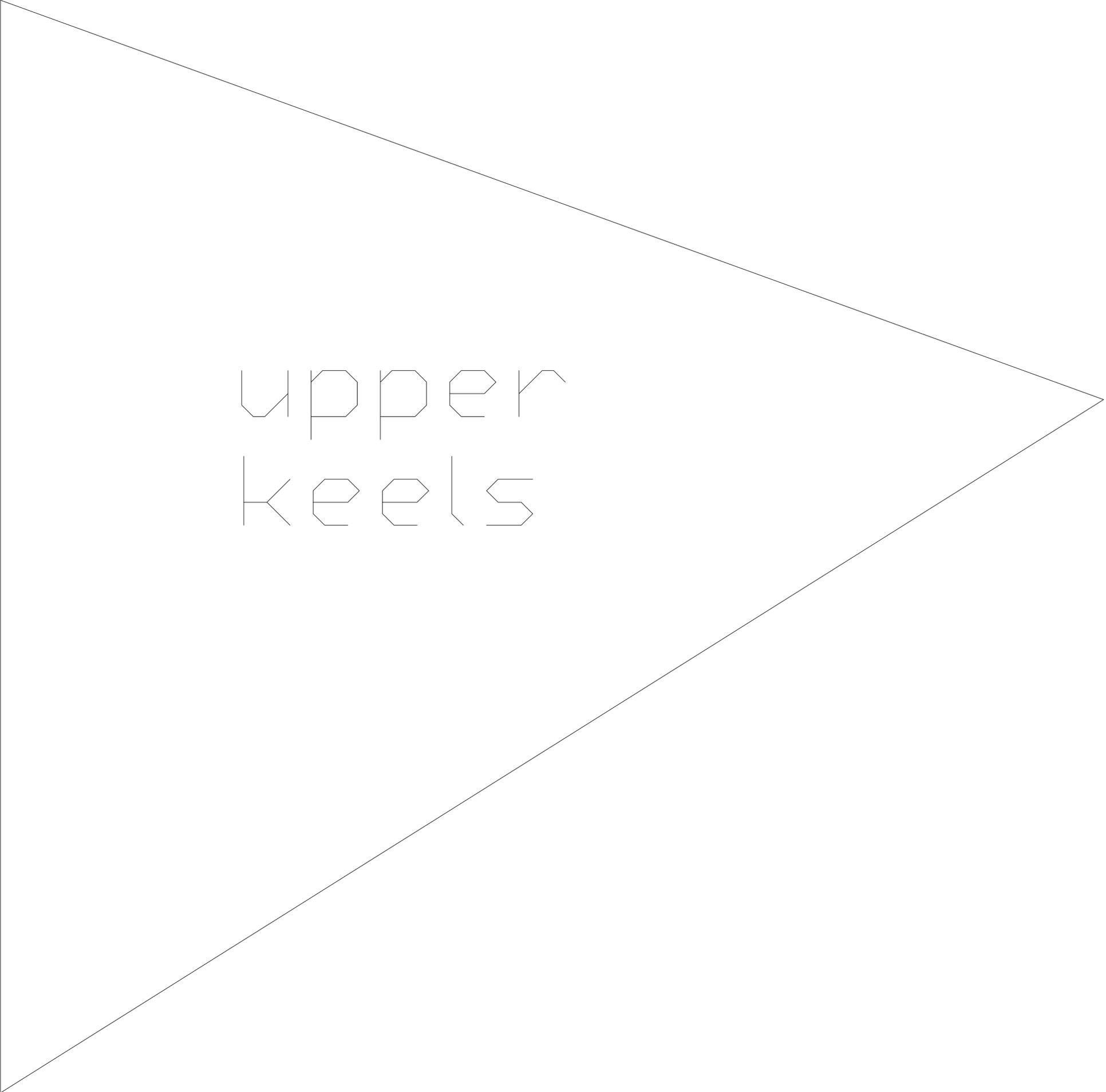
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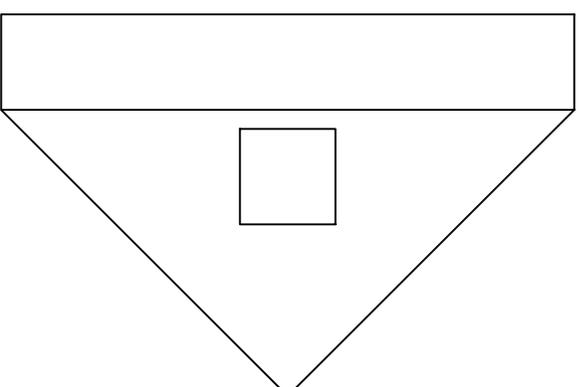






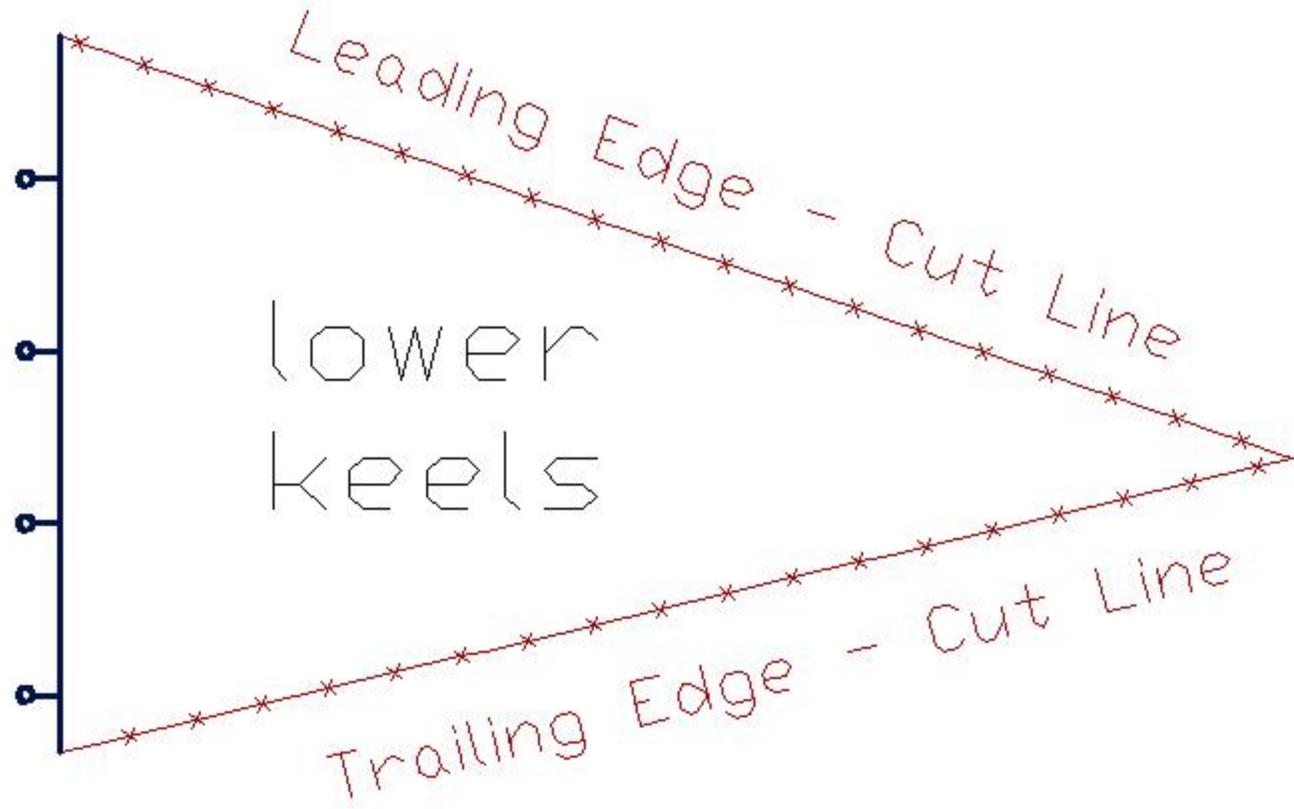
UPPER
KEELS

Wing/Bridle
Pass-Through
Reinforcement
Patch



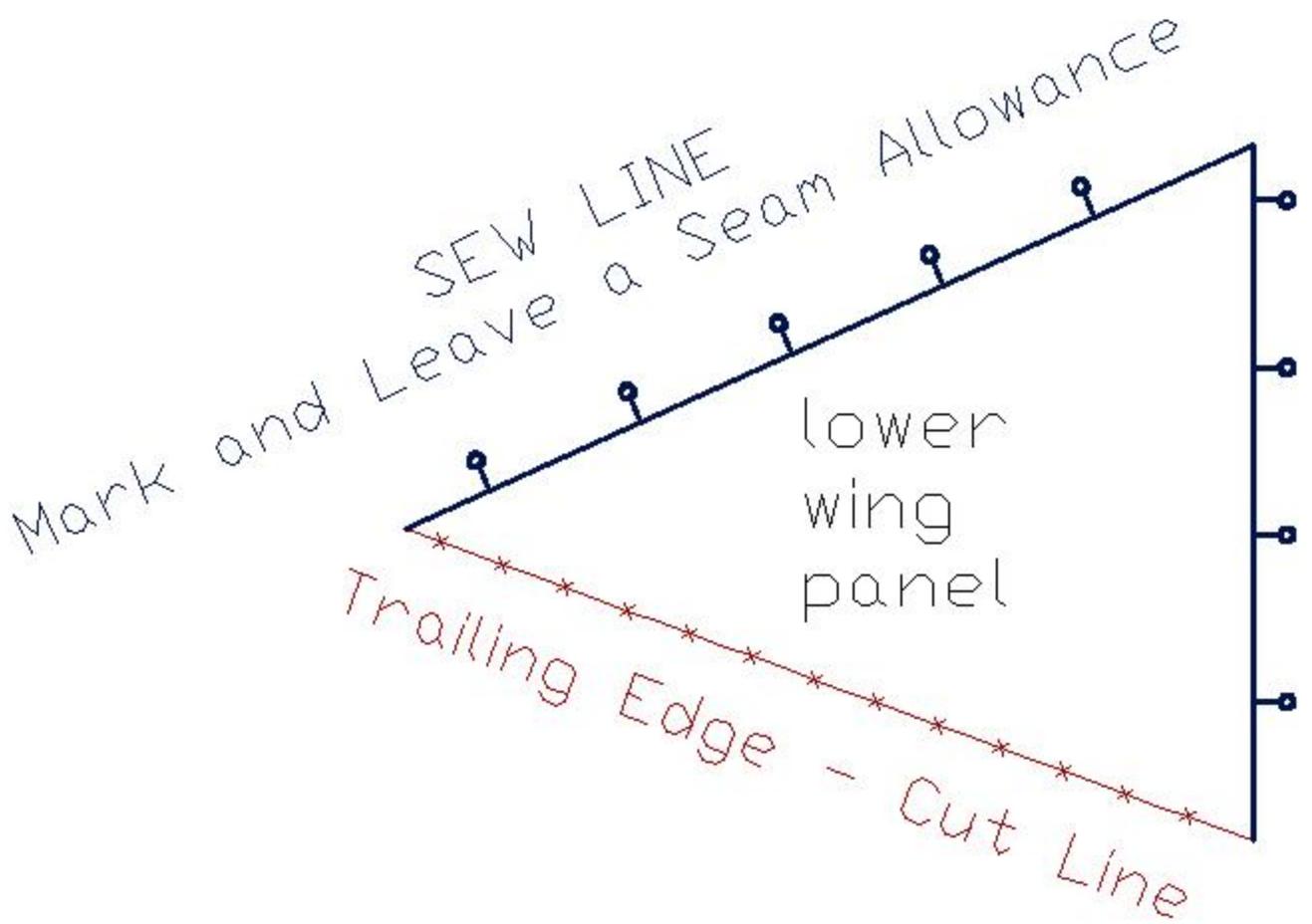
SEW LINE

Mark and Leave a Seam Allowance



SEW LINE

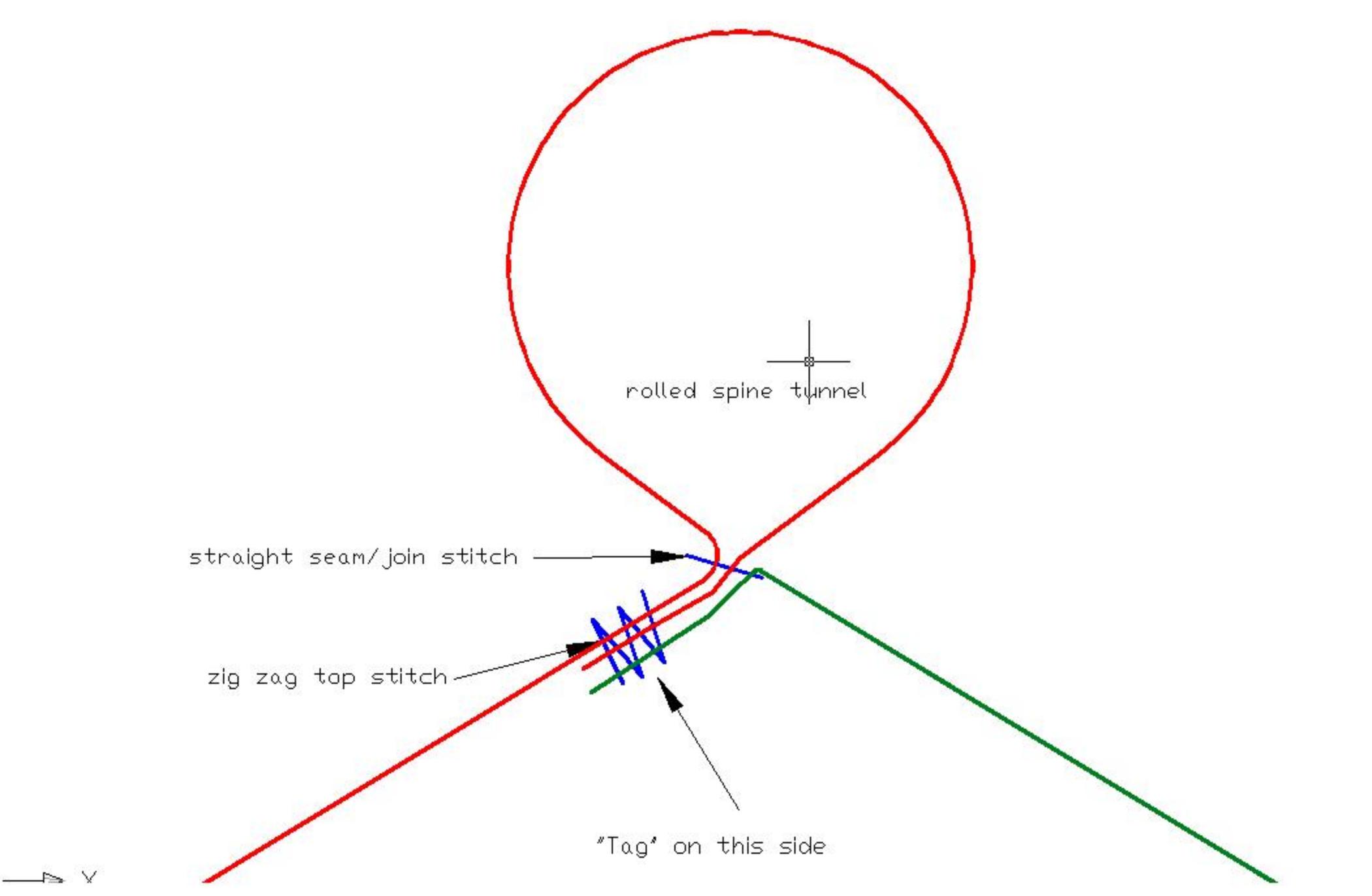
Mark and Leave a Seam Allowance



SEW LINE
Mark and Leave a Seam Allowance

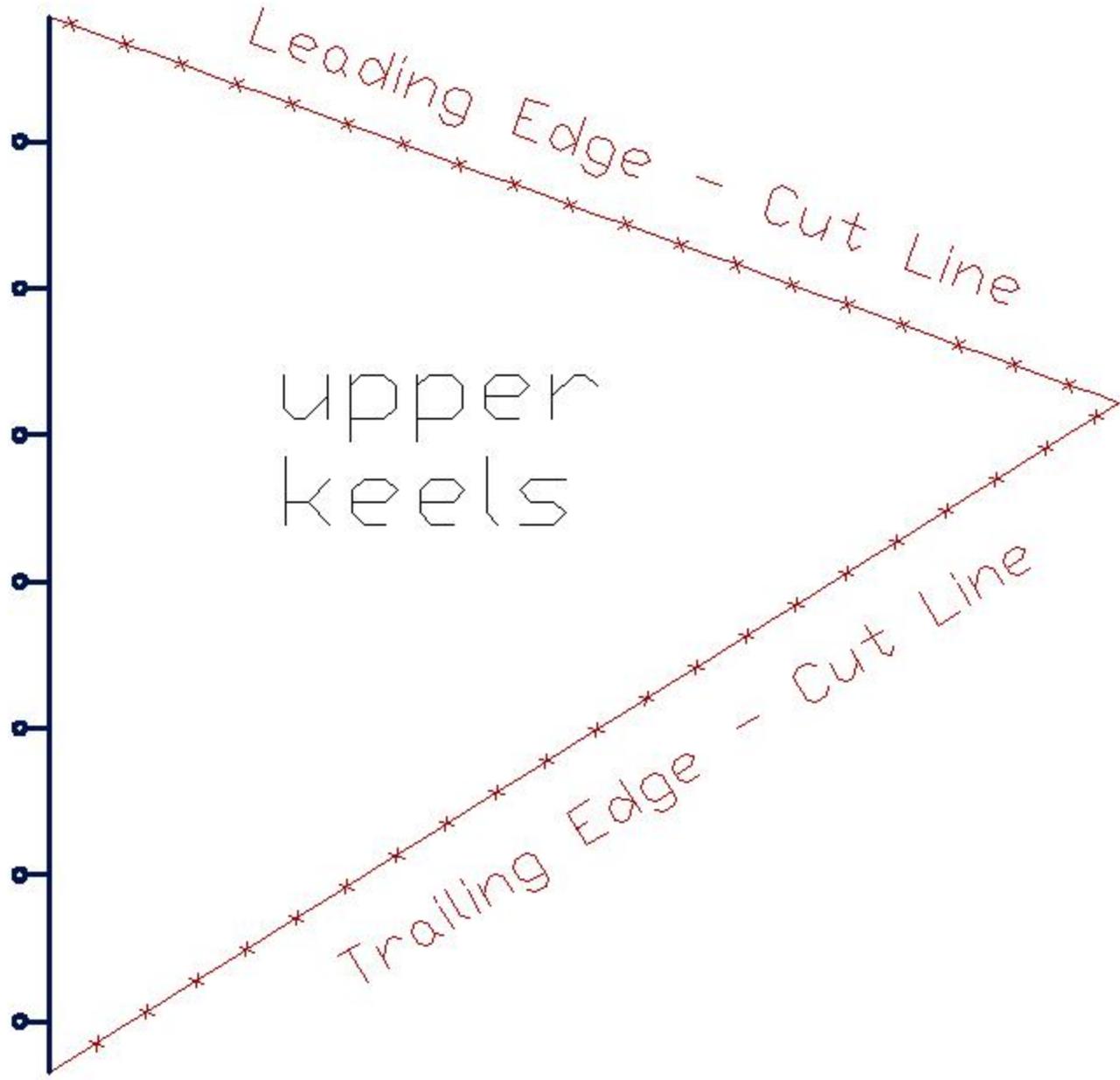
lower wing panel

Trailing Edge - Cut Line

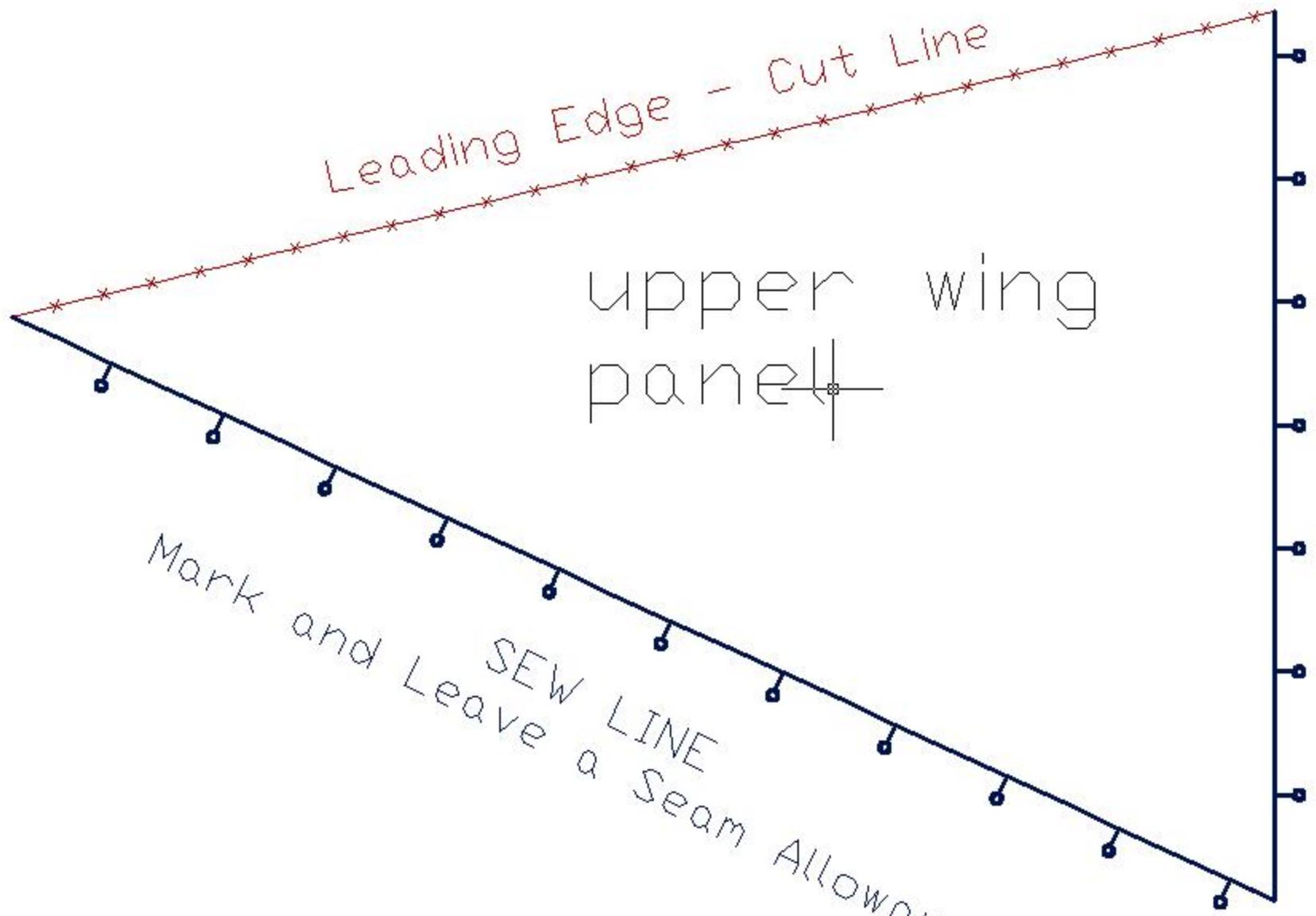


SEW LINE

Mark and Leave a Seam Allowance



SEW LINE
Mark and Leave a Seam Allowance



Leading Edge - Cut Line

upper wing panel

SEW LINE
Mark and Leave a Seam Allowance