A Bateman Fighter
Beginner version
Fort Worden, 2005

These are directions for making a beginner Bateman fighter, presented at Fort Worden's Kite making conference 2005. Though written detailed, these directions are written as if you were present for small miscellaneous bits of information in the class, and that you received a kit contained some prettied bridle and tension pieces. Instructions for the construction of these pieces were presented in the class, and can be made available at a later time (in pdf format).

Materials requested to bring, as printed in the brochure:

- Cutting surface
- A new break away knife (no edges broken off),
- Darning needle that is rounded or small crochet needle (wedged into a cork is great)
- Sandpaper for rounding graphite,
- Scissors
- Two fabric weights
- Minimum 12" ruler
- Super glue (both regular and thick)
- Sharp pencil
- Soldering iron or lighter
- Dremel rotary tool if possible
- Good eyesight and attention to detail.

Materials supplied in kit

- 1 sail
- 1 spine and 1 bow spar, cut to length
- 1 tension string (with bead)
- 1 V-line string
- 1 complete bridle (4 pieces, black 20 lb Dacron line)
- 2 battens
- 1 needle threader

Materials supplied as needed during construction

- ¼" 3M 9460 tape
- ½" 3M 9460 tape
- Scraps of fabric

Tips/Notes:

- When ever you apply tape the sail, do not put it under tension (lay it down and press so it is not applied stretched out)
- Handle the 9460 tape by the edges of the backing. While the tack isn't that high, it will come off the backing when stuck to your skin which can create little beads of adhesive that will underlie your seams and sticks.
- Tighten keeper knots well.
- Instructions given here don't include directions for both sides of the kite; you are assumed to know which directions need to be done for both sides of the kite ☺
- In an effort to save paper, the formatting of this document is a bit odd. 2 columns is interspersed with 1 column format. I tried to help this with lines separating the sections. If you have any questions, please feel free to ask me.

Instructions for construction

1. Obtain about 20" of ½ 9460 tape. Cut the tape into 2 10" pieces. Using a scrap of fabric the same color as the sail, apply the tape to the fabric with the grain of the fabric (not on the diagonal). Using a knife, cut the tape out by running the knife along the sides of the tape (still with the backing on it). These will be used as leading edge reinforcements for the kite.
2. Using weights and scotch tape, hold the kite down flat on the table. Apply the tape to the straight portion of the leading edge with about 2/3 of it on the kite (not critical, just try to keep the kite symmetrical).
3. With a metal ruler, cut off the excess tape that is now sticking your kite to your work surface. See figure 1.

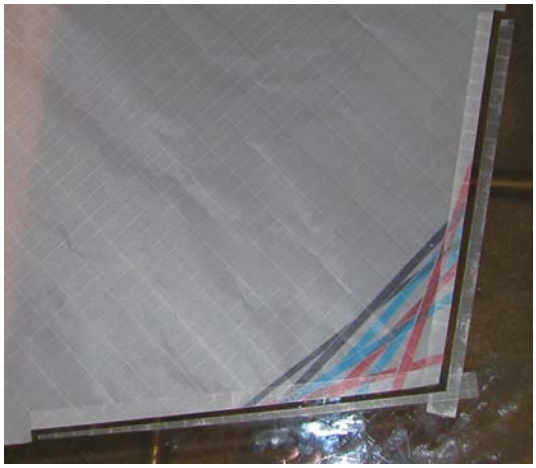

Figure 1: Leading edge reinforcement has been applied and excess has been cut off. Decoration has been applied first; we will apply decoration **after** leading edge reinforcement.

4. Decorate your kite. Using the 9460 tape (your choice for size) and scraps of fabric that now abound around the room, create colored 'tape' (like you did for the leading edge reinforcement) and apply as you like. I prefer to have the nose to be distinguished, as this helps in seeing where the nose is when the kite is a distance away. Your choice.
5. Obtain about 20" of the ¼" 9460 tape. On the back side of kite, apply a small piece to the end tabs of the kite. See Figure 2.

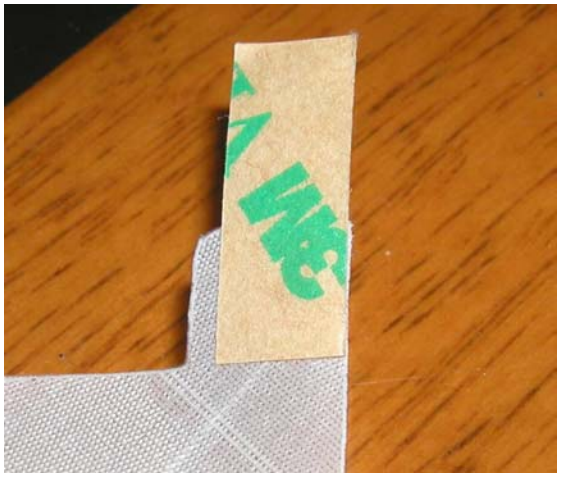

Figure 2: Small piece of ¼" tape applied to wing tab.

6. Trim the excess tape off the wing tab.
7. Apply small piece of ¼" tape right next to the first piece, as per Figure 3

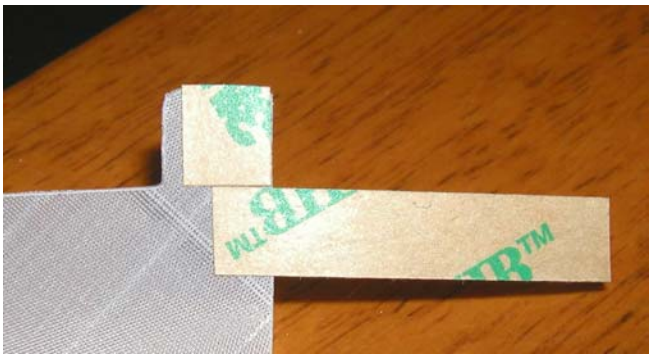

Figure 3: Small piece of tape next to first piece (first piece has been trimmed off). The absence of tape will create the pocket for the bow spar.

8. Trim the excess tape off, as per Figure 4.

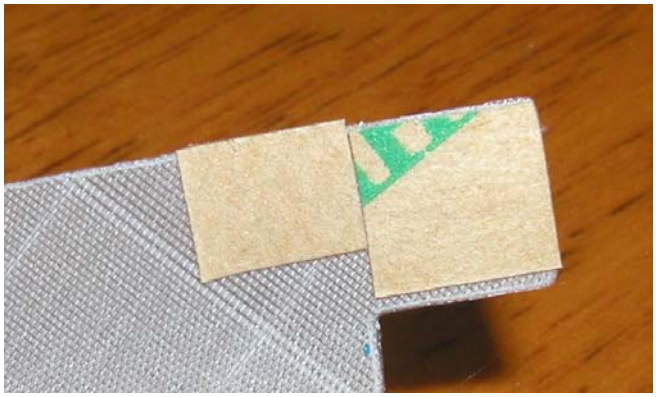

Figure 4: Trimmed tape on wing tip.

9. Apply small piece of tape (about ¾" or 2cm) to the leading edge, starting at the last piece of tape you put down. When you get the end of the roll over (the extra fabric at the leading edge of the sail), trim to fit the roll over. Press down well to adhere. See figure 5 and 6

Figure 5: Small pieces of tape on the leading edge. Keep them as close as possible to the edge of the fabric. Close!!

Figure 6: Roll over section with tape applied.

10. Obtain about 20” of ¼” 9460 tape. Soften up the ends of the flat carbon, but keep the general shape square. Apply the flat carbon spine to the tape, trying to keep it centered as best you can. Don’t press down to hard. See Figure 7

Figure 7: Flat carbon spine applied to center of ¼” tape

11. Using something like the edge of your scissors, burnish the tape down the center of the spine. The flat carbon material isn’t perfectly flat; it has a small grove down the center. This will help eliminate any bubbles that might form between the spine and the sail. See Figure 8.

Figure 8: Burnishing the center of the spine to the tape.

12. Now burnish the entire tape the down side of the spine. Be careful not the apply the tape to the sides of the spine.
13. Cut off the excess tape on the side of the spine with your knife. It is best to cut off the ends first, then run along the side. Don’t slide the graphite along your hand! Graphite splinters are very painful. Don’t cut the graphite with the knife! Think about how to angle the knife so as to cut the tape **right** at the edge of the graphite. See Figure 9.

Figure 9: Cutting the excess tape off the spine.

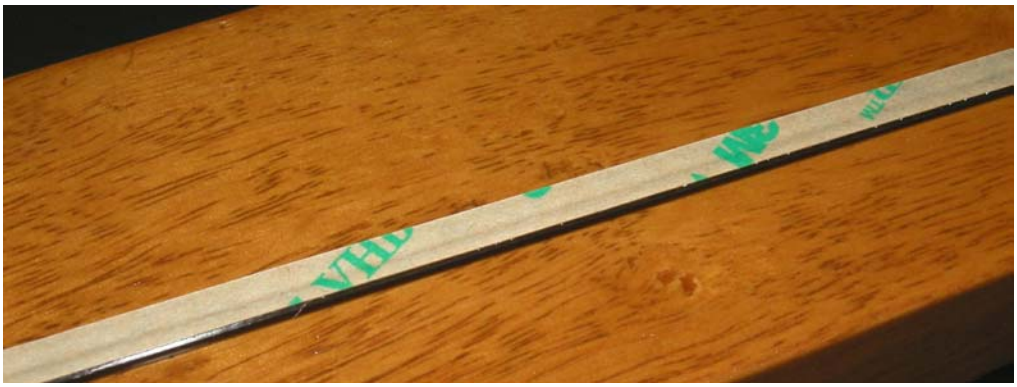

Figure 10: The finished spine with adhesive, ready for applying to sail.

14. Tape the sail down to the work surface; 2 small pieces offset at the nose, one small piece at the tail. Then 2 fabric weights to draw out the sail in the middle. The objective here is to have a sail that is **flat** for the application of the spine. It shouldn't be stretched, just firmly flat. See figure 11 and 12.

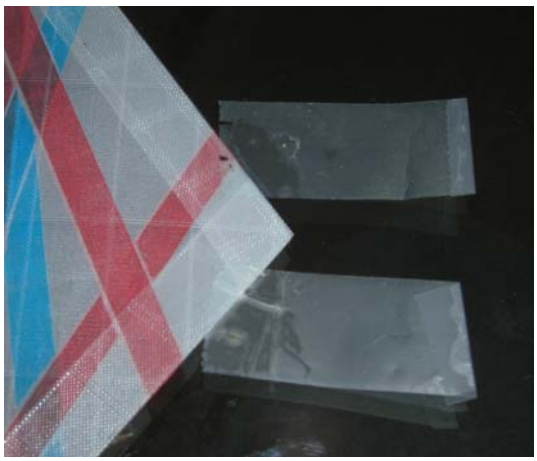

Figure 11: Two small pieces of tape hold the nose down, and allow for the application of the spine between them.

Figure 12: Sail is drawn out firmly flat using two pieces of tape at the nose, one at the tail, and two fabric weights.

15. Test place (with the backing still on!!) the spine on the kite. Think how you will want the spine to fit; if it is a little to long (possible), have the spine extend over the tail. The corners of the nose end of the spine should **meet** the edges of the fabric at the nose; not go over or under. The tail end can be (if desired) trimmed after the kite is finished. Mark the location of the spine at the nose and the tail (side to side location). See Figure 13.

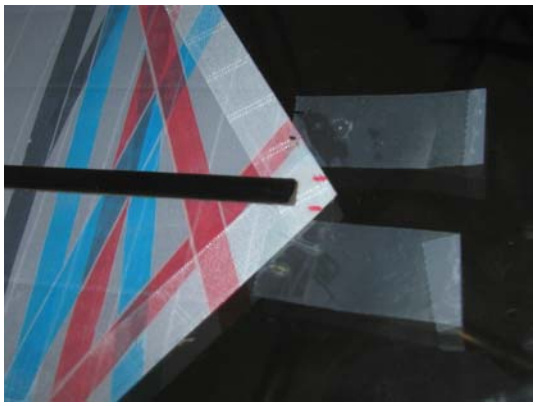

Figure 13: Two small marks indicate where the spine will go. These should also be marked at the tail end.

16. Test run applying the spine to the kite. Hold the nose end of the spine with one finger at the nose, and practice laying it down on the kite, matching the tail end of the spine with the marks you made. Do this until you feel comfortable doing this. In the last moments of the spine leaving your fingers, your should feel the stick slowly being released from the friction of your finger (my left index finger in Figure 14).

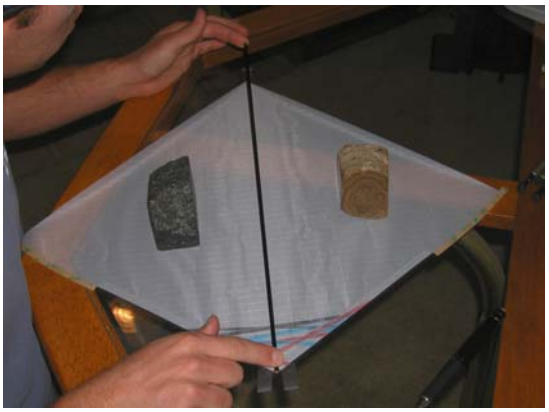

Figure 14: Applying the spine to the sail.

17. Remove tape from spine and apply to kite. Go slowly as this is the most important step in getting a balanced kite. Turn the kite over slowly to reveal the front of the kite.
18. Press with your fingers to burnish the spine to the sail. See Figure 15.

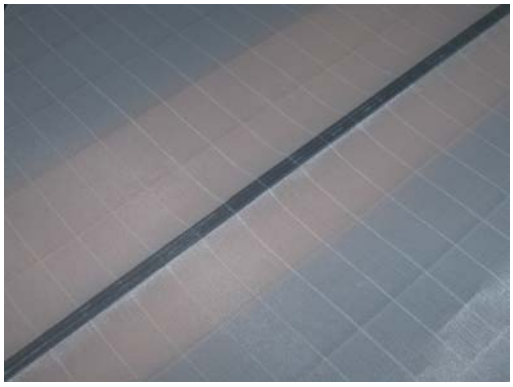

Figure 15: Fully adhered spine to sail.

19. Back to the wing tips. Trim off any excess fabric that is below the wing tip tab. See Figure 16.

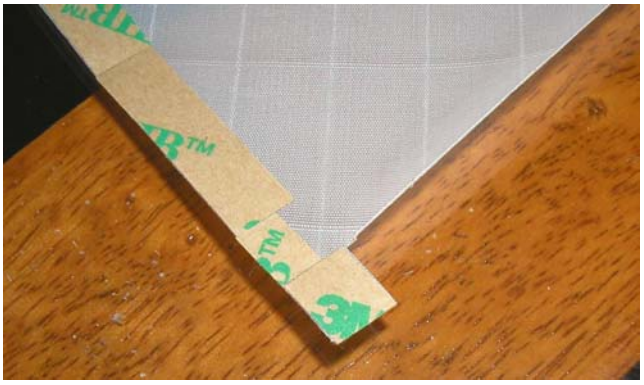

Figure 16: The finished wing tip, with any excess fabric on the tab cut off.

20. Cut a single cut along side of the offset piece of ¼" tape. The cut should be right next to the first 2cm length tape, so it should extend into the kite by ¼". The cut should go right in-between the two pieces of tape. See Figure 17.

Figure 17: ¼" Cut being made at the wing tip.

21. Fold and crease the piece, keeping the fold parallel to the leading edge at the end. See Figure 18.

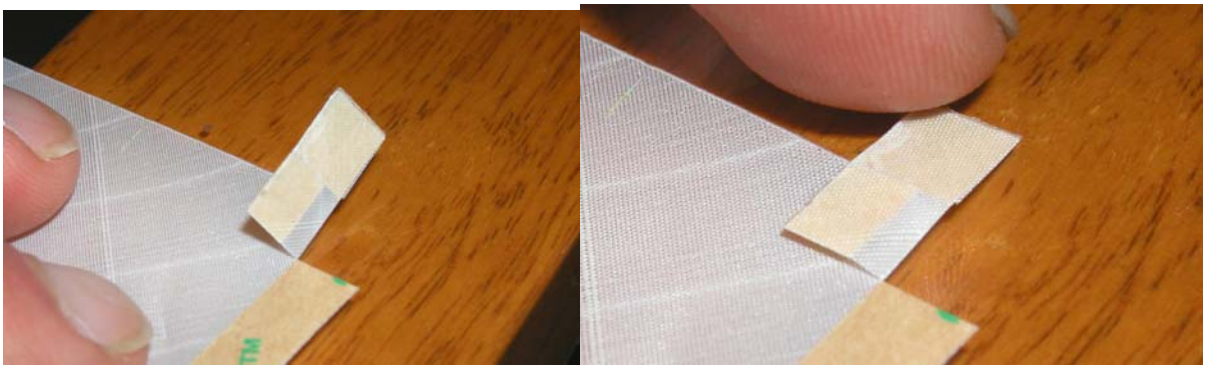

Figure 18: The fold in the tip.

22. Take off the backing on the offset piece of tape and fold over again. See Figure 19.

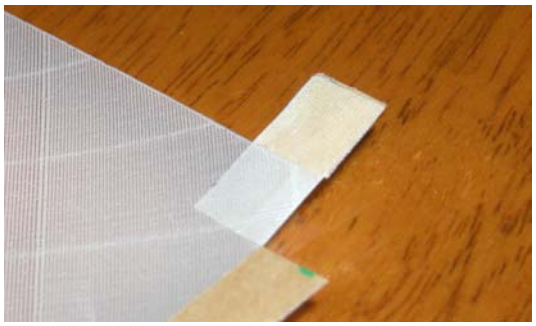

Figure 19: The piece now folded over and adhered to the sail.

23. Cut the tab in half, so you are left with a tiny piece of adhesive backed fabric. See Figure 20.

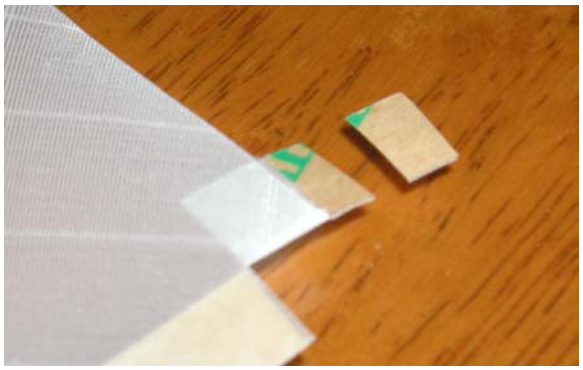

Figure 20: The tab cut in half, leaving a small piece of adhesive backed fabric.

24. Set the small piece aside. Take the backing off the tab and wrap around to the front of the kite. This closes off the pocket. See Figure 21.

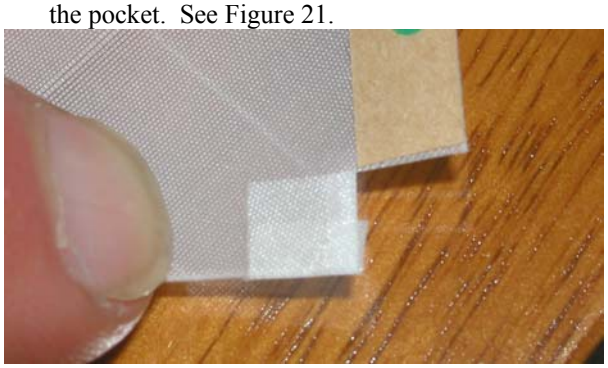

Figure 21: The tab wrapped around to the front, closing off the wing tip pocket.

25. Round the ends of your bow spar. Using first a needle, then the rounded end of the bow spar (0.06" graphite rod), expand the spar pocket to accommodate the end of the bow spar. You should be left with a crease as to where the spar will be. You might need to roll the spar (keeping it parallel to the leading edge) to get this crease. See Figure 22.

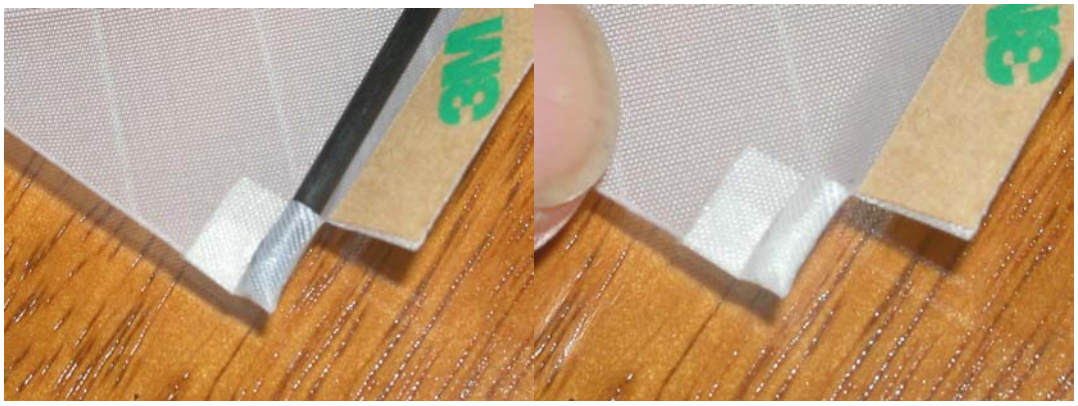

Figure 22: Sizing the spar pocket with rounded graphite, leaving a crease as to where it will be.

26. Take the backing off that tiny piece of fabric, and using a needle, apply it at an angle to that crease point. This will keep the pocket from coming apart during construction. See Figure 23.

Figure 23: Application of reinforcement to spar pocket.

27. Place the bow spar into the pockets. Look, we **are** getting somewhere! If the spar seems to long (it should not extend over the leading edge at all), trim it in ½ mm increments, rounding afterwards. It should meet the leading edge by the same amount on both sides; if it doesn't try rotating it or switching it around.
28. Measure and mark 1" on either side of the spine just below the bow spar. See Figure 24.

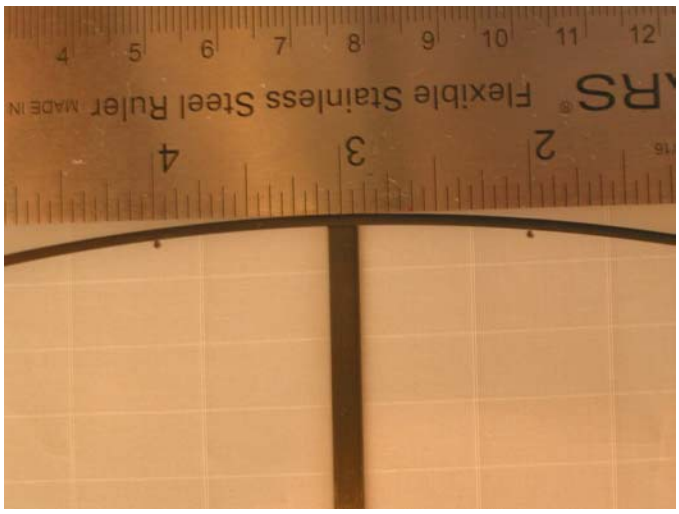

Figure 24: Put marks just below the bow spar, 1" on either side of the spine.

29. Prepare 2 pieces of fabric tape about ¾" long and apply them directly over (centered) the dots from step 28. See Figure 25.

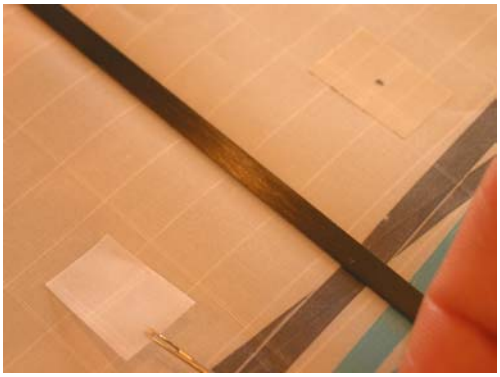
Figure 25: Applying the reinforcement for the bridle holes.

30. Using an eraser guide template (from instructor), cut small oval holes centered on the dots. You will have to turn the eraser guide template around to do both ends of the oval. See Figure 26

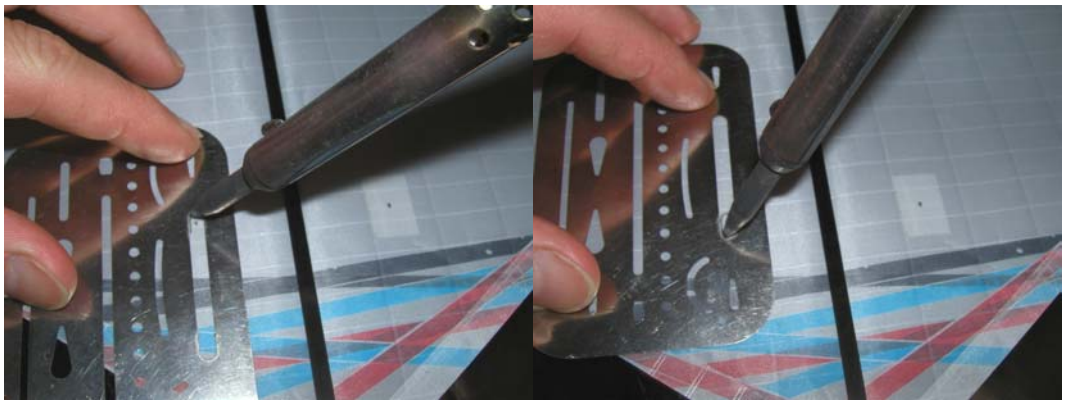

Figure 26: Cutting the holes for the bridle.

31. Pass one end of the Kevlar V-line up through (from the front side) one of the holes (doesn't matter which) and larks head it around the bow spar. Pass the other end of the V-line up through the other bridle hole and larks head it on the bow spar. Slide the bow spar until it is centered and install the bow spar in proper orientation (you may have rotated it a specific way in step 27). See Figure 27.

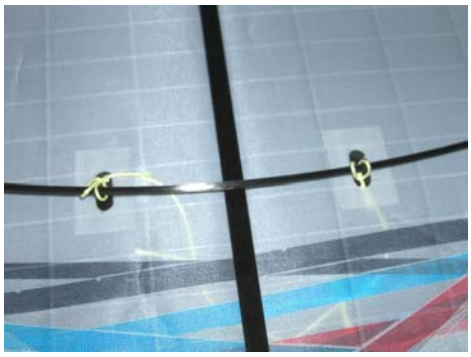

Figure 27: Viewed from back, V-line is attached to bow spar.

32. About 1cm from the top end of the roll over, cut with scissors from the edge of the tape to the spar. See Figure 28.

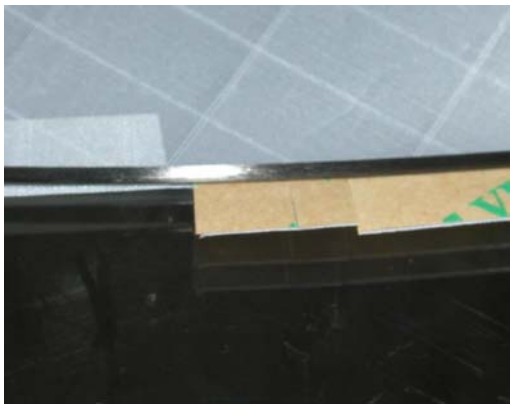

Figure 28: Cut to the spar about 1cm down from the top end of the roll over.

33. Take the backing off the section you just cut and, while keeping the bow spar in its natural position (Very Important), wrap it around the bow spar. Use a needle or crochet needle to get the roll over tucked next to the spar, so it is tight on the spar. You may need to hold the top edge of the roll over with your finger as you press down on it with the needle, so as to get it tight on the spar. See Figure 29.

Figure 29: Wrapping the roll over around the bow spar.

34. Cut the roll over at regular intervals; I end up with 7 roll over sections (so a total of 6 cuts including the first one). Roll over these sections in an alternating pattern, then come back and finish the entire leading edge. Use the procedure as in section 33. See Figure 30 and 31. Afterwards, burnish the roll over down firmly with something that can get into the corner (I use a letter opener).

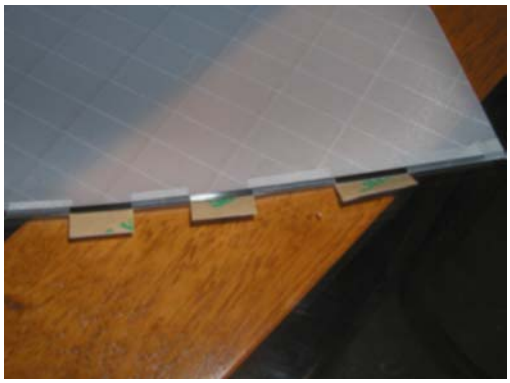

Figure 30: Alternating pattern of the roll over, and finished leading edge.

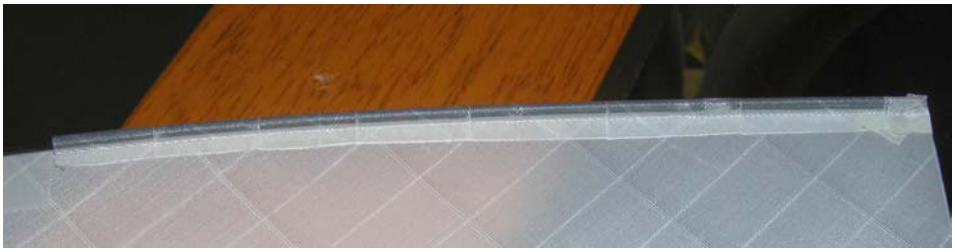

Figure 31: Finished leading edge.

35. Obtain about 4" of the ½" wide tape and make this into fabric tape (color of your choice). Cut this in half and apply one of the these pieces to the backside of the nose; perpendicular to the spine and flush with the top of the spine. Use a small piece of wax paper to keep the kite from being stuck to the work surface. Use your needle to get the tape into the corner of the spine/fabric junction. See Figure 32.

Figure 32: ½" wide tape applied on the backside of the kite with wax paper underneath.

36. With a metal straight edge, cut off the tape so it is flush with the sides of the kite.
37. Keep the kite backside up. Take the other piece of tape and apply it to the front side, aligning the edges of the tape with the visible edges of the first tape. Cut, with scissors, a section at an angle as shown in Figure 33. These will be wrapped over and should not extend down past the tape.

Figure 33: Viewed from backside, ½" wide tape is applied to the front and cut as shown. The cut allows the overhand to wrap over the leading edge cleanly.

38. Wrap over these triangular pieces, keeping the fold as close to the true edge of the kite as possible.
39. Mark with pencil on the back of the kite the locations of the holes for the tension line and bridle. Measurements for the holes for the tension line are (measure from the nose of the kite): 1/8", 3/8", 7.75", and 8.25". Measurements for the bridle (measured from the bow spar/ spine junction) are 3.5", 7.5" and 12".
40. Bring kite up to the instructor and the holes for the bridle and tension line will be drilled. I use a #69 drill bit for 20lb Dacron and 50lb Kevlar. This size hole allows me to secure the line to the kite with a simple over hand knot on the backside.
41. Obtain 2 pieces of ¼" wide tape, about 7" long. Find the 2 small batten sticks (0.03" carbon about 6" long) and stick these to the tape, then stick these two to some fabric (the fabric can be drawn firm with some scotch tape). This will create a sandwich of fabric, batten, and tape. Cut these out by running a knife along the side. See Figure 34.

Figure 34: Batten applied to tape, then applied to fabric creating sandwich of fabric, batten, and adhesive.

42. Mark the half way point on the trailing edge of the kite (should be about 7"). Using a line drawn on your work surface as a guide, align the kite so the line goes from the nose to this halfway point. If the line isn't that visible, you can place a ruler as a guide (with fabric weights to hold in place), but offset to the line (parallel to it by about ¼"). See Figure 35.

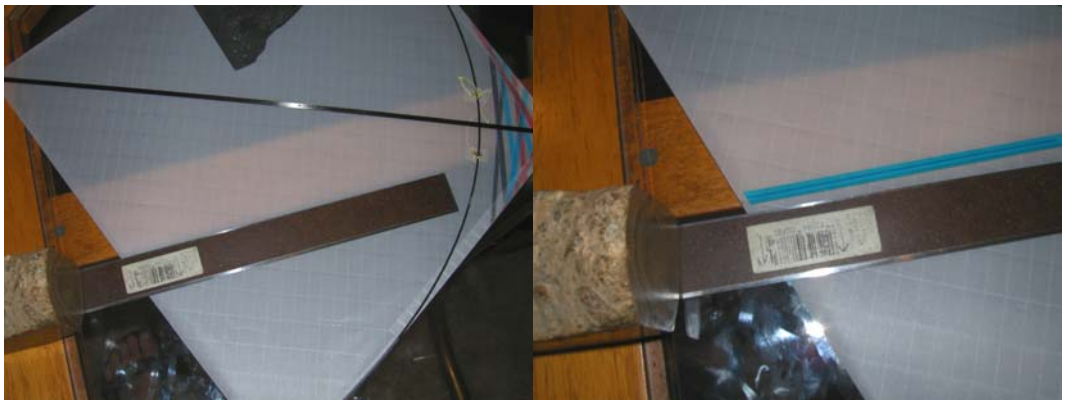

Figure 35: Underside line (here a support for my table) is used as a guide for placing the batten, from the nose to the halfway point on the trailing edge. Batten/tape thing is cut to fit the angle of the trailing edge.

43. Trim one end the batten/tape thing to fit the angle of where it will be on the kite. Trim the other end so you have about ¼" extra (it should only be flush with the batten at the trailing edge). Take off the backing and apply it to the kite along the line; if you are using a ruler as an offset guide, maintain a constant distance from it as you apply it (from the trailing edge to the other end)

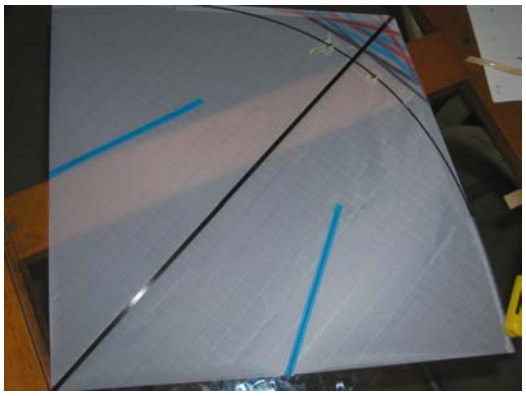

Figure 36; Battens applied to kite.

44. Thread the small end of the tension line (the Kevlar line with the bead) toward the front with the needle threader into the ¼" hole, then back through the ¾" hole. Tie a stopper knot in the Kevlar so that the bead will be past the bow spar by about ½"(toward the tail).
45. Thread the other end of the tension line (the long end, with the prussic knot) down through the 8.25" hole (toward the front) and back out the 7.75" hole. Affix with a knot so that the prussic knot is about halfway between the bead and the 8.25" hole. See Figure 37.

Figure 37: Keeper knots in tension line

46. Organize the black bridle pieces. You should have 4 pieces; one about 23", one about 11" with one small loop, and one about 9.5" with 2 loops. There should also be a small loop about 1-3" long.
47. Take the 9.5" piece with the 2 loops. Larks head the larger loop through the tiny hole in the V-line.
48. Take the 11.5" piece with the 1 loop. Thread the 'empty' end through the 3.5" hole from the front and to the back. Affix with a small knot quite close to the end. See Figure 38.

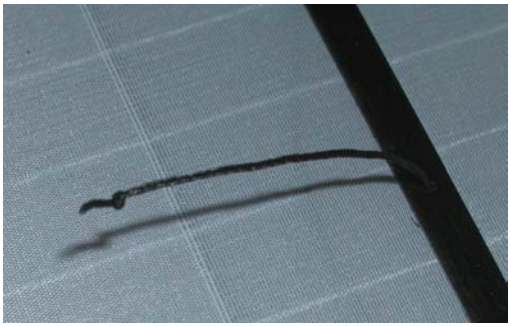

Figure 38: Keeper knot on the end of the bridle lines.

49. Take the 23" piece and thread one piece through the 7.5" hole, from the front. Affix with a keeper knot on the back close to the end.

50. Thread the 11” loop through the 9.5” loop. Thread the 23” end through the 11” loop. Thread the end of the 23” into the 12” hole and affix on the backside. See Figure 39 and 40.

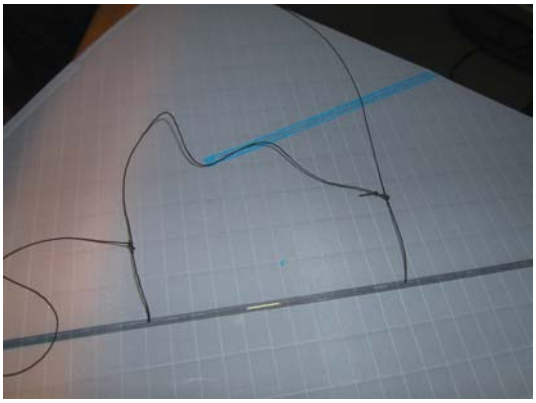

Figure 39: Bridle assemblage.

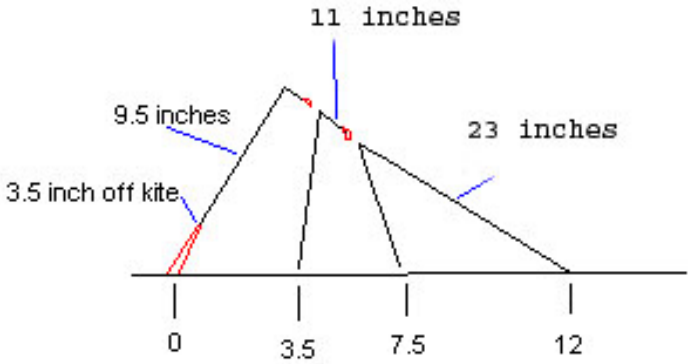

Figure 40: Structure of the cascade bridle.

51. Double prussic the small loop onto the 9.5” piece and slide close to the small loop. See Figure 41.

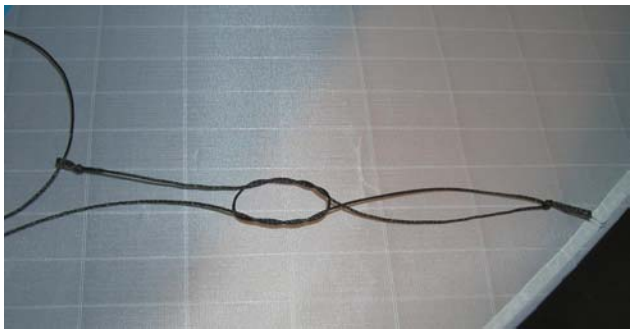

Figure 41: Double prussic knot to attach line attachment point.

52. Tighten and center the V-line attachments on the bow spar (in the holes in the sail). Place a very small amount of thin super glue on the backside that will hold this V-line in place.
53. Place a very small amount of thick super glue at the junction of the bow spar and the sail, right where it “leaves” the roll over section.
54. After the glue has dried, center the V-line on the spine. You will have to move the prussic knot to shorten or lengthen one leg. Also adjust the angle of attack to an angle of about 10-15 degrees. This can be adjusted in the field.

Done!