

Plan for building a light weight kite box, by Steve Bateman, 7/29/04



These are plans for building a light weight kite box, suitable for airline travel and field use. The box has room for many kites and 4 spools of line. The outside dimensions of the box are 21" x 16" x 7", and the inside dimension for the kite area is 15.5" x 16" x 6.5". Total weight is less than 2lbs. The area for the spools will accommodate spools that are no thicker than 2" and no larger than 6.5" in diameter (the size of a common Yo-yo type spool)

Read through the plans and see what is involved. I've made 6 of these type boxes now and this one takes me about 5-6 hours. If you don't understand a step, read ahead and look at the pictures. They might key you in as to what was involved before. Feel free to email me if you are really lost. I can take pictures of the finished product as needed. I'm at geokite@hotmail.com

Materials needed

- 1 piece of Coroplast (corrugated plastic), 2' by 8' with the grain running the length of the piece. Coroplast comes in 4' by 8' sheets for about \$10; cut it length wise in half to fit in most cars.
- 25" of 2" wide webbing, loose grain. I would not suggest using something like seatbelt webbing for this. Use the most flexible webbing you can find. Cordura or other heavy fabric could be used as a substitute.
- 20.5" of Velcro, both sides
- 58" of large teeth zipper (I use #10)
- 2 sliders for the zipper
- 26 T-nuts, #8-32 x 1/4"
- 26 3/8" machine screws that fit the T-nuts
- 26 small washers to fit machine screws
- 2 Graphite rods, 0.125" diameter, about 15.5" long each
- About 40" of 1" wide webbing, for the handle (your choice as to what weight you want)
- 3' of about 50lb Dacron or other line of approximately the same size.

Tools needed

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| Ball point pen | Soldering iron |
| Carpet knife | Large cutting surface |
| Metal meter stick | Electric drill with 5/32" drill bit |
| 45/45 triangle, or something to give a 90° cut | Large darning needed for Dacron line |
| Regular sewing machine (heavy duty machine is NOT needed) and thread | Masking tape |
| | Silver Sharpie |

Guidelines

Directions are given here with reference to the box orientated as in the above picture, the top of box being the zippered lid and the bottom on the ground.

Half cut w/ the grain: where you only cut through the material half way. Typically these are fold points where you will fold toward the cut, compressing the Coroplast slightly. You only are cutting through one thin layer of the plastic. To make these cleanly, after you have cut through one layer of the plastic run a ball point pen in the cut to push the plastic down. This plastic will be compressed when the bend is made, pushing it down helps it get out of the way.

Half cut against the grain: where you cut through the material halfway, but you are cutting against the grain. These cuts are harder to do; the ruler needs to be held very securely to accurately do. You only need to cut down about 2 mm, afterwards the cut can be furthered by bending to open the cut up, but not to much. Then fold the cut toward the cut surface. The plastic will deform and be crunched together.

Cutting the pieces

1. Take 2' x 8' sheet of Coroplast and square off one end with the 45/45 triangle. When cutting, cut down a bit into the Coroplast and then fold open. This gives a nice groove to run the carpet knife through. This works best for cuts across the grain. For cuts with the grain it is best to just press hard with knife, or to make repeated cuts. See figure.



2. Cut a piece 20 3/8" wide off the end of the Coroplast, with the grain running the 20 3/8" dimension. Measure 6.25" from the end of this piece and make a half cut w/ the grain. This will be folded to an angle of 90°. This piece will be both the back side (the 6.25" side) and the bottom of the box.
3. With the piece folded in the 90° position, measure 15.5" from the inside surface and mark. Then cut with the grain at this mark. See figure.



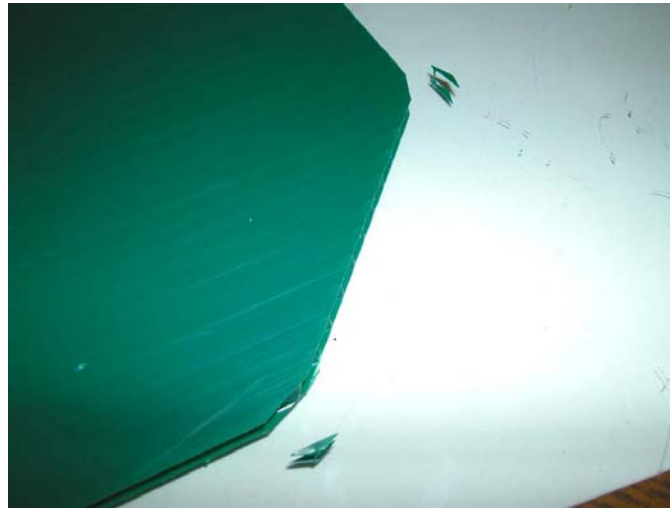
4. Cut 2" by 2" diagonals off the corners. See figure.



5. Cut out the top. The top is 20 3/8" by 15.5" with the grain running the 20 3/8" direction (same as the bottom/back side). If faced with a rib of the Coroplast, lean toward having the top a little shorter in the 15.5" dimension.
6. Cut off 2" by 2" diagonals from the front corners, and 2" by 1" diagonals from the back corners (with the 1" dimension measured with the grain). See figure.

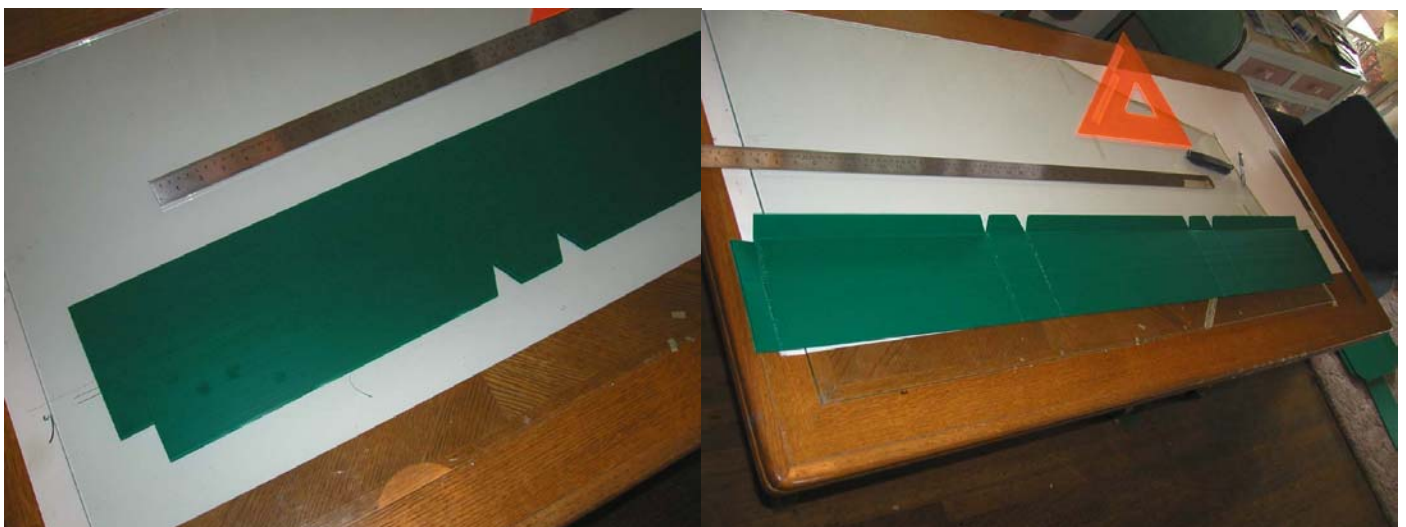


- Cut off a tiny bit of the front corners to make them more round. Should be no more than $1/8''$. Remember, you will be sewing a zipper around these corners, and this will make that easier. See figure.



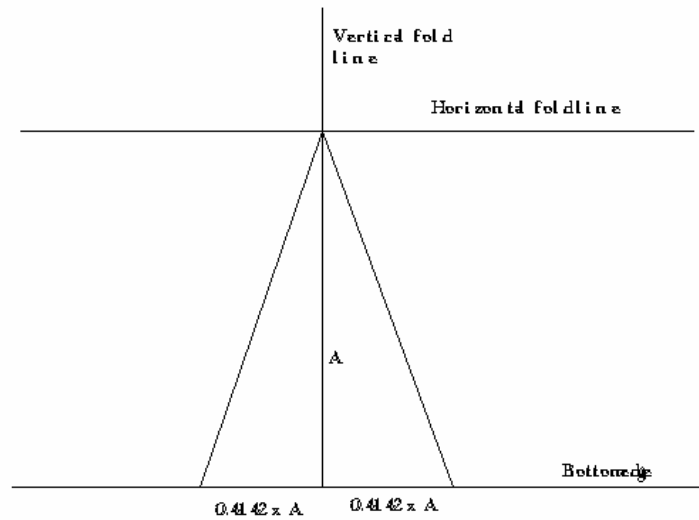
The other 3 sides of the box (left, right, and front) are made from one single piece of Coroplast. There are 6 vertical folds in this piece; 2 are 90° folds and 4 are 45° folds (meaning that that the bend angle will be 90° and 45° , respectively). There are 3 other folds that wrap the sides around to the bottom, allowing it all to be screwed together. Those are 90° folds.

- Cut a piece of Coroplast $7''$ high and $51 \frac{7}{8}''$ long, with the grain running length wise. Make vertical marks at $1.25''$, $14.75''$, $17.75''$ from one end, and the same from the other end. That will leave a section in the middle that is $16 \frac{3}{8}''$ long. These vertical lines will be fold lines, but don't fold them yet.
- Pick the long edge of this piece that you want to be the top; I prefer to have the cleaner edge (the edge where the next rib of the Coroplast is closest) on the underside of the box. This edge will not be seen, but it will rub against your leg occasionally. Not a big deal really. Measure $1.25''$ from the bottom edge and draw a long horizontal line (will be with the grain). This line will be a fold line.
- Cut out the corners on the bottom edge of this piece. You can use the $1.25''$ fold line as one edge, and $1.5''$ from the bottom edge (yes, $1.5''$. This allows it all to fit together). See figure below and at the end of this section.

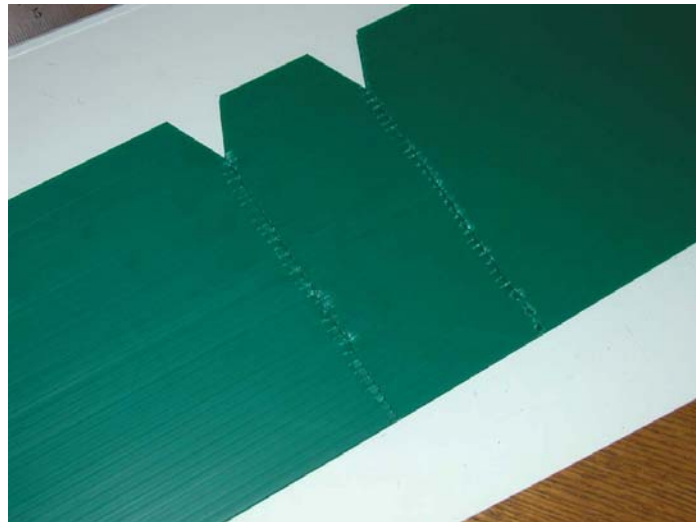


- Cutting out the triangular cutouts as seen in the figure above. Measure the distance from the horizontal fold line to the edge (should be around $1.25''$, but it might be a little off). Multiply this by 0.4142 .

Measure that amount on either side of the vertical fold lines (the inside 4 of the 6, not the 2 outer ones) and mark. Cut out the triangle that forms, up to the horizontal fold line. See figure



12. Half cut against the grain all the vertical fold lines, and then fold toward the cut. The outer two will be folded 90°, while the inside 4 will be folded 45°. Pre-folding these is **very** important, because if you don't the sides of the box will curve outward. This should also be done right before final assembly. See figure.

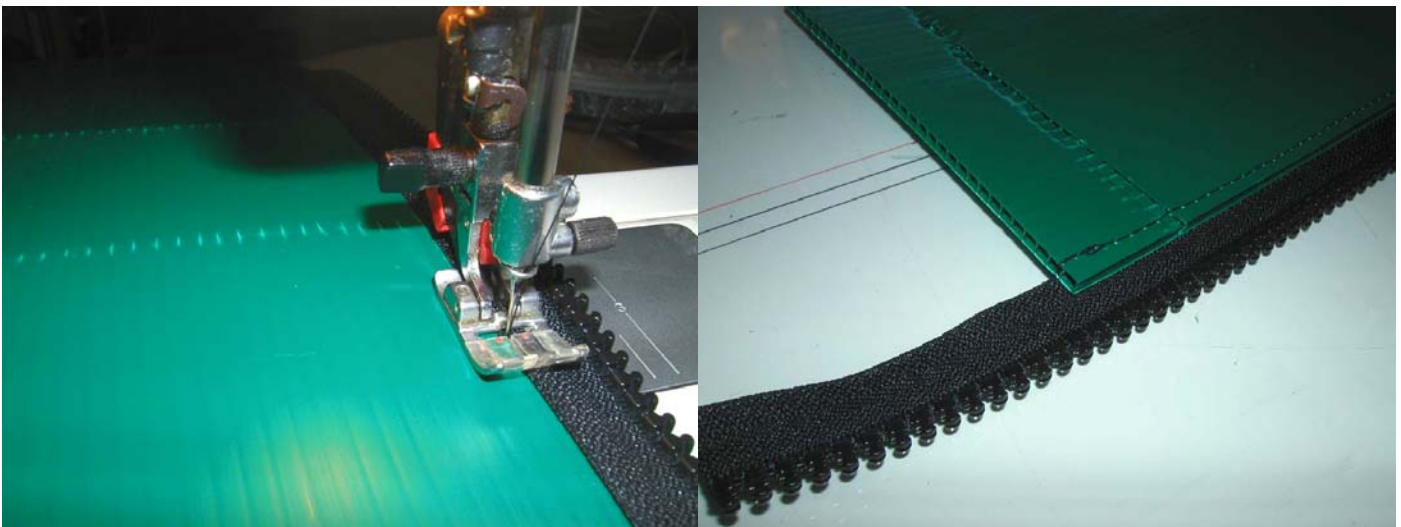


13. Half cut with the grain the horizontal fold lines. These will be folded to 90°. Again, it is very important to pre-fold these. See figure

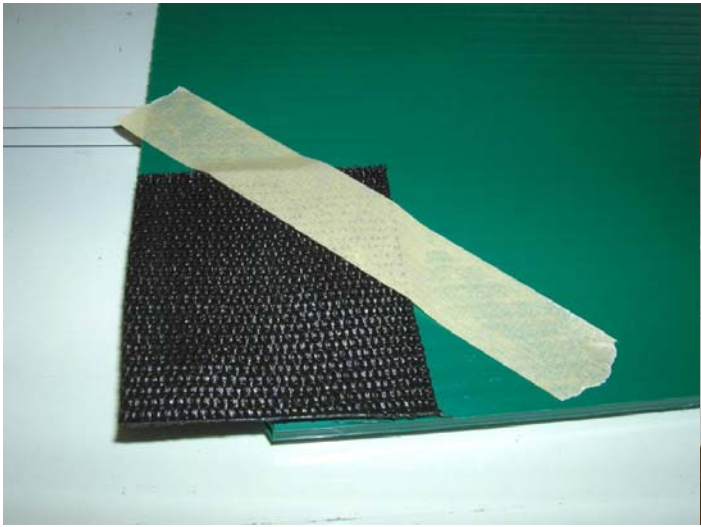


Sewing the pieces

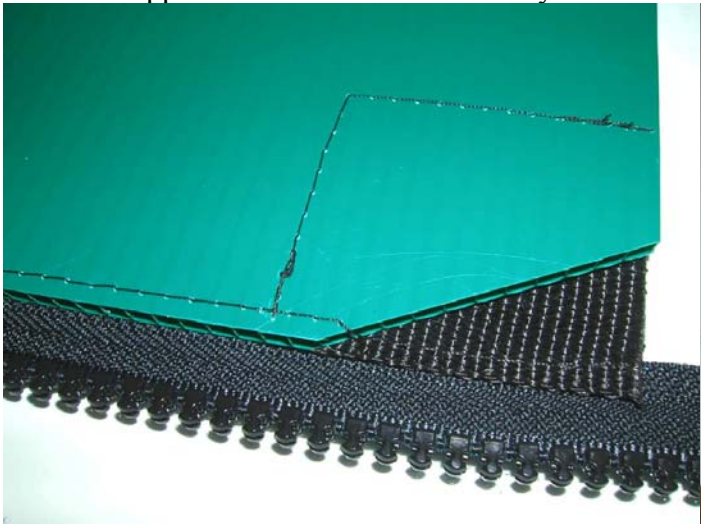
14. Sew half of the zipper onto the top edge of the side piece. Leave about 3-4" extra at both ends and start from the end. Use the largest stitch length your machine can sew. Sew the zipper so that you encompass one wall of the Coroplast. With the size zipper that I use this puts the edge of the teeth $\frac{5}{8}$ " away from the top edge of the side. See figure.



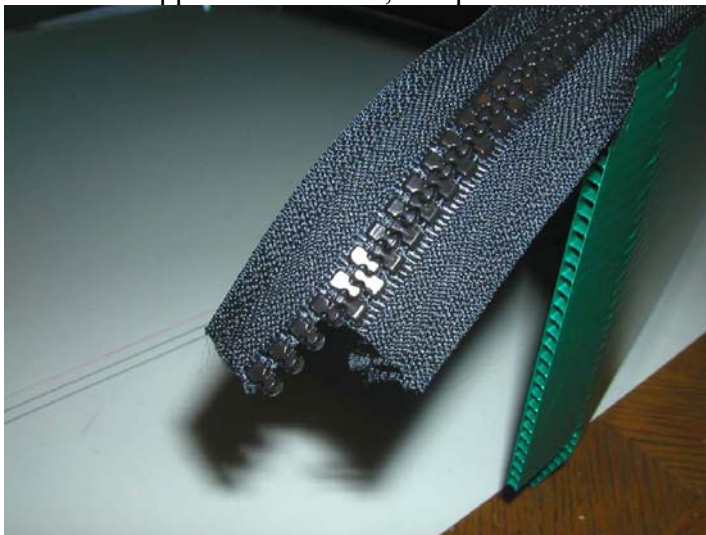
15. Hot-cut 2 pieces, 2.25" long, of 2" webbing. Sew these onto the top of the lid, over the back edge cut outs, flush with the edges. Sew on the two edges of the webbing that are entirely on the Coroplast. You can use masking tape to affix in place, and then sew through the tape. See figure



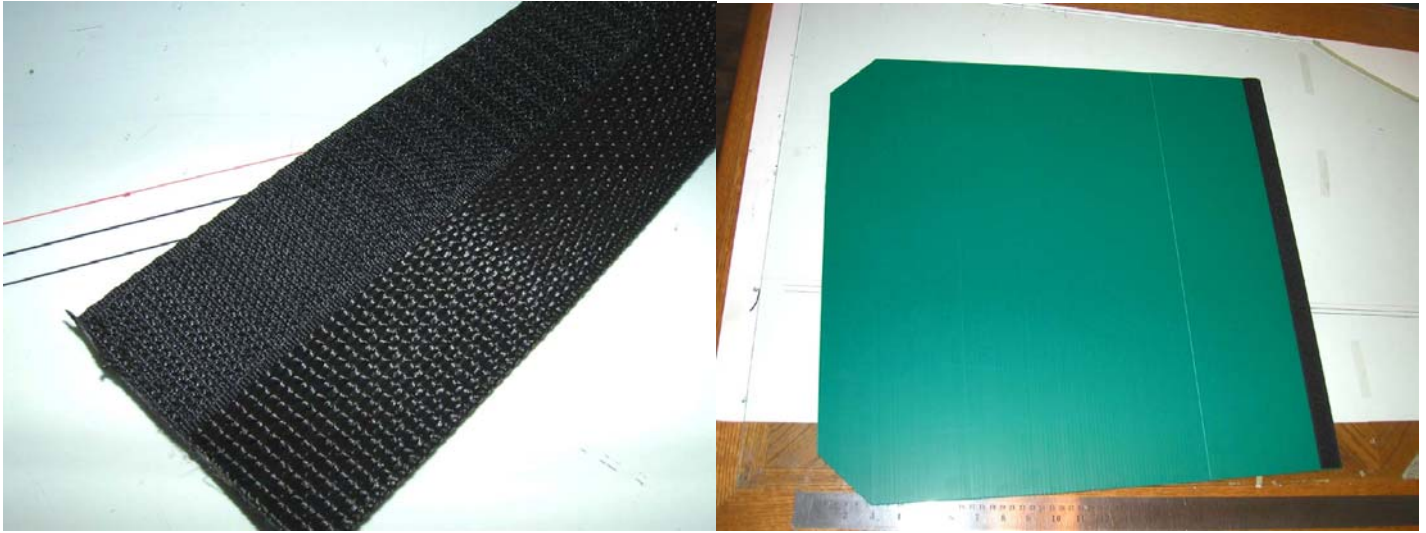
16. Sew the other half of the zipper onto the lid. Again, leave about 3-4" extra at both ends. The zipper should overlap the Corroplast by about the same as on the sides; using the zipper that I use, the edge of the zipper teeth are about $9/16$ " away from the edge of the lid. See figures.



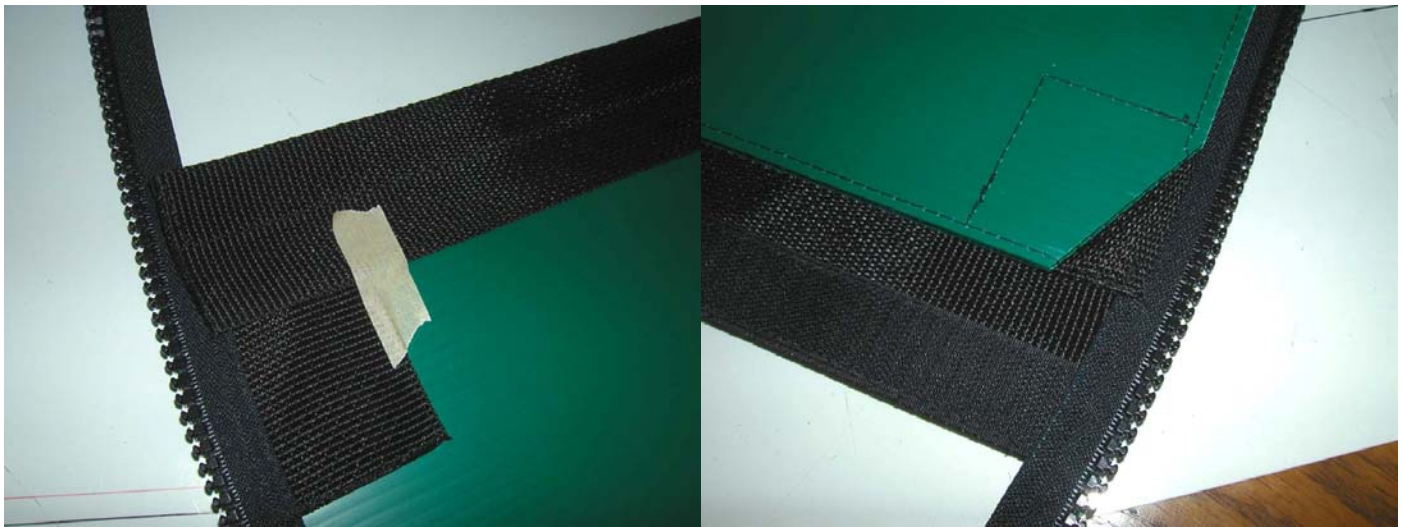
17. Pre assemble the lid onto the sides. Use only one slider to do this. This will allow you to see which teeth from the lid should line up with which teeth from the sides. Assemble the two pieces until the lid is *centered* on the sides, and then mark with a silver sharpie on both halves of the zipper, both ends of the zipper. Afterwards, unzip the lid from the sides. See figures.



18. Hot-cut 20 3/8" of 2" wide webbing (it will be the hinge for the lid) and sew the same length of hook Velcro onto one side of the length of webbing. Sew the loop portion of the Velcro (same length) onto the *outside* top edge of the bottom/back piece. See figure.



19. Sew the assembled webbing onto the top of the lid, with the Velcro hanging off the lid. Sew the webbing right along the edge with about 3/16" of overlap. Center it as best you can. It should overlap the zipper on both sides. You can hold in place with masking tape. See figure.

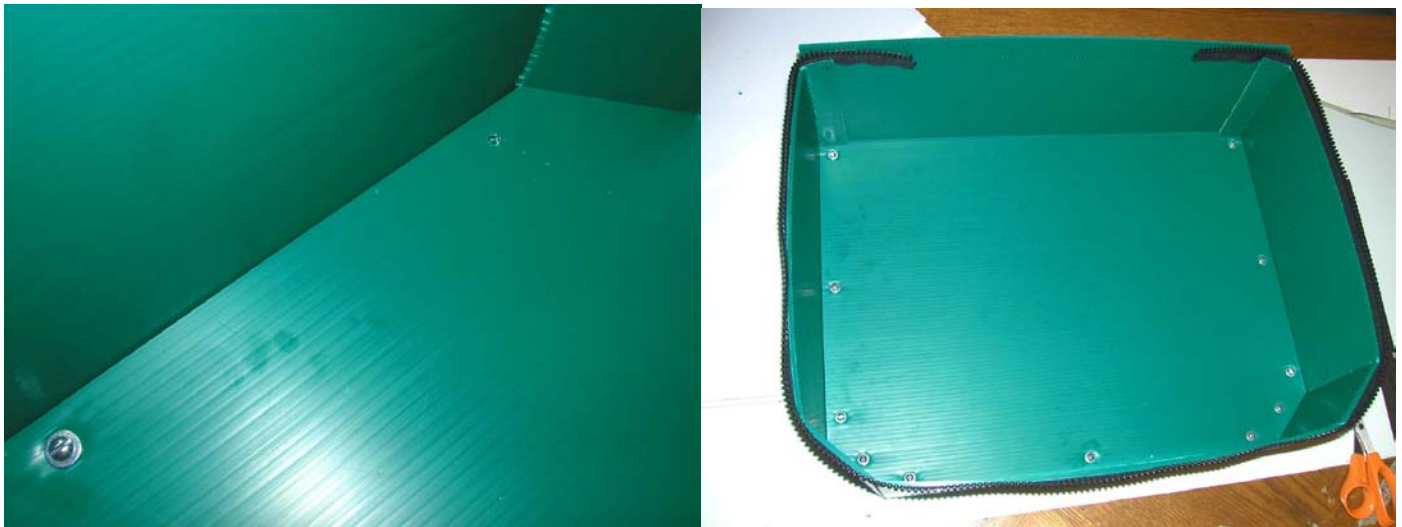


Assembling the box

20. Pre-fold the sides again, just to make sure the folds are well creased to the angles they will be in. You won't be able to get 90° folds to stay put, but it should be easy to get them into 90° folds.
21. Tape together the sides and bottom with masking tape. The bottom sits down inside the sides, with the bottom side 'tabs' wrapped underneath. The back tabs are in the *inside* of the box. You will need plenty of masking tape. The pieces in the back are the key pieces that hold it all together (for right now of course). See figure.



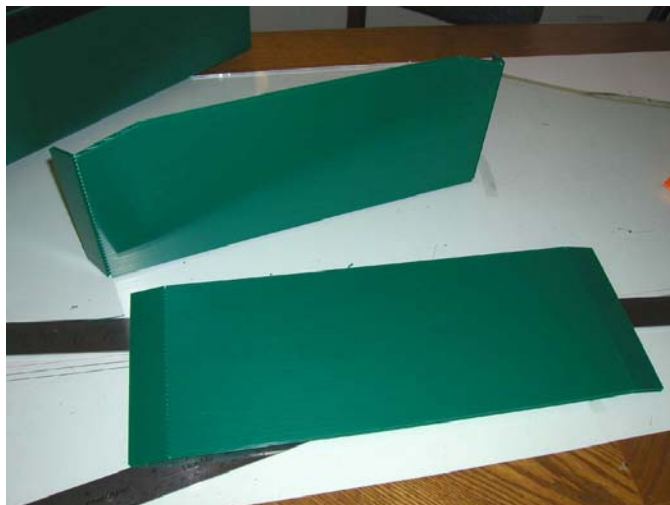
22. Use two pieces of scrap Corroplast underneath to protect your work surface from the drill. Pushing the pieces together as best you can, drill a $5/32$ " hole through the bottom from the inside at the center point of the front side. The hole should be $3/4$ " from the side (it should come out on the other side about half way through the overlap tab). Push a T-nut in from the bottom outside (it will be a tight fit; a larger bit could be used, but then the screw wouldn't get such a good fit) and screw in a screw/washer combo. Don't screw it in past the T-nut; the end of the screw should be flush with the bottom of the T-nut. Work your way around the box, setting screws as you go. The key thing here is to start at the center of the front side and work toward the back, doing your best to drill holes with the pieces tightly together. See figure.



23. Line up the back edge of the box with the back tabs and drill, from the outside (it's easier), two holes. These holes should be placed at the ends of the tab (as is reasonable). Set T-nuts and screws in these holes to hold together. See figure.

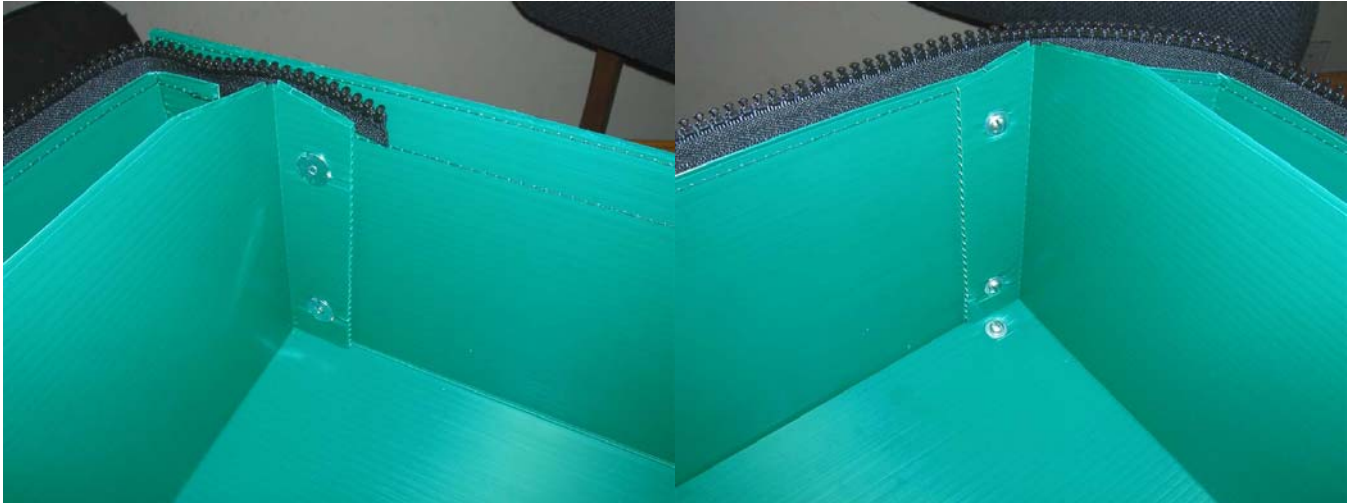


24. Cut out the dividers. The dividers are made from 2 pieces of Corroplast, $17 \frac{11}{16}$ " long by $6 \frac{9}{16}$ " high (the height of a Yo-yo spool). The grain goes the length of the dividers. The folds on these are made a little differently than other folds. The folds are cross grain and are opened up *away* from the cut. This allows the folds to be perfect 90° angles, not causing the Corroplast to buckle or bend. The reduced strength is not a concern here.
25. After cutting the pieces out, mark vertical cut lines at 1.25" from each end. Cut and fold away from the cut. Mark 2" from the folds on the top edge, and 5.5" up from the bottom on the sides. Cut off this triangular piece. This will allow the lid to open and close. *You are making two dividers; make sure they are mirror images of each other!* One will have to fold one way, the other the other. See figures



26. Cut a piece of 0.125 graphite rod to fit the length of each divider (the inside length, between the folds). Insert into one of the center chambers of the Corroplast to stiffen.
27. The dividers are screwed in just like the sides and bottom were. They need to be 2" away from the sides and flush with the bottom. It is best to get a reel and place it vertical inside the box to see exactly where

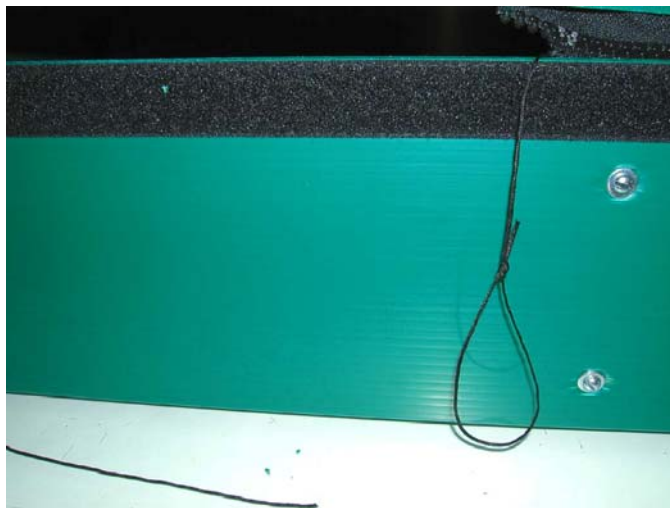
the dividers will end up. Drill two holes in the back, screw in place, then two holes in the front and screw in place. Holes should be drilled in the center of the 1.25" tab of the dividers and at the approximate ends (taking into account that you don't drill through the Velcro. Your choice as to which way the T-nuts face. In the box pictured here I chose to have the T-nuts on the inside so as to give the box four nuts on the bottom, kind of like little feet. But I don't think it will protect the bottom very much. See figures.



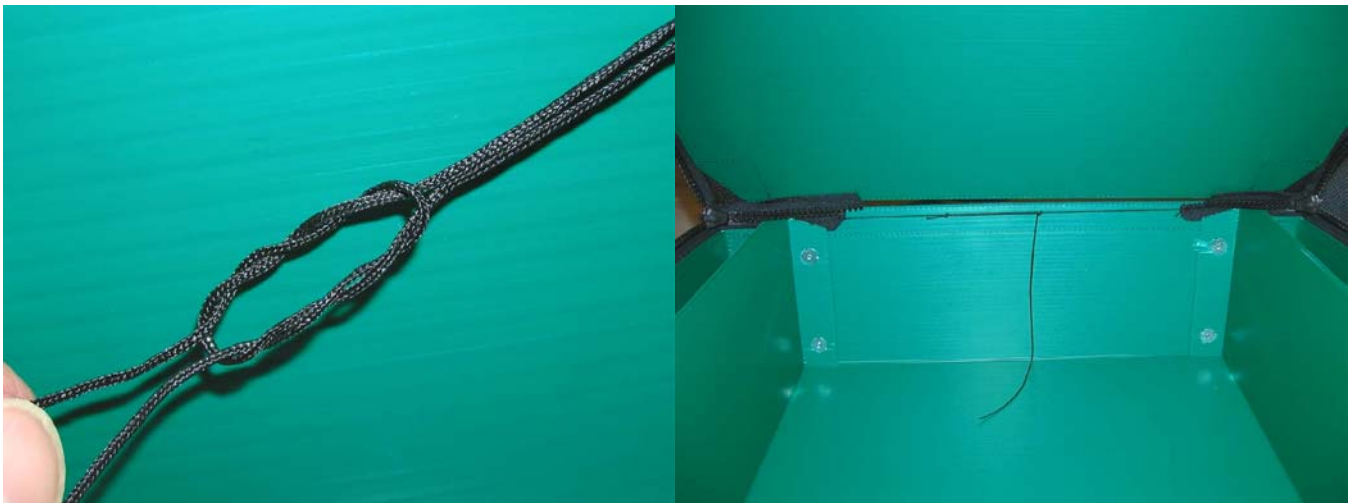
28. The lid can now be zippered onto the bottom portion. Aligning the marked zipper teeth, slide the sliders onto the zipper and work past the tight section in the back. The box should be looking really good now!
29. The zipper needs to have a line connecting the ends inside. Thread about 18" of 50lb Dacron through the end of the zipper (either half or both, it doesn't really matter) and tie to the zipper. Do the same for the other zipper end. See figure



30. Tie a loop in one of the lines, about 3-4" in length. Cut off the excess. See figure.



31. You will now be making a prussic knot to tighten the zipper ends together. Using the figure as a guide, follow the loose line around and out of the loop. The finger you see is holding the loose end of the line, and the loop is originating from the right side. Tighten the knot down, open up and slide it to tighten the line between the zippers. See figure.



Adding a strap handle

The strap is attached at 3 points; the back side and the 2 small sides near the front, the 45° sides. It is designed to be as no obtrusive as possible, and to lift the *whole* box (unlike a handle attached to only one side would do).

32. Locate the back center of the box, where the strap will run along the back. Drill a 5/16" hole here.
33. Follow the grain of the Corroplast around to the small 45° sides. Mark the middle of these sides and drill a hole. Place T-nuts, from the inside, in these two holes.
34. Take the 1" wide webbing and wrap it around the box for the handle. Making sure it is centered, draw it as tight as you can and mark where to sew it together. Sew it together, cut off the excess and test fit the tight band of webbing around the box.
35. Take the webbing band off the box. Hot-cut a hole in the sewn portion of the strap big enough to fit a T-nut through. Only hot-cut in a well ventilated area, as this will create lots of fumes. When done, replace the webbing band onto the box.
36. Push the T-nut through the hole in the webbing at the back side and affix with a screw/washer from the inside. See figure.



37. The webbing should be passing over the other two T-nuts you have already placed from the inside, on the 45° sides. Making sure the webbing perfectly centered over these T-nuts, and feeling where they are underneath the webbing, hot-cut a hole through the webbing into the T-nut (the T-nut acts as a guide for location and size of the hole). Then screw in a screw/washer from the outside. See figure.



Done!

Notes

This box meets most (if not all) of the airline requirements for carry-on luggage. This box has a total dimension of 41", while airlines have a requirement that carry-on luggage does not exceed 42".

While this box may fit underneath a seat on an airplane, the mere fact that it is a **box** and that boxes don't pass through our knees makes this irrelevant. This box will fit endwise in the overhead compartments and is thick enough to not allow anything heavy to be placed on top.

Internal dividers for kites can be fashioned from additional pieces of Corroplast. Just make sure to allow cut outs for your fingers to remove them.

Depending on what strapping you use for the handle, the strap may loosen and tighten with the humidity.

Additional strength can be put in the lid (especially the back edge) by placing large carbon rods in the chambers of the Corroplast. The 0.125 used here might not be the biggest that can fit, it was just what I had around and is a common size.