

# Make Bruce's High Performance 'F3' Fighter Kite In Less Than 2 Hours For Under \$3

This article was inspired from a chapter in *NORTH AMERICAN FIGHTER KITES*, my 400+ page fighter kite book on CD ROM. If you want more information about the book or want to order a copy of the book on CD, please email me at [kitefighter@nwinform.net](mailto:kitefighter@nwinform.net) or [kitefighter@yahoo.com](mailto:kitefighter@yahoo.com).

The kite plan described in this article is a new design, F3, I created in August, 2004. However, the primary point about this article is the building technique. You can apply the building technique described in these instructions to ANY fighter kite plan you choose to build. And almost any fighter kite plan can be built in less than 2 hours using this technique. The less than 2 hours time assumes you have on hand all the needed materials and tools.

F3 got its name from the template material I wanted to use; a file folder, File Folder Fighter – F3. F3 as described in this article is a kite I designed for optimum performance when flown in winds of about 4 mph to 9 mph. If you fly in stronger winds, replace the 0.05" (1.27mm) diameter carbon fiber bow with a 0.06" (1.524mm) diameter carbon fiber bow of the same length and the kite will perform best in winds from 8 mph to 16 mph.

F3 is designed primarily for precision or skills competition and line touch competition for competitors wanting a very controllable predictable kite that won't surprise the flyer.....and of course for fun flying any time!

The F3 is a kite with gentle requirements from the flyer. One of the reasons it is such an easy flying kite is that it is not particularly fast compared with competition line-touch fighter kites. But for precision competition a slower, well behaved and easily controlled kite is what is required for success and the F3 delivers!

The construction technique used to make the F3 is straightforward and easy. Most importantly, this construction method produces a great flying competition caliber kite no matter what kite plan you choose to build; a super fast line-touch competitor such as the 'SlowDog' or an indoor fighter kite or a fighter kite to perform ballet routines to music.

If you have all the tools and materials on hand, making your first F3 should take less than 2 hours to complete, including making the template for the kite's skin. With a template of the kite skin, after you make one, making each additional F3 will probably take you about 1 hour or less.

Even if I plan to make only one of a particular kite plan, I always make a template for each different kite I build.

**BEFORE YOU BEGIN** building the F3; read the entire article through a couple of times. You'll have a better idea of the building process which will make the kite easier and faster to build.

## TOOLS YOU'LL NEED

- Ultra fine tip Sharpie marker

- Pencil
- Silver gel marker for marking the carbon fiber bow. A black marker or pencil mark is visible on carbon fiber, but more difficult to see.
- 24" (61mm) ruler marked in 1/16" or mm increments, a metal rule is best.
- A couple of toothpicks and a small piece of wax, beeswax, part of a candle or paraffin
- A pair of sharp scissors
- Large eye sewing needle
- A utility knife with new blade, break-off style or standard
- ? Hobby knife with new blade or new single edged razor blade or rotary cutter. If you use a rotary cutter, you'll need a cutting mat, otherwise several layers of smoothed out newspapers could be used as a cutting surface.
- A small piece of medium sandpaper
- A smooth flat work surface

### THE MATERIALS YOU NEED

Note: the widths of the various tapes mentioned are not critical, use tape widths that are readily available that is close to the width indicated.

- A letter sized manila file folder for making the template.
- Good choices for the kite skin material include ½ oz.(0.0142 kg) ripstop nylon or ripstop polyester, plastic film such as a poly gift wrap, Orcon, a plastic shopping bag. Whatever material you choose for the kite's skin, it should be at least 16" (410mm) x16" (410mm) or larger. Skin material 16"x16" (410mm x 410mm) requires you have the spine of the kite running diagonally, from corner to corner of the material.....this isn't a problem unless it affects the orientation of the pattern on the skin material you've chosen.
- A couple of drops of CA glue; CA glue is also called superglue.
- 3/4" (19mm) wide tape, or tape that is similar in width, that bonds well to the skin material you are using. Usually transparent tape or 'magic' style tape will work fine, you'll need about 50" (1.27M) of length. The best tape to use is the thinnest, most pliable and flexible tape.
- 2" (50.8mm) wide packing tape; you'll need about 4" (102mm) of length.
- . Low tack masking tape (the low tack masking tape is blue in color). You may need about 10" (254mm) of length of a ¾" (19mm) or 1" (25.4mm) wide tape.
- Peel-off self-stick plastic photo mounting corners, you'll need 4. I bought mine at Wal-Mart in the scrapbook making section of the craft department. They come on a roll of about 250 for less than \$4.
- 4' (1.22M) length of bridle line, any 12 lb (5.44 Kg) test line or stronger will work, but it is best to use a low stretch line such as Cotton, Linen, Dacron or Spectra. I use 16 lb (7.26 Kg) test 'green spot' Dacron fishing line I buy from Cabela's outdoor supply on-line.
- Carbon fiber rod 0.050" (1.27mm) in diameter 22-3/16" (58.896cm) long. Carbon fiber rods are available from many kite stores including on-line stores. Often the lengths of carbon fiber rods available are 25" (635mm) to 48" (122 cm) long.  
(*HIGHER WIND OPTION:* if you want to fly your F3 in 8mph-16mph wind, use a bow made of 0.06" diameter carbon fiber rod.)
- Two 5" (127mm) long pieces of 0.03" (0.762mm) or 0.04" (1.016mm) diameter carbon fiber rod, or a 5" length of a bamboo skewer split lengthwise or two 5" (127mm) long pieces of a small diameter

drinking or stirring straw. Any of these will work fine for the battens of the kite.

- A piece of split bamboo for the spine. The spine should be about 3/16" (4.765mm) wide on the skin side of the bamboo x about 1/8" (3.175mm) thick x 17" (431.8mm) long. If you don't have bamboo to split or don't want to bother splitting it, you can buy bamboo spines from me...they are virtually ready to use. I sell bamboo spines that I imported from India. They are about 24"- 25" (61cm) long and about 3/16" (4.765mm) wide and 1/8+" (3.175-4mm) thick, they are smooth, have no knots or nodes along their length and are generally straight and easy to shave or shape using a standard or 'break-off' utility knife. The price is currently 25 spines for \$7 USA dollars plus postage. If you want more information or want to order some spines or other fighter kite making materials please email me at [kitefighter@nwinfo.net](mailto:kitefighter@nwinfo.net) or [kitefighter@yahoo.com](mailto:kitefighter@yahoo.com) for a current list.

### **MAKING THE TEMPLATE FOR CUTTING THE KITE SKIN**

The template is a **full sized template of one half of the kite** and is made from a standard manila letter sized file folder.

- Open the file folder so it is lying flat on your work surface. Using a sharp pencil, draw a straight line about 1/4" (6.35mm) in and parallel to one of long sides of the open file folder. The line will be perpendicular to the fold of the file folder. This line is the SPINE LINE of the kite. Write 'spine' along the line.

- From the natural fold crease line in the file folder, measure 8-1/8" (206.375mm) along the SPINE LINE you drew and make a mark on the SINE LINE. This is the NOSE of the kite. Write 'nose' near the mark.

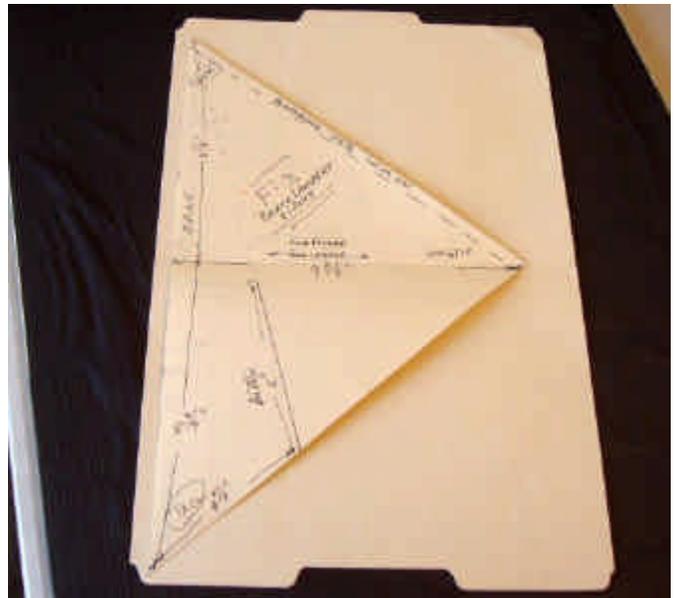
- In the opposite direction, from the fold crease line in the file folder, measure 8-7/8" (225.425mm) along the SPINE LINE and make a mark on the SPINE LINE. This is the TAIL of the kite. Write 'tail' near the mark.

- Beginning at the SPINE LINE measure along the fold crease of the file folder 9-3/4" (247.65mm) and make a mark on the fold crease line. This is the WINGTIP of the kite. Write 'wingtip' near the mark.

- Draw a straight line from the NOSE mark on the SPINE LINE to the WINGTIP mark on the fold of the file folder. This line is the leading edge of the kite.

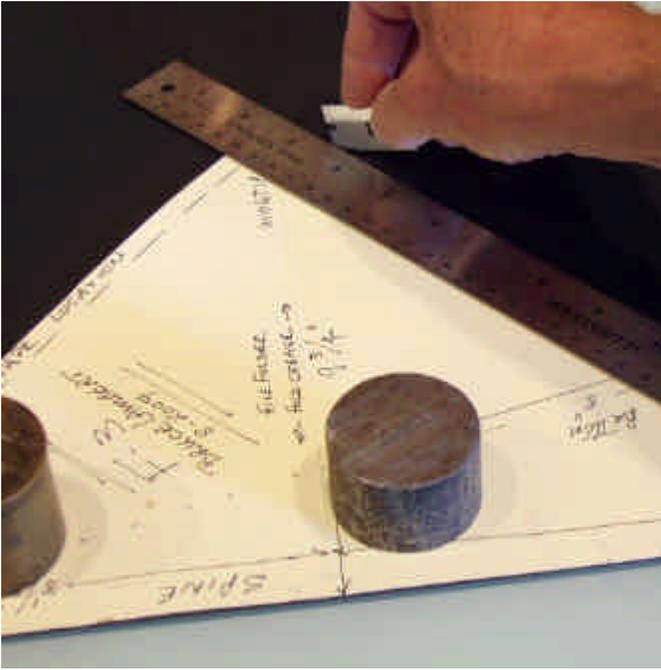
- Draw a straight line from the TAIL mark on the SPINE LINE to the WINGTIP mark on the fold of the file folder. This is the trailing edge of the kite.

- The triangle shape you've drawn is the full sized shape of 1/2 of the kite skin. Cut out the triangle using a straight edge and razor knife. The triangle is your kite skin template.



### **CUTTING OUT THE SKIN**

- Fold your skin material so the length of the fold is at least 18" (457.2mm) long. Fold it so the surface of the skin material you want to be the front of the finished kite will be on the outside when the material is folded. Crease the fold.

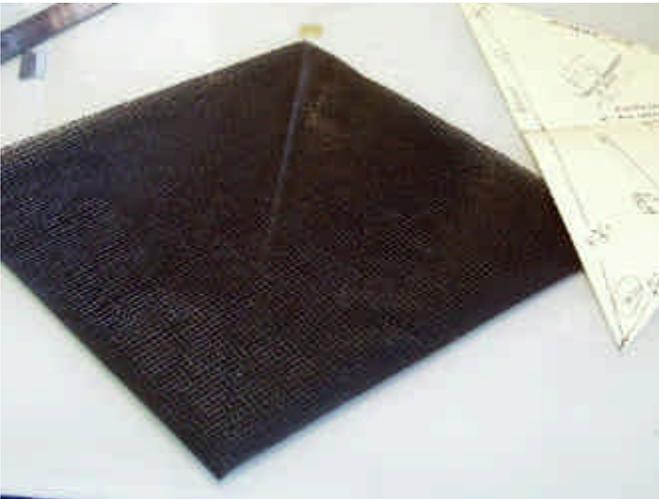


- Smooth the folded skin material onto your cutting surface.
- Lay the template on the folded skin material aligning the spine line of the template, the longest edge, on the fold of your skin material.
- Use a straightedge placed on top of the template as a cutting guide. Use a hobby knife, single edged razor or rotary cutter to cut the skin material following the outline of the template. You will be cutting through 2 layers of skin material.
- **IMPORTANT TIP:** If your skin material is a plastic or poly film make only one non-stop pass with your knife for cutting each side of the skin. Stop your knife only at a corner. If you stop and restart your cut, it could create a nick in the skin material. The nick will be a weak point on the kite's edge. With most plastic films, a nick will be a point where a tear will begin, maybe during the kite's first flight.

*NOTE: Because Orcon & Orcon tape show up better in photos than shiny plastic film and clear plastic tape, the photos show black Orcon for the kite's skin and a light colored Orcon tape.*

## CONSTRUCTING THE KITE

- Open the folded kite skin with the nose pointing away from you and tail pointing toward you. Smooth it out on your work surface so the crease is a 'valley'. This means that the surface of the skin material that will become the front side of the kite is lying on your work surface and the backside is facing up.

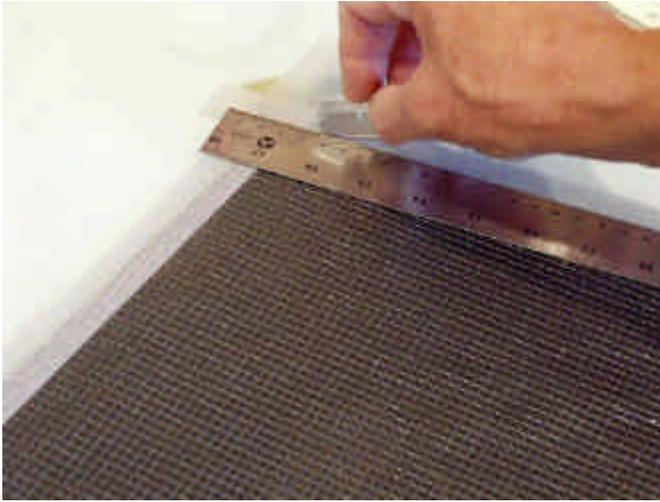


- Apply a piece of  $\frac{3}{4}$ " (19mm) wide tape to the leading edge of the kite from the nose to the wingtip. You want about  $\frac{1}{4}$ " (6.35mm) to  $\frac{3}{8}$ " (9.525mm) of tape on the kite skin; the remaining part of the tape will be stuck to your work surface.

Repeat on the other side of the kite. This tape is for reinforcing the leading edge of the kite. It significantly increases the kite's durability and improves flight performance at the same time.

- Lay a straight edge on top of the leading edge reinforcing tape and align it with the leading edge of the kite skin. Cut along the leading edge of the kite skin with a razor or hobby knife. Then cut through the small portion of tape along the trailing edge beginning from the wingtip. Remove the excess tape from your work surface. Repeat on the other side of the kite.



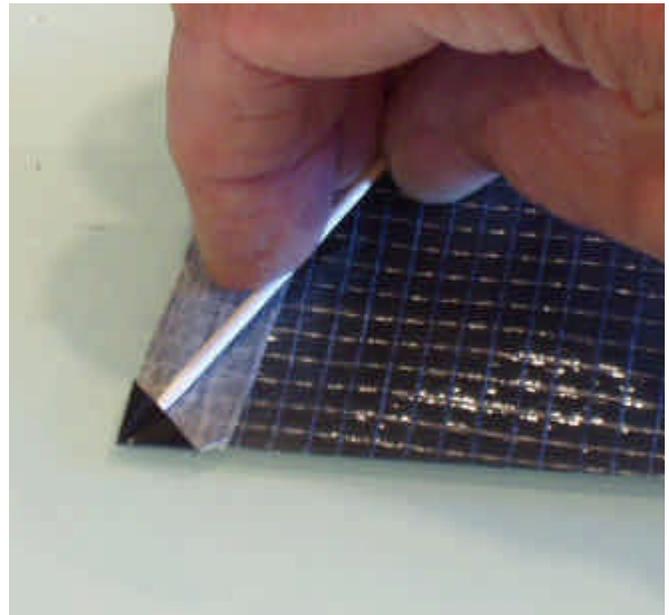


- Using a toothpick, remove a plastic adhesive backed photo corner from its paper backing. To remove the photo corners, I insert a toothpick into the photo corner and lift the corner off the backing. This prevents me from reducing the bonding strength of the adhesive on the back side of the photo corner by touching it.

- Carefully align the photo corner so the corner of the photo corner is on the corner of the kite skin's nose. The nose photo corner will actually be applied directly on the leading edge reinforcing tape. Press it down onto the nose of the kite on the reinforcing tape.

- Remove another photo corner and carefully align this photo corner so the corner of the photo corner is on the corner of the kite skin's tail.

- For the wingtip photo corners it is important to align the edge of the photo corner so it's parallel and right along the **leading edge** of the kite. The wingtip photo corners will actually be applied on the leading edge reinforcing tape. Press it down onto the reinforcing tape.



*NOTE: When using this building method, sometimes the shape of a kite plan you are making won't allow the entire photo corner at the wingtip to be on the kite skin. In that case, align the photo corner so one edge is aligned with the **leading edge** as described above. If a portion of the photo corner overhangs the trailing edge, that's ok, it can be trimmed away later. If the trailing edge portion of the photo corner doesn't quite reach the trailing edge, that's no problem either.*

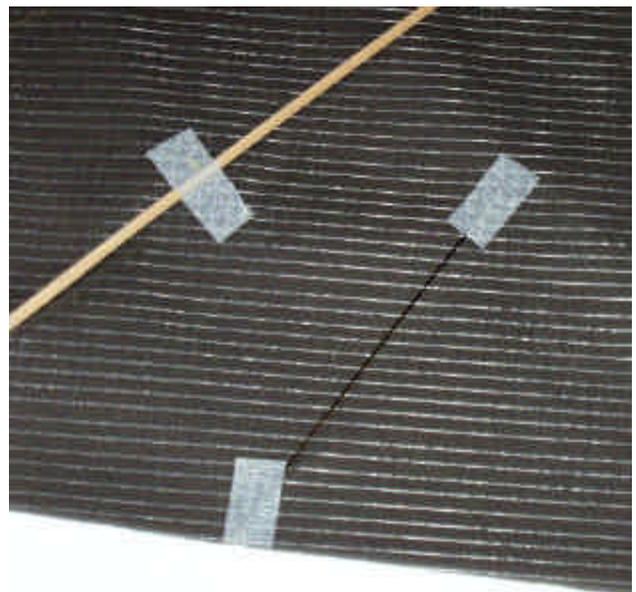
- From the tail of the kite, measure 5-1/2" (139.7mm) along the center fold of the skin material toward the nose and make a mark on the skin material. This is the point where the lower bridle line will connect to the spine later in the construction.

### ATTACHING THE BATTENS

Battens can be attached at any time during the construction process. I describe them at this point only because it is as good a time to attach the battens as any other.

- On the backside of the kite skin, measure along one of the **trailing edges** of the kite beginning at the tail and going toward the wingtip 4-3/4" (120.65mm) and make a mark on the trailing edge of the skin material. Repeat for the other side.

- Place your straight edge so it connects the nose of the kite to the mark you just made on the trailing



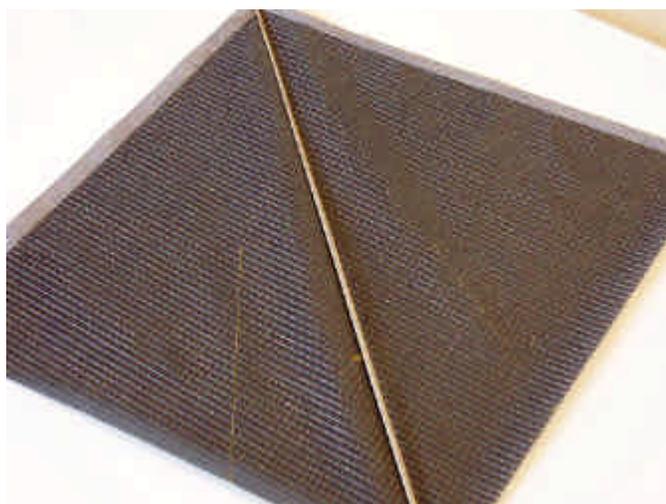
edge. Draw a straight line beginning at the trailing edge and extending 5" (127mm) toward the nose. Repeat for the other side of the kite. These lines are the locations for the kite's battens.

- Lay the battens on the batten lines you just drew on the backside of the kite skin and tape in place with  $\frac{3}{4}$ " (19mm) wide tape. Place a  $\frac{3}{4}$ "x  $\frac{3}{4}$ " (19mm x 19mm) piece of tape at the end of each batten and burnish well. The tape should extend over the end of the batten closest to the nose of the kite, but tape should be trimmed that extends beyond the trailing edge of the kite. Or, you can apply tape along the entire batten length.

## PREPARING AND INSTALLING THE SPINE AND BOW

- Cut the spine length to fit in the photo corner tips located at the nose and tail. Depending on how you applied the corners, the exact length may vary slightly, but it will be close to 16-7/8" (428.625mm) long.

- Cut the spine so it is long enough to create a small amount of tension in the kite skin when inserted into the nose and tail corner pockets.



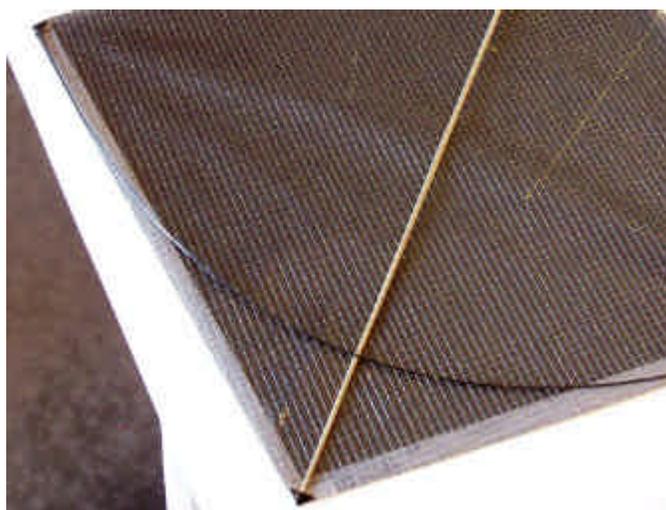
- Shape the ends of the spine with a knife or sandpaper so they are thin enough and slightly pointed to easily fit into the photo corner pockets.

- Insert the spine into the nose photo corner. After inserting the spine into the nose pocket, turn the kite over then use the spine to press the nose on your work surface. Then push on the spine to bend it slightly. This shortens the spine enough to allow the tail end to easily slip into the tail corner pocket.

- The kite skin should have a small amount of tension in it after the spine is installed. The tension may cause a slight bending of the spine and/or a slight tension wrinkle in the skin parallel

with the spine; either or both is fine.

- Usually the photo corners will pucker up a little, even if the spine has been shaved quite thin. The puckering is normal and doesn't affect the performance of the kite.



- Cut the carbon fiber 0.050" (1.27mm) diameter rod to the correct length, 22-3/16" (563.563mm).

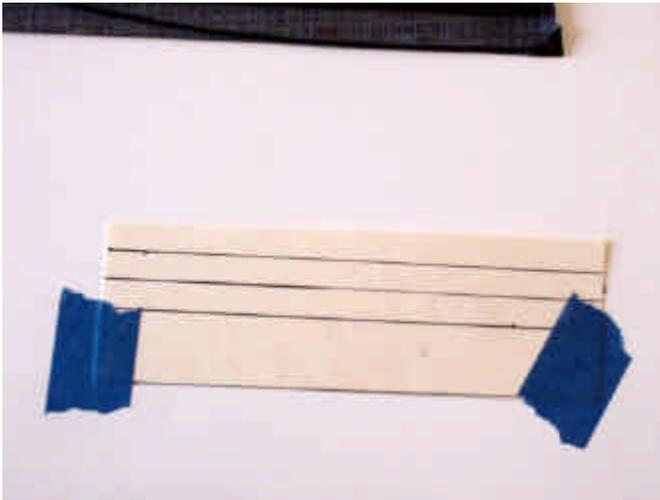
- Sand the ends so they're smooth.

- Measure from each end of the bow 9-5/8" (244.475mm) and make a mark with a silver pen. These marks show the location where each end of the upper bridle line will be secured

- Insert one end of the bow into one of the photo corners at the wingtips. Be certain the end of the bow is firmly seated into the corner. Sometimes it helps to use a toothpick to open the photo corner so you can easily slip the end of the bow into it. Insert the other end of the bow into the other wingtip photo corner.

**IMPORTANT STEP:** Once the bow is inserted into the photo corners, twist the bow so it rotates around its axis to allow it to find its 'natural' bending position. Its natural bending position is the position the bow will 'jump' to when you rotate it. It may have several positions it 'jumps' to, any of the positions is fine. Once the bow's natural bending position is determined, you are ready to bond the bow to the kite skin.

## BONDING THE BOW TO THE KITE SKIN

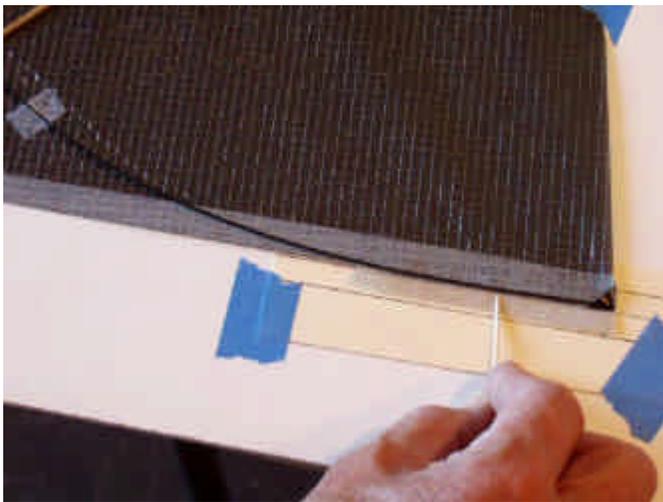
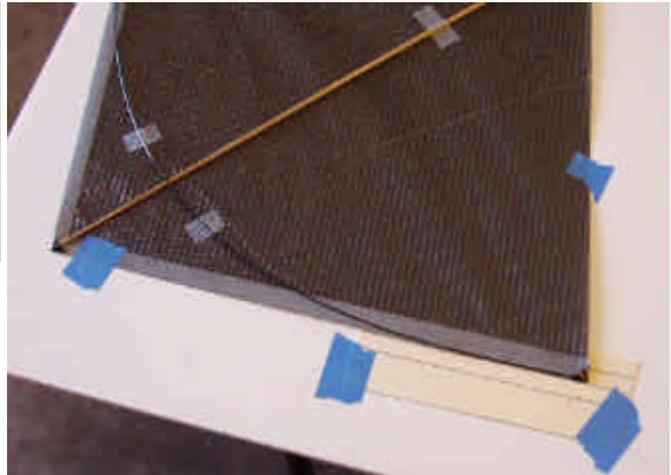


folder to your work surface so it won't move around. The lines should be facing up.

- Position the wingtip of your kite so the **leading edge** is aligned on the center line. You should be able to see the center line extending beyond the wingtip and one of the other lines will be under the kite and the other will be completely visible.

- Use a 6"x 2" (152.4mm x 50.8mm) scrap piece of the file folder and draw three 6" long parallel lines 3/8" (19mm) apart. These parallel lines will be used as a guide in positioning tape to bond the bow to the kite skin.

- After the lines are drawn, tape the piece of file



- Orient the front face of the kite so it's facing down toward your work surface. Align the kite's leading edge over the middle line on your guide; you should be able to see the center line extend beyond the wingtip slightly. You may want to use some low tack masking tape to secure your kite in this position.

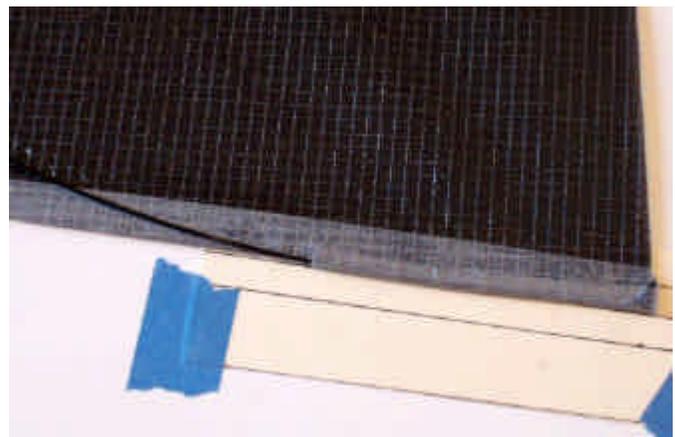
- Cut a 4-1/2" (114.3mm) long piece of 3/4" (19mm) wide tape. Adhere it to the tip of a toothpick. Hold the tape sticky-side-up with the toothpick. Lift up the leading edge of the kite slightly and position the edges of the tape's length so they are aligned and parallel with the two outside parallel lines on the paper guide. The middle line should be in the center the tape's

width. The tape is on top of the paper guide and under the kite's leading edge with the sticky side facing up and has a toothpick lightly attached to it.

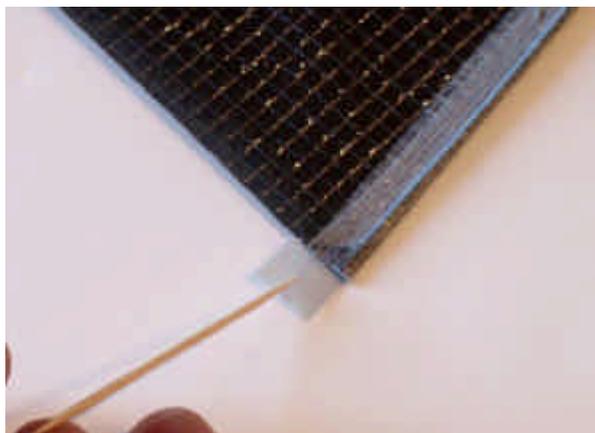
- Once you have the kite leading edge aligned with the center line of the guide and tape is in place, press the kite onto the tape and burnish.

Burnishing means to rub and smooth the kite skin onto the tape so it adheres well. You now have 1/2 of the tape exposed, sticky side up and the other half bonded to the front face of the kite along the leading edge, beginning at the wingtip and extending 4-1/2" (144.3mm) along the leading edge.

- Fold over the exposed half of the tape onto the



back side of the kite skin around the leading edge and bow. When folding it over the leading edge, where the bow is no longer at the edge, be careful not to bend the leading edge as you fold over the tape. Burnish it well. The tape bonds the bow to the kite skin.

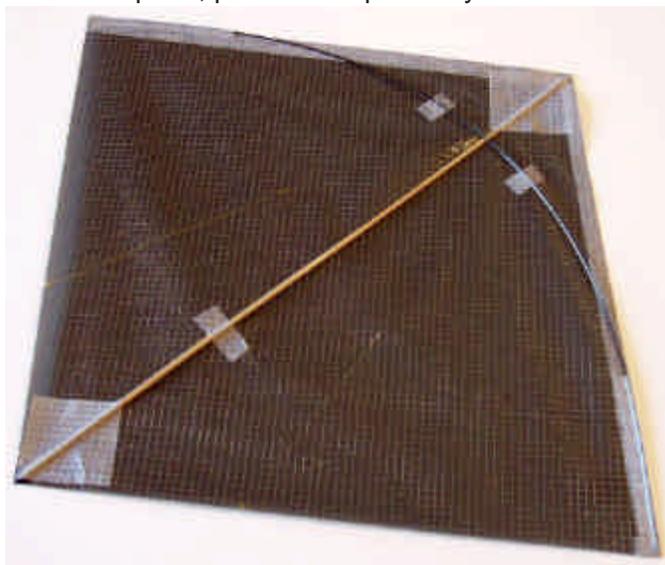


- Apply a 1"x3/4" (25.4mm x 19mm) piece of tape around the end of the wingtip; half of the tape on the front face of the kite and the other half on the backside.
- Repeat these two procedures on the other side of the kite.

NOTE: Explaining how to bond the bow to the kite skin makes the task seem long and maybe difficult, but doing it is actually easy and quick.

### SECURING THE SPINE TO THE KITE SKIN

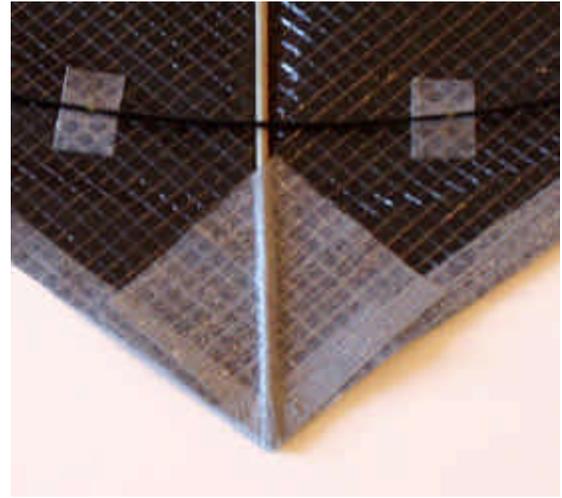
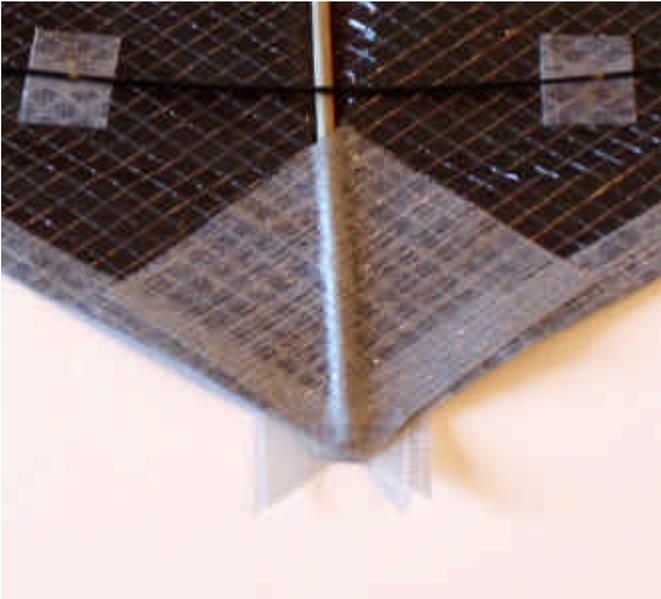
- Cut a 1" (25.4mm) long piece of 3/4" (19mm) wide tape. At the mark you made for the lower bridle connection point, place the tape sticky side down so the center of the spine is in the center of the tape; about 1/2" (12.7mm) from each end.



- Burnish it well around spine and onto the kite skin.
- Cut two 2" (50.8mm) long pieces of 2" (50.8mm) wide packing tape.
- On the back side of the kite at the nose, place one piece of tape, sticky side down, so the tape is diagonal, corner to corner, along the spine. Burnish well around the spine and onto the kite skin. Place the other 2" (50.8mm) square similarly on the backside of the spine diagonally along the spine at the tail of the kite.

- To add additional 'crash protection' to the nose of the kite add an additional 3/4"x1" (19mm x 25.4mm) piece of tape that begins on the front face of the kite and wraps around the nose and onto the backside of the kite, cut as shown.

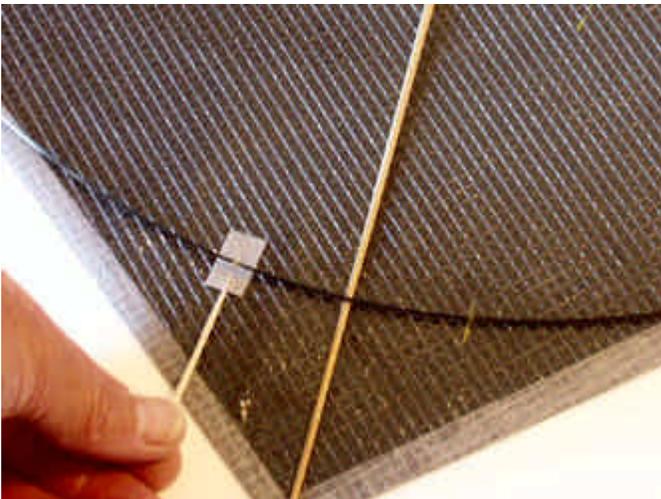




Or you can paint the nose of the kite with 'Tool Dip' or 'Liquid Electrical Tape' to add extra crash protection. Both of these products are sold at a Home Depot or most other hardware stores.

### PREPARING FOR BRIDLING

- Using a marker; put a small mark on the kite skin at the location of the silver marks you made on the bow. Locate the marks on the bow and directly below them on the backside of the kite skin make a mark.



- Cut 2 pieces of 3/4" (19mm) wide tape 3/4" (19mm) long.

- Using a toothpick, hold one piece of tape sticky side down. Center it on one of the marks you placed on the kite skin under the bow's bridle connection points. Press the tape onto the kite skin and burnish.

- Repeat for the other bridle connection point on the other side of the bow.

- The marks on the kite skin under the tape are the locations of the bridle holes for the upper bridle line. The tape is to reinforce the holes.

### MAKING THE BRIDLE

*NOTE: Running the bridle line through a piece of beeswax, candle wax or paraffin will make the knots hold more securely.*

#### The Upper Bridle Line or Yoke

- Cut a 12" (304.8mm) long piece of bridle line; Dacron, cotton or whatever line you plan to use.

- Thread a large eyed needle with your 12" (304.8mm) piece of bridle line. At the upper bridle connection mark on the kite's skin that is covered with tape, insert the needle from the front of the kite



so it slides along the edge of the bow closest to the tail of the kite.

- Wrap the line around the back of the bow and bring the needle through the backside of the kite skin to the front of the kite. When poking the needle through the skin from the back, the needle should rub across the top edge of the bow, the edge closest to the nose of the kite.



- Using a double half hitch or any other knot you know holds securely, tie the piece of bridle line to the bow. The knot is on the front of the kite.

- Slide the bridle line so it's on top of the silver mark on the bow.
- Repeat the steps above with the other end of the bridle line and the opposite side of the bow.



- **HOWEVER, before you tie** the second end of the upper bridle line to the bow, shorten the upper bridle line enough so when you pull the loop taut toward the nose, it won't quite reach the nose.

- Align the bridle line on the other silver mark on the bow and tie it securely.
- Trim the excess from both bridle knots. Usually, I leave about 1/4" (6.35mm)

of line after I trim it.

● Paint the bridle line on each silver mark on the bow with a drop of CA glue. Let it dry undisturbed. This secures the bridle line to the bow at the correct location.

● Apply a small drop of CA glue to the upper bridle line knots themselves to 'lock' the knot from slipping.

● You just completed the upper leg or yoke of the bridle.

### The Lower Bridle Line

● Cut a piece of bridle line about 24" (609.6mm) long, this will become the lower bridle line. Fold over about 5" (127mm) of one end and tie a figure eight or overhand knot to form a loop.



● Using a larkshead knot, secure the loop at the end of the lower bridle line to the center of the upper bridle yoke.

● Lock the larkshead knot as close to the center of the upper bridle yoke as you can. However, most likely the knot will need to be adjusted slightly during your initial flights in order to get the kite to fly in a straight path; this is normal and is part of adjusting your kite. (If you want details about optimizing the adjustments of your kite, please read my article about 'Optimizing the Performance of your Fighter Kite'.

● Thread the other or loose end of the lower bridle line into the needle eye. Insert the needle into the front side of the kite skin along one side of the spine at the location of the piece of tape at the lower bridle connection mark.

● Wrap the line around the backside of the spine and poke the needle from the backside to the front of the kite alongside the spine.



● Pull the end of the lower bridle line to shorten it so when the lower bridle line is pulled taut toward a wingtip of the kite, it won't quite reach the wingtip. It should be about 1/2" - 1" (12.7mm - 25.4mm) inboard of the wingtip.

● Tie the lower bridle leg to the spine using a double half hitch or any secure knot.

- Apply a drop of CA glue to the knot securing the lower bridle line to the spine. This will assure the knot will not loosen.

### **The Tow Connection Loop**

- Cut a 5"-6" (127mm – 152.4mm) length of bridle line. Fold in half and tie a figure eight or overhand knot to form a loop with a finished length of about 2"-3" (50.8mm – 76.2mm). Trim the tail ends leaving about 1/4" (6.35mm). This is the tow connection loop.
- Using a larkshead knot, secure the tow connection loop to the lower bridle line.

### **Two Pre-Flight Adjustments**

Carefully making these two adjustments will virtually guarantee your kite will fly well the first time it's launched.

- Position the tow connection loop on the lower bridle line so when the kite hangs by the tow connection loop it is at a slight angle with the tail hanging lower than the nose. The angle should position the nose of the kite about 1-1/4"-2" (31.75mm – 50.8mm) above your work surface when the tail of the kite is just touching the work surface. This is a generally reliable 'pre-flight' position for the bridle that will virtually assure your kite will fly the first time you launch it!
- After positioning the tow connection loop as mentioned above, put a slight 'rocker' shaped bend in the spine. The spine's bend is created by putting the front face of the kite against your stomach, then gently press on the backside of the spine at several points holding the gentle pressure for a few seconds at each point. The bend should be a slight rocker and should begin at the nose of the kite and extend about 7" (177.8mm) toward the tail. From about 7" (177.8mm) from the nose and extending to the tail, the spine should be straight.

THAT'S IT...

YOU'VE JUST COMPLETED THE F-3 COMPETITION FIGHTER KITE.....HAVE FUN FLYING IT!

If you have questions, here's where you can find me. [kitefighter@nwinform.net](mailto:kitefighter@nwinform.net) or [kitefighter@yahoo.com](mailto:kitefighter@yahoo.com)

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