

KITFOX AIRCRAFT

KITFOX SUPPLEMENTAL FABRIC COVERING INSTRUCTIONS

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Section A. Introduction

Covering your airplane with fabric can seem like a daunting task if you have never done it before. Although most builders find the process to be fairly easy and enjoyable, there are usually some questions and concerns before they begin.

In this chapter, we will address the most commonly asked questions. We will also give some specific details relating to covering the Kitfox.

For many years we have used and recommended the time-tested Poly-Fiber covering system. As this system has been well documented by Poly-Fiber, begin by reading completely through the book *How to Cover an Aircraft* by Jon Goldenbaum. You will likely read through it several times before you are finished, but this will give you a good idea of what the process will involve.

The main purpose of the fabric is to provide an aerodynamic covering for the flying surfaces of the airplane. If the fabric is not applied properly, your aircraft may be unsafe in flight. Take your time when covering and do the job right. One of the advantages of the Poly-Fiber method is that most errors can be easily corrected.

We recommend that you begin by covering the wings. The excess fabric that you will trim off the wings is enough to cover the horizontal stabilizer, elevator and rudder. Covering other parts of the airplane first can result in a shortage of fabric.

You may also wish to break up the covering process and do it while assembling other parts of the airplane. Covering the airplane is a fairly time-consuming process, and some builders prefer to do it in stages so that it does not seem repetitious or monotonous.

Although some components will have specific steps added to the covering process, the following outline covers all of the steps you will need to accomplish to cover the structure.

1. Properly prepare the surface(s) to be covered.
2. Cover the surface:
 - A. Bond the edges of the fabric to the structure.
 - B. Iron the edges where bonded.
 - C. Heat shrink the fabric.
 - D. Brush on the first coat of Poly-Brush.
 - E. Rib stitch (wings only).
3. Add doilies and reinforcement pieces for inspection holes and chafe protection.
4. Apply finishing tapes and heat smooth the edges.

The finishing of the fabric involves three steps:

1. Apply a spray coat of Poly-Brush.
2. Apply spray coats of Poly-Spray (silver-colored UV protection).
3. Apply paint.

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Figure A-1
Covered Parts

Note

Most pictures are shown without Razor Back installed

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Section B. Covering the Wing

- 1. Begin covering the lower surface of the wings as described in the Poly-Fiber manual. We suggest that you allow extra material along the leading edge that will allow you to wrap the fabric onto the top of the front spar, as shown in Figure B-1. Scallop the edge of the fabric so that it stops at the leading edge of each rib.
- 2. Sand the surface of the fuel tanks with 220-grit sandpaper, being careful around the spars. Clean the dust off and apply a coat of three parts Poly-Brush mixed with one part reducer.
- 3. Pre-coat each rib capstrip with Poly-Tak.
- 4. After attaching the lower fabric to both the leading and trailing edges, cut slits in the fabric that are just large enough to allow the ears of the lift strut brackets to pass through. See Figure B-2.
- 5. Apply two coats of the Poly-Brush/reducer mixture to the fabric reinforcing plates that you made during the wing assembly process. Once dry, place the plates as shown in the wing assembly manual on the **inner** surface of the lower wing fabric using Poly-Tak.

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Figure B-1
Leading Edge Overlap with
Scallops to Clear Ribs



Figure B-2
Fabric Cut to Allow Lift Strut Bracket
Ears to Protrude

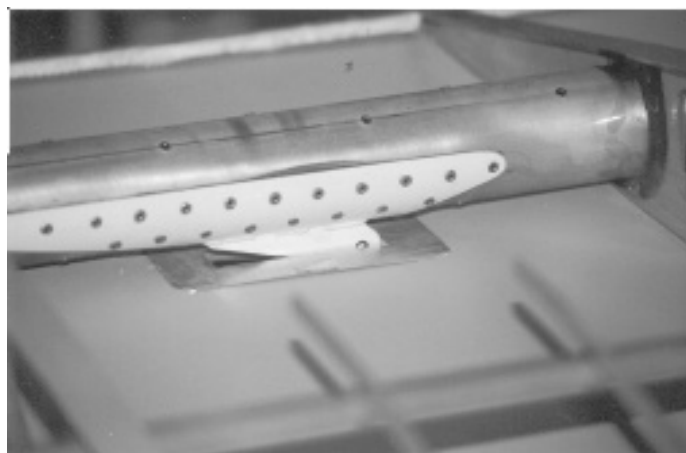


Figure B-3
Fabric Reinforcing Plate

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6. After you have attached the fabric and have applied heat to all of the bonded areas, do the initial heat shrinking of the fabric on the lower surface of the wing by heating it to 250°.
7. Make a cutout in the fabric on the upper surface of the wing to clear the fuel tank fill neck with a razor blade.
8. Do not bond the fabric on the upper surface of the wing to the top of the fuel tank. Bond it to the capstrips of the ribs on both sides of the tank and the partial rib (rib #2).
9. Do not completely cover the root rib (#1) with fabric. Heat form the fabric around the edge of the rib capstrips and bond it to the inner surfaces of the wood. Trim the fabric where it contacts the rib web. If you are installing wing tips, do the same with the fabric on rib #10.
10. Do not do the final heat tightening of the fabric on the wings at temperatures above 325°. Doing so can cause the aluminum trailing edge of the wing to deform.

NOTE

You can achieve the final 350° fabric tension if you bond sections of aluminum tubing in the gap of the aluminum trailing edge pieces. This aluminum should be $\frac{3}{8}$ " diameter and have a wall thickness of .028" to .035". See Figure B-5.

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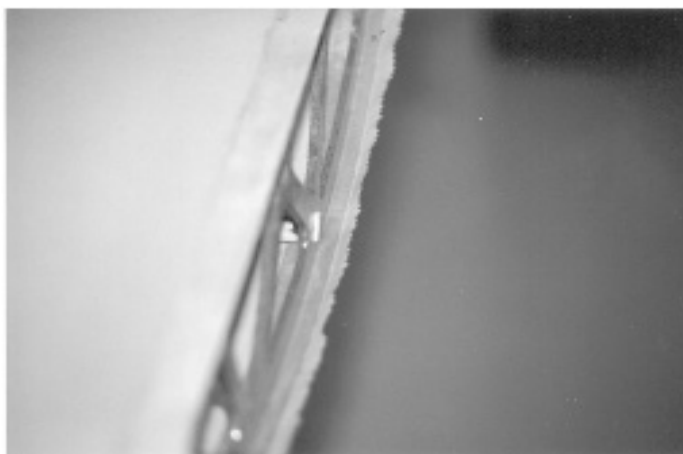


Figure B-4
Fabric to be Heat Formed and
Bonded Around Capstrip of Rib #1

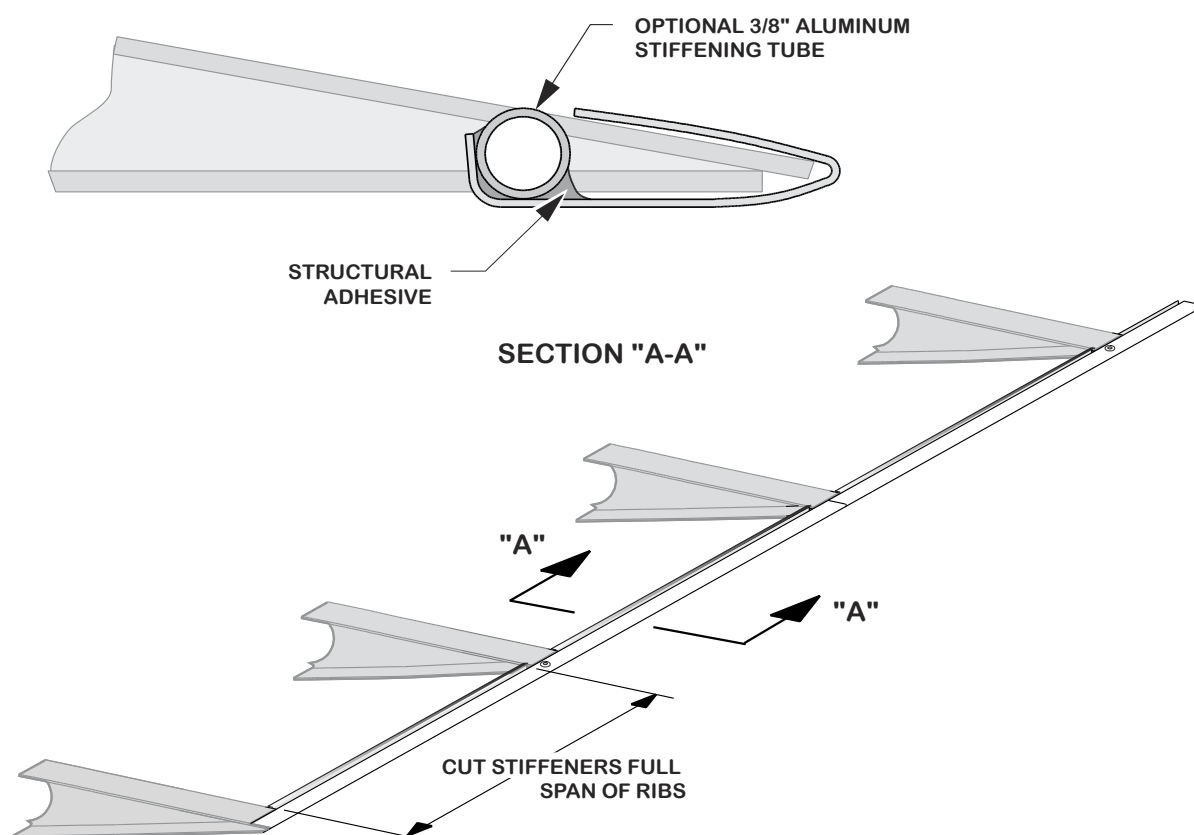


Figure B-5
Wing Trailing Edge with
Optional Stiffener Tubing Installed

11. If your wings will have wing tips, melt small holes in the fabric and rivet the aluminum mounting strips to the capstrip of rib #10 using the hardware called out in the wing chapter of your assembly manual. See Figure B-6.
12. Although Kitfoxes have not required rib stitching on the wing ribs in the past due to the fabric being bonded to the 1" wide capstrips, Poly-Fiber and Kitfox Aircraft recommend that you secure the fabric to the rib capstrips by rib stitching. Refer to the Poly-Fiber manual for the proper method of doing this.
13. After you have done the final heat tightening and stitched the fabric to the ribs, place the finishing tapes on the wings as described by Poly-Fiber. Add the tapes to the ribs and false ribs before adding the leading edge tape. Always remember, place the further-forward tapes on last to help keep the slipstream from working its way underneath further back tapes. Use 2" tapes over the ribs, 2" and 4" tape over the leading edge, and 4" tape on the trailing edge. For the false ribs, cut 2" tape in half to make 1" wide tapes. Refer to Figure B-7.

NOTE

You may wish to order an optional roll of 6" wide tape and cover the leading edge of the wing with a single tape. You can also purchase a roll of 1" wide tape for covering the false ribs. Contact Kitfox's customer service department for ordering information.

14. On the upper surface you will need to add a reinforcement "doily" around the fill neck of the fuel tank. Add reinforcements on the lower surface of the wings at the fuel tank sump, lift strut brackets, jury strut brackets, pitot tube, and fuel tank drain.
15. You should add inspection cover rings on the lower surface of the wings. You may wish to install one or two, or you can place one in every other wing bay between the ribs. We like to use 2 per wing, one at the lift strut attach area and one over the tank at the finger strainer for future use should the strainer need to be replaced. One should be placed near the pitot tube. Keep the rings aft of the lower false ribs, if installed.
16. Add a drain hole in the lower fabric at the aft, outboard edge of each wing rib. You can cover them with drain grommets as desired for a more professional look.
17. Heat smooth all of the finishing tapes and doilies.

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Figure B-6
Wingtip Mounting Strips Riveted to Rib #10 Capstrip

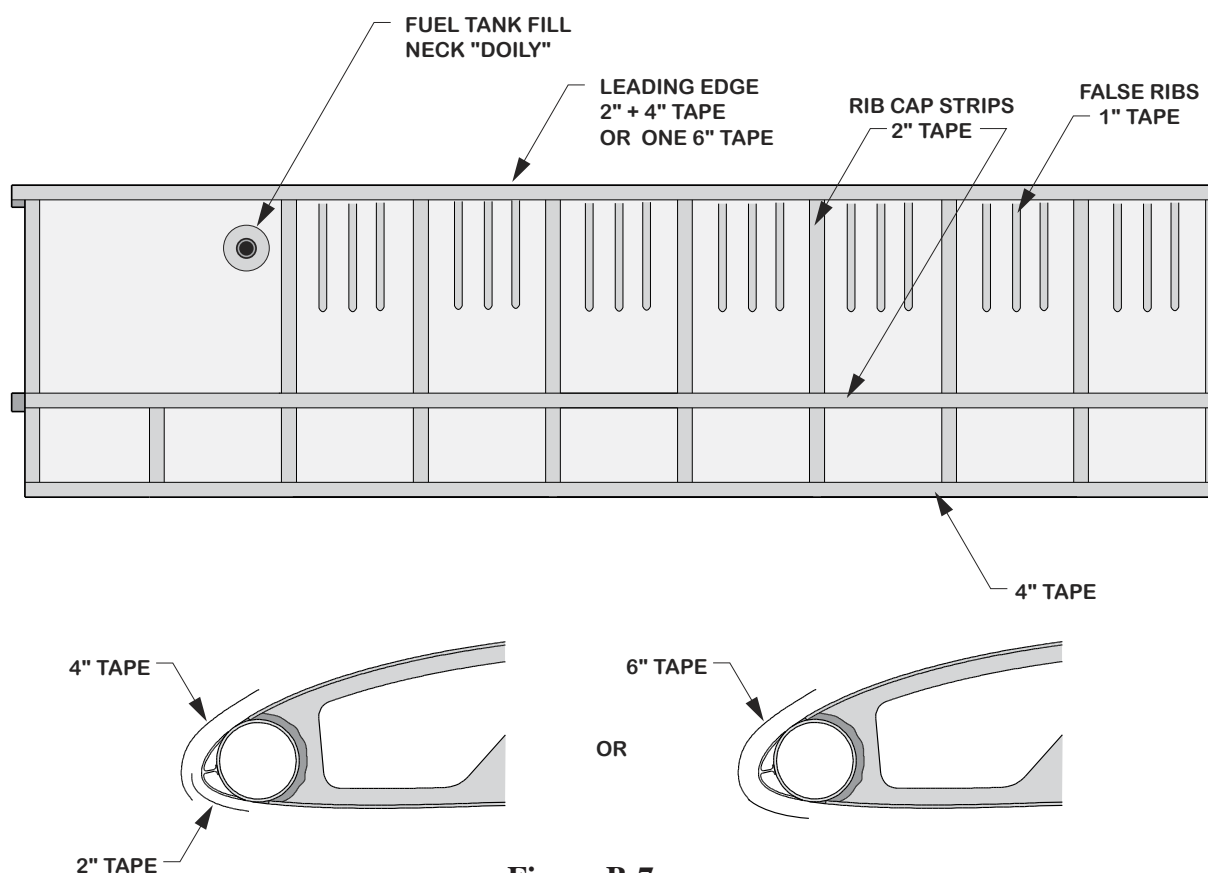


Figure B-7
Wing Finishing Tape Details
(Top View)

Section C. Covering the Fuselage Belly

The fuselage will be covered using the "blanket" technique described in the Poly-Fiber manual, and no sewing is required. The belly of the fuselage will be covered first, followed by the sides, and then the top.

- 1. With the fuselage inverted, roll the fabric along the entire length as indicated in Figure C-1. Trim around the edges of the fuselage, allowing about 3" excess, and clamp the fabric in place. Save the fabric removed in a clean location for later use. The fabric will stop at the first transverse tube behind the front of the airframe, as shown.
- 2. Attach the fabric to the "tangential point" of the perimeter of the structure (Figure C-4) with Poly-Tak, gently pulling the slack out as you proceed to remove the wrinkles. Work the Poly-Tak into the weave thoroughly. If Poly-Tak flows along the inner edge of the tube and bonds the fabric below the tangential point, don't be concerned. This can be fixed quite easily. First, when the fabric is heat tightened later the tension of the fabric may cause the bond to separate up to the tangential point. If not, applying a small amount of MEK to the fabric over the area below the tangential point will cause the bond to release.
- 3. It is a good idea to place an inspection ring to allow access to the rear idler bellcrank for maintenance or adjustment.

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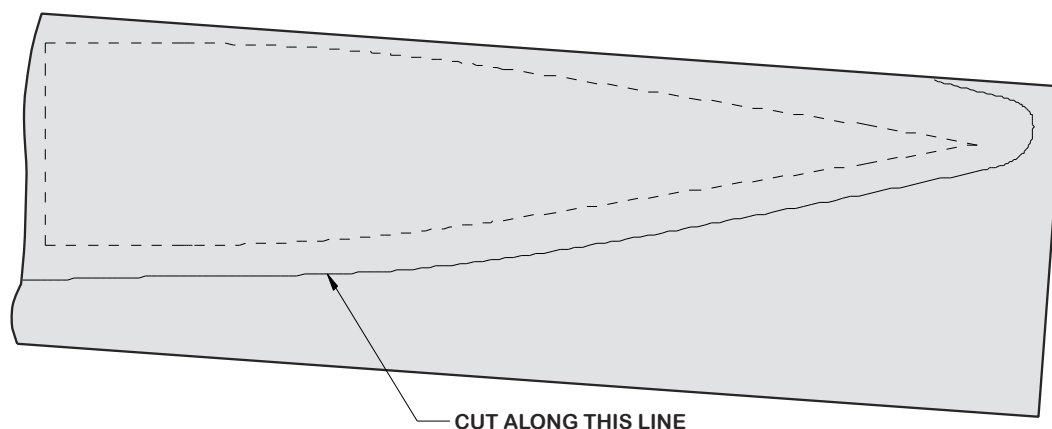


Figure C-1
Fuselage Belly Fabric Cut Pattern

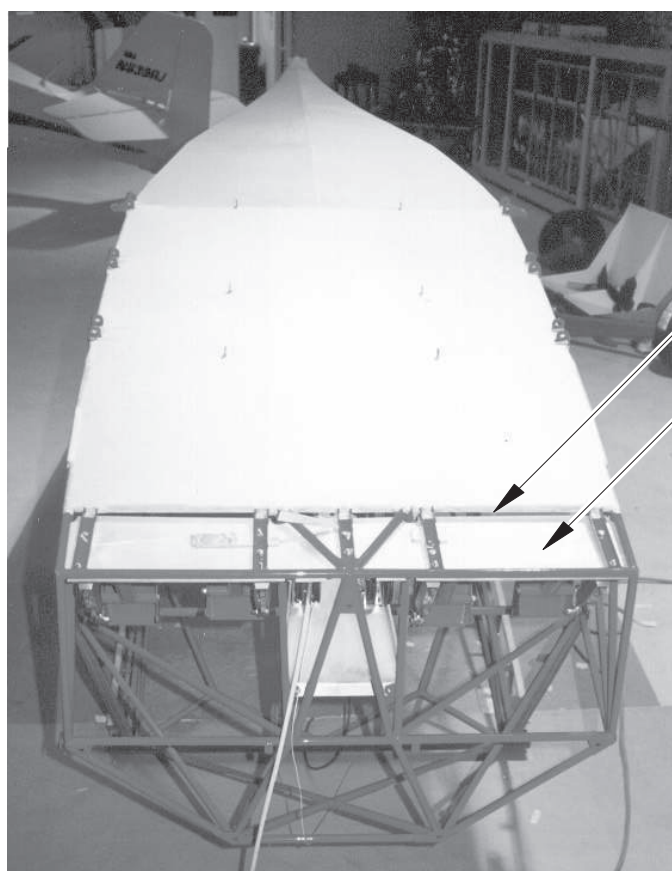


Figure C-2
Series 7 Belly Fabric Forward Termination

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- 4. Make cutouts in the fabric to allow it to be formed around tubing intersections and brackets as shown. You may also need to make relief cuts in the fabric to allow it to wrap around the structure without causing wrinkles to form. Heat form the fabric around the perimeter of the fuselage.
- 5. Trim off the excess fabric, making sure the fabric will wrap ³/₄ of the way around each tube. Bond the remaining portion of the fabric to the tubes using Poly-Tak.
- 6. Heat tighten the fabric up to 350°.
- 7. Use the tip of a hot soldering iron to melt slots in the fabric where any mounting tabs are located on the belly of the aircraft.

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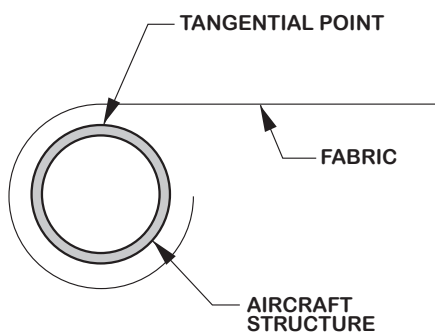


Figure C-4
Fabric Interface with Structure



Figure C-5
Fabric Cut to Clear Structure

Figure C-6
Fabric Cuts to Wrap Around
Tubing Clusters

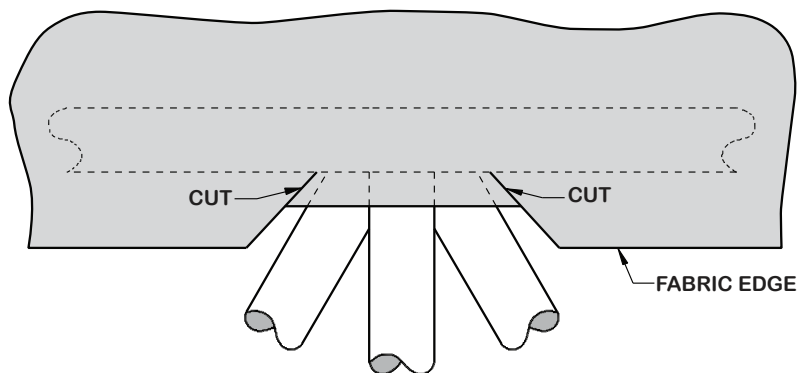


Figure C-7
Completed Fabric-to-Structure Bond

Section D. Covering the Fuselage Sides

1. Prep the aluminum door angles and aluminum quarter window angles with Poly-Brush as described in the Poly-Fiber manual.
2. Roll fabric along the side of the fuselage, similar to what was done on the belly. Clamp the fabric and trim to shape. You should trim the fabric so that it does **not** extend onto the vertical stabilizer, as it will be covered separately later.
3. Tack the fabric to the airframe along the tangential point of the structure. Trim the fabric to overlap the belly fabric by 1", and trim the top to wrap $\frac{3}{4}$ of the way around the structural tubing. If you have aluminum door angles, trim the fabric so that it will wrap completely over the square structural tubing. Although challenging, you can continue the side fabric up to the Razor Back. This will remove the underlying seam where the top and the side pieces would overlap. Be careful when you heat tighten not to distort the Razor Back.
4. Make cuts in the fabric to allow it to pass over the tabs, brackets, and bushings of the fuselage, as shown.
5. Bond the remainder of the overlapping fabric to the structure and belly fabric and heat tighten as before.

NOTE: The trim actuator can be accessed from above through the tail access area if needed. Some have chosen to place an inspection ring to allow for easier access if needed.

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Figure D-1
Fabric Rolled Out and
Trimmed on Side of Fuselage



Figure D-2
Fabric Trimmed around
Door Opening



Figure D-3
Cutouts for Rudder Stop and
Tailwheel Spring Plate

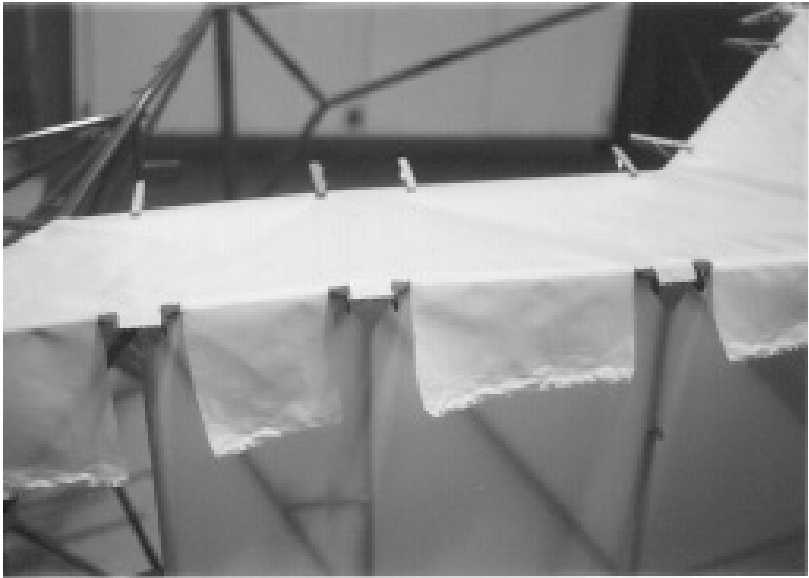


Figure D-4
Fabric Trimmed to Fit
Around Mounting Brackets



Figure D-5
Trimming Fabric for Proper
Overlap Along Longerons



Figure D-6
Front End Details



Figure D-7
Bonding Side Fabric
Overlap to Belly



Figure D-8
Rear End Details



Figure D-9
Completed Sides

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Section E. Covering the Fuselage Top

- 1. Cover the area on the top of the fuselage with a piece of fabric that will extend from the aft end of the turtledeck to the tail access opening and across the razor back to the side upper longerons.
- 2. Mark the sides of the fabric where it will be trimmed to overlap the sides of the fuselage with a straight edge and carefully cut along the lines. This edge will be visible underneath the finishing tape, and any variations in the edge will be noticeably visible.
- 3. Place a 2" finish tape along the forward edge of the top cover.
- 4. Install the turtle deck angle at this time. Refer to the Final Assembly Section G, Turtle Deck. Body work the angle for a finished look. Apply another piece of 2-3" finish tape over the angle to conceal and blend it into the fuselage covering.

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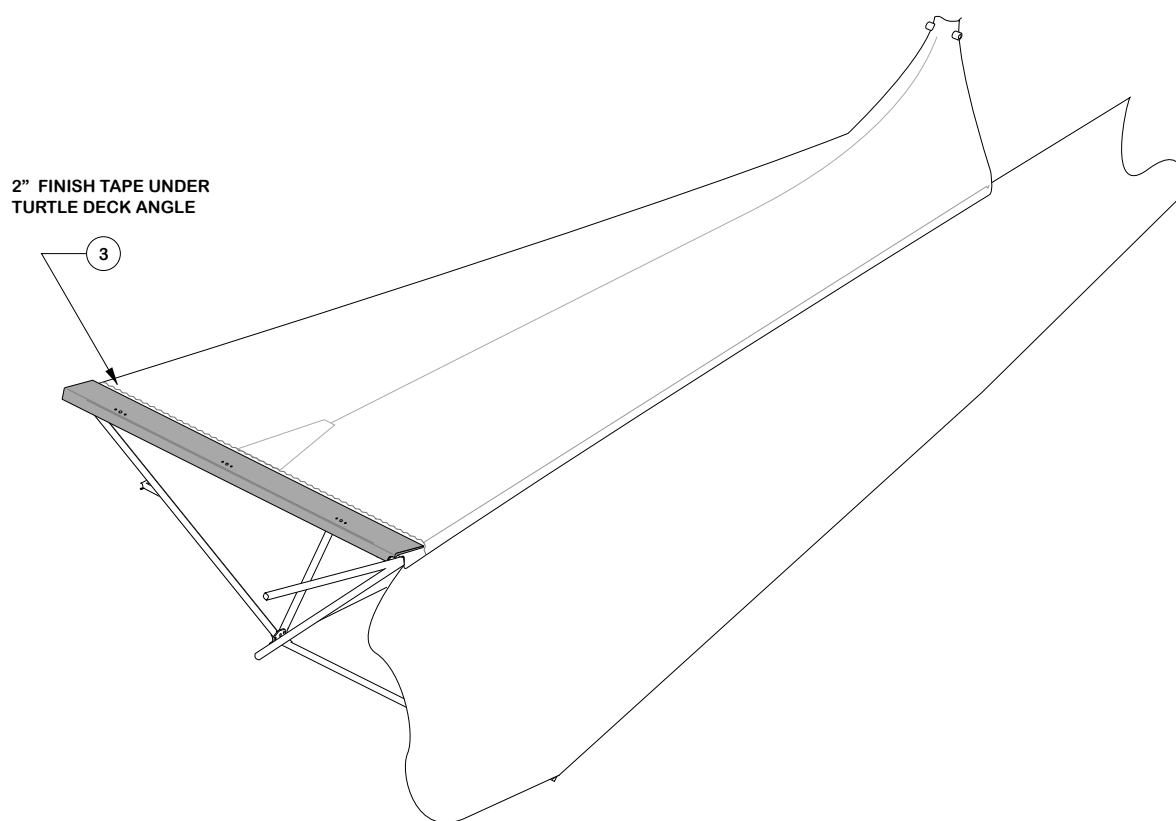


Figure E-1
Top Cover and Turtle Deck Angle Installation

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- 3. To cover the area at the base of the vertical stabilizer, begin by cutting a piece of fabric that will cover both sides of the stabilizer. Bond the fabric securely to the leading edge of the stabilizer tube, as shown in Figure E-4.

NOTE

Figures E-4 through E-7 depict the covering procedures for the Super Sport aircraft without the Razor Back installed.

NOTE

Some builders prefer to cover this area using two separate pieces of fabric - one for each side of the stabilizer. This is acceptable, as there will be a finishing tape placed over the leading edge of the stabilizer later.

- 4. Melt a hole in the fabric where it will pass over the wing lock-back brace bushing with the hot tip of a soldering iron.
- 5. Pull downward and rearward to remove the slack from the fabric. While holding the tension, bond the fabric to the structure using Poly-Tak. Continue to pull on the fabric while the Poly-Tak dries.
- 6. Heat tighten the fabric.

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Figure E-4

Bond Fabric to Leading Edge of Vertical Stabilizer



Figure E-5

Melt Hole to Clear Bushing



Figure E-6

Pull Tension on Fabric and Bond Around Perimeter

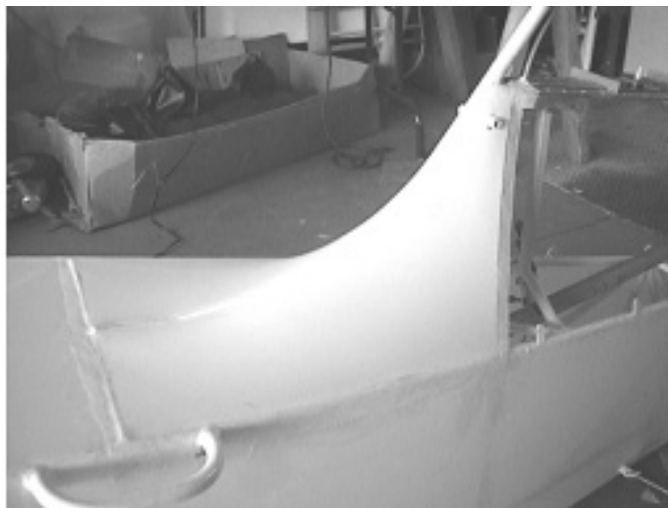


Figure E-7

Heat Tighten Fabric

Section F. Covering the Vertical Stabilizer

- 1. You can cover the vertical stabilizer using a piece of fabric on each side or a single piece wrapped around the leading edge. Using a single piece, however, can be somewhat more difficult to form the fabric around the curve and top of the stabilizer. Make relief cuts in the fabric along the radius to allow it to form smoothly around the structure as shown.

NOTE

If you have a molded fiberglass fairing on the trailing edge of the stabilizer, coat it with Poly-Brush as described in the Poly-Fiber manual before bonding the fabric to it.

- 2. Heat tighten the fabric in the usual manner on both sides of the stabilizer, bringing both sides up to the same temperature before increasing to the next higher temperature level.

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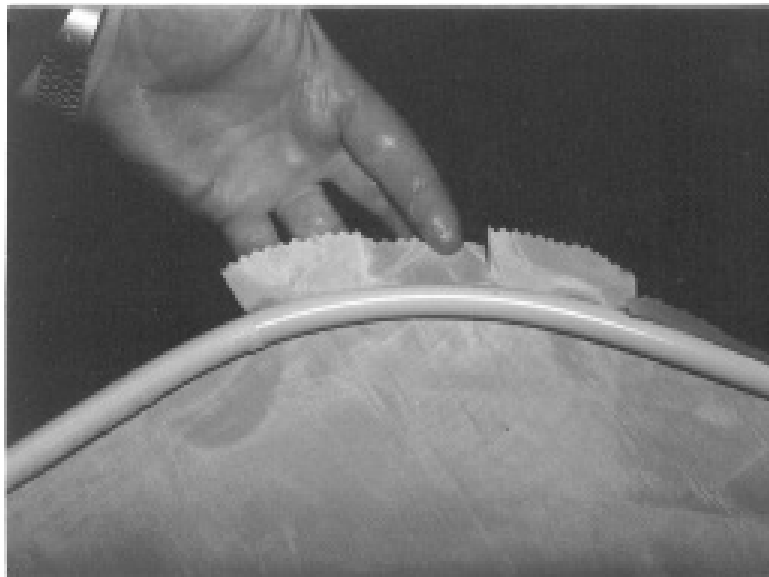


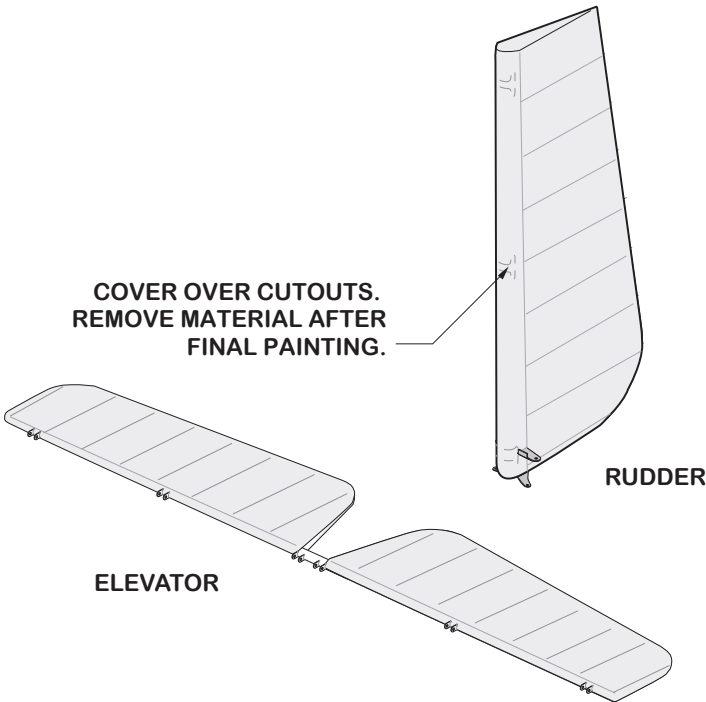
Figure F-1

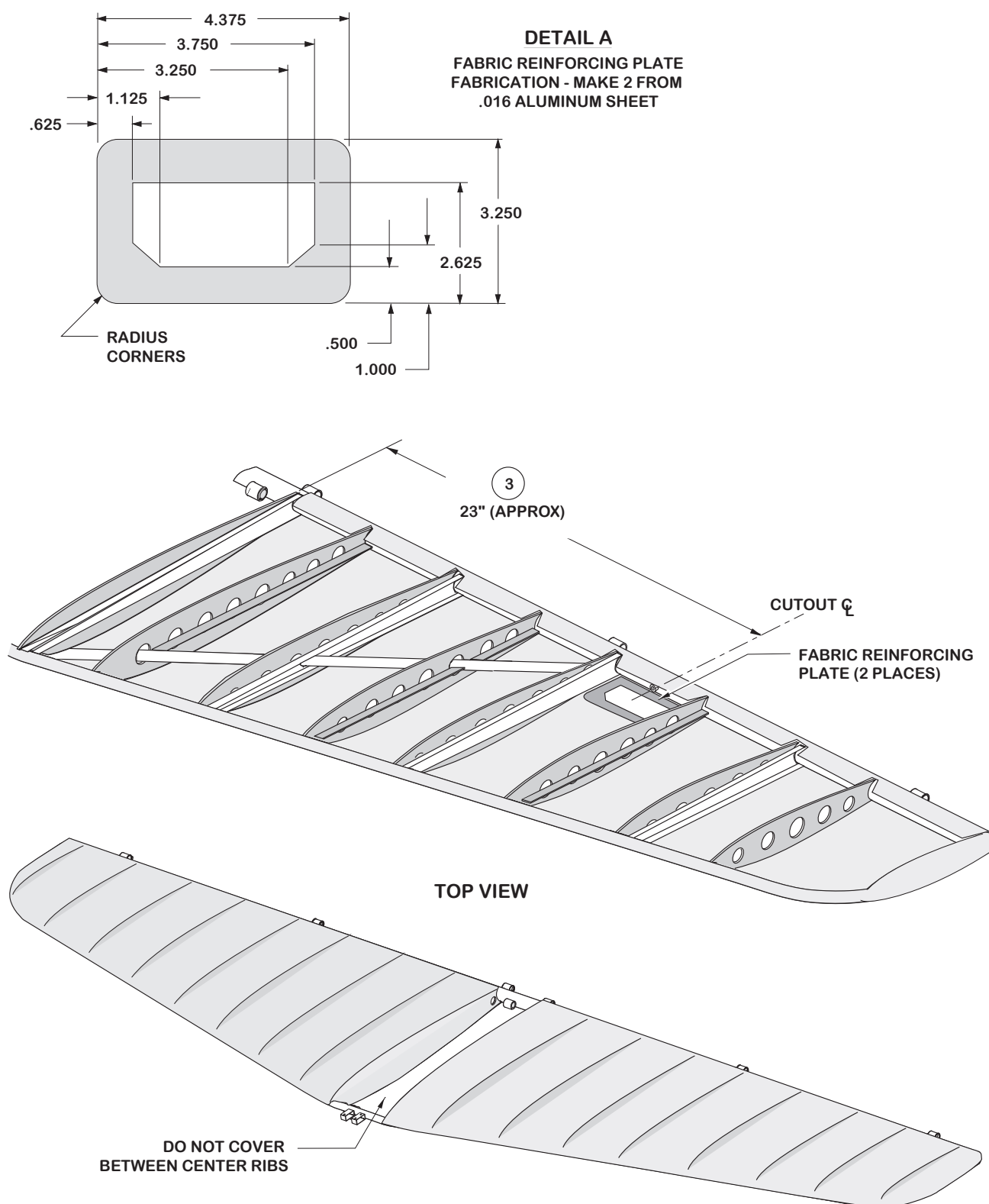
Forming the Fabric around the Top of the Vertical Stabilizer

Section G. Covering the Rudder, Elevator, and Horizontal Stabilizer

1. Cover the bottom side of the horizontal stabilizer using the techniques described in the Poly-Fiber manual.
2. Fabricate two fabric reinforcement plates as shown in Figure G1, Detail A.
3. Apply two coats of the Poly-Brush / reducer mixture to the fabric reinforcing plates. Once dry, place the plates on the inner surface of the lower horizontal stabilizer fabric behind the tail brace attach points using Poly-Tak. Line up the inboard edge of the reinforcement plate with the edge of the fifth rib. The cutout of the plate will be slightly offset from the tail brace attach point to allow the horizontal stabilizer brace to angle toward the fuselage. Remove the fabric from the cutout area after heat tightening. (See Figure G1.)
4. Continue to cover the upper horizontal stabilizer using the techniques described in the Poly-Fiber manual. Figure G1 shows the completed horizontal stabilizer covered.
5. Cover the elevator and rudder. You can cover each side of the elevator and the rudder using either one or two pieces of fabric, silimilar to how your covered the vertical stabilizer. (See completed components below.)

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FINISHED HORIZONTAL STABILIZER

Figure G-1
Horizontal Stabilizer with
Fabric Reinforcement Plate Installation

Section H. Covering the Butt Ribs

Covering the butt ribs is one of the more challenging parts of the Kitfox. There is a variety of methods to achieve the end result of closing in the butt rib area. Also, having many different lines and irregular shapes in a rather small area contributes to the difficulty. To successfully cover the butt ribs, take your time to prevent making mistakes that will cause you to start a given segment of the process over again.

- 1. You may want to cover the **inner** face of the butt rib prior to riveting it to the fuselage. If already installed, the **outer** face can be covered. This surface can also be covered with a variety of finish materials such as fabric, plastic, or wood. Whatever is used, be sure to open the center window to allow viewing of the fuel sight gauge. See figure H-1.
- 2. To enclose the entire butt rib area, you may wish to fabricate aluminum cuffs for the front and rear ends of the butt ribs using scrap pieces of .020" aluminum. The purpose of the cuffs is to close out the area between the butt ribs and the structure of the airframe, as shown in Figures H-2 and H-3. You may find it easier to make templates out of a heavy bond paper or non-corrugated cardboard initially and trim them until the desired shape is achieved. The shape of the templates can then be transferred to the aluminum. Keep in mind as you are fitting the cuffs that they must not interfere with the wing spars.
- 3. Once you are satisfied with the shape of the cuffs, prep the mating surfaces of the cuffs, butt ribs, and airframe structure and bond them in place with structural adhesive mixed with flox. Clamp the cuffs in place while the adhesive cures.

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Option Butt Rib Closeouts

Kitfox offers an aluminum Butt Rib Closeout. Part number 73503.000 that can be used rather than fabric covering the closeout between the butt rib and the fuselage. This simplifies this step and we do not install the front or rear butt rib cuffs.

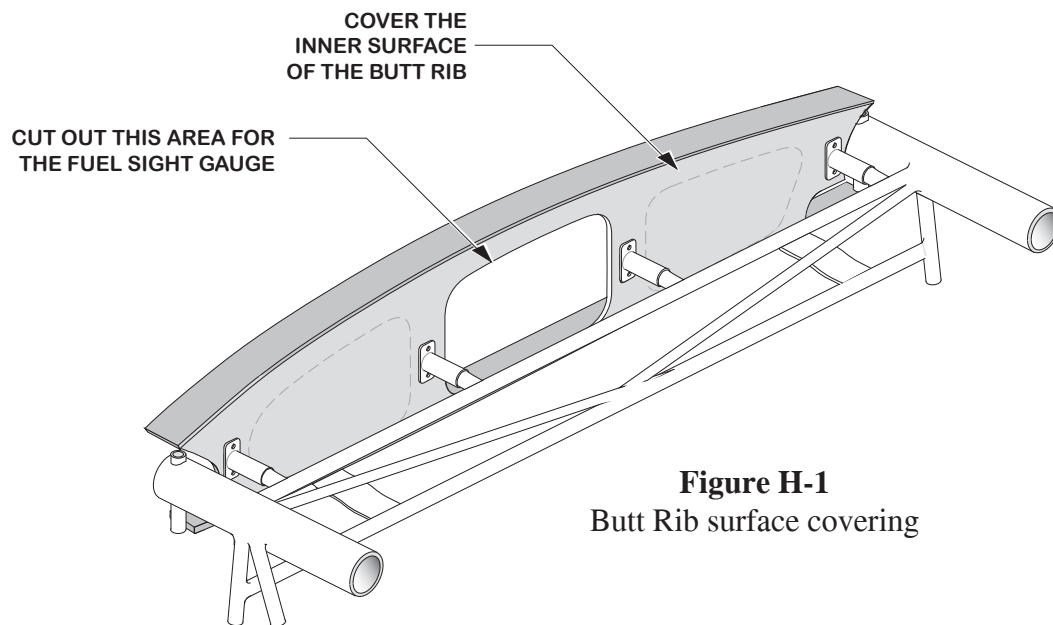


Figure H-1
Butt Rib surface covering

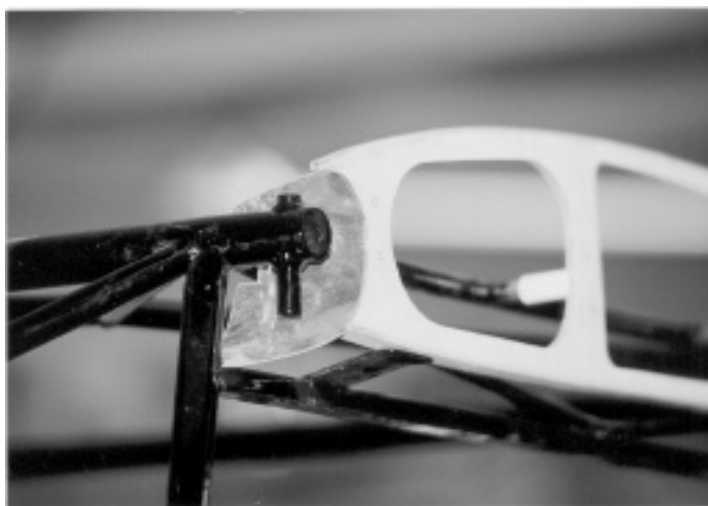
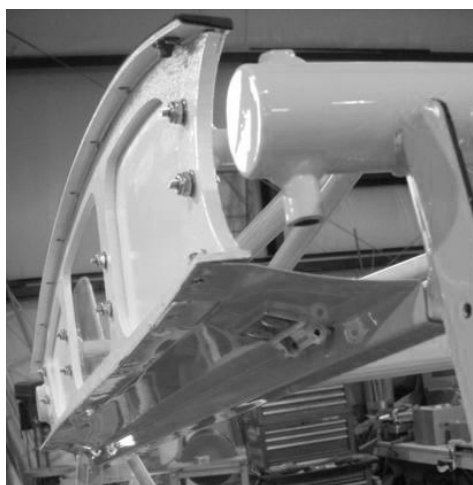


Figure H-2
Front Butt Rib Cuff



Optional Butt Rib Closeout



Figure H-3
Rear Butt Rib Cuff

- 4. Cover the bottom side of the butt rib from the lower butt rib cap strip to the fuselage door frame. Wrap the fabric up and over the cuffs if they are installed. See Figure H-4.

NOTE:

A preformed aluminum butt rib closeout filler panel is available for covering the bottom butt rib to the fuselage. Part number 73503.000
Contact Kitfox Aircraft for ordering information.

- 5. Heat tighten the fabric. As the area of fabric is relatively small, it may not get as tight as the other parts of the airplane that you have covered. Heat the fabric to 350° to get it as tight as possible.

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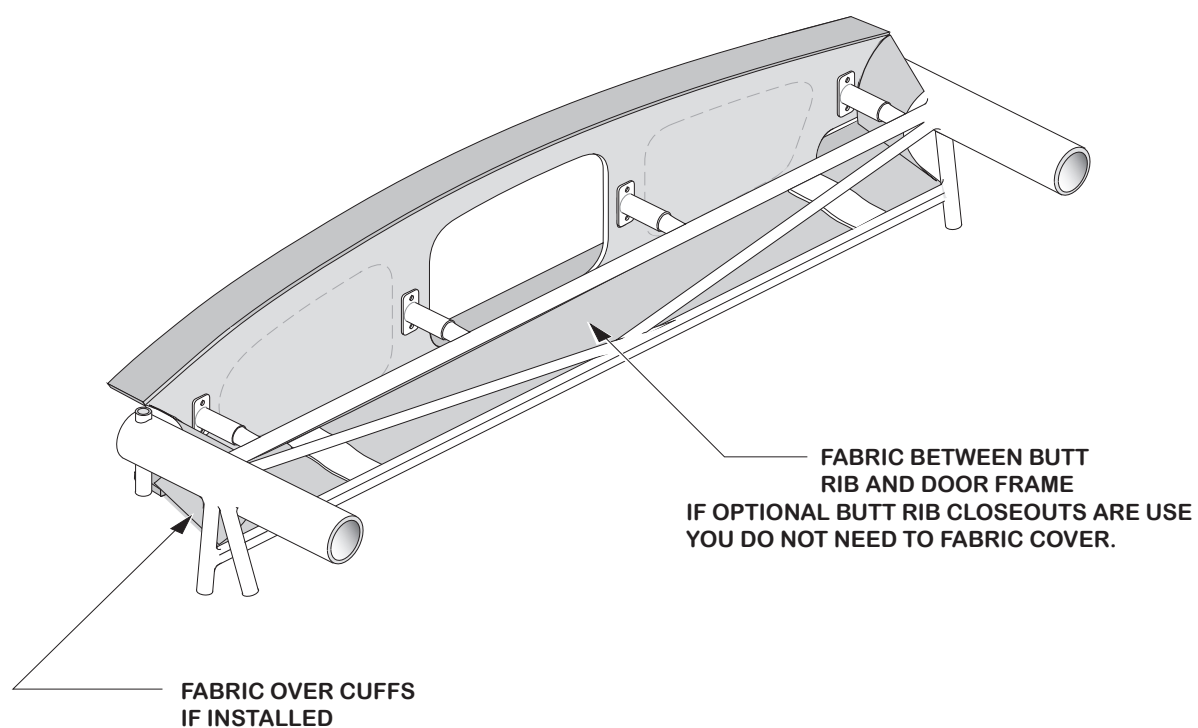


Figure H-4
Covering the Lower Butt Rib to Fuselage Gap

Section I. Finishing Tapes, Gussets, and Doilies

Place the finishing tapes, gussets, and doilies on the fabric using the procedures described in the Poly-Fiber manual. You need to have one of these forms of reinforcement over **every** place where the fabric lies over a structural member of the aircraft or where there is an opening in the fabric.

As a general rule, you will use 2" finishing tape over all of the tubes of the fuselage, horizontal stabilizer, elevator, and rudder. Use 4" tape on the leading and trailing edges of the vertical and horizontal stabilizer, rudder, and elevator. You may wish to use a 3" bias tape on the leading edge of the vertical stabilizer and trailing edge of the rudder as it tends to form more easily around the radiused shapes.

To have nice, straight lines to place the finishing tapes, you may want to use a 2" wide clear, plastic straight edge with a centerline drawn on it, as shown in Figure I-1. By placing the centerline of the straight edge over the structural member to be covered, you can simply draw a straight line on either side of the member. This will ensure that the finishing tape will be centered along the length of the structure.

Refer to the following photos to get further specific information regarding the placement of the reinforcement pieces and inspection rings on the aircraft. You should place an inspection ring on the lower, left side of the empennage near where the horizontal stabilizer strut attaches to the fuselage. Place another on the belly of the empennage. If you installed a static port in the side of the empennage, install this ring below the port location. The wing inspection ring locations are described in Section B.

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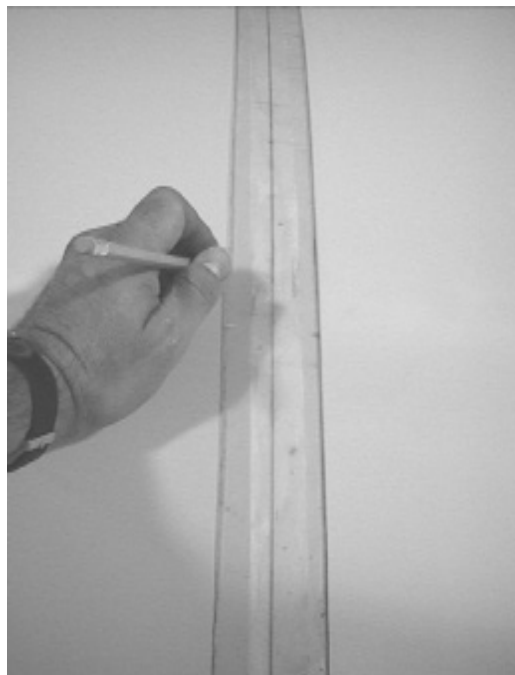


Figure I-1
Clear Straight Edge for Marking
Finishing Tape Locations

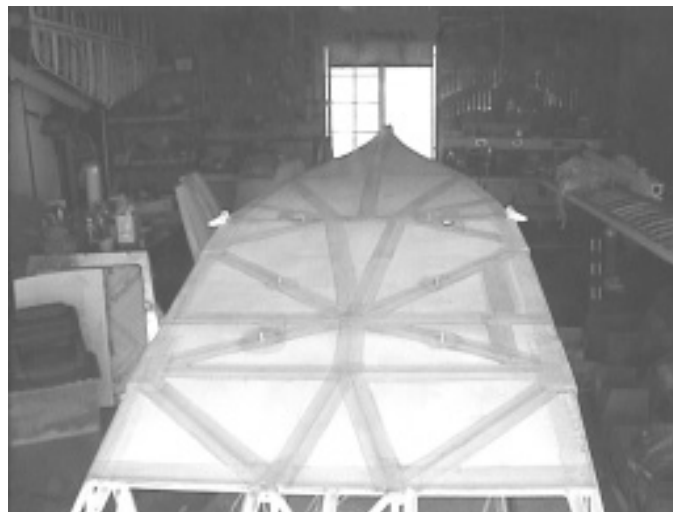


Figure I-2
Fuselage Belly Finishing Tapes



Figure I-3
Fuselage Side Finishing Tapes

Figure I-4
Finishing Tape on
Lower Longeron

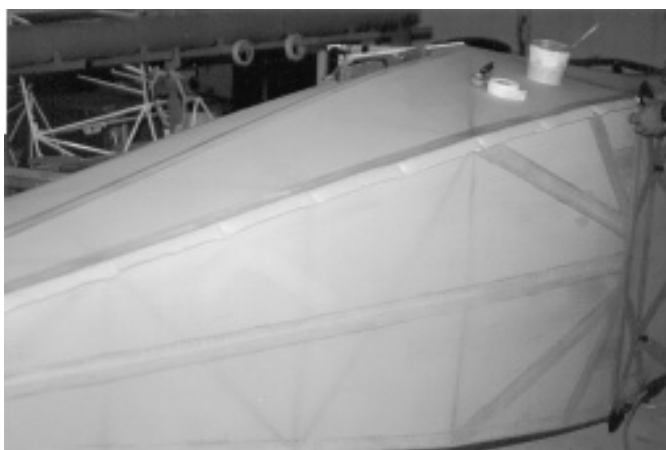




Figure I-5
Finishing Tapes around Door Frame



Figure I-6
Horizontal Stabilizer Strut Doily

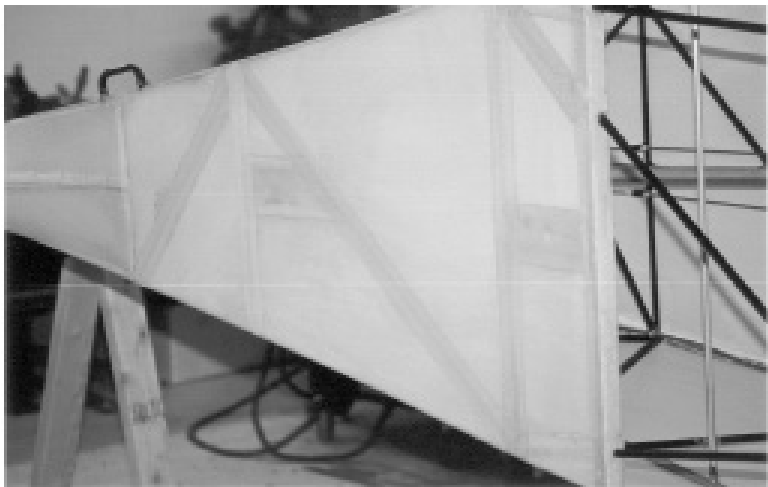


Figure I-7
Fuselage Top Finishing Tapes



Figure I-8
Vertical Stabilizer Finishing Tapes

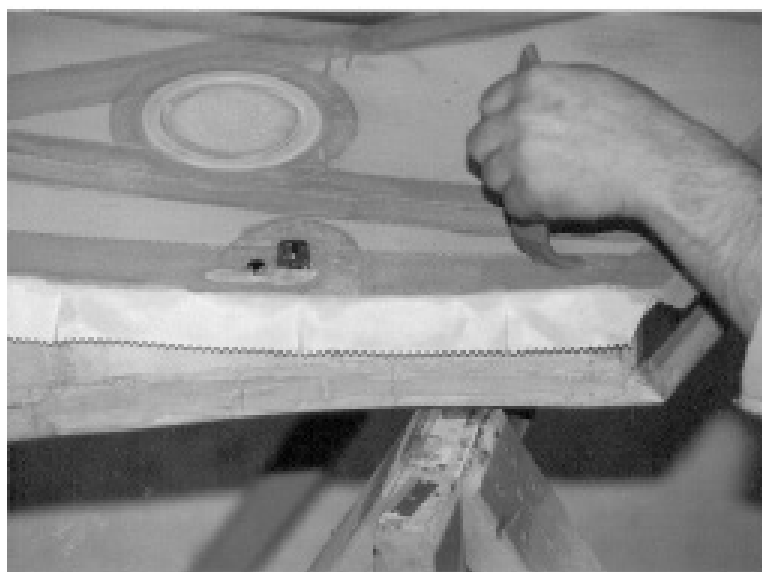


Figure I-10
Empennage Finishing Tapes - Series 7

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Figure I-11
Elevator Leading Edge Finishing Tape

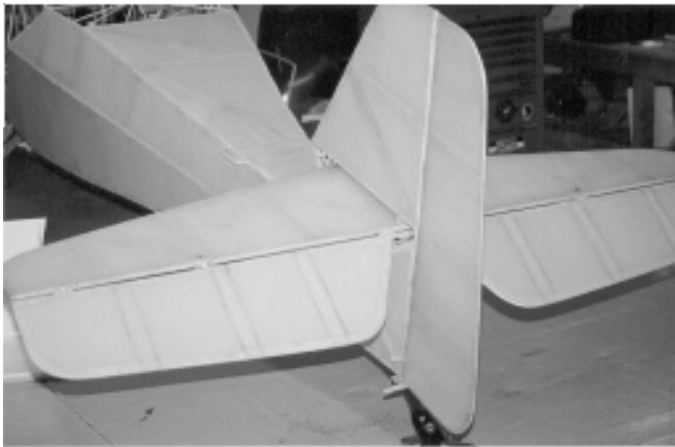


Figure I-12
Horizontal Stabilizer and Elevator Finishing Tapes