CHAPTER 18
(Pressurized version)
REVISION LIST

The following list of revisions will allow you to update the Lancair IV construction manual chapter listed above.

Under the "Action" column, "R&R" directs you to remove and replace the pages affected by the revision. "Add" directs you to insert the pages shown and "R" to remove the pages.

Page(s) affected	Current Rev.#	Action	Description
18-1	0	None	
18-2	P3	R&R	Added NOTE after Figure 18:i:1
18-3 thru 18-17	0	None	
18-2	PB 9	R&R	Revised

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CHAPTER 18
WINDOWS
(Pressurized version)

REVISIONS

From time to time, revisions to this assembly manual may be deemed necessary. When such revisions are made, you should immediately replace all outdated pages with the revised pages. Discard the out dated pages. Note that on the lower right corner of each page is a "revision date". Initial printings will have the number "0" printed and the printing date. All subsequent revisions will have the revision number followed by the date of that revision. When such revisions are made, a "table of revisions" page will also be issued. This page (or pages) should be inserted in front of the opening page (this page) of each affected chapter. A new "table of revisions" page will accompany any revision made to a chapter.

ARROWS

Most drawings will have arrows to show which direction the parts are facing, unless the drawing itself makes that very obvious. **"A/C UP"** refers to the direction that would be up if the part were installed in a plane sitting in the upright position. In most cases the part shown will be oriented in the same position as the part itself will be placed during that assembly step. However, time goes on and changes are made, so careful attention should be paid to the orientation arrows.

CONTENTS

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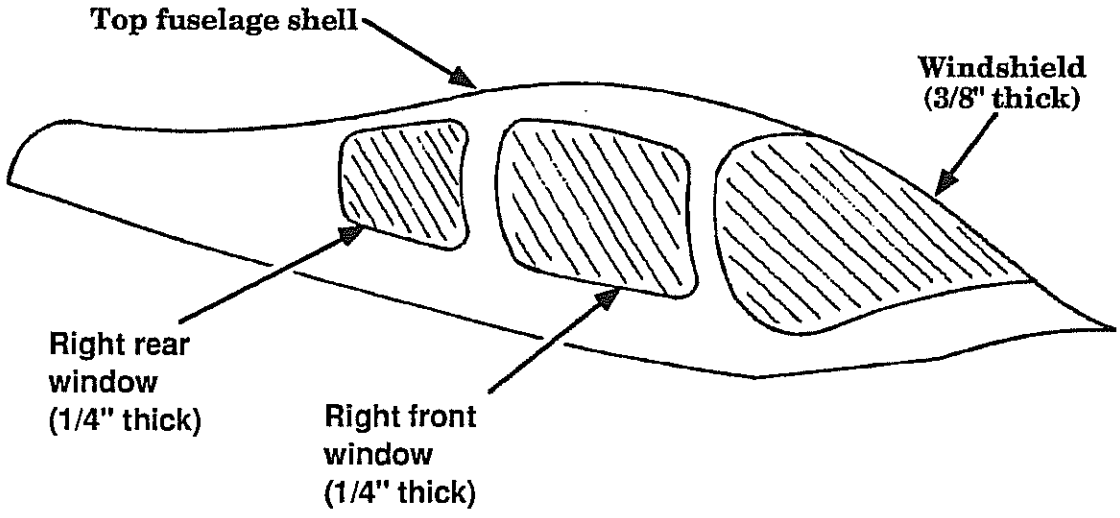
1. INTRODUCTION

There are five windows to be installed in the top fuselage shell (one windshield and four side windows. This chapter deals with the installation of the windshield, right side windows, and the left rear window. The left front window is installed during the cockpit door construction in Chapter 28.

A protective film is applied to all windows at the manufacturer. This is a water-based protectant and should be left on the windows until you have completed the airplane to avoid nicks and scratches.

Windows
Figure 18:i:1



NOTE: The pressurized Lancair IV has thicker side windows than the unpressurized version. If you have a pressurized IV, please double check that you have the 1/4" thick side windows (the unpressurized side windows are 3/16" thick). The windshield of both versions are the same thickness.

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2. SPECIAL PARTS, TOOLS & SUPPLIES LIST

A. PARTS

1 Upper fuselage shell
1 Windshield (3/8" thick)
2 Forward side windows (1/4" thick)
2 Aft side windows (1/4" thick)
Lower fuselage assembly

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B. TOOLS

High speed angle grinder
40 grit abrasive wheels for angle grinder
Drill
3/16" drill bit
Dremel tool
Drum sander

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C. SUPPLIES

Epoxy
Hysol
Micro
Flox
MC
40 grit sandpaper
Paper towels
Fiberglass
Electrical tape
Mixing cups
Tongue depressors

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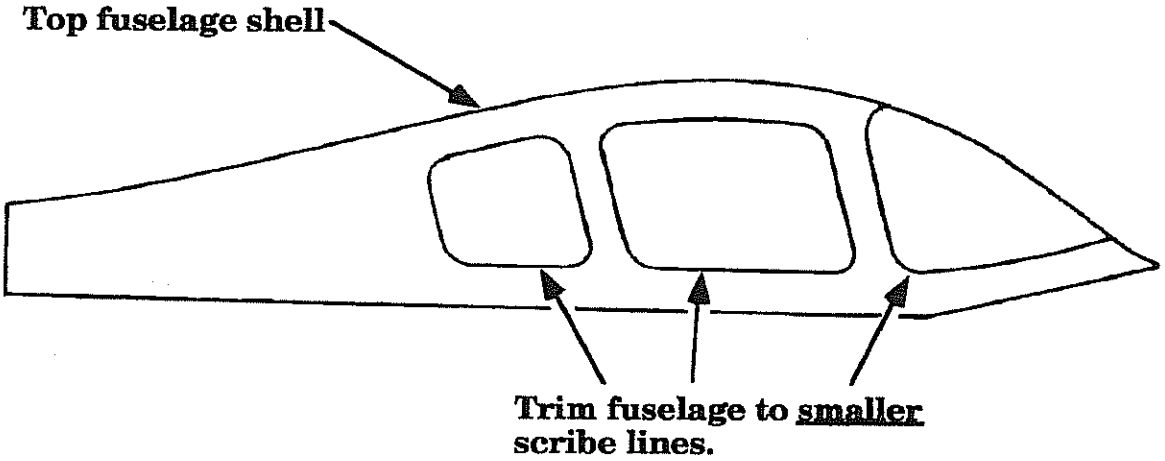
3. CONSTRUCTION PROCEDURE

A. PREPARING UPPER FUSELAGE SHELL

The window outlines are scribed into the upper fuselage shell. The smaller outlines are intended for the pressurized version.

Upper fuselage shell
Figure 18:A:1



A1. Trim the upper fuselage shell to the window scribe lines. Some earlier fuselages have two sets os scribe lines. For the pressurized version, you must trim the top shell to the *smaller* scribe lines. Be careful, the edges of the fuselage shell are sharp! A drum or flapper wheel type sander works well for sanding the radius in the window corners.

A2. Place the upper fuselage shell upside down on a low bench so you can easily reach the inside surface around the window areas.

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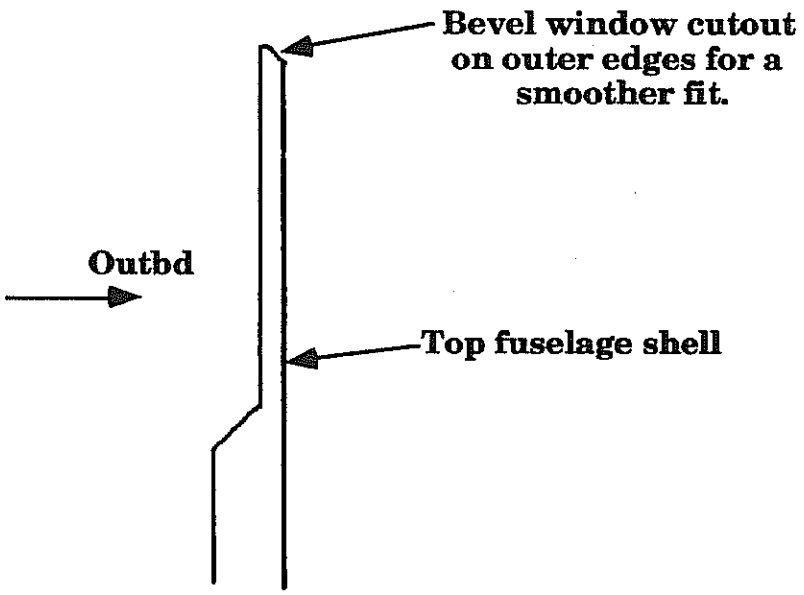
Trimming to window scribes
Figure 18:A:2



A3. Bevel the edges around the window cutouts about 45°. Later, after the windows are installed, you will have to some more careful trimming of these edges.

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B. PREPARING WINDOWS

The windows provided in your kit are oversized and must be trimmed down before bonding them to upper fuselage shell.

Here's some do's and don'ts for handling plexiglass that have been learned from much ($$) experience.

DO: Leave the protective barrier on as much of the windows as possible for as long as possible.

DO: Cut the plexiglass with a band saw or an angle grinder. The band saw should have a fine tooth blade an be set on low speed.

DO: Always keep the plexiglass held firmly against the working surface when cutting or trimming. An old section of carpet on your work bench lessens the danger of scratching the plexiglass.

DON'T: Cut plexiglass with a reciprocating blade, like a saber saw.

DON'T: Drill holes through plexiglass. It's too easy to crack.

DON'T: Clean plexiglass with acetone or MC. They may not seem to affect the surface, but these chemicals dry out the plexiglass and cause later discoloration. Cleaning should be done with isopropyl (rubbing) alcohol.

B1. Set the windows into their respective locations. On pressurized versions, the windows must be 2" larger than the cutouts. This will provide a 2" wide bond between the windows and fuselage. For cutting large areas of plexiglass, a band saw works well. For the smaller trimming jobs, use an angle grinder with a 40 grit abrasive wheel. And ***be careful!*** The plexiglass is tough stuff, but if you try to cut too fast, or drop a window on the floor, the plexiglass can break. It is also a good idea to remove the protective barrier *only* in the areas that you are cutting or grinding. This will prevent the protectant from contaminating later bonds.

Note: Take your time cutting and trimming the windows. If you are rushed, then you are more likely to damage the windows. More than one builder has lost control of a high speed grinder and permanently engraved the plexiglass with unwanted graphics.

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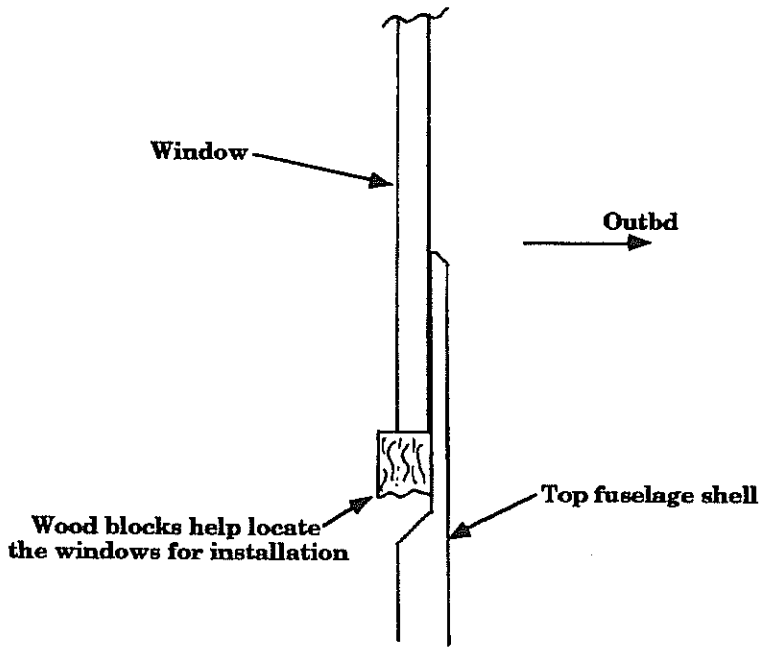
Fitting windows

Figure 18:B:1



NOTE: The drawings in this chapter will all show one, generic view of a typical window installation. All side windows and the windshield are installed similarly, (bonded from the inside of the top fuselage shell).

B2. Carefully locate the windows in the upper fuselage shell. Use instant glue to bond a few temporary wood locating blocks (1/2" x 1/2" x 1/2") to the fuselage. These blocks will hold the windows in place and free up your hands for other work.

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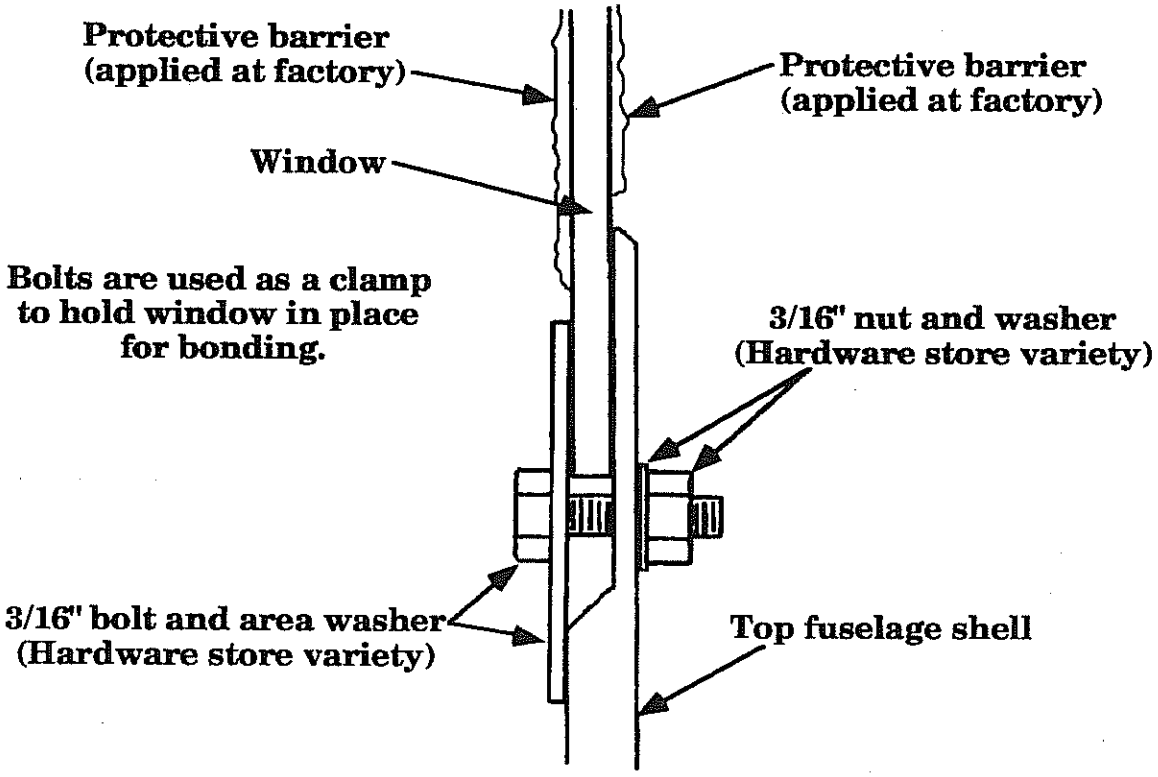
B3. To clamp the window against the fuselage when bonding, use 3/16" diameter bolts (hardware store variety is fine). Drill 3/16" diameter holes every 4" around the perimeter of the windows. The holes should be centered about 1/4" away from the edges of the plexiglass. Don't drill through the plexiglass!

Using bolts to clamp windows in place
Figure 18:B:2



B4. Do a trial clamping run with no adhesive to figure out the proper lengths of the bolts. Large area washers should be inserted on the bolts, then the bolts should be slid through the holes you drilled around the windows. Insert the bolts *from the inside*. Use small washers and nuts on the outside surface to tighten the bolts. There will be gaps in some areas around the perimeters of the windows, especially around the windshield, but these gaps will be filled with adhesive. Because of the differences in ply thickness, it would be impractical to try to get a perfectly even recess around all the windows. Do not grind away carbon fiber thickness to get a flusher fitting window!

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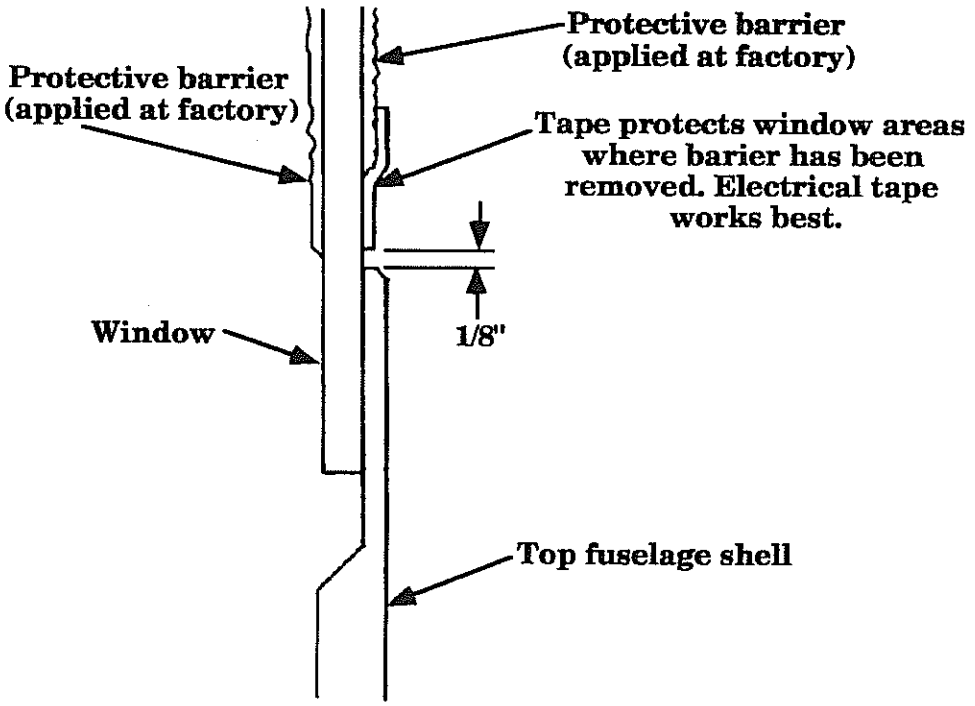
B5. While you have your windows located, draw a reference line on them showing the edge of the cutouts. You will use this line to trim away the protective material.

B6. Remove the windows from the top fuselage shell.

B7. Peel away the protective material from the both inner and outer surfaces of the windows in the bonding areas as shown in Figure 18:B:3. There should be a 1/2" clear space between the protective material and the bonding areas. Use the reference line you drew in Step B5 as a guide for removing the material.

Protecting windows from adhesive
Figure 18:B:3



B8. Apply a layer of 1/2" wide electrical tape to the outer surface of the windows, covering the narrow clear areas between the protective barrier and the edges of the fuselage cutouts. The edge of the electrical tape should be held just short (1/8") of the cutout edges. After the windows have been glued in, the tape will be removed, leaving a sharp, clean edge around the windows. So treat the masking tape application carefully and make the corners smooth and round.

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B9. Clean the bonding areas of the windows with alcohol. Clean right up to the electrical tape.

B10. Use 40 grit to sand the bonding areas of the windows. Sand thoroughly so no "glossy" areas remain. Be careful while sanding up to the electrical tape edges not to damage the tape.

B11. Reclean the bonding areas of the windows with alcohol. The windows are now ready to be installed.

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C. WINDOW INSTALLATION

The windows are bonded in position with Hysol structural adhesive. The bond is reinforced with 4 BID from behind.

C1. With 40 grit, sand the inner surface of the upper fuselage shell where the windows will be bonded.

C2. Clean all bonding areas with MC. (Except the windows, of course. These are cleaned with alcohol.)

Note: You don't have to bond all the windows in at the same time. If you're alone, best not push your luck and stick to bonding one or two windows in at a time.

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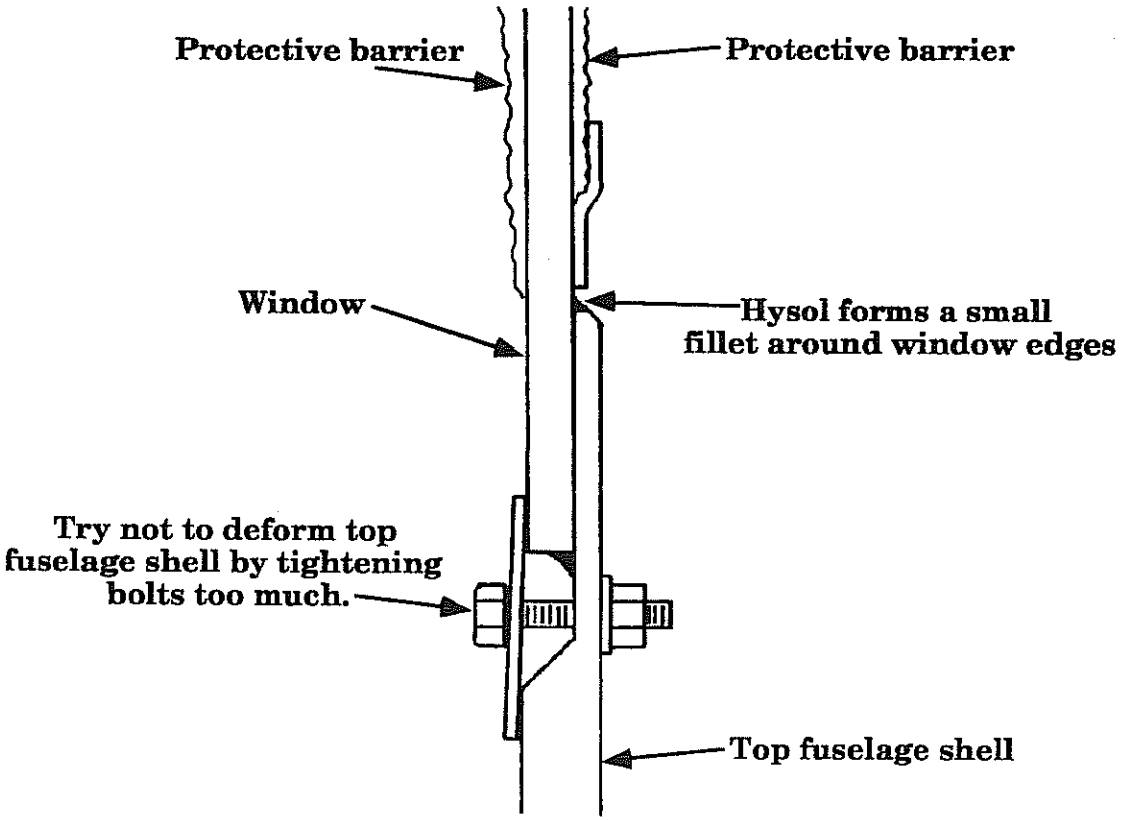
C3. Bond the windows to the fuselage with Hysol. A little flox mixed in with the Hysol helps with consistency. Snug up the clamping bolts just enough so you get a squeezeout, but not so the outer surface of the fuselage is deformed. If there is still Hysol squeezeout but no skin deformation, tighten all the nuts just a bit more and recheck.

Use a modified tongue depressor to scrape away the excess Hysol and form a small radius around the perimeter of the fuselage cutout. Scrape away enough Hysol so the edge of the electrical tape is visible. Don't let you any drips or yucky fingers touch the unprotected plexiglass.

While the windows are curing in position, you should place the top fuselage shell in position on the bottom fuselage and secure with a few clecoes. This will hold the top shell at it's proper width and prevent undo stresses on the windows.

Bonding in windows
Figure 18:C:1



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C4. After the Hysol has cured, remove the top fuselage shell from the bottom and put it back on the low workbench.

C5. Remove the clamping bolts around the windows.

C6. With 40 grit, sand the inner surface of the windows and the top fuselage shell where the 4 BID reinforcement will be applied. Remember, there should be no glossy surface left in the plexiglass area that will receive the laminates. It is highly suggested that you apply a layer of electrical tape to the inner surface of the windows around the perimeter of the fuselage cutouts (just like you did on the outer surface before bonding). This electrical tape will keep wayward epoxy or fiberglass off the clear unprotected surface.

C7. With alcohol, clean the plexiglass where the BID tapes will be applied. Clean the carbon fiber areas of the fuselage with MC.

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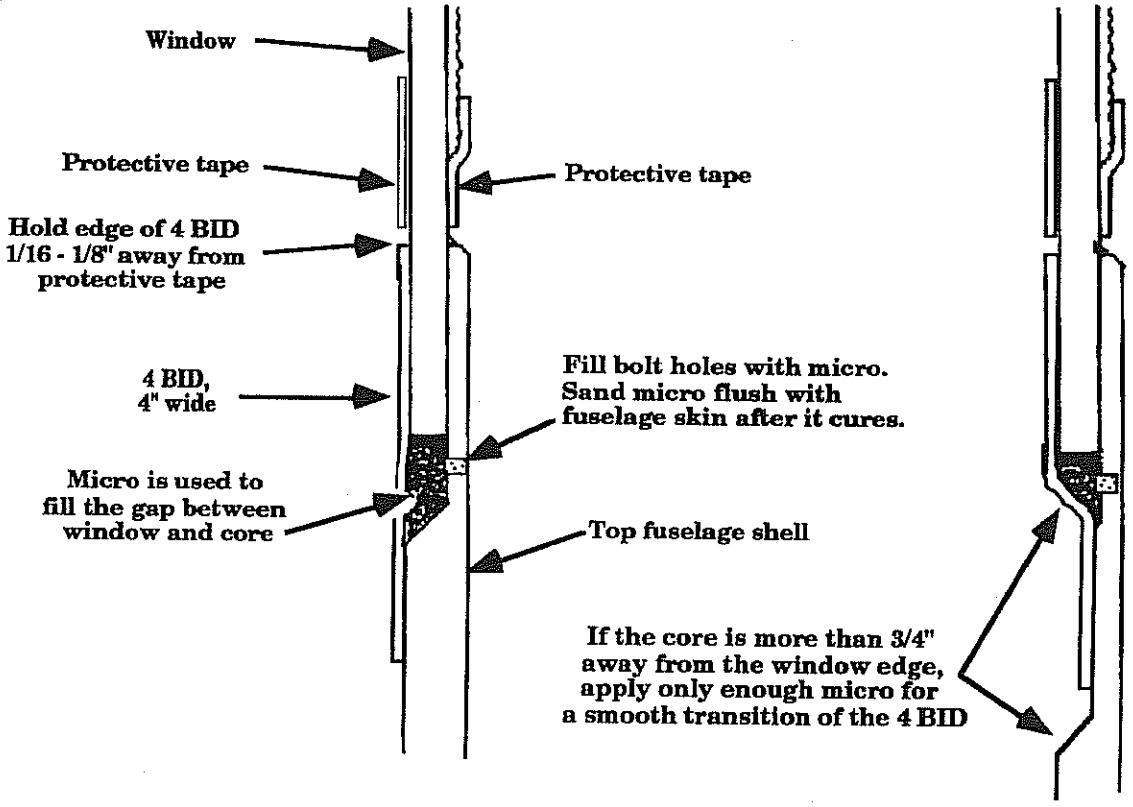
C8. Fill the area between the edges of the plexiglass and the fuselage core with a thick epoxy/micro mixture as shown in Figure 18:C:2. If the distance from the outer edge of the windows to the beginning of the fuselage core is greater than 3/4", filling the entire depression is not necessary, just apply a micro radius around the window edge for a smooth BID transition. This micro will also fill the bolt holes in the fuselage.

C9. Apply 4 BID, 4" wide strips to reinforce the bond between the windows and the fuselage shell. It would be impossible to do these laminates in one piece for each window, so segment the laminates and overlap them onto each other by 1". Use the electrical tape as a reference. Carefully position the edges of the 4 BID laminates in a straight line, about 1/16 - 1/8" away from the edge of the masking tape. Using a gentle touch on the fiberglass, it's fairly easy to get a good straight edge and save yourself some tricky sanding later. Another time saving suggestion is to use peel ply on these laminates for a smooth finish if you later want to simply paint around the windows.

Reinforcing window/fuselage bond
Figure 18:C:2



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C10. For a nice, finished look to the outer edges of the window cutouts, bevel the edges with a folded piece of 80 grit sandpaper. Of course, you must be very careful not to scratch the unprotected plexiglass. You can also apply a small amount of epoxy/micro around the edges of the windows. The micro is much easier to sand than Hysol. Another round of applying protective electrical tape before sanding is worth the effort. You could still sand through the electrical tape, but it's better protection than nothing.

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