# **CHAPTER 28 REVISION LIST** (Pressurized Version)

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

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	Current	ł						
Page(s) affected	Rev.#	Action	Description					
28-1	PC11	R&R	Edited outline.					
28-6	PC8	R&R	Step A5					
28-13 thru 28-14	PC7	R&R	Step C5 revised					
			Step C7 revised					
28-15	PC6	R&R	Fig. 28:C:3 revised					
28-17	PC6	R&R	Fig 28:D:1 revised					
28-20	PC12	R&R	Edited paragraph D10.					
28-21 thru 28-22	PC8	R&R	Fig.28:E:1					
28-23	PC11	R&R	Added note.					
28-27 thru 28-30	PC7	R&R	Fig. 28:F:2 revised					
			Step F1 revised					
			Step F2 revised					
28-34	PC6	R&R	Step G7 corrected					
28-37	PC12	R&R	Edited bolt size in part c.)					
28-38 & 28-39	PC11	R&R	Revised Fig 28:G:2:d and edited G1.					
28-42 & 28-43	PC12	R&R	Revised notes and Fig. 28:G:5 & 28:G:6.					
28-44	PC11	R&R	Step G13 revised and Fig. 28:G:7 edited.					
28-46	PC11	R&R	Edited Fig. 28:G:8.					
28-47	PC6	R&R	Step G19 revised					
28-48	PC11	R&R	Edited G20.					
28-49	PC8	R&R	Step G22					
28-51	PC17	R&R	Revised Door Latch Mount Assembly					
28-51.1	PC17	Add	Revised Door Latch Mount Assembly					
28-52	PC17	R&R	Revised Door Latch Mount Assembly					
28-53	PC6	R&R	Step numbers revised.					
28-54	PC11	R&R	Re-numbered text and revised G30.					
28-55	PC11	R&R	Step numbers revised.					
28-56	PC6	R&R						
28-57	PC11	R&R	Step numbers revised.					
28-58	PC11	R&R	Fig. 28:H:1 and text revised.					
28-59	PC11	R&R	Edited Fig. 28:H:2.					
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		$\mathbf{V}$	$20^{-1}$ Door and Fuselage Closeout					

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	Current	ĺ		
Page(s) affected	Rev.#	Action	Description	
28-60 28-61 28-62	PC11 PC11 PC13	R&R P&R R&F	Edited Fig. 28:H:3 and paragraph I Edited text and Fig. 28:H:4. Added text.	H2.
28-62 28-63 28-64 thru 28-71 28-72 28-73 28-75 28-76 28-77 28-82 &28-83 28-84 28-86 28-87 thru 28-90 28-91 28-92 28-93 28-97 28-94 thru 28-97 28-98 & 28-99	PC13 PC11 PC11 PC8 PC11 PC11 PC11 PC11 PC8 PC16 PC15 PC8 PC8 PC8 PC8 PC8 PC8 PC8 PC8 PC8 PC8	R&R R&R R&R R&R R&R R&R R&R R&R R&R R&R	Added text. Edited and added text. Omitted due to modifications. Revised Edited text. Edited Fig. 13:I:4. Edited Fig. 28:J:1 and added text. Edited Fig. 28:J:2 and added text. Revised Edited Fig. 28:L:1. Edited Step L2. Revised Revised Figure 28:L:7. Edited Figure 28:L:8. Revised Fig. 23:L:12 revised. Revised. Revised. Revised. Revised repeat and added text.	
			2011 Chapter REV. PC16/10-15 DOOR AND FSLG CLOSE	-97 OUT

# CHAPTER 28 DOOR AND FSLG CLOSEOUT

### (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 outdated 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 particular assembly step. However, time goes on and changes are made, so careful attention should be paid to the orientation arrows. That old cartoon of the guy agonizing over the plans for his canoe, built one end up, one end down, should not happen in real life. Especially to you.

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#### 1. INTRODUCTION

The door is comprised of 3 basic items:

1. The door frames: These are molded channels (upper and lower) that bond to the inside of the fuselage and form the finished edge of the door opening in the fuselage.

2. The door skin: This skin is fitted into the joggle on the fuselage, accepts the hinges, window and stiffener, along with the latches and handles.

3. The door stiffener: This is a strange looking molded part which bonds onto the inside of the door skin after the window has been installed. The stiffener extends to the edges of the door skin and therefore also lays into the joggle on the fuselage. The door latches are installed inside the channel formed by this stiffener. The handles are install just above the lower stiffener channel, toward the rear section. A removable panel will later cover this mechanism.

Latches: The latching system is rather unique and very secure, it was designed for the pressurized model. The difference between a standard Lancair IV latch system vs. a pressurized model is essentially the number of latches installed. The standard Lancair IV utilizes two latches at the bottom of the door while the pressurized model has eight along with a second actuation handle.

These latches offer the ability to reach out and draw down on the latch pin. The final air seal for the door is via a pump-up door seal, this is common to both models. The difference is in the method of pumping up the seal. The standard IV uses a simple hand pump while the P model uses an automatic, electric air pump. (The electric air pump is also available as an option on standard Lancair IV's.)



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#### V

#### 2. CONSTRUCTION A. LOWER DOOR FRAME

A1. <u>Cleco the top half of the fuselage in place</u>. It is necessary to have the top half of the fuselage clecoed firmly in place for the door installation to ensure a good fit. It may be a good idea to install another cleco on each side of the door if you have not already done so.



A2. <u>Trim the fuselage joggle in the door area to 1 1/4"</u>. Eventually the joggle will be trimmed down to approximately 1". **Do not trim the upper part by the hinges.** The joggle on the upper part will end up being approximately 2" wide.



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A3.







- A6. <u>Align the door stiffener</u>. From step A5 you know how to align the lower section of the door stiffener. Center the door stiffener fore and aft in the door opening.
- A7. <u>Push the fore and aft sides of door frame in until they touch the wood alignment</u> <u>blocks on the door stiffener.</u> Cleco the door frame in place when you are satisfied with the alignment.
- A8. <u>Glue 1/2" wood alignment blocks on the outside of the upper door frame just as</u> you did on the lower door frame.
- A9. <u>Trial fit the upper door frame</u>. The alignment should be obvious: the hinge pockets should align with the hinge mounting pads in the fuselage and align to the wood alignment blocks. The upper door frame will fit on top of the lower door frame. Adjust the lower door frame if necessary.
- A10. <u>Trim the door stiffener to fit into the joggle.</u> The easiest method to do initial trimming of the door stiffener is as follows:
  - 1. Draw a line 1" outside of the joggle on the fuselage.
  - 2. Position the stiffener into the fuselage in between the wood alignment blocks.
  - 3. Measure back 1" from the line onto the stiffener and draw a line.
  - 4. Trim the door stiffener to this line.

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A11. <u>Starting at the bottom, re-check the gap between the door frame and the door</u> <u>stiffener.</u> Drill holes for clecoes or equivalent to hold the door frame and the stiffener in place. (You can also use #6-32 screws with corresponding washers and nuts). In some places you may find the clecoes to be too short. Use bolts at these locations. As you near the top, keep checking the gap between the door frame and or stiffener. Realign the stiffener and door frame if necessary. Note: The door the stiffener will seem to "grow" as you near the top. Reposition the upper door frame section to match the door stiffener as necessary.

#### **Cleco Alignment Holes for Door Frame**

Fig. 28:A:6



A12. <u>When you are satisfied with the alignment, remove the door stiffener.</u> The door stiffener does not need to be in place for gluing the door frame in place.

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- A13. <u>Remove the door frame (upper and lower) and the door stiffener.</u>
- A14. Using 40 grit sandpaper, thoroughly sand all bonding areas on the top half of the fuselage and the door frame and clean with MC.
- A15. <u>Apply release tape to the bottom half of the fuselage where the door frame and fuselage contact.</u> (You will bond this portion permanently when the two fuselage halves are glued together). You should cleco or screw the lower part of the door frame in place to assure that it makes contact with the fuselage bottom during the bonding process.
- A16. <u>Apply a thin coat of Hysol™ to the door frame and top half of fuselage in the bonding areas.</u>
- A17. <u>Add 10% flox to your Hysol™</u>. <u>Using the Hysol™/flox mixture, spread it evenly onto the fuselage bonding area or the door frame</u>. You should have a good idea of how much Hysol/flox is required to fill any gaps. It is best to spread the Hysol/ Flox mixture in a "V" shape as you did on the capstrips to avoid bubbles. The upper door frame is bonded on top of the lower door frame so make sure you have adequate adhesive on the bonding surfaces.
- A18. <u>Position the door frame in place using the alignment holes as shown in Figure</u> <u>28:A:5.</u>
- A19. <u>Bond the lower door frame in place</u>. Align using the alignment holes you previously drilled.
- A20. Bond the upper door frame in place.
- A21. <u>Fill the "step" between the lower and upper door frame pieces with micro to allow</u> for a smooth transition. This is necessary to allow for a good seal.
- A22. <u>Now that you have bonded the door frame you can trim the door joggle flush with the door frame.</u>



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## B. DOOR SKIN

The door skin should be trimmed to size so as to fit into the fslg joggle. You'll note that the joggle appears too deep for the door skin, this is due to the fact that the joggle must also accept the door stiffener. When these two are bonded together, the joggle will be filled.

The hinges are set into the deep joggles on the fslg top. These two joggles must be parallel to each other, if not, a bind will occur when the door is opened. The hinges mount on the top, outside of the fslg and under the door skin and stiffener.



B1. <u>Trim the door skin, sizing it to fit inside the door/fslg joggle using the same</u> method as you did with the door stiffener. This will surely be a back and forth fit, typically requiring at least three sessions to get it just right.

You may use the door stiffener you already trimmed as an initial guide, but make sure you do not take too much material off! Since the fslg joggle is deeper than just the door skin, you must place some shims on the joggle to elevate the skin. You must do this in order to achieve an accurate fit. An even 0.07" gap will allow for paint and slight movements.

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- B2. <u>Trim the door stiffener to fit the core in the door skin.</u> You will most likely have to trim the lower side of the door stiffener to fit the door skin.
- B3. <u>Place the door stiffener back into the joggle.</u> The wood alignment blocks should still be superglued to the door frame so you can double check your alignment.
- B4. <u>Place the door skin back in place (on top of the door stiffener)</u>. Stick tongue depressors in the gap along the perimeter to get an even gap.

Door Skin, Door Stiffener, and Joggle Alignment Holes Fig. 28:B:2



B5. <u>Drill #23 (0.154" dia.) holes every 3" through the door skin, door stiffener, and joggle in the fuselage.</u> You should use the pre-existing holes you drilled through the door frame and the joggle. **Start** at the bottom and work your way up both sides at the same time. The #23 holes are for #6-32 screws (and corresponding washers and nuts) from the hardware store, but you can use whatever works. Use more screws where required. Secure each bolt before proceeding to the next hole.

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## C. DOOR WINDOW

The window hole size is determined by the latch pockets in the door stiffener. It is aligned vertically using the windshield and the aft left window. **Do not** trim to the scribe lines on the door skin (they are only used to determine the shape). The initial part of this chapter is done with the door and stiffener still bolted to the fuselage. You will initially draw the outline of the window hole on the outside of the door skin. Then you will remove the door skin and fit the window. You will then glue it in and bolt the door skin (with the window) to the fuselage to cure. You should read through this whole section and plan the bonding process.



- C1. <u>On the outside of the door skin, mark the location of the inside edges of the latch</u> <u>pockets by the window as shown</u>. The window hole is cut flush up against the innermost latch pockets. You need to check for this on both the forward and aft edge of the door hole.
- C2. <u>Starting at your marks from step C1, draw a line parallel to the scribe line.</u> The line will most likely be on the inside on the scribe lines (so the window hole will be a little smaller than shown by the scribe lines).

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- C3. <u>Draw a line that follows the lines of the lower edge of the aft window and the windshield.</u> The lower edge of the door window should follow the lines of the aft window and the windshield. The scribe line should be of good help to determine the shape even though it may not be at the correct location. Stand back and see if your line looks right.
- C4. <u>Draw a line at the top scribe line</u>. Stand back and see if this looks right: does the line you just marked look like it would intersect that of the top edge of the rear window? Adjust accordingly. You will connected these four lines with a radii in the corners later in this section.
- C5. <u>Remove door skin and stiffener</u>. Transfer the lines from the outside of the door skin to the inside. One method of accomplishing this is to drill a few 1/16" dia. holes along the lines. Then simply redraw the lines on the inside of the door skin. You will be using these lines in step C7 to ensure that you will have at least 2" of bonding area between the door window and the door skin.
- C6. <u>On a table, place the door skin with the inside facing up.</u> Find something soft to lay the door skin and window on to prevent scratching the window.
- C7. Lay the window into the door skin. Using the line you drew in step C5, position the door skin so you have at least 2" of contact area between the door skin and the window.

Warning: it is important that you have 2" of bonding area between the window and the door skin.

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- C8. Connect the four lines you marked in steps C2-C4 with radii like on the scribe line.
- C9. <u>Trim the door skin flush to this line</u>. Double check that you have at least 2" of bonding area between the door skin and the door window. If you have more than 2" of bonding area between the door skin and the door window, you may trim the excess off the window.
- C10. Bevel the window cutout as you did with the other window cutouts in Chapter 18.
- C11. Drill 3/16" holes every 4" around the perimeter of the window (not through the window). Leave a 1/8" gap between the edge of the window and the bolt. This will allow the window to move to allow the door skin and window to conform to the top fuselage half during bonding. Install washers and nuts on each of the bolts.
- C12. <u>Turn the door skin and frame over and draw a reference line on the window</u> <u>showing the edge of the cutout.</u> Make another line 1/2" to the inside. This is the line you will remove the protective barrier up to.
- C13. <u>Remove the window.</u>
- C14. <u>Remove the protective material on the bonding side up to the line you just drew.</u>
- C15. Apply a layer of 3/4" 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 1/8" short of the cutout edges.
- C16. <u>Clean the bonding areas of the windows with isopropyl (rubbing) alcohol.</u> When cleaning the bonding areas, use a soft cloth such as a T-shirt. Do not clean the edges. The edges may absorb the alcohol and cause crazing. Sand thoroughly so no "glossy" areas remain. Be careful while sanding up to the electrical tape edges not to damage the tape.
- C17. Using 40 grit sandpaper, sand the bonding areas on the door skin. Do not touch the sanded areas in order to keep them clean. Do not use alcohol or any other solvent on the windows after they have been sanded. It is sufficient to simply blow them clean.
- C18. <u>Glue tongue depressors in the door joggle to simulate the thickness of the door</u> <u>stiffener.</u>
- C19. <u>Bond the window in with Hysol.</u> As always, first apply a thin coat of pure Hysol<sup>™</sup>. Then mix a little flox in with the Hysol and apply the mix to the door skin in the bonding area. Snug up the clamping bolts just enough to hold the window in place. The bolts will be retightened after the door is back in place on the fuselage.

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- C20. <u>Bolt the door skin (with the window in it) to the fuselage.</u> This is where you'll need an extra hand to help you tighten the bolts. Make sure you can get out of the fuselage after you are done! You can either exit through the baggage door or the landing gear cutout.
- C21. <u>Tighten the bolts enough to get a good squeezeout from the Hysol.</u> Do not tighten them too much or the bonding surfaces will separate.

Checking Door Stiffener Fit Fig. 28:C:3



- C22. <u>Check door stiffener fit.</u> You may need to shave a little of the window. Refer to Figure 28:C:3.
- C23. <u>Secure the window with 4" wide 4 BID</u>. Note that the 4 BID reinforcement extends all the way to the edge of the door.

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1. The lower reinforcement is approximately 4" wide and 31" long (measure the exact dimensions on your door. The width is governed by the location of the core (see the above figure).

2. The aft side reinforcement is approximately 34" long. The width is governed by your window and joggle location.

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### D. DOOR STIFFENER

In this section you will cut out the 7 latch access panels. You will then make flanges and install the nutplates. The door stiffener will then be bonded to the door skin.



D1. <u>Cut the latch access panels in the door stiffener using the dimensions in Figure</u> 28:D:1. You will note that some of the latch pockets do not have a dimension to the center. The center is at the widest part of these latch pockets. The cut along the sides should be 0.7" from the top of the radius. Use a rotary type cutter.

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Access Panel Nutplate Locations Figure 28:D:2					
The lower at panel require	The 3 BID flan plate loc	nge is 1/2 cations a	2" at nut- and 1/4" elsew	here	
D2. <u>Make 3 BID flang</u> a). Cover the panel b.) Tape the panel c.) Lay a 3 BID fla the piece that was o Note that you'll ne- in Figure 28:D:2.	nutplate is insta es for the access els with release t ls back into posit inge onto the inst cut out. This form ed a larger flange	alled lat panels tape. tion in t ide of th as the jou e area fo	in the door stiffen he door stiffen e stiffener ext ggled flange to r the lower aft	<u>iffener.</u> er. ending about 1/2" onto hold the access panels. access panel as shown	
d.) After cure, remo where nut plates a	ve the panels, tri re to be installed	im the 3 d. At th 28-18	BID flange dov e nutplate loca Chapter 28 DOOR A	vn to about 1/4" <b>except</b> ations leave 1/2". REV. 0 4-10-94 ND FSLG CLOSEOUT	



- D3. <u>Install the MS24693-S28/S26 screws with K1000-06 nutplates as shown in</u> <u>Figure 28:D:3.</u> You may also use the K2000-06- nutplates in tight places.
- D4. <u>Place release tape around door frame joggle area.</u> When you bond the door skin to its stiffener, excess adhesive will squeeze out around the door perimeter. You must be sure that this adhesive does not bond the door permanently closed! Simply lay some plastic release tape over the full fuselage door joggle. If you so choose, you could fit the stiffener pieces first, remove them and then apply this release tape.
- D5. <u>Using 40 grit sandpaper, sand the bonding areas between the door stiffener and the door opening and clean with MC.</u>



Figure 28:D:4





- D6. <u>Check for a final time that you have the proper spacing between the door frame</u> and the door stiffener. If you removed the 1/2" wood spacer blocks you previously used to align the door frame, glue them back on. The most critical location is by the latches so make sure you have proper spacing at the latch pockets. The inflatable door seal and its mating piece require 0.4" minimum but it will inflate up to 3/4" if necessary. Should your previous alignment be off (if the holes you previously drilled don't line up) you should re-drill the holes. This is also a good time to check the gap along the rest of the perimeter of the door stiffener. When bonding the door stiffener to the door skin, remember to apply more adhesive to the areas with gaps between the door stiffener and the door skin.
- D7. <u>Place the door stiffener back in the door opening</u>. Using the holes you already drilled through the joggle, door stiffener, and the door skin. Stick a few bolts through from the inside through the joggle and the door stiffener.
- D8. <u>Pre-install the door skin.</u> This is a last check prior to bonding the skin to the stiffener and the time to drill for more of the temporary clamping bolts. If necessary, sand the mating surface of the stiffener to achieve a flat fit against the door skin.
- D9. <u>Bond the door skin to the door stiffener with Hysol<sup>TM</sup></u>. As always, first apply a thin coat of pure Hysol. Mix in 10% flox with the Hysol and apply a generous amount to the bonding areas. Carefully lay the door skin onto the door stiffener. Secure the door in place with all the bolts. Install more bolts if required. We prefer to install the bolts from the inside so that after cure, you can remove the nuts (on the outside) and knock the bolts through. Wipe off excess Hysol<sup>TM</sup>.
- D10. <u>Mark the height of the door stiffener on the door frame</u>. This is the height you will trim the door frame to later (you can of course trim the door frame with the door on if you think it is easier). <u>Do not</u> trim the arm rest or the top. The top will be trimmed after the overhead console is installed.
- D11. Lift (or pry) the door loose from the release tape and sand to clean up excess <u>adhesive, etc.</u> Your door should now be in pretty good shape and fitting the fuselage joggle opening in the best possible manner.

28 - 20

D12. Trim the door frame as described in step D10.



## E. HINGING THE DOOR

**Door Hinges** Figure 28:E:1



The deep hinge joggles will be pretty close to parallel but you should establish this for certain. (Note that from initial appearance, these two deep joggle bases will look quite out of parallel, this is due to the curvature of the top fslg skin - the joggles really are quite close to parallel.)

The easy method of establishing parallel door hinges is to make a simple fixture that establishes two in-plane pads, then place that on the joggles using a micro release to take up any discrepancies.

## Door Hinge Joggle Fixture

Figure 28:E:2



This will help you align the hinges heightwise.

E1. <u>Cut a hinge fixture from a piece of 2 x 4 or equiv</u>. Anything similar will work fine provided the two bases (where the hinges locate) are parallel to each other. Note that the fixture extends a little forward and aft of the forward and aft hinges as shown in Figure 28:E:2. The purpose of this is so you can easily align the hinges heightwise. Cover the hinge pieces and the fixture base with release tape. This fixture is then used to set the pads. Using quick set glue, temporarily attach the hinges to the bottom of the wood fixture in the proper position. The three simple issues of alignment are:

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- 1. The hinges must be "in plane" with each other.
- 2. The hinges must be aligned (fwd/aft) such that their hinge pin axes are concentric with each other.
- 3. The hinges must be spaced apart the correct distance to fit into the joggles. The hinges should be 20.5" apart but check this dimension with your joggles.
- 4. The hinges must be as far forward as possible to avoid a collision with the door stifner and the nuts will fit on the bolts.

Note: Check the hinge alignment by simply connecting the hinge sections which attach to the door skin using a flat piece of wood. Use superglue or bolts to secure the flat piece of wood. If the hinges rotate freely up and down, then their alignment has been achieved and you can continue with setting the micro pads in the fslg door hinge joggles.



E2. <u>Set the fslg door hinge joggle pads.</u> Release tape the hinges. Prep the joggles on the fslg top and place an epoxy-flox pad on the joggle. Carefully lay the hinge fixture assembly onto the pad and press it down until the door hinge fixture makes contact with the fuselage. This will correspond to where the fwd edge of the fwd hinge and aft edge of the aft hinge become flush to the surface of the top fslg. (The other side of the hinge will be below the surface which is normal.)

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The thicker portion of the hinge, that with the pivot pin in it, should be just off the edge of the step on the fslg joggle.

Note: For cosmetic reasons, we typically fill the large lightening hole with micro. And we do not recommend that you fill over this hinge piece with micro since the hinge will be installed and removed several times. When it's all completed, that contour disparity with the fuselage looks quite acceptable.



NOTE: THE HINGE PINS NEED TO BE INSPECTED AND POSSIBLY RE-PLACED EVERY YEAR. PLEASE ALLOW FOR THIS MAINTENANCE IN INSTALLATION. E3. Bolt the hinge section (fuselage side) into position.

After the micro pad cures, use MS24694-S54 countersunk screws with AN365-1032A lock nuts and a washer (AN960-8) from the under side. Once again, be sure the hinge pins are aligned concentric with each other before you set the attachment screws.



E4. <u>Attach the door to the hinges.</u> This is a multi step process and it's helpful to have someone to briefly lend a hand.

a.) Prop up the door hinge section so that it is up to the surface of the fuselage joggle. Use tongue depressors or equivalent. Note that one side of the hinge section will be below the joggle.

b.) Add a micro pad on top of the hinge section to fill the area between hinge and the upcoming door skin. Cover the hinge with plastic tape so that the micro will stick to the door, not the hinge.

c.) Place the door into position on the fuselage and set the clamping bolts if necessary to hold it in place while the micro cures.



## **Bolting Door Hinge to Door Skin**

Figure 28:E:6

E5. <u>Drill the door hinge attach screw holes.</u> With the micro cured on the door hinges, carefully lift the door while the hinges are temporarily stuck in place. You must be very careful to not break loose the micro from the hinge piece. (This is where some help is required.) Using a #12 bit, drill through one hole on each hinge piece and set the machine screw (or any bolt to hold it). With one screw or bolt temporarily securing each hinge piece, one can relax a little as you drill the remaining three holes in each hinge piece.

After the holes are drilled, the door surface side will have to be  $100^{\circ}$  countersunk to accept the machine screws.

Use: MS24694-S56 screws (long)

MS24694-S55 screws (short) to attach the hinge with AN365-1032 lock nuts.

(Note: screw lengths could vary depending on the thickness of your micro pad. If you need a different length screw(s), please contact one of our service representatives.) Also, do not yet permanently install the door, you'll need it off for additional installations processes.)



### F. GAS STRUT INSTALLATION

The gas strut installs at the upper rear portion of the door. Note that this strut must be positioned with the shaft side facing down. In this position, it will self dampen at the end of the opening stroke and prevent any "banging" as the door reaches its full up and open position.

**Door strut** 28:F:1 Door strut attach Door bracket -Gas strut Ч ļ 11 Chapter 28 REV.0 4-10-94 28-26 ur a i o Ur u R DOOR AND FSLG CLOSEOUT





F1. <u>Make and install the door strut/fuselage attach bracket.</u> You have been supplied with a 1/8" x 3" x 3" piece of phenolic which will be fitted and attached with 3 BID on each side. Cut the phenolic piece to fit against the inner door skin, butted against the stiffener. The bracket will be located 1 1/2" forward of the door stiffener as shown.

Install the bracket using epoxy/flox with a couple of dabs of quick set glue in the corners to hold it firmly. Apply the 3 BID to each side, extending about 1" onto the door surfaces and all across the bracket surfaces.

When cured, drill the 5/16" dia. hole to attach the gas strut. See Figure 28:F:2 for dimensions.

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F2. <u>Make and install the door strut/fslg attach bracket.</u> This is also a simple, 1/8" phenolic piece which is installed using 3 BID on each side.

Trim the phenolic bracket to size (adjust as necessary to fit well against your fuselage. Note that the bracket is mounted vertically.

When installing, it is a good idea to use quick set glue to temporarily hold this bracket in place.

F3. DOOR GAS STRUT DIMENSIONS (lengths available):

Maximum 20"

Minimum 11.8"

The door will be fully open when the dimension reaches 20".

The minimum dimension available from the strut is 11.8", anything less will bottom out the strut and create a jam thus not allowing the door to close.

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From the open position, move your door slowly closed and verify that the minimum dimension is not less than what is available from the gas strut. Adjust the bracket on the fuselage if necessary.

NOTE: For best strut position (in the cabin) when the door is closed, the fslg bracket should be located such that the strut does compress to within 1/8" of its minimum dimension. This will raise the strut

Note that the door frame will require a mild "scallop" shape cut out of it for clearance of the gas strut shaft when it transitions through its upper, near fully extended positions.



Door gas strut installation

- F4. <u>Attaching the door gas strut.</u> The gas strut should be attached as follows:
  - a.) The upper strut pivot fitting installed facing aft on the door.
  - b.) The lower strut pivot fitting installed facing fwd on the fslg bracket.
  - c.) The strut aligned with the shaft down and body up.

Note: that it is not necessary to permanently install the strut yet as the door will be removed for latch installations, etc.

Note: You should always insert the "keepers" on the strut ends during any operation since the strut could pop off otherwise.

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## G. DOOR LATCHES

Before you install the door latches, the simple process of installing the fuselage top must be completed. You should already have the top positioned and have a good fit of the fuselage top.

Prior to installing the top we suggest that you complete the following steps:

1. Install the overhead duct as described in section L of this chapter.

Installing the Fuselage Top Figure 28:G:a

2. Install the flange for the aft pressure bulkhead as described in a later Chapter.

(Both the overhead duct and the flange for the aft pressure bulkhead may be installed with the top on should you want to wait).



- G1. Prep all bonding areas. The bonding areas include:
  - 1. The joggles between the fuselage bottom and top.
  - 2. The joggles between the fuselage top and the vertical stabilizer.
  - 3. The bonding areas between the lower part of the door frame and the fuselage bottom.
  - 4. The section on top of the firewall and where it makes contact with the fuselage.
- G2. <u>It is a good idea to practice closing the fuselage before the real thing.</u> If you just drop the fuselage down in place, you may have a problem with the adhesive being scraped off. Practice lowering the fuselage top in place by pulling the sides out some so that the joggles will make direct contact. Make sure you have enough help to accomplish this successfully. Inspect all bonding areas for gaps. Install more screws or clecoes as required.

NOTE: If you already installed the firewall blanket, pull it back and scrape off the silicon for the 2 BID. (Refer to Figure 28:G:b)

- G3. <u>Apply a thin coat of pure Hysol™ to all bonding areas</u>. Mix in flox with the remainder of the Hysol and apply it to the bonding areas where you already applied the pure Hysol. You will need to fill the core on top of the firewall. Build up a 1/8" tall "V" shape with the Hysol.
- G4. Lower the fuselage top onto the fuselage bottom and cleco or screw it in place. Ideally you should pull the sides of the fuselage out to make direct contact onto the adhesive. You can not just drop the fuselage in place as you normally would as this tends to scrape off the adhesive. Make sure you have a good squeezeout along the joggles.

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G6. <u>On the outside of the fuselage, fill the gap between the fuselage bottom and top with micro.</u>







G7. <u>Apply 6 BID reinforcements to the aft side of the door opening and onto the door frame and stiffener as shown in Figure 28:G:c.</u> Superglue a 10" x 1 1/2" 2 BID E-glass stiffener as shown. The 6 BID will extend onto the E-glass stiffener beneath the door frame. Also apply a 6 BID to the forward side of the stiffener. After you prepare all bonding surfaces superglue the 2 BID E-glass stiffener in place.

The aft 6 BID reinforcement itself is 4 1/2" wide and 34" long. It extends 10" beneath the door opening. The BID will extend 1 1/2" onto the door frame and the stiffener. The forward 6 BID reinforcement is 10" long and extends 1 1/2" onto the door stiffener and 3" forward of it.

G8. After cure, grind the flange for control pushrod clearance.




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G9. <u>Assemble the latches.</u> These assemblies swing the hook through a 90° plane, draw down and achieve an "over-center" self locking condition. They should be smooth operating with very little drag when properly assembled. Look for any burrs etc. in the laser cut pieces. Hand file and smooth as necessary. Five of the eight latches are identical while the three others are similar. The differences are explained in the assembly instructions.

Attaching the Clevis to the Links Figure 28G:2:a



a.) Press the small pins into the ends of the clevis, they must be centered on the clevis tab end. The vise is handy for this purpose. Insert a link on each side as shown.

# Insert the Assembly in the Hook

Figure 28G:2:b



b.) Insert link/clevis assembly into the hook. Then insert this assembly into the latch housing. You will need to align the hole that goes through the hook and clevis with the slot in the latch housing. We find the easiest way to accomplish this is to lay the assembly on its side. Then take a wire and align all the holes. Next insert the clevis pin. You will need a cir-clip washer on each side of the latch housing. Notice that the bevelled edge of the washer faces the latch housing. Attach a cir-clip on each side.



c.) This is where the latches differ. Five of the eight latches are identical and use drive pins while the other three use AN5-33A bolts. The purpose of the bolts is for emergency door openings which will be fully explained in the emergency procedures of the operating handbook. You will complete assembling the five identical latches first.

Assemble 5 of the latches as follows:

1. If necessary, insert AN960-516L washers on each side in between the latch housing and the hook on each side.

2. Center the drive pin through the hole in the latch housing.

3. Using the hole in the clevis as a guide, drill a # 41 size hole through the center of the drive pin. Insert the RP-01 spiral pin.

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Chapter 28

## **Drive Pin Installation**

Figure 28:G:2d



guide block on the bolt head and end of bolt. Check dimensions on blueprints #A-316. Note that additional room is needed on the aft latch (#1), as the chain enters at a slight angle. (All drive bolts have been supplied extra long so that they can be cut to fit.) **Do not drill and pin the sprockets at this time.** Using the hole in the clevis as a guide, drill a hole through the bolt and insert the spiral pin through it.

2. Assemble 1 of the remaining 2 latches in the same way you assembled the first **EXCEPT that the bolt goes through from the OTHER side.** 

3. Assemble the final latch as follows: insert a bolt from the side shown. You will need a 1/32" gap between the bolt head and the latch housing. Using the hole in the clevis as a guide, drill a hole through the bolt and insert the spiral pin.

Make sure all the latches operate smoothly and lock in place.







Latch Pad Fixtures FIgure 28:G:5



G11. <u>Make the latch pad fixtures.</u> This is a simple fixture that will help you properly make the epoxy/flox mounting pads. Follow the above figure for assembly.







G13. With the door closed, fit the fixtures as shown (the lower fixture is shown in Figure 28:G:7) You will need to cut a notch in each of the fixtures in order to fit over the armrest, door stiffener and the door frame. The flox pads on the door side need to extend up to the door stiffener. And, they should be relatively slim for latch clearance. The lower three will be 1/4" thick and tapered so that there will be clearance for the torgue tube actuator arm. (See blueprint #A-316.) The pads on the **fuselage** side should extend up to the door frame. Note that the anchor pads are installed on top of the core in the fuselage. This will require a fairly thick flox buildup. While you are fitting the fixtures, note how much flox you will need underneath the pads. You will need approximately a 3/8" thick flox pad for the lower forward latch on the **fuselage side**. This pad is also slightly thicker on the lower side than the upper side. The latch will therefore be installed slightly tilted in order for the latch to clear the door frame in the open position. This should make sense when you are fitting the door fixtures. The other pads will be slightly slimmer. Once you are happy with the fit of the fixtures, drill holes for the dry wall screws as shown. The screws will hold the fixtures in place while curing.

# Note: Make sure you have the fixtures oriented correctly with the 0.14" shim on the door side.

G14. <u>Prep all the surfaces that will receive the mounting pads</u> (8 in the door and 8 in the fuselage).



- G15. Cover the fixture bottoms with plastic release tape.
- G16. <u>Make the latch mounting pads.</u> You will need to plan this step as it requires the door to be shut. We suggest the following procedure using a helper:

1. Bolt the door shut using the existing holes along the perimeter of the door skin. It is important that the door is properly closed as the mounting pads will dictate the final fit of your door.

2. Have your helper mix up a bunch of resin to hand to you inside the fuselage. Apply a thin coat to the latch mounting pad areas.

3. Mix flox in with the remaining resin. Apply a generous mound at each of the 16 mounting pad locations. You should have a good idea of how much flox you will need from the gap under the fixture bases. You will at some pads require up to a 3/8" thick pad, normally around the sides.

4. Set the fixtures in place and have your helper install the screws from the outside. Make sure all fixtures are installed with the 0.14" shim on the door side. Wipe up all the excess squeezed out flox that can be reached. This saves having to grind it later.

NOTE: It is important to keep the micro/flox pad relatively thin inside the door. If the pad were allowed to get too thick, then the latch body might not fit inside the stiffener. To see this, simply place the latch inside the stiffener in the approximate position, trial fit the inspection cover over it, and observe how much room you have available. Use this as a reference when setting the fixture with micro/flox. If pressed firmly in place during cure, the pad height should be OK.

G17. <u>After the pad cures, remove the fixture and clean up the pad areas.</u> You will not need these fixtures again so don't worry about wrecking them. There will be plenty of squeezed out flox so it's worth a little time cleaning this up with a rotary tool.

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- G20. <u>Temporarily position the three lower latches into the door stiffener using the tube</u> <u>shafts as guides.</u> The door must be bolted in place when installing the latches and the actuator arm (316-51) should be installed **but not drilled**. (The door hinges should already be bolted on). Figure 28:G:8 shows the location of the different types of latches. The longer shaft tube is in front of the shorter tube as shown. In summary the alignment criteria are:
  - 1. There should be approximately a 1/8" gap between the latch housing and the tube shaft.
  - 2. The latches should be as close as possible to the lower side of the stiffener.

3. Approximately center the latches on the flox mounting pads. Make sure that the aft latch anchor doesn't hit the gear box mounting bracket.

4. The latches must be in parallel alignment with each other, the fixture has already assured that the pads are in plane with one another. The tubular connecting shaft will assure this parallel latch alignment.

When satisfied with the alignment, superglue the latches in place.

#### Latch/anchor Installation X-section

Figure 28:G:10



Note: The latch must be over-center (locked) when determining anchor location

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G21. <u>Position the three lower anchors.</u> It is important that the anchor is positioned correctly on the adjustor plate as described. When satisfied with the alignment, superglue the anchors in place.

NOTE: The receiver is slightly wider than the hook. It is generally best to orient the hook so it is slightly aft of center in the receiver. This is because, the gas strut on the door will tend to drive the door forward and this hook / receiver orientation will then best accommodate any variations due to the gas strut's influence.

- G22. Drill the 3/16" dia. holes for the lower three door latches. Countersink the holes. Find the correct screws for the latches. It would be wise to get some castle nuts or equivalent for easy removal (you'll need to remove the latches a few times). You have been supplied with a variety of MS24694 bolts. Later you will find the correct bolts, but for now it is okay to use slightly long bolts. Note: Screw lengths vary depending on the thickness of your flox pad. If you need a different length screw(s), please contact one of our service representatives. Notch screw heads on ANCHORS only.(NOT ON DOOR LATCHES) This will keep the heads from turning, should you have to undo the lock nuts securing the anchors.Install screws with flox
- G23. <u>Drill the 3/16" dia. holes for the lower three anchors.</u> Make sure that the anchor is still positioned correctly on the adjustor plate.

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 DOOR AND FSLG CLOSEOUT

Removing the Outboard Laminate and Core

Figure 28:G:11



G25. <u>Install the latches on the sides and the anchors one at a time.</u> We suggest that you first install one of the lower side latches then its anchor. Remove the core where necessary and countersink. Leave the latch in the "locked" position before installing the next latch.. Proceed with the latch above it. It is a good idea to make a "dry run" with the flex cables installed to make sure the positions are correct.

NOTE: When installing the side and forward bottom latches, it's necessary to drill through the window. Follow steps 1-6 for more detailed instructions.

Installing the Tube Shafts and Flex Shafts Figure 28:G:12





Step 4) Fill the holes with Hysol/flox, re-assemble and let cure.



G26. <u>Remove the bolts securing the door.</u> The latches should now hold the door tightly shut. You can make minor adjustments (if necessary) with the adjustor bolt.



G27. With the lower three latches locked in place drill 1/8" holes through the tube shafts and the drive pins as shown in Figure 28:G:13. Operate the three latches and make sure they function smoothly. You can use a wrench on the bolt head of the lower aft latch to operate all three latches.



G28. <u>Drill halfway through the flex shafts as shown in Figure 28:G:14.</u> It is considerably easier to drill a guide hole before you install the flex shafts. You will drill through the rest of the flex shaft after it is installed and aligned.

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G29. <u>Install the flex shafts.</u> The flex shafts are not as torsionally rigid as the tube shafts. If you were to just lock the latches and install the flex shafts, the latches would open at different times. Ideally all latches will lock at the exact same time. To accomplish this, you must install the latches at a slight offset. The above figure shows how you can easily accomplish this. In summary:

1. Slide the flex shafts onto the drive pins. Refer to Figure 28:G:8 for the correct flex shaft lengths. You should be able to install the flex shafts without removing the latches.

2. Lock the lower three latches in place.

3. Start at the lower latch on each side. Open the lower latch on each side all the way. It should hit the latch housing. With the latch in this position, drill a #41 size hole all the way through the hole you already drilled in the flex shaft and insert the spiral pin.

4. Move up to the middle latches. With a 1/16" gap between the latch housing and the hook, drill a hole for the spiral pins and install them.

5. With a 1/8" gap between the hook and the upper latch housing, drill a hole for the spiral pin and install it.

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G30. <u>Latch receiver adjustment feature:</u> The latch receiver can be adjusted toward or away from the hook to effect the proper fit. The fit is correct when the latch closes with a <u>slight</u> "snap" (but not hard) as the hook pulls up on the pin and internally goes over center.

You'll note the four mounting holes in the aluminum receiver body are oval or slotted, this represents the degree of adjustment available. The steel base plate is located in a fixed position and the rear adjuster bolt screws the receiver in or out as required. When the position is set, the four attachment screws are tightened down.



G31. <u>Fit the door anchor covers.</u> All the side latches are covered with plastic covers. The lower three do not require covers as they will be covered by a panel. Fit the five covers at each of the anchors. We recommend to use velcro to secure each cover to the the anchors as shown..

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\* Inbd/outbd location: It should be installed such that the inbd edge of the block flange is approximately aligned with the inbd most surface of the door stiffener.

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Cut a square hole which makes a snug fit. A light dab of epoxy or paste adhesive can be used to secure the Guide Block in position but if the fit is snug enough, that alone can be sufficient to hold it in place.

A few words on door movement/ pin alignment: The Centering Pin will engage in a sliding motion, sweeping into the Guide Block slot as the door is closing. Thus the pin will sweep from outboard side of the block and move inboard. And typically, the pin will engage along the outbd, <u>aft</u> edge of the slot so as the door closes, it will be shifted forward slightly into its proper closed position due to the pin. This slight rearward door shift is typically due to the forces exerted onto the door by the gas strut.

To install the Centering Pin:

a.) Close the door and note the distance between your nylon block and the door stiffener. Place 5/16" washers over the pin to equal this distance (minus the thickness of the pin bonding flange).

b.) Place the pin (with the 5/16" temporary spacing washers) into the Guide Block, locating the pin toward the inboard end of the block's slot.

c.) Place a dab of bondo or equiv. on the top of the bonding flange of the pin and then close the door. Allow the bondo to set up against the door stiffener, then try opening the door being careful to not break the bondo and pin off the door stiffener. This will verify that you've located the pin in an acceptable manner. If you can not open the door without breaking the pin off, then it was not properly orientated in the nylon slot. This is all pretty simple, but adjust as necessary and when finished, note the pin position (with the door closed) which works correctly. d.) Clean off the bondo and set the pin back in the noted position in the Guide Block. It is a good idea to cover the block and local area with some release tape just in case some epoxy/flox were to drop off the pin's bonding flange.

e.) Apply a mound of Hysol to the top of the pin's bonding flange and simply close the door onto it.

Secure the door in the closed position until the Hysol cures. Then open the door and clean up the area as desired.

f.) We recommend applying a small 1 BID tape over the pin to assure that it remains in place (and this can help dress up the installation as well).

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# H. DOOR HANDLE

There are two door handles mounted in the aft section of the door. The latches are activated by a push pull rod, sprocket and chain. When the door handles are in the shut position, the over center spring helps lock the mechanism in place. (See blueprint #A-316.)



**Note:** You may fit the handle cover as described in section "J" prior to installing the door handle.













1. Be certain to maintain the correct distance between collets so the overcenter spring will work correctly.

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2. The two door handles must be parallel. an easy way to assure alignment is to glue tongue depressors together as shown and drop them into the notch. The tongue depressors must be parallel for this to work!

3. Thoroughly sand the bonding area on the collet. The anodize should be completely removed for a good bonding surface. When satisfied with the alignment, pot the collet in place with  $Hysol^{TM}$  or flox.

H4. <u>Attach the handle (external) to the spindle.</u> First install the spring and then use the roll pin to lock them together. Refer to the exploded view Figure 28:H:2.

Install the screw into the spindle until it bottoms out. Cut off the exposed threads and remove the screw. Grind off some more so that the screw will bottom out on it's shank when installed.

- H5. <u>Install the two O-rings on the spindle.</u> Put a light lubrication film over the pieces before assembly (bearing grease works well).
- H6. <u>Slide the spindle into the collet mounted in the door</u>. Insert the screw through the door handle drum, collet, and spindle. You may as well wait with installing the door knobs as it will give you a little more room to install the push/pull rod and chains with them off. This is also a good time to test fit the overcenter hoops and spring. Use caution as the spring is a very snug fit. See blueprint #A-316.
- H7. Assemble the push/pull rod (316-50) and install as shown on blueprint #A-316. Extra threads have been provided so that it can be shortened. Cut or grind a slot in the stiffener for the push/pull rod to get past. Other helpful hints:

1. Install the clevis pins for the over center hoops and tape in place. These are difficult to install after the push/pull rod and chains are in place.

2. Latch "open" stop is achieved by clevis #6D-330-12 and actuator arm #316-51 hitting the inner surface of the door stiffener. Make sure that the end of the clevis is round to prevent damage to the stiffener and allow maximum travel of the latch.

3. Use sufficient washers to shim the rod end (HFC-3) away from the door handle tab to prevent it from rubbing in the closed position.

4. Adjustment - Wait until the door is installed to drill the hole through the torque tube, for the spiral roll pin (RP-02) in the actuator arm. With the door installed, open the bottom latches until the door can just barely be opened. Allow +/- 1/4" clearance between the latch and door frame. Move the actuator arm to it's open stop position (see hint #2). Drill the hole and install the spiral roll pin in the actuator arm. Re-adjust the push/pull rod untill the interior handle is in the correct position when the door is closed. See Figure 28:H:1. The exterior handle should be in a neutral position with no force on the handle drum screw (91251A155). It should rest freely and not be bound to the collet.



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H8. <u>Install the chains and the guide blocks for the side latches.</u> Remove the bottom two side latches and insert a piece of 15" chain. Reinstall, using the shortest possible screw and shear nut, under the chain and sprocket. It may be possible to "snake" the chain around the sprocket but the screw and nut must be replaced. If there is not enough room for the chain between the sprocket and the door stiffener, it may be necessary to make a small bulge or pocket for the chain. Cut away the inside of the door stiffener for the chain to pass through. Install the chain guide block (316-46) for the aft latch chain. See blueprint #A-316 for the correct position. If the chain rubs on the push/pull rod, the guide block may need shimmed up. Attach with flox and 2 BID.

Install the turn buckles with master links onto the chain. Cut and install the chain onto the top sprocket of the handle to complete the "loop." Position the turn buckles so that they will not cross over the guide block and not hit the sprocket when the handle is operated. Be sure to install a jam nut on the right hand thread of turn buckle.

### WARNING: DO NOT OVER TIGHTEN THE CHAIN UNTIL THE PHENOLIC GUIDE BLOCK IS IN POSITION!

With the latches and the handle in the locked position and the exterior handle in a nuetral position, drill the sprocket and the pin with a spiral roll pin. (It may be necessary to hold the side latches closed with a wrench because of the pre-load on the flex shafts.)

Install the front latch chain guide (316-45) with flox and 2 BID. Round the top corners of the block so the BID will be easier to wrap over it. Exact location of the chain guide is not critical. It should position the chain straight onto the latch sprocket and be far enough away to allow room for the turn buckles. Install the chain and turn buckles on the bottom sprocket. Make a "dry run" before attaching the guide block to make certain that the turn buckles won't hit anything when the handle is moved. Drill the sprocket as described previously.

- H9. Install phenolic guides by the chain sprocket and the push/pull rod. Refer to blueprint #A-316 for the location. The exact shape is not critical. The purpose of the guide is to prevent the tube shaft from bending when a force is exerted on the actuator arm. The tube shaft must be fully supported with a phenolic guide and a phenolic hoop. (Refer to blueprint #A-316.) The drive bolts on the lower side latches also get phenolic guides but no phenolic hoops are needed. Secure with flox and 2 BID on each side.
- H10. Reinstall the over center hoops and spring.



#### THE FOLLOWING PAGES HAVE BEEN OMITTED DUE TO MODIFICATIONS 28-64 THRU 28-71

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 Chapter 28
 PC11/3-7-95

 DOOR AND FSLG CLOSEOUT

I. DOOR LOCK

To keep all the crooks out of your Lancair we supply a lock that locks the aft door handle in place. (This locks the three lower latches). To install the door lock we recommend that you remove the door from the aircraft (it is easier to install the door handle cover with the door off too).





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- I2. Drill a 7/8" diameter hole from the outside as shown in Figure 28:I:3. It is ideal if you can make it 3/8" deep, but you **must not** drill all the way through the door! Every door will vary in thickness at this location so check you door. You can simply check the depth of your 1/4" hole that you drilled. You should leave at least 3/16" of material beyond the 7/8" diameter hole. It is OK if the face of your lock sticks out a little.
- I3. <u>Drill through the remainder of the hole</u> using a 5/8" diameter drill.
- I4. Enlarge the hole so the rest of the lock will fit. First place the aft door handle in the locked position. It is somewhat difficult to determine exactly on which sides to enlarge the hole. Ideally the lock will drop into its hole with a snug fit on all sides to prevent it from rotating. Here is our suggested method:
  - 1. Turn the lock over so you are looking at the front of it. With the key, turn the lock all the way clockwise. This is the locked position.
  - 2. Put the lock tab on the assembly.
  - 3. Point the lock tab directly at the tab on the door handle drum. Grind the hole so the door lock will fit snugly in this orientation. Should you remove too much material you can fill with epoxy/flox.



Recessing the Door Lock



# J. HANDLE COVER

In this section you'll cover up the work you've spent so much time on with the handle cover. The handle cover can be removed with the handles in the open position.



- J1. <u>Fit the handle cover.</u> You may find it easiest to remove the door handles for this step. The cover fits into the flange on the door stiffener and covers the latch mechanism. When trimming the handle cover, you may choose to cover the nutplate locations or trim enough away to expose those areas. The choice is yours.
- J2. <u>Drill two 1 1/4" diameter holes for the door handle drums.</u> This will allow room for upholstery. Make sure you are able to install and remove the handle cover with door handle in place.
- J3. <u>The handle cover may be installed with nutplates, or J-nuts</u>. J-nuts are easy to install, and nutplates are more difficult but solid.

NUTPLATES: (K10008 and K3000-8) Installed in the latch access covers. Apply as many as are necessary to hold the cover down.

J-NUTS: (94809A111) Cut a slot next to the hole and slide it into position. See Figure 28:J:2.

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## K. DOOR SEAL

The door seal consists of the seal on the door frame and the inflatable seal on the door side. Powered by an electric pump, the inflatable door seal will expand up to 3/4". The door seal is attached with silicon.



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Door Seal Modification Figure 28:K:2



K1. <u>Cut the door seal for the fuselage side as shown.</u> 1/8" flange is all that is required to provide a good seal.

Installing Door Seal on the Fuselage Side Figure 28:K3



- K2. <u>Install the door seal on the fuselage side.</u> Try to get the door seal as close to the edge as possible. The 1/8" wide ridge must be on the outboard side or closest to the door opening (shown in Figure 28:K:1). You will have to avoid the door hinge latch pockets on the top. You have been supplied with SWS-951 silicone for gluing the door seals in place. Use duct tape to hold the silicone in place as you follow the perimeter of the door. Wipe off excess silicone with lacquer thinner.
- K3. <u>Bolt the door back on if it still off.</u> Do not close the door until the silicone has dried.

Installing Door Seal on the Door Side Figure 28:K:4



K4. <u>Install the door seal on the door side</u>. The door seal on the door side should be in full contact with the door seal on the fuselage side. This will correspond to approximately 1/8" from the door skin except on the top where you'll need to transfer mark onto the door stiffener so that the door seals will make contact. Orient the door seal (on the door side) so that the outlet stem is located approximately halfway in between the two door hinges. Drill a 1/4" hole through the door stiffener at this location and pull the 4" long outlet stem through. Also refer to Figure 28:K:5.

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K5. Connect the air line to the stem with the union (Part # 22-4).

HINT: If you are having a difficult time fitting the air line onto the bridge tube and unions, heat the air line up first.

- K6. <u>Route the air line back to the outside of the door stiffener</u>. Drill the 1/4" diameter holes so that the air line will fit between the air seal and the door skin.
- K7. <u>Make a 1 1/2" x 1 3/8" piece of 3 ply E-glass</u>. When dry, drill a 1/4" diameter hole in the center of it. The grommet will later fit into this hole.

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- K9. <u>Install the 3 ply piece you made</u>. We find that the easiest method of doing this is to first slide the grommet in the hole in the 3 ply piece. Use silicone to secure the grommet. Cover each side with release tape, and lay over 2 BID to capture the grommet.Drill through these cover plates. Bolt the bridge tube in place. When you have established the proper orientation for the grommet plate, secure with self tapping screws # 91632A146(6-3/8"). You will need to drill a hole in the overhead console for the air line to run through.
- K10. <u>Route the air line down along the forward side of the door.</u> Run the line along the door frame and on the outside of the anchor covers. Electric pump hook-up will be explained in a subsequent chapter.

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# L. OVERHEAD AIR DUCT

This overhead duct is a molded piece forming a passageway for air from the plenum formed in the vertical fin. A variety of vent and accessory arrangements can be installed into this duct based on personal preference. One item that is supplied is a rotary knob which will actuate a slide valve at the pressure bulkhead. The valve must be closed during pressurized operations.

NOTE: You'll see a shallow joggle in the air duct at approximately 43" fwd of the aft end. Generally, the duct will be split into two pieces for shipping purposes at this point. In some cases, the duct may arrive in one piece, if so, you will need to split it for installations required just in front of the pressure bulkhead.





1. <u>Trim and trial fit the fwd portion of the airduct into the top fuselage</u>. This is performed with the top fuselage resting upside down on a table and the air duct is laid in position.

Trim the edges of the premolded piece so that about 3/4"-1" remains for bonding onto the inner side of the top fuselage, there should only be about 1/2" along the front where it gets close to the windshield. Note that the duct must bump (and seal) against the fslg/door frame. The duct will essentially center on the top fslg. If your duct is in two pieces, simply butt them together for alignment purposes. Grind or sand as required to attain a good fit onto the top fslg and a snug fit against the door frame.

This piece should be trimmed so that it is about 5" short of reaching the aft pressure bulkhead.

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L2. <u>Fit removable panels into duct.</u> It is a good idea to fit the aluminum panels and any desired items into the duct prior to bonding. It's not essential, just an easier that way.

The two flat areas measuring approx. 5-7/8" x 13-7/8" will need removable aluminum panels fitted. These panels simply screw into place and provide access to the door hinges, the pump up door seal air line and the rotary assembly for the rear bulkhead slide valve.

The panels (approx. .060" aluminum ) are rough cut to size for you. Use a belt type sander to quickly sand a radius around the corners as desired.

Screw the panels in place using 8-32 Allen head screws. Space the screws approximately three inches apart. The air pressure is often sufficient to blow air by if spacing is greater than that.

Trim away the fiberglass in the panel areas leaving about 1/2" around the perimeter. Attach the K1000-08 nut plates and set the screws.

(Note: It generally looks good if these panels are covered with interior trim material for an accent, such as leather, vinyl, etc.)

Additional items of possible interest to mount into the aluminum panels, etc., might be per the following:

a.) Type of air vents (we've used one eyeball vent for each seat position) and this approach seems to work to everyone's satisfaction. There are several types of vents that can be installed. Neico Aviation carries two possible choices, a panel mount type and a screw mount type. Other types are also available from a variety of sources.

b.) Overhead light: A cabin light could be a useful addition in this area.

c.) Overhead control switching location: The area might be suitable for low profile rocker type switches.

d.) Overhead oxygen system.

L3. Bond the fwd portion of the airduct into position.

Rough up the surfaces and bond the airduct in position using epoxy/flox. You can either weight the flanges down to achieve a compression bond or set clecoes to pull it down against the top fuselage.

L4. <u>Add 2 BID to connect duct to door frame</u>. Make a small micro fillet and apply 2 BID to seal this area.



For the following steps, you'll need to have the aft pressure bulkhead flange installed, which will provide you with the exact position of the bulkhead.

L5. <u>Install the aluminum panel in the cabin air plenum box.</u> This aluminum panel measures 6" x 8-3/4". Again, sand the edges to achieve a pleasing radius. This panel too, looks good with finished with accent upholstery.

Cabin Air Plenum Box Figure 28:L:3

Install 4 screws down each side and 1 in the middle of each end.

Use: 8-32 x 5/8"L, Allen head screws (#91251A-196) K1000-08 anchor nuts AN426-3-5 rivets

# APPROXIMATE DIMENSIONS

L6. <u>Fit the cabin air plenum in position.</u> This is a vacuum formed piece that is rather box shaped. It will house the blower as well as the slide valve. The slide valve allows for outside air ventilation when not operating under pressurization. During pressurization, this slide valve must be closed and cabin air circulation can be achieved using the blower motor located in this plenum box.

The plenum box should measure about 11" wide, measured across the back upper corner (where it meets the pressure bulkhead and top fslg.) This will create a taper with the box being wider at the top bulkhead point compared to the bottom (about 8.5" wide at the bottom). This becomes important when you get the trap door swinging.

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L7. <u>Secure plenum in place. (temporarily).</u> Cover its edges first, with a layer of duct tape (inside and outside, extending up the sides about 1.5"). This plenum must be removable. To secure it in place and allow for removal, first secure it with a few dabs of fast set glue, or equiv.



L8. <u>Add BID to form a flange for the plenum to register into.</u> This is accomplished through the following procedure.

a.) Lay a narrow 3 BID layup around the outside of the plenum, this BID attaches to the pressure bulkhead, and the plenum releases free of it.

b.) Lay a slightly wider 3 BID layup around the inside of the plenum, this BID attaches to the pressure bulkhead as well.

c.) Lay a narrow 3 BID layup along the sides of the plenum on the outside. This BID will attach to the top fslg. It should stop short of the fwd end of the plenum by about an inch or so. This is not critical however.

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d.) Lay a wider 3 BID layup along the sides of the plenum on the inside and across the front. This BID will attach to the top fslg and over the air duct in the front. Make this BID wide enough at the front side corners so that an anchor nut can later be installed there to secure the plenum.

L9. <u>Remove plenum and trim the BID flanges.</u> Pull the plenum out and trim the flanges. The outside flanges should be kept quite short (about 3/8" high), that way upholstery, etc. will easily cover it and you won't have to paint it. With the flanges trimmed, it will hold itself in pretty good position at the back and bottom but the top, front will need a couple of screws to secure it.

L10. <u>Add two screws in the plenum top front.</u> On the front side corners, set a screw (MS24694-S5). Install the K1000-08 anchor nuts into the inner flange. Refer back to figure 28:L:3.



Plenum Trap Door Cut Out Figure 28:L:5

L11. <u>Cut the plenum door hole and mount the door</u>. This door allows for air to get into the fan when operating it while the bulkhead flapper door is closed(during prressurization).

This plenum door is a simple aluminum panel which is secured to the inside of the plenum. Note that there is a small doubler under the portion of the hinge which attaches to the plenum, this is to align the flapper door properly. The door should swing freely to the inside and lay flush against the side of the plenum. As the fan sucks air, this door will swing open.

L12. <u>Cut the flapper door hole in the bulkhead and make the flapper door.</u> See figure 28:L:11 for flapper door dimensions.



### Flapper door hole position Figure 28:L:6

a.) Cut the through hole in the upper pressure bulkhead.

b.) From the back side of the panel, cut back the skin and core 1.25" around the hole. Close this out with 5 BID all around.

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bracket.

1.) Place a piece of cardboard on the motor to create a former. Apply release tape on both the cardboard as well as the motor.

Lay 8 BID, 3/4" onto the motor and extending down the cardboard former. Allow to cure, pop off and trim to size. -OR-

2.) Make a simple wood former, cover with release tape and lay the 8 BID over it to form the basic attach bracket. See figure 28:L:8.

The motor will be clamped to this custom bracket.

**Bonding Fan Attach Bracket** 

Figure 28:L:9



L15. <u>Mount the fan attach bracket</u>. Position the fan in the plenum comfortably. It will have a small, plastic cupped piece added to transition the fan output end into the air duct. For now, allow enough clearance it so that its attach bracket can be permanently installed onto the top bulkhead.

With the position of the fan looking good, position the attach bracket on the fan, and use a few dabs of quick set glue to set the bracket in place.

Then gently remove the fan and add a 3 BID attach tape to both sides of the

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# REAR AIR DUCT INSTALLATIONS

L18. <u>Install the aft portion of the air duct.</u> This piece bonds to the top fslg similarly to that of the fwd portion. Its fwd end should terminate about 5" aft of the pressure bulkhead flange. Trim the air duct accordingly. Bond it in position with epoxy/ flox.



Aft Air Duct Connection at Pressure Bulkhead Figure 28:L:12

L19. <u>Fabricate a fairing to blend from air duct to aft side of bulkhead.</u> This shape can be made with either cardboard or thin pieces of foam.

With a suitable form in place, cover all areas with release tape.

a.) Lay 3 BID over only the lower half of the form, running over onto the pressure bulkhead by about 1". Allow to cure

b.) Now cover the upper part of this layup with plastic release tape.

c.) Next lay a 3 BID over the upper area. Overlap the lower piece by about 1". Cover the entire upper area extending about 1" onto all surfaces. Allow to cure. d.) After cure, pull both pieces off and remove the forming materials. The plastic tape will allow the two pieces to separate.

e.) Bond the upper piece permanently in position onto the top fslg, air duct and bulkhead flange.

f.) Position the lower piece, it will lay inside the upper and overlap about 1". This piece should then be bonded to the back of the pressure bulkhead.

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In this manner, you'll be able to remove the bulkhead and the att fairing will automatically nest into each other when the bulkhead is placed in position. It may sound complicated, but it's relatively simple. The idea is to get a nice tight fit so that air doesn't leak out when you've opened the slide valve and are allowing outside fresh air in for ventilation.

# Attaching the Aft Duct Hose Pickup

Figure 28:L:13



L20. <u>Make and install a hose pickup at the aft end of the aft air duct.</u> A 3" diameter hose is used to connect the aft plenum (in the vertical fin) to this air duct. This is nearly identical in process to that performed in Chapter 14, section G (vertical fin plenum), refer to this section for making the air duct pickup using a pop can wrapped with 4 layers of duct tape. **Attaching Hose to Air Duct Pickups** 



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L22. Build and install the forward portion of the aft air duct. This portion will bridge the area between the bulkhead and bulkhead support flange. Make a foam plug from the 1/2" thick foam which is supplied. It will take two or three layers of foam to make the plug.



- L23. Shape the foam by sanding. Permanently install the two filler blocks with micro, to the aft bulkhead. The filler blocks should rest flush with the core of the bulkhead. See Figure 28:L:15.
- L24. Cover the entire foam plug with clear tape, overlapping the tape onto the bulkhead and duct at least 3". Lay the tape as neatly as possible for this surface will be a mold. The following steps will explain how the lower half of the duct is constructed so that the bulkhead may be removed with the duct still attached to it.
- L25. Lay 3 BID onto the mold, overlapping 1 1/2" onto the bottom half of the mold only. Place some peel ply or plastic tape over the area where the upper portion of the duct will overlap 1".

**Peel Ply Location** 



- L26. Apply a 3 BID layup to the upper piece of the duct which will remain attached to the bulkhead support. The lower half will be attached to the pressure bulkhead later.
- L27. Once cured, remove the 2 halves, clear tape and prepare the surfaces for bonding.
- L28. Bond the two parts of the duct into position with hysol and epoxy.

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