

Hinged and removable rear quarter windows for the Lancair Legacy.



Installation Instructions

Acrobat pdf copies of these instructions are available at www.AirCraftersLLC.com



AirCrafters

Introduction

Thank you for purchasing AirCrafters' hinged window frames. They will provide much greater utility for the baggage compartment of your Legacy.

If you have questions concerning the installation of the frames, you can call or email AirCrafters: 831-722-9141 or email@AirCraftersLLC.com. The Lancair Mail List is another great source of information for all Lancair topics: www.lancair-online.com. You can find lots of pictures and comments regarding the Legacy window installation on Don Barne's web site: www.lancairlegacy.com

Many thanks to Don and the LML for helping hatch this project.

There has been some interest in installing the frames using carbon fiber piano hinge instead of the aluminum hinges provided. One of the great things about experimental airplanes is that you can do whatever you want! We used carbon hinge in the photos at the request of the airplane owner, but they are installed as if they were the aluminum hinges, with screws and threaded inserts. AirCrafters has not installed or flown an installation with bonded hinges.

Before you start, you will need to provide:

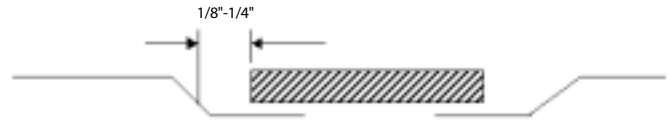
- *Mold release wax or some other release agent*
- *Hysol*
- *Silicone gasket material*
- *Masking tape*
- *#30 Clecos and pliers*
- *Pop rivet tool*
- *Dremel and various bits*

Finally, the easiest way to position the fuselage for this job is to rotate it in the rotisary so the quarter window you are working on faces down, with the canopy removed. That way you can stand on the floor with your work right in front of you. That said, we have also installed them with the fuse upside down and sitting on the gear.

Take your time and fit everything before you glue. Have fun!

Dave Saylor
AirCrafters

1. Trim the plexiglas window as shown in the Legacy assembly instructions. The window should have at least a half inch of overlap with the outer fuselage skin. 1/8 to 1/4 inch between the window and the cored bevel is ideal.



2. Prep the INSIDE of the window for Hysol as described in the Legacy manual. Keep in mind the manual has you prep the OUTSIDE. Later, you will bond the INSIDE of your window to the AirCrafters window frame.



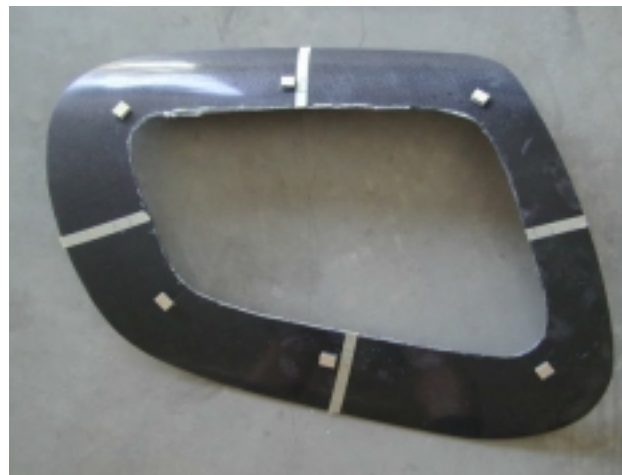
3. To the outside of the window, apply six evenly spaced tabs made of six layers of masking tape to simulate the thickness of the silicone gasket you will make later.

4. Use hot glue to temporarily attach the window to the fuselage. The glue will cool quickly so a few big puddles in 4-6 places work better than a thin bead around the whole perimeter.

5. Trim the window frame to fit so the opening in the frame is slightly larger than the opening in the fuselage. Don't trim the frame opening any more than 1/2" larger than the fuselage opening. Make sure the frame clears all current and future obstructions in the baggage area. The main area of interference will be along the forward edge near the stiffener, aft of the canopy opening. If you want less material outboard of the frame stiffener, you may trim the outside edge to within one inch of the stiffener "bump". Make sure to leave enough edge to securely attach the hinges to the frame (see below).



6. Keeping the window opening aligned, secure the window frame over the window with 4 Clecos (you will need to drill through the window frame and the inner layer of skin). Double check all fits and alignments. Make sure the window opening in the fuselage is centered in the opening in the window frame.



7. With the window temporarily hot-glued in place and the window frame Clecoed to the fuselage, drill 6 evenly spaced 1/8" holes through the fuselage and window margin, about 1/2" from the fuselage opening. Use Clecos to secure the window to the frame and fuselage.

NOTE: These Clecos will stay in place while the Hysol is curing, so make sure they are well coated with release wax or your favorite release agent.

8. Remove the window frame by removing all Clecos, and mask everything but the window-to-frame interface. You are about to apply Hysol that will be very difficult to remove from an improperly masked window. Mask both the window frame and the window, protecting any surface that the Hysol could damage. Mask both sides of the window.

9. Now you will glue the window to the outside of the window frame. The frame will be secured in place inside the fuselage while the Hysol cures.

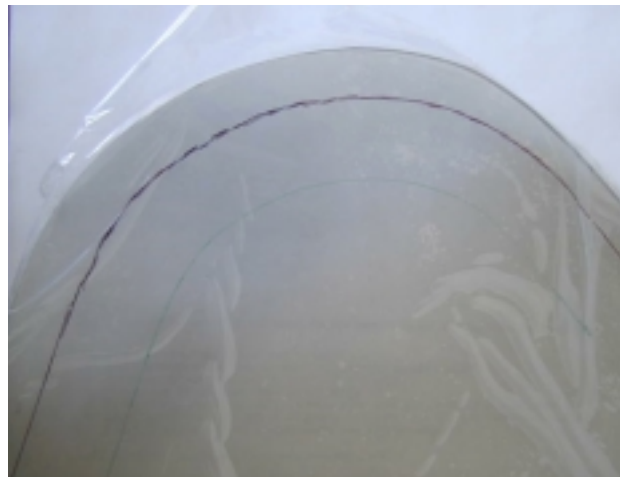
You may want to add a small amount of flocked cotton to the Hysol to give it some thickness.

When masked and prepped as per the Lancair instructions, apply Hysol to the window frame and the inside edge of the window. Set the window in place in the fuselage and secure it with a few Clecos from the outside of the fuselage. The tails of the Clecos will stick up through the Hysol to remind you that they should have release wax on them!

You should NOT be gluing the window to the fuselage. You should be gluing it to the window frame—sticky side in.

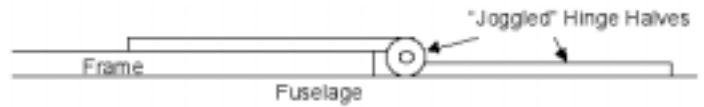
Now secure the window frame to the fuselage with the inside Clecos. As you set the frame in place, you will need to release each of the outer Clecos to allow them to settle into the holes in the frame. Install all six Clecos from the outside of the fuselage to sandwich the window between the frame and fuselage. Again, be sure the Clecos are well coated with release agent. This will be a back and forth process as you remove and insert the outer Clecos one by one. As the frame mates up against the inner fuselage you can install the inner Clecos.

10. Allow 24 hours for the Hysol to cure. Check occasionally and wipe up any excess Hysol that squeezes out of the joint.



11. Remove Clecocos from the window frame and fuselage and remove the bonded window/frame assembly. When you unmask the window, you will be able to see the Hysol bond through the edge of the window. A few bubbles are OK. The Hysol should not have been completely squeezed out from between the window and frame, but it can look pretty thin in places.

12. You are provided with 4 sets of extruded aluminum hinges. These hinges will be "joggled" in reverse-joined fashion, with the hinge pin on the frame hanging down to clear the thickness of the edge, while the hinge on the fuselage projects upwards to avoid interference.



13. Put the window frame assembly in place in the fuselage, and use CA glue to temporarily attach the hinges.

NOTE: Do not let any CA glue get in the hinge joints, or they will not function! You may apply a film of mold release wax to the hinge joints to minimize this risk.



14. Two hinges will form the joint on both upper and lower hinge locations, with a common pin (to be fabricated later) running through them. Use the long sections of pin supplied with the window frame to align the axis of each front and rear hinge set, or the window frame assembly will not be able to move! The easiest way to do this is to position the hinges simultaneously, with a piece of straight hinge pin running through both hinges. You should place all the hinges in this step, and be sure to check the hinging action. As you will be removing one pin when opening the window, you do not need to have any specific alignment between the upper and lower pin assemblies.

Important: Position the front hinges at least 4 inches aft of the canopy opening stiffener. If you position the hinge too close, you will not be able to insert the hinge pin from the front.

Trace the outline of the lower hinges on the fuselage. They will probably run over the edge of the fuselage bond line bevel. Later, you will fill the gap with Flox, so that the hinges rest on a flat surface.

15. Drill three #40 pilot holes through each hinge half. Space the holes evenly with at least 1/4" edge distance. Be careful not to drill through the frame AND fuselage when drilling the frame-mounted hinges.

DO NOT drill through the inner fuselage skin when drilling the pilot holes for the upper fuselage mounted hinge half.

For the two hinges that overhang the joint line bevel, don't drill through the skin—only the hinge. You may want to place a piece of plywood, etc., under the hinge to back it up as you drill.



16. Remove the window frame assembly, taking care not to break the hinges loose from the window frame (CA glue joint).

17. Enlarge all #40 holes to #30 holes. Drill all the way through the window frame.

18. The hinges will be attached to the window frame with Hysol and 3 flat-head pop rivets each. Later, attachment to the fuselage will be with screws and inserts. For now, countersink the outside of the window frame drill holes in preparation for the rivets.



19. Remove the hinges, and prep the surfaces for Hysol. Mask any areas that could be exposed to Hysol beyond the hinge/frame bonds. NOTE: Do not let any Hysol get in the hinge joints, or they will not function!

20. Apply Hysol to the window frame and hinges, and rivet the hinges to the inside of the frame.



21. Enlarge the holes in the fuselage for attaching the upper hinge half. They should be enlarged with a Dremel tool or small hole saw to accept the inserts. Remove only the inner skin, then remove the honeycomb to form a small pocket for the insert. The pockets should be a little oversized to allow the inserts to float into proper alignment.

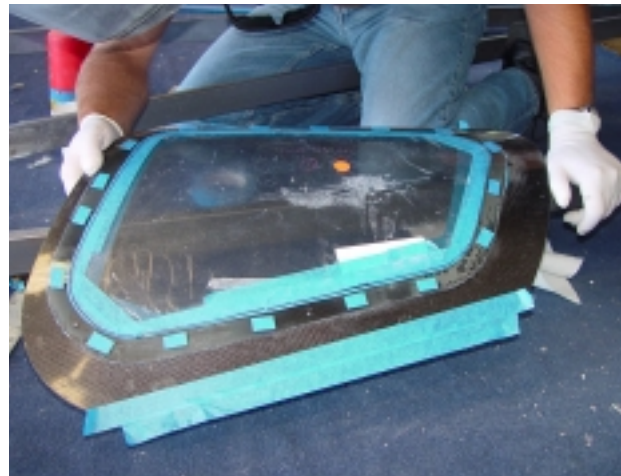
22. In the next step, it will be helpful to put each insert into a vise and run a screw into it to loosen up the threads. Take care not to put the screw too far into the insert or it will break out through the bottom. Adjust the length of the screw with washers or other shims when installing the inserts onto the hinges—in most cases the screws will be a little too long. Put wax in all the insert holes and on all the screw threads. Screw all the inserts to the corresponding hinge half (4 pieces). It will be helpful to put a layer of release tape or wax on the flat outside surface of the hinge, but don't get any wax on the outside body of the insert. Also, take extreme care to keep any resin out of the hinge bore.

23. Cleco the window frame assembly back into the fuselage using the cleco holes on the inside. Mask the area near the hinges so any flox that oozes out doesn't get between the frame and the fuselage.

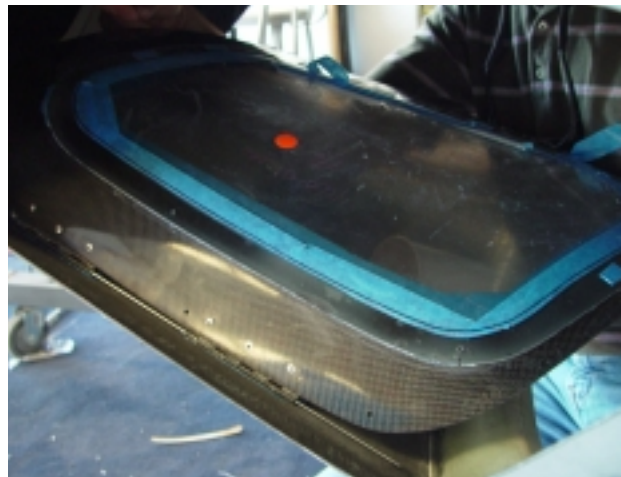
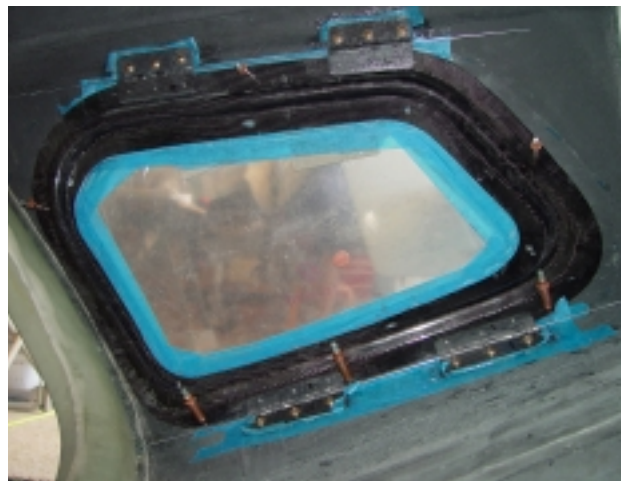
24. Do a trial run to make sure everything fits. Place the hinge/insert assembly into the pockets so the hinge rests flat against the inner fuselage skin.

At this point, the hinges may not lay perfectly flat against the inside of the fuselage. That's OK as long as they are within 1/16" to 1/8". You can keep adjusting and fitting to get them to lay down flatter, but the main variable here is the placement of the window mounted hinge half, which is already done.

Put a long piece of hinge pin through the upper hinges so they align. The pockets you cut out should be large enough so a little play allows the hinges to align on their own without any binding or forcing.



25. Pin the lower hinges so they align. The inserts should rest against the skin in the bottom of the bevel. If they don't lay flat, that's OK because the flox mixture will fill in any gaps. The most important thing is that the hinges rotate smoothly.
26. When everything is fit and well aligned, fill the area under the lower hinges with a thick flox mixture. Don't worry if a little runs out. You can clean it up and add more after the initial positioning.
27. Put a little flox in the pockets, and coat the six upper inserts with flox. Press the insert-hinge assembly into the pockets and pin it with the long hinge. Set the lower hinges in place against the fuselage and hold them in place with tape if necessary.
28. Allow the Hysol to cure for 24 hours.
29. After the Hysol in your mixing cup is well cured, pull the hinge pins out. Since these are simple lengths of hinge pin, you will have to work the flexible pin around the structure of the fuselage. Removing the pins will be much easier in their final form.
30. Lift the window frame assembly out of the fuselage. Clean up any masking material, flox boogers, etc. At this point you can get a feel for how the window will hinge from either the top or bottom hinge line.



31. Now you will make the silicone gasket seal between the window and the fuselage.

You may want to hold off on installing the gasket until construction inside the fuselage is closer to finished. As with any airplane part, you will want to take care to avoid damaging the gasket, so the best way to do that may be to wait until you're done passing tools and parts through the window. If you decide to hold off on the gasket, you can still make the final hinge pins—see below.

32. When you install the gasket, the idea is to put the window in place with a bead of wet silicone between the window and the airframe. The bead can be up to 3/4" wide. It should be at least 1/4" wide. Mask the inside of the fuselage opening so the gasket will form right up to the edge of the opening, as wide as you care to make it. The gasket will mate against the smooth surface of the window.

33. Remove the tape spacers from the window's gasket mating surface. Have the four short sections of reduced diameter hinge pin ready to secure the window while the gasket cures. The smaller pins will make sure the final pins compress the gasket a small amount.

34. Mask any areas of the airframe and window frame you don't want to receive the gasket material. Prep the section to receive the silicone with 120 grit sandpaper and acetone.

35. Leave the bonded section of window that overlaps the frame unmasked. Put a very thick coat of release wax on the surface of the window that will mate to the gasket.



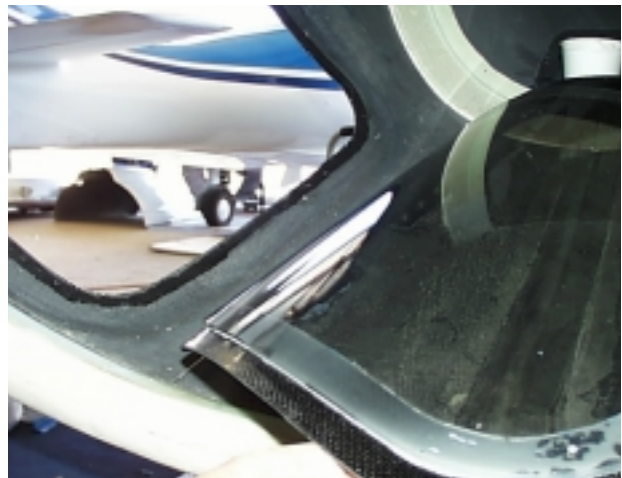
36. Using your favorite silicone material and color, squeeze out a very wide bead of silicone onto the fuselage. Use more silicone than it seems like it will need. You want to get the gasket done in one step, but if you have voids it's easy enough to fill them in another round.

37. With the wet silicone in place, carefully set the window frame into the hinges. Slide the small hinge pin sections through each hinge. Let it cure for at least 24 hours. If you don't get a good even bead of squeeze-out around the window opening, don't worry. You can fix it later, which is preferable to removing the window to add more silicone before it cures.

38. After the silicone has cured, remove the hinge pins and release the window frame. You will probably have to get a putty knife or similar tool under the edge of the window between the hinges to start to break it loose. Once you feel the silicone start to pop loose it comes out pretty easily.

39. Now you can see the gasket and any voids that need attention. Re-wax the window and lay more silicone into any voids, and repeat the process.

40. Once you're happy with the gasket, unmask everything and put the long hinge pins back in. They will be a little harder to slide in now since you're compressing the gasket a little, but they should go in without too much effort.



41. Now form the final hinge pins from the long pin sections. The idea is to make the stroke required to pull the pins out as short as possible. Grind a point on each tip to help get them started. Make the aft end about 3/8" longer than the hinge section so it starts through before the forward section. That will make threading the hinge much easier.

That's about it! Feel free to call or email AirCrafters with any questions, and thank you for your purchase!



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Custom Aircraft Construction and Repair