

**ATTENTION:
THE GENERIC WINDSCREEN INSTALLATION INSTRUCTIONS ARE LOCATED AT THE END OF THIS ARTICLE**

From: Craig Sawka
Sent: Monday, August 15, 2011 7:48 AM
To: Dcombs @ The Luscombe Endowment
Subject: CEE Bailey Wind Screen

Hi Doug,

Just a quick note to share my experience on the installation of the new wind screen for the Luscombe. I received my new Cee Bailey screen last month. It came well protected and shipped with no damage. I procrastinated on the installation for I thought I was in for a lot of work. I have installed over six wind screens on different aircraft. All took many hours of care full grinding and cutting and refitting. (scratchy, itchy work)

To my surprise- the Cee Bailey screen was different. It actually fit!!! There was minimal trimming on the lower edge and that was it. The entire job to fit it took less then an hour. That included sanding and smoothing all edges. What's more, I know the screen is on and not stressed. It fits without bending. A sure cause of some failures. Thanks for your recommendation of this manufacturer.

Sincerely,

Craig Sawka
N2299K

A note from Luscombe Mechanic Doug Combs:

The Luscombe Endowment and Classic Aero LLC do not usually stock Luscombe windscreens (like we do the flat windows), but do take these orders from our customers, then have the items drop shipped factory direct from the manufacturer. Our reasoning is that there is a variety of quality, as well as colors (clear, green, gray), and a variety of manufacturers, some of which stock, or, can manufacture the items quickly to custom order, or might be more local to our customer's location. Prices for these items can vary significantly with the choices available.

WHAT DOES IT COST?

Our experience is that often the most expensive choice of windscreen vendor is really the least expensive installation. Let me explain. When installing a windscreen there is the product procurement cost, there is the Shipping cost from manufacturer to user/shop, and there is the installation / fitting cost. These all can vary significantly.

Shipping can be 1/3 to 2/3 of the total procurement cost, and installation time/cost can be a similarly large component of the total cost. We have found that the cheaper windscreens often have more "extra" plastic at the edges, and therefore require considerable fitting, cutting; more fitting and more cutting, **AND** the risk of breakage during numerous installs and re-fittings. Obviously, there is time and tools required for these fittings and re-fittings at a cost of \$35-\$85 per hour *in addition to the breakage risks*.

For the absolute best fit and optical quality we have found that the CEE Bailey wind screens (shipped from California), have the closest "drop-in" shape available for the Luscombe 8 series. These screens are also more expensive (about 50% more than the 'cheapest' producer). This price must be added to the expanded shipping cost to the east coast (up to the price of the windscreen for freight/UPS), and the cost seems prohibitive, until

factoring in a savings of 6-8 hours labor, and the significantly limited risk of installation damage by handling the screen LESS.

Cheap wind screen \$165 cost, plus \$75 freight, plus 6 hours install (\$300) = \$540
Expensive wind screen \$220, plus \$125 freight, plus 2 hours install (\$100) = \$445

We hope this explains our comments about windscreen installations, their cost, and other factors affecting our customers. We also provide supply from LP Aero, Great Lakes Aero Plastics, Aircraft Windscreens, and Dorcliff-Aerocrafts, all of whom provide acceptable quality and sometimes better shipping options or availability to our customers.

See also "installation of the 28149 wing root seal"

THE LUSCOMBE ENDOWMENT
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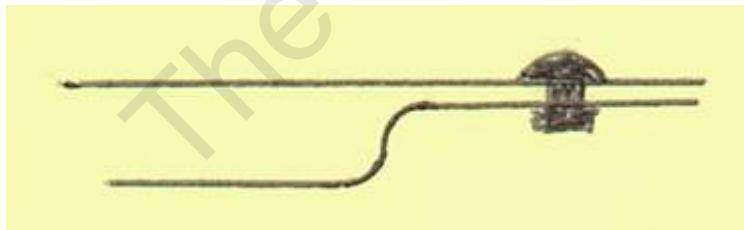
December 31, 2008

LUSCOMBE WINDOW INSTALLATION

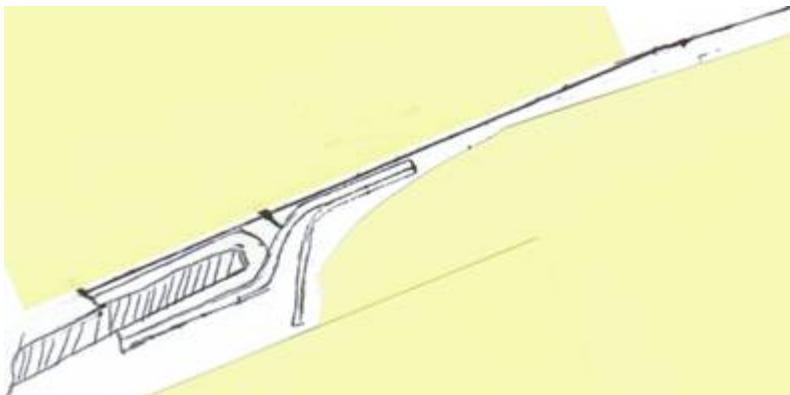
We must all renew the windscreen and/or windows in our airplanes every 15-20 years because the plastic will craze, fog, or otherwise become damaged from sunlight exposure. This article addresses the several installation options available in Luscombes of different vintage, and the current options for those seeking new windows and windshields. You will need felt markers, masking tape, fairings, Dux seal, rubber seal or silicone sealer, fairing mounting hardware, and a windshield to install. Please read all of the following tips before proceeding- this is not a read and do instruction. It is a reference article on the process and installation differences.

THE WINDSCREEN

The windscreen installation consists of three compression channels at the top, left hand, and right hand sides of the fuselage, just forward of the door uprights. The cabin top skin (08011-3 or 08011-8) is riveted to the 08011-14 channel, which creates a 5/8" deep channel into which the top of the windscreen is inserted. On either side of the aircraft, the 08043-16 skins are riveted to the 081105-7 retainer channel creating a 5/8" deep channel into which the sides of the windscreen are fitted.



SIDE WINDSCREEN CHANNELS



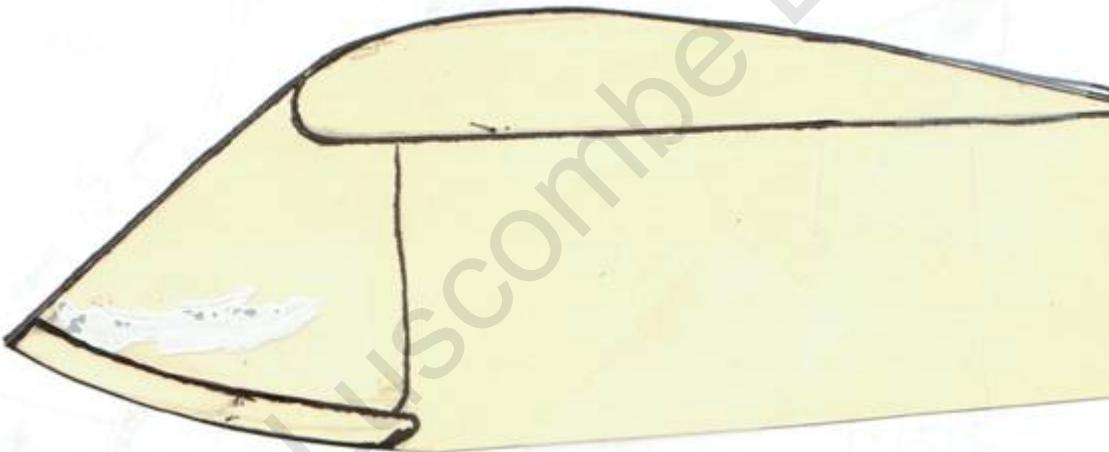
TOP WINDSCREEN CHANNEL AND INTERIOR MOUNT

THE A, B, C directions for fitting a Luscombe windscreen.

The goal is to have the top edge of the windscreen mate in profile to the ends of the wing root, while simultaneously meeting three other conditions:

- A- Where the root fairing 18249 can be installed as a parallel continuation of the wing leading edge;
- B- Where the front lower edge of the windscreen drops just inside the front retainer strips (081105-9 [LH], and 081105-11 [RH]);[\[1\]](#)
- C- Where the windscreen ALSO mates into all three channels.

A profile view of “A” above looks like this-



Goal “A” is the first, foremost and most time consuming fit-up.

The top cabin skin is supposed to have about a 10 degree downward bend from the front carry through spar. To the extended line of the top skin. This angle is designed to approximate the slope of the front of the wing leading edge, and if installed, it will assist the person in meeting the objective of fairing-in the windscreen with the leading edge profile.

For this reason one must trim the top edge first, so that when the screen is fitted into the top channel and the windscreen is rotated downward the top fuselage skin and top windscreen profile is aligned with the wing root. Note: During this fit-up, one should protect the exterior skin of the upright members so that the windscreen can pass OUTSIDE those skins (not into the channels), while the front lower part of the windscreen is fitted down onto the forward fuselage skin.

When the top part of the windscreens are trimmed to make the top 1/3 of the curve meet the wing root profile, proper alignment can be verified with a straight edge from one wing root to the other, across the top section of the windscreens.

Goal “B” is accomplished AFTER Goal “A”, by removing the windscreens and securing it out of the work area. There are two styles of Windscreens retainer strips used in the Luscombe 8 series airplanes. These mounting methods are differentiated later in this article. Our discussion here, addresses most all of those airplanes produced from 1938 to 1949.

With the windscreens secured out of the work area, one installs the windscreen retainer strips (081105-9 [LH], and 081105-11 [RH]), using clecos or screws.[\[1\]](#) (These windshield retainer strips are available from Classic Aero if yours are damaged or otherwise unusable- 480-650-0883) With those retainer strips installed, one can then mark an arc INSIDE THE FLANGE, with a felt tip marker pen, or by some other means that identifies the intersection of the retainer lip, and the fuselage skin. When the marks are made around the front ½ of the windscreens the retainer strips can again be removed and stowed nearby. The mark on the skin at the inside edge of the flange intersection can now be used as a guide line for fitting the windscreens.[\[2\]](#)

Once again, the top of the windscreens are installed in the top channel, and the two sides of the windscreens slide outside the vertical formers as the windscreens are fitted down to the line in the front ½ of the fuselage skin area (dashboard). One can sight through the lower area of the windscreens and mark the cut line for the front ½ of the window. CUT AND FIT TWICE IF NECESSARY, but DO NOT CUT THE WINDSCREEN SHORT!

When the front ½ of the windscreens are fully fitted, then one can finish cutting the second ½ of the bottom of the windscreens using a similar method to determine where the inside of the retainer fairing will fall.

Fastening one side of the lower windscreens retainer strip into place while fitting the other side may now be a useful procedure. --- Again I remind you- leave the sides of the windscreens OUTSIDE the vertical channels, and DO NOT CUT THE WINDSCREEN SHORT.---

Goal “C”, is the finish cut of the vertical sides of the windscreens, and finally, the fitting of those parts to the two side retainer channels on the upright skin. This fit is pretty easy after accomplishing Goals A & B because the retainers at top and bottom, with the sides of the windscreens positioned OUTSIDE the vertical doorpost, allows one to view the rivet line and channel location, and then to mark the windscreens on both sides for a trim-cut of the plastic. When the final windscreens cut at each of the side channels is completed, the windscreens in the side channels should be 1/16” or 3/32” SHORT of the bottom of the channel to allow for any expansion of the plastic in outdoor sunlight.

FINISHING TOUCHES step “D”

Once all the rough cutting and sizing is done, I find that a better fit and seal to the airframe skin can be accomplished by putting a slight bevel along the lower edge of the windscreens that more closely aligns with the skin profile. The use of a die grinder and rotary file, or the oblique edge of a die grinder with a cut-off wheel works well for this process.

SEALING THE WINDSCREEN step “E”

When the windscreens are fully fitted and after it is dry fitted with no sealant in the joint to verify a good fit, we can finally consider the final installation and sealing of the windscreens into place on the fuselage. Most of the Luscombe airplanes used Dux seal as a sealant, and a small 180 degree rubber channel at the base of the window to effect a watertight bond. I have found that a small bead (1/8” to 3/16”), of rolled Dux Seal at the top and side retaining channels, is quite adequate for sealing those joints. Luscombe drawing 081105 calls for a Dux seal application, but specifies no particular amount to be used.

Obviously the sealing process follows the same A, B, C, process with sealing rolls in the top and two sides – positioned initially by a small piece of plastic or cardboard preliminary to the windscreens installation. Then the

windscreen itself is installed into the top and side channels. Finally it is pressed into alignment along the lower edge.

When the top and both sides are fully adjusted to seat, one then places Okonite rubber tape and a bead of Dux seal along the lower edge of the windscreen so that when the windscreen retainer is installed, it will squeeze the sealant under the retainer and windscreen edge, creating a watertight seal.

As I said before, I prefer to use rivnuts or nut plates in this process. One may use other fasteners with equal success, but I have tired of the ‘mechanic inverted’ position required to remove the nuts and screws at the next windscreen replacement- so I try to make it easier for me, or another mechanic in the future.

TRIMMING THE WINDSCREEN

If you read this far, you may have noticed that I did not specify any tools of specific methods for trimming a windscreen. We all have preferences. What I have learned about plastic materials in 40 years could fill a book. (Mr. Robinson was right).

1. Plastics are generally heat sensitive.

They are malleable when warm,

They are less likely to break when warm,

Heat can be used to pierce plastic with relative impunity.

2. Plastics are notch sensitive- they crack when rough cut with a saw or serrated knife.

3. Plastics can crack from vibration or rough handling.

4. Plastics use specially cut drills to minimize “feed”, and reduce the chance of cracks propagating from holes drilled.

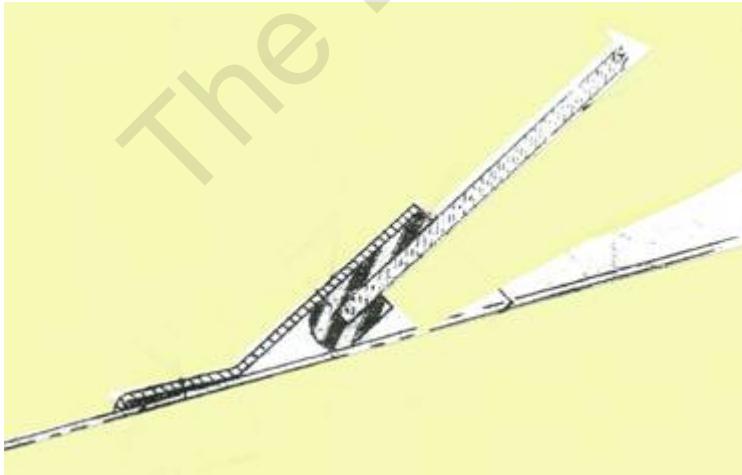
5. I personally trim all windshield edges with a 3” cut off wheel in a 1/4” drive pneumatic die grinder operating in excess of 10,000 RPM. I insert any holes for screw attachments using a small pencil style soldering iron, trimming the melted ‘roll’ with a countersink bit while it is still warm. Your selection of tools may be different- I have not broken a windscreen in more than 10 years while fitting it with these tools.

LP Aero Plastics provides an excellent guideline for plastic patterns and fitting that is attached to this report in its entirety.

WINDSCREEN RETAINER MOUNTING(S)

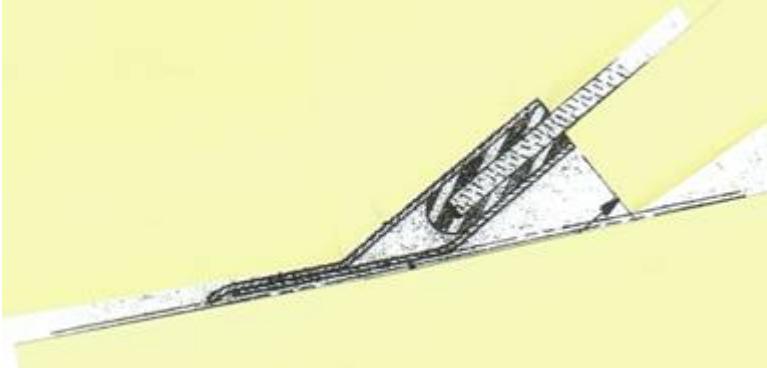
The Luscombe 8 series used three different styles of retainer fairings to mount the lower edge of the windscreen.

The early style(1938-1943) was a ‘V’ shaped, and it mounted on the outside of the windscreen as depicted below.



The subsequent installation (1943-1946) used a slightly larger inboard section on the ‘V’ to extend further over the windscreen.

An alternate installation was also created by the factory which utilized a secondary channel UNDER the windscreen to sandwich the windscreen into place between two aluminum strips. The alternate installation is depicted below:



Your aircraft may have any of the above, all are legitimate. The outer retainer strips are all interchangeable between the three different styles.

WINDSCREEN PRODUCTS

It is important to note that virtually ALL manufacturers of the Luscombe windscreen build products that are oversize in all four directions, and **WILL require trimming**. This is a situation where the cheapest price paid for a product is not likely to be the least expensive installation. Let me explain.

Luscombe used two or three vendors originally for their aircraft windscreen production. Of those companies, one remains in business (Cee Bailey), and the mold assets of another vendor (Heath), are owned and used by a successor vendor which remains in business today. Both of these vendors have the MOST EXPENSIVE windscreen products, **BUT** both of their products are the most precisely trimmed to a nearly ‘drop-in’ fit upon the airplane.

Obviously these companies had considerable interface with the original Luscombe factory during the tooling development, ERGO the better fit. If I were an owner paying a mechanic or shop \$40 or more per hour to install a windscreen, I would opt for the more expensive windscreen to minimize any trimming time and labor costs associated with installation. While there is no guarantee, It is my experience that the expensive cuts of windshield not only provide superior fit initially, but also deliver better optics and lengthier service life.

In the end, the most expensive windscreen can be the least expensive installation because it will take less time to trim and fit it properly into the airframe. The cheaper windscreen suppliers will save you money up front on the purchase, but the product may require two, three, or more trims by the mechanic to make it properly fit into the airframe channels, and align with the wing root.

SCREW MOUNTING OF WINDOWS

None of the Luscombe drawings or parts manuals depict, describe, or advocate the installation of the Windscreen with screws through the plastic. Never-the-less, we see many of these installations completed with several to dozen(s) of these screw installations. Such installations create stress fractures and compression loads that hasten localized crazing.

Because many of these airplanes have been described as ‘acrobatic’ , and because they have been abused in such service, it is reasonable to assume that those pilots strained the airframes and broke or damaged a few windscreens while gyrating through the air near or in excess of the recommended design ‘G’ loading. We know from discussions with folks who maintained these airplanes in the 40’s and 50’s, that it was common practice to ‘safety’ the windshields into the mounting channels with screws to prevent them from “popping” out

during such maneuvers. I do not advocate the use of safety screws, and believe that they are un-necessary if the installer takes time to properly install a window.

The Luscombe Endowment and Classic Aero have developed a dealership arrangement with five different wholesale producer / suppliers of Luscombe windscreen products. We would gladly quote from any of those sources in clear, gray, green, or blue tint. Pricing is direct ship drop ship, and usually cheaper than advertised pricing.

OTHER WINDOWS??

Visit us in the next issue for a continued discussion about installing skylights, fixed and opening door windows, observer doors, and 'D' window modifications.

WINDSHIELD INSTALLATION AND HANDLING INSTRUCTIONS

Depending on your aircraft make and model, the windows which you purchase may require trimming and/or drilling. The following directions will give you tips on the proper procedures for accomplishing this. Check our list of installation supplies for acrylic drill bits, cleaners, finish restorers, tapes and sealants. **WE HIGHLY RECOMMEND THE PURCHASE OF OUR ACRYLIC DRILL BITS WHEN HOLES ARE TO BE DRILLED IN THE ACRYLIC.**

WINDSHIELD TRIM VARIATION: We can guarantee fit on most of our windshields, but many aircraft manufacturers allowed variations to exist in the original trim of the windshields. We therefore manufacture and trim the replacement windshields for these aircraft slightly oversize to allow trimming for each individual aircraft. These windshields may require trimming or grinding to fit upon installation. **NOTE: As a service to our customers we will accurately trim any windshield or window which we manufacture to the exact size of your original window at no additional charge. Please notify us in advance of your shipping the original window or template to us. All transportation charges will be the responsibility of the customer.**

HANDLING: It is very important to keep the windshield well supported at all times. Do not allow a strain to be put on the windshield during the cutting or grinding operations. Warm temperatures are not required during these operations however, acrylic will take much more abuse at 80 degrees than at 30 degrees. **DO NOT STORE ANY WINDOW OUTDOORS WHILE THE PROTECTIVE COVERING IS STILL ON THE WINDOW. THE COVERING WILL BECOME VERY DIFFICULT, IF NOT IMPOSSIBLE, TO REMOVE WITHOUT DAMAGING THE WINDOW.**

PREPARATION FOR INSTALLATION: After inspection of the window, trim the protective covering to expose enough of the edge of the window to allow for fitting including the portions going into channels and under fairings. The remaining protective covering should be left on the window to protect it until fitting has been completed. Residue left behind by the "Spraylat" protective coating may be removed by soaking the area with isopropyl alcohol and rubbing with an alcohol soaked soft flannel cloth. Residue left behind by the adhesive backed paper covering can also be removed by the above method. If, however, the paper covering has been stored on the window for an extended period of time, you will have to soak the paper with kerosene and keep it wet for several hours. You will then be able to remove the paper backing, but the adhesive will remain. This may be removed by using a mixture of equal parts of kerosene and isopropyl alcohol. Soak a soft flannel cloth with this mixture and rub the window with the cloth. The window should be cleaned after this procedure with a dish washing liquid and plenty of water. **REMOVE THE REMAINING PROTECTIVE COATING AND INSPECT THE WINDSHIELD BEFORE FINAL INSTALLATION.**

MARKING FOR TRIM - PAPER PATTERN: The windshield may be marked with a china marking grease pencil, felt tip marker, or masking tape. A fast and accurate method for trimming can be accomplished through the use of a paper pattern made by laying a piece of craft paper over the outside of the old original windshield and trimming the paper exactly to size. The paper will lay flat on windshields of simple curvature and can be taped in position. The windshield outline can then be traced onto the paper with a marker. This pattern can then be cut out, properly aligned over the new windshield and the new windshield marked to size. On windshields of compound curvature the paper should be pulled tight across the outside center of the original windshield and taped at this point. At a 90 degree angle to this the paper should again be pulled tight and taped. The loose areas between the tape should be cut with a razor knife and overlapped with enough cuts to allow the paper to follow the curvature of the windshield. Once this is accomplished, masking tape should be used over all the cuts to hold them in place. An outline of the original may now be made and cut to size. This pattern may then be removed from the original windshield, aligned properly on the new windshield, taped in position and traced. When tracing these patterns on the new windshield allowances should be made for areas which were short on the original installation. If mailing patterns to us be sure to mark the pattern as to left side, right side, and outside.

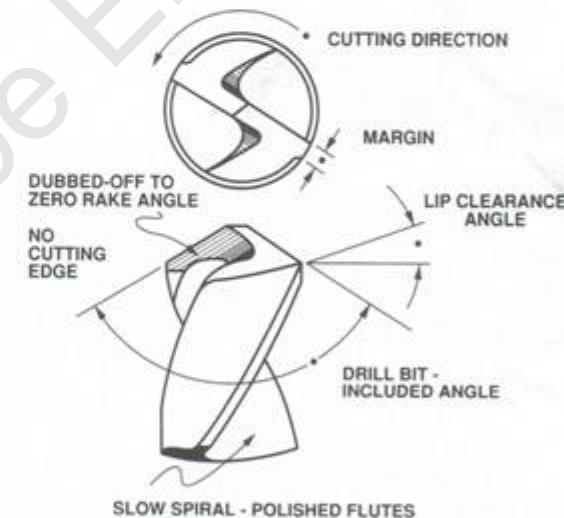
MARKING FOR TRIM - CUT AND FIT: If the original windshield is not in condition to make a pattern then you must cut the new windshield to fit. Remove the wing and cowl fairings and place the new windshield in position allowing the top and sides to hang over. Mark and trim the bottom first. Make sure that the windshield is aligned at the wing roots or that trimming will bring about alignment at the wing roots. After trimming and fitting the bottom, the sides and top will not be difficult to fit. Care should be taken to fit the windshield in place using small cuts rather than one large cut. Remember, you can always trim a little more, but once cut you can never add to it.

MARKING FOR TRIM - OVERLAY: Place the new windshield over the outside of the old windshield and trace a trim line. This will give an oversize rough trim. This method is not recommended for any Cessna windshield or any other windshield where a tight fit between the windshields cannot be achieved.

WINDSHIELD TRIMMING: Trimming is best done with a band saw using a 1/4" or 3/8" wide raker blade with 14 or more teeth per inch. Mask the band saw table to protect the windshield from scratches. Support the windshield during the cutting operation and do not allow the weight of the windshield to rest on the edge being cut away. After cutting, the edges should be sanded with a belt sander to remove all saw marks. Satisfactory results may also be had by using a 7" or 9" disc sander with a coarse 40 to 80 grit sanding disc. This will remove material quite rapidly with only slight pressure. A belt sander may be used with similar results. For best results the edges should be smoothed and rounded with fine sand paper. This can be sanded by hand, with a rotary drum sander, or a file may be used in place of sanding. Smoothing the edges will lessen the tendency towards edge cracking or breakage. It will also extend the service life of the windshield.

NOT RECOMMENDED: Trimming with a jig saw, saber saw, or a hand saw is not advisable. If hand sawing is absolutely necessary, a coping saw with a bone cutting blade with 30 teeth per inch may be used. Extreme care must be used to avoid the blade hanging up and starting a crack. We recommend that the blade be inserted in the saw backward so that the blade cuts when it is drawn towards you. Do not allow the edges of the acrylic to pinch and bind the blade.

DRILLING WINDSHIELDS: Do not use a standard metal or wood cutting bit to drill acrylic. This type of bit must be resharpened for acrylic. Take this bit and square off the cutting edge as per the drawing. The drill bit sharpened in this way will scrape a clean hole through the acrylic with no tendency to dig in or grab. Sharpen your drill bit as shown or purchase one of our special acrylic drill bits. The small price you pay for the correct drill bit will pay you dividends a hundred fold by drilling smooth clean holes. Practice drilling on your old windshield or a piece of scrap acrylic before drilling your new windshield. Use a high speed with very light pressure when drilling. Holes should be drilled oversize to allow for expansion and contraction of the acrylic. Example: Drill a 3/16" hole for a 1/8" screw. Do not over tighten screws. Screws should be snug only. Over tightening will cause cracks around the holes. **STANDARD WOOD OR METAL BITS WILL CAUSE BINDING AS IT BREAKS THROUGH THE OPPOSITE SIDE OF THE ACRYLIC. THIS WILL CAUSE SMALL CHIPS, FRACTURES, CRACKS, OR CAUSE THE WINDOW TO BREAK. DO NOT TAKE THE CHANCE!**



WARRANTY: Our windshields and windows are warranted against defective materials and workmanship. The warranty is limited only to the replacement of the defective parts. There is no allowance for labor costs incurred during installation and removal of a defective part. Prior to installation the protective coating should be peeled and the part inspected. After inspection the window may be recovered with the protective coating which was removed or recovered with a cling type plastic food wrap. We will not assume any liability for damages due to improper installation or any damage incurred during shipping. Our warranty does not cover cracking, crazing, scratches or breakage. Any item shipped to us without proper authorization will be refused. Call for a return authorization number.

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[1] The Luscombe parts manual improperly depicts the windscreen retainer strips (figure 3, items #9 & 95) with holes in both flanges, which is contradictory to the production drawing depiction.

Later versions of the airplanes utilize inner windscreen supports, PN 081105-10 and 081105-12 the Inner windscreen strips

[1] Early airplanes used screws and nuts under the instrument panel. Later airplanes used rivets to install the retainers. I have long advocated the installation of rivnuts or nut plates into the front skins under the panel, into which one can screw #6 or #8 screws that are $\frac{1}{2}$ " long, eliminating the need for a second mechanic or helper, thereby contributing to ease of window installation and replacement at a great labor savings.

[2] An alternate marking plan is to install the retainer flanges and mark the outside flange area with tape. One can then measure inboard from that line by the distance occupied by the mounting flange on the retainer. That line will then identify a proper line for fitting up the lower part of the windscreen.