

## Metal Aircraft Landing Light Installation Instructions

This landing light kit was designed for the Thorp T-18 as a method of installing a halogen landing light in the leading edge of the outer bay of the outer wing panel.

Since there are several different airfoils used on the Thorp T-18, it is necessary to make your own form for the plexiglas lens to be used with your airplane. Also, airfoils will vary by how the leading edge of the wing skin was formed. With the following instructions the installer can make a form to fit any metal wing. This kit will also work with all RV Aircraft.



### *Supplies Needed:*

1. 6 Amp circuit breaker switch (recommended), or a toggle switch, fuse holder and 6 amp fuse.
2. About 15 ft. of 18 gage shielded aircraft wire.
3. Clear silicon sealer. Aircraft Spruce Part #09-27800 \*
4. Six 1 1/2'' # 8 Drywall Screws \*
5. Wood Glue
6. Cotton Gloves
7. 8'' x 12'' Piece of 1/32 plywood sheet \*
8. 2 feet of 3/4'' x 6'' shop pine\*
9. One piece of felt about one foot square.\*
10. \* These Items Provided

### *Tools you will need:*

1. T Square, Compass, Tape measure
2. 2 clothes pin type sheet metal clamps
3. Sheet metal cutting tools and files
4. Rivet tools and dimple dies for 3/32 rivets and # 6 AN flush screws
5. Cotton gloves
6. Wire crimpers and hand tools
7. Oven set at 310 degrees fht.
8. Whitney punch if available
9. 3/32 clecoes and pliers
10. Rivet Squeezer
11. Hand drill with # 40, 5/32 and 3/16 drill bits. Band saw and disk grinder.
12. Hole cutter (Malco HC1)

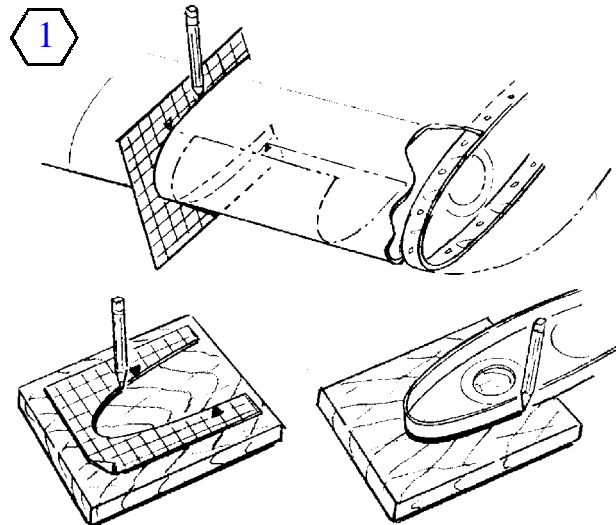
### ***IMPORTANT FACTS ... BEFORE INSTALLATION***

Before you unpack the landing light remember this: **Halogen lights burn very hot and touching the bulb will greatly diminish it's life due to the oils in your skin.** If you should forget and touch the bulb, clean with isopropyl alcohol before turning on. With regular use the bulb should never have to be replaced.

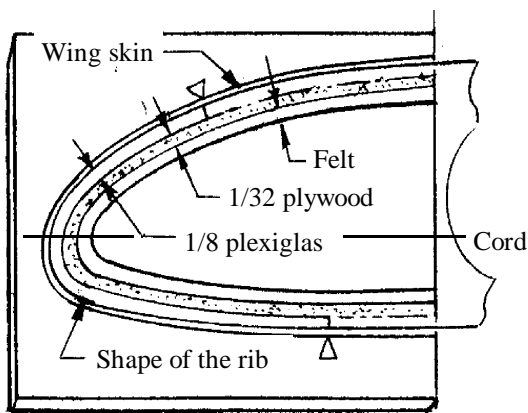
Also, **laying out the opening in the wing and cutting the wing skin should be done with great care.** You do not want to re-skin your wing panel because of a mistake.

**Step 1.** If the outer wing is completed, carefully remove forward outer wing rib by drilling out the 1/8 AN rivets. You may use this rib to make a pattern for making the landing light lens. Refer to figure 1.

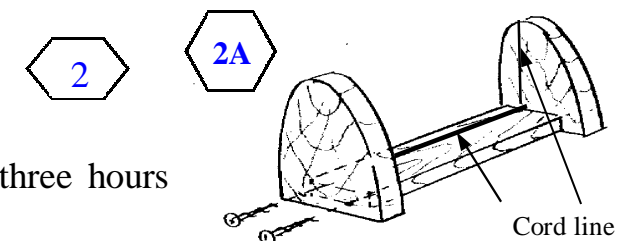
A form must be made to shape the plexiglass to the shape of the airfoil. A pattern can be made to the shape of the outside of the airfoil and transferred to a piece of 3/4 by 6'' pine, or take the outer wing rib and trace around the rib. The cord of the wing must be perpendicular to the spar end of the rib. After making two of these pieces, cut outside of the line and sand to the line on a disk sander. This completes step one.



**Step 2.** After forming two pieces the shape of the rib, material must now be removed to allow for the thickness of the plexiglas, plywood covering and felt which will cover the form to keep from scratching the Plexiglas while forming. Cut shape on band saw to the line marked felt. Leave the line and sand to the line on disk sander.

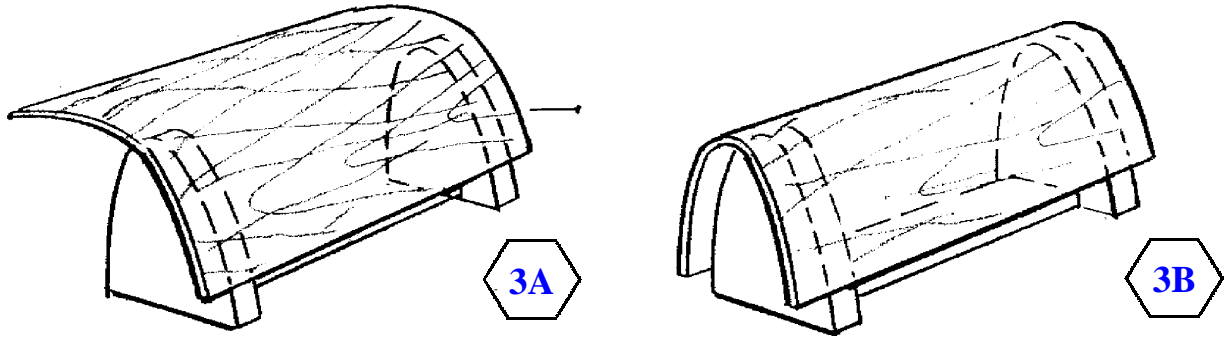


Cut a board 4.5''x 3.5'' to place between the two airfoil shapes. Make sure cord lines are on the same plane. Screw and glue together. Use white glue and drywall screws. See figure 2A. This completes

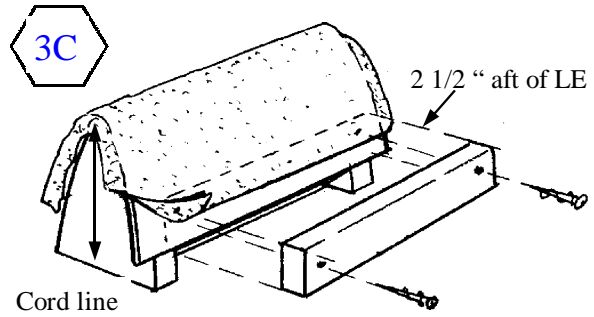


**step 2.** Let the glue set up for about three hours before starting **step 3.**

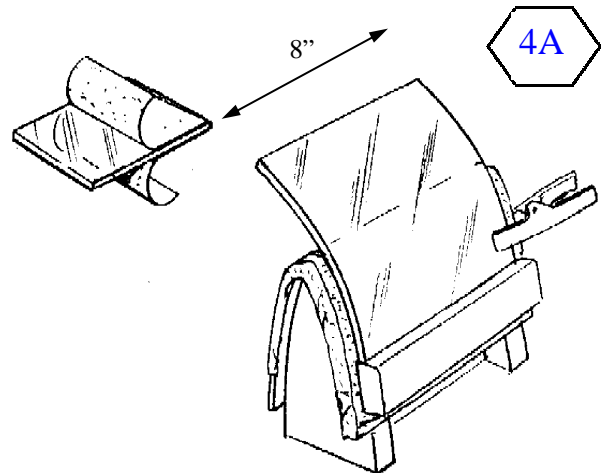
**Step 3** Cover the form with the 1/32 plywood. This can be done without breaking or cracking the plywood by soaking it in hot water for a few minutes. Wrap the plywood around the form with the grain. Hold in place with some large rubber bands until dry. See figures 3A and 3B. After plywood has dried glue and staple to form. Let glue dry and remove staples. Light sand and cover with felt. Felt can be stapled on the bottom and drawn tight but does not have to be attached in any other way. See view 3C.



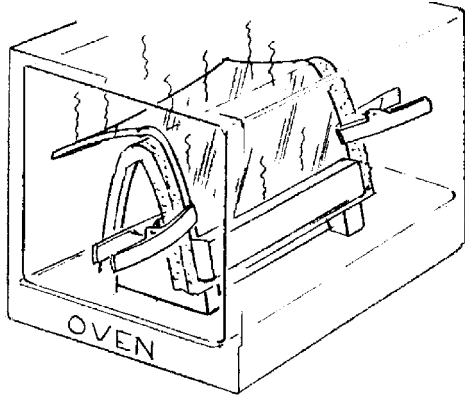
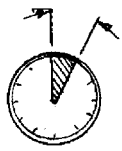
After the felt has been applied to the form a squaring block must be screwed to the form. It is on what will be the top part of the leading edge of the wing and is 2 1/2 inches back from the leading edge along the cord and is parallel with the leading edge. Figure 4A shows why this block is necessary. The squaring block is made from a piece of pine and can be attached with two 1 1/2 inch #8 drywall screws. The squaring block is 2 1/2 inches aft of the leading edge on the top of the wing



**Step 4.** Forming the lens is actually the easiest part of this installation. After removing the protective paper, clamp the 1/8th plexiglas to the form using sheet metal clamps, one on each side. Make sure that the 8" width is parallel to the squaring arm, figure 4A. Set oven for about 310 degrees. You will probably have to remove most of the oven racks to get everything in. Forming this piece of plexiglas will not hurt your oven. To avoid gouging or scratching the hot plexiglas remove all rings or other jewelry and where cotton gloves to keep from burning your fingers. After being in the oven a few minutes remove everything and give the plexiglas a gentle push around the form just past top center. Place everything back in the oven for about five minutes. The plexiglas will gradually start to droop, figure 4B. When it is almost all the way it is time to remove from the oven. With a small stick about 8" long, covered with felt, start to iron the plexiglas in the direction shown in figure 4B. Keep ironing until the part has cooled. Be sure to have your gloves on before doing this. And remember no jewelry. You will be amazed at how well the new lens fits and hugs the form.

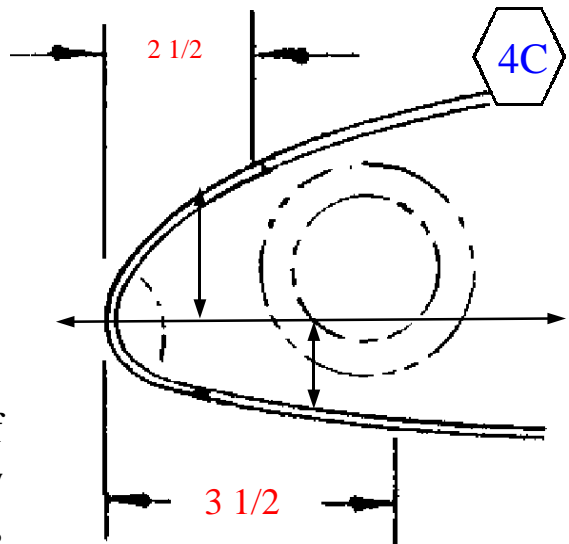
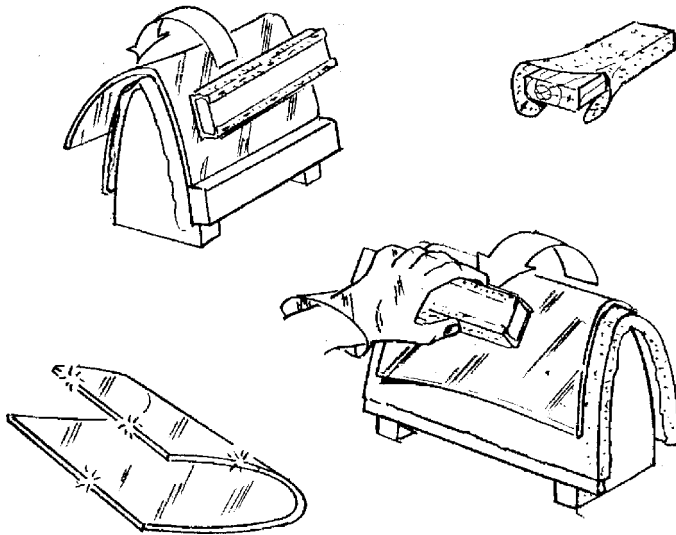


4B

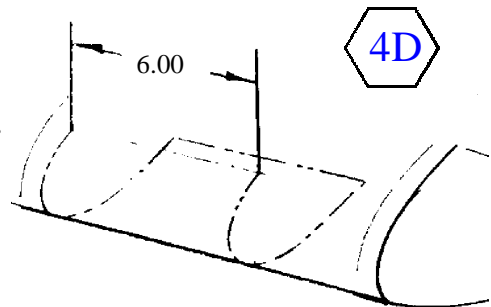


After forming the lens put the paper back on and set aside.

The finished dimensions for the lens is: eight inches wide, 2 1/2 inches back on the cord line on top and 3 1/2 inches back on the cord line on the bottom. The top should be the right size and the width should also be correct but the bottom will probably have to be trimmed on the band saw and sanded smooth on the disk sander.

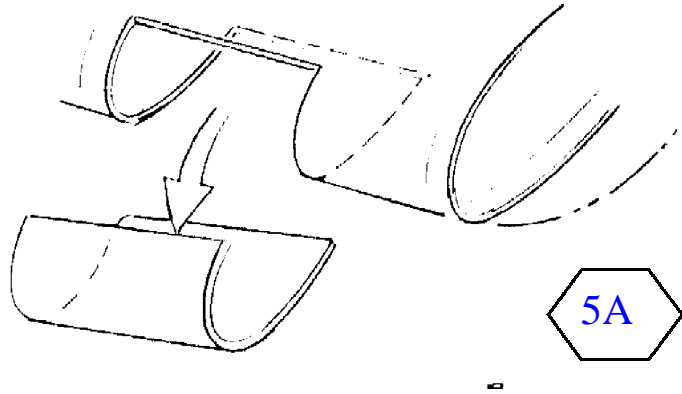


You have now completed part one of the landing light installation. It is now time to put the wood working tools away and get out the sheet metal tools. Laying out the cutout in the wing can be accomplished with a #2 pencil and a T-Square. Measure back along cord 1 1/2 inches on top of wing along the cord and 2 1/2 inches along bottom of wing, figure 4C. Using a T-Square on the tip of the wing draw a line top and bottom parallel to the leading edge. These two line represent the rear cut lines top and bottom. The red numbers in figure 4C represent the location of the lens and the arrows lead lines represent the cut lines for the sheet metal. The width of the opening is six inches. 4D This means that the lens will extend 1 inch larger all the way around the

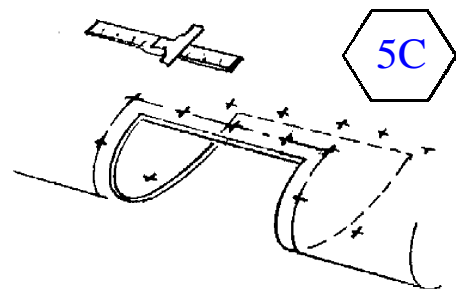
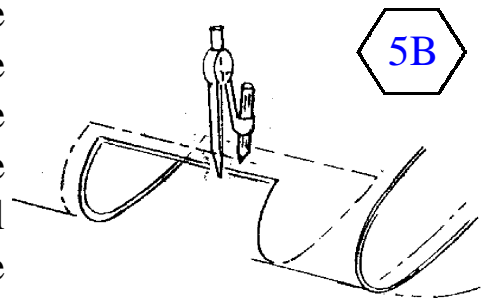


inside of the skin.

**Step 5.** Layout the cut out on the wing skin. It should be 6" wide and 1 1/2" back from the leading edge on the top of the wing and 2 1/2" back from the leading edge on the bottom. Also the cutout should be centered in the outer bay of the outer wing. Or centered between the two outer ribs. Carefully remove this piece of skin using left and right hand sheet metal snips. A starter hole is helpful using a large step drill. Leave the line and file a radius in all four corners with a 1/4" round file. **No Sharp Corners.** With a mill file very carefully file to the lines making the cutout fit the above dimensions. See view 5A.

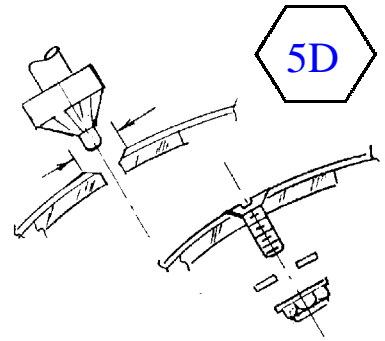


With a pencil compass draw line 1/2 inch all around the opening. This will be the centerline for the attaching stainless screws for the lens, five holes across the top and bottom and one hole on each side top and bottom half the distance between the rear screws and the leading edge. Accurately laying out these holes gives the appearance of professional workmanship, view 5B and 5C. Holes in the skin can now be drilled or punched out to 1/8th of an inch and de-burred on the inside of the skin. Take the new lens and carefully push it into the wing as far forward as it will go. You will notice that it does not fit perfectly. They never do. Take the formed lens and center it and assure yourself that it is 1" larger than the opening all the way around. If you followed all the instructions this will be the case.

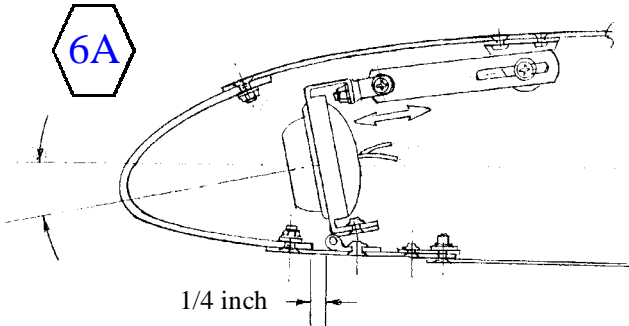


    Holding the lens in place drill, and

cleco as you go. After all holes are drilled in the lens remove the lens and enlarge holes in the wing skin to 5/32. Now dimple these holes for #6 flush screws. See view 5 D. Now enlarge the holes in the lens to 3/16. The over size holes are to allow for expansion and contraction. Now countersink holes in lens only to accept dimple in wing for #6 screws.

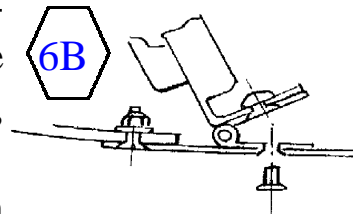


**Step 6.** With lens held in place with a couple of temporary screws it is time to locate the hinge that will be the main support for the light and give the light the ability to be adjusted to different angles. The hinge



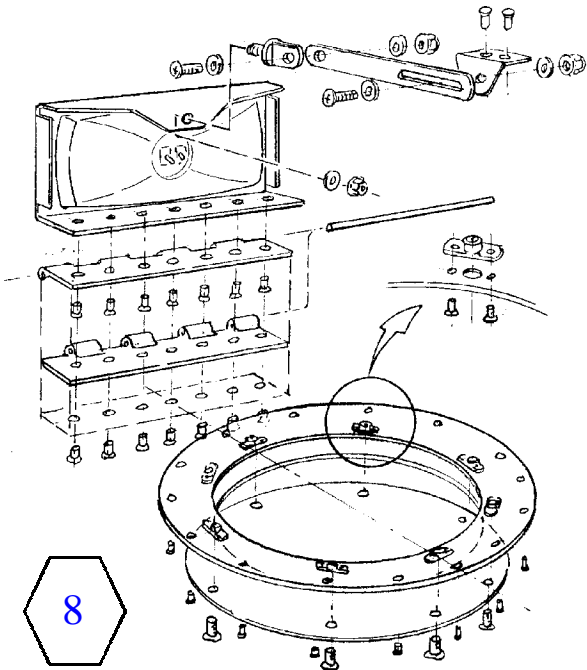
should be located 1/4 inch aft of the bottom rear of the lens. Center hinge behind the lens and drill with #40 drill and cleco through holes provided. Be sure to use the hinge half marked bottom. Dimple the skin and countersink the

hinge for flush rivets. Rivet the hinge half in place, figures 6A and 6B



**Step 7.** It is now time to install the lens. Using a clear silicon, Aircraft Spruce Part #09-27800, put a 1/4 inch bead of silicon all the way around the outside inboard of the screw line. When the lens is pushed into place the sealant will ooze out. screw into place with the Stainless #6 screws. Do not over-tighten screws. They should be snug so they do not turn but not tight. With the locking nuts they will not come out. Whip up excess silicon but leave enough to fill any gaps between the skin and the lens. It will take about 24 hours for the silicon to cure. After the silicon has cured it is time to install the light assemble. All that holds the light assemble in place is the hinge pin and the adjustment arm. After putting the hinge pin in place you will notice the light has plenty of travel. We used a portable 12 Volt battery to test the light in the dark. Sitting on the tarmac of the airport we set the light to

hit the ground about fifty feet in front of the airplane in the tail wheel position, It is a good place to start until you can actually go out and do some landings. After finding the right angle for the lens, rivet the L/bracket to the top of the skin so that the obround slot in the adjustment arm is centered. This allows adjustment for and aft of the fifty foot setting. Attach adjustment arm to L/bracket..



**Step 8.** The access panel and ring are for the purpose of readjusting the light and the possibility of ever having to change the bulb. If you are not concerned that this problem will be an issue, then don't install it. If you are going to install the panel now is the time to do it, before reinstalling the outer wing rib. An inspection panel can be built into the outer wing rib but that still requires removing the wing tip every time you have to work on the light. I believe the access panel is much better.

The outer ring for the panel is 10 inches in diameter, so the center of the ring should be 5 1/2 inches back from the trailing edge of the bottom hinge stock. Cut an 8 inch hole in the wing using a circle cutter. If you do not have one most RV 4 builders do, borrow it. After cutting the hole, screw the 8 inch plate to the ring and place in the hole and use the ring as a drill template. Cleco as you drill. Remove the plate from the ring and dimple and rivet ring in place. You can now screw the panel to the ring on the outside of the skin. Reinstall the out wing rib. The ground wire can be attached to the outer rib after it has been installed and the hot wire ran through the wing to the 6 Amp circuit breaker switch. This completes the installation of the halogen landing light. Contact me with any problems.      [cborden@slonet.org](mailto:cborden@slonet.org)