

Modification Report

MOD # : MOD-005

**Taran Laval – SAAA Builder 7417
Van's Aircraft RV7 - 73918**

LANDING LIGHT ADDITION

I ELECTED TO INSTALL THE DUCKWORKS L.E.D LEADING EDGE LANDING LIGHT SYSTEM IN BOTH WINGS, THIS INVOLVES CUTTING A HOLE APPROX 5"x5.5" IN THE OUTBOARD BAY OF THE LEADING EDGE, INSTALLING A PLEXI PIECE IN PLACE AND A PRE MADE BRACKET IN BETWEEN RIBS.

THE INSTALLATION IS DONE IAW THE ATTACHED MOD-005-APPENDIX1

*****AFTER CONSULTING OTHER BUILDERS I DECIDED TO EXTEND THE LANDING LIGHT CUTOUT 1.5" OUTBOARD SO THE LED LAMPS WOULD LINE UP, THIS WILL ALSO GIVE THE BENEFIT OF BETTER LIGHT DISPERSION INBOARD.**



Date: DD MMM YY

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The Duck & his Dad over the Cascade Mountains of Oregon

Duckworks Website: www.duckworksaviation.com

Go to our website and check-out our Round Light options, including HID

You can also contact us via our email: duckworks@comcast.net

DUCKWORKS LANDING LIGHT INSTALLATION INSTRUCTIONS

1. INTRODUCTION

Thank you for ordering a Duckworks Landing Light. We hope you enjoy installing and using it in your RV. As is the case with the RV itself, straight-forward functionality at as low a cost as possible is our goal. We think you will find this product follows that example for you.

2. INSTALLATION INSTRUCTIONS

Follow these instructions carefully. It should take only a few hours to install a Duckworks Landing Light. Note that these instructions are written for installation in a completed wing. Some steps will be easier if your leading-edge is still accessible off of the wing, and the wing-tip removed, some will not. If you **are** installing it in a completed RV, don't worry, it will all fit thru the lens hole.

2.1. Tools

These tools will be needed during installation:

- Drill motor, #40, #30, 7/64, 5/32, 11/64, and 3/16 drills.
- #40 and #30 countersinks.
- #40 and #20 (or #30) dimple dies.
- Sandpaper and/or small scotchbrite wheel.
- Hand rivet squeezer.
- Pop rivet gun.
- Assorted files.
- 90 degree drill adapter.
- Hacksaw and/or dremel-type cut-off wheel.
- Snips.

2.2. Preparation

Inventory all parts against parts list. If any are missing or damaged, contact Duckworks immediately

Locate the Leading Edge and Wing Cutout Templates. Follow the instructions and prepare them for use.

Determine which 'bay' to install the light in. We recommend that it be the last outboard bay. It is not known if structural integrity of the wing/leading edge will be affected by installation in the more inboard bays, but we do advise against it. Also, in the last bay, your lights will be farther apart/more visible, and will reflect the least off of the prop 'disk'.

2.3. Making the Lens Cut-Out

Using Template A, align "rivet line" with the **INBOARD** rib *rivet line* (see photo). Adjust it so that top of lens 'cutout' is the distance from the Leading-Edge/Top Skin seam shown on the drawing.

Taping the Template in place will help hold it while you trace the opening onto the wing. Remove template once hole is traced.

CAREFULLY cut the hole in the wing, leaving enough to allow for filing to a smooth, clean edge. If snips are used, make the initial cut 1/2" from the line, then carefully trim-out to line. This will help prevent distorting the skin around the hole.

Once the hole is cut and shaped satisfactorily, sand or buff edge with fine sandpaper or a scotch-brite wheel, to make a nice smooth edge.

Fit Template A back over hole. Mark the six holes as shown on Template. Use the small "Retainer strips" in the kit for a drill guide, this will make sure that the holes in the skin will match the retainer strips later. If your hole is slightly oversize, relocate the holes to fit. Using a #40, drill the center hole, clecoe the retainer strip in place, then drill the remaining 2 holes, **BEING CAREFUL TO NOT DRILL THE NUTPLATE RIVET HOLES IN THE SKIN.**



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When the cut-out is completed, it will provide enough access to the wing needed to finish the installation.

2.4. Mark, Drill, and Mount 10-32 Plate-Nuts to Ribs

Fit Rib-shaped Template B into leading-edge and mark the 2 locations (A & B) on both ribs.

Drill the 4 holes with a #30 drill. Use a 1/8" Clecoe to attach a 10-32 plate-nut in a hole & drill the 3/32 (#40) holes using the plate-nut as a guide (be sure to drill ONE hole at a time and put a #40 clecoe in to steady the plate-nut before drilling the second hole).

Drill the screw holes-out using a 3/16 drill.

Install 4 **10-32 (K1000-3)** plate-nuts using the 3/32 pop rivets (you can use regular AN426 rivets if the leading-edge is off of the spar). **NOTE** - the plate nuts go on the **OUTSIDE** of the ribs that form the mounting bay.

2.5. Install the Reflector Mount

NOTE - When fitting the Reflector Mount, it is important to remember that the pre-bent end CLOSEST to the lamp hole always attaches to the INBOARD rib. This maintains alignment of the lamp with the leading-edge cut-out.

The 10/32 (K1000-3) plate-nuts will need to be riveted to the mount. Use AN426 rivets and hand-squeezer (note that the rivet holes will require machine counter sinking).

Sizing the mount to the bay – For the RV-7 & 8, the reflector mount will fit without modification (go to 2.5.1).

For the RV-4, 6, and 9 you need to trim the mount to a shorter length. Measure the width of the bay from rib to rib, at the stiffening rings pressed into the ribs.

The **RV-4** may fit without trimming. If not, trim the **longest** end of the mount as needed, 1/4 to 1/2 inch LESS than the measured width. Slide it thru the cut-out for a test fit. Note, if there is not enough material remaining on the end that was trimmed off to allow re-attaching it, contact Duckworks for a new piece.

For the **RV-6**, you will need to trim appx 1.4" from the **longest** end of the mount. Save this piece for the next step. Test fit the trimmed mount.

For the **RV-9**, trim appx 1" from the **longest** end of the mount. Save this piece for the next step. Test fit the trimmed mount.



Once you are satisfied with the mount length, drill and rivet the end mounting plate to trimmed-end of main mounting plate. For the RV-4/6 and 9 you will trim and use the end piece cut off in the previous step (the end plate should look similar to the one in the photo). Remember that the overall length of the completed mount should be the approximate width of the bay as measured in the last paragraph. Use #30 drill and rivets to rivet the end mount to the main mount, or dimples and AN-426 rivets could be used. (If you ruined the end piece, contact Duckworks for a replacement).

2.5.1 The reflector mount can now be fitted into the bay and attached to the ribs using 4 washers and flathead 10-32 phillips screws, supplied with kit. Note that adjustment of the light is accomplished by loosening these screws and shifting the mount.

For the HID unit only – **Decide if you prefer mounting the Ballast on the main mount, or on the Spar or a Rib.** If you are mounting the ballast on the Spar or a Rib, use the mounting bracket on the Ballast as a guide and drill holes. If the Ballast does not have threads in the mounting tabs, install nutplates. The ballast should be mounted and attached using the supplied cables. If you did NOT put the Ballast on the mount, I would plug the cables into the Ballast prior to mounting it, and attach the power and ground wires (in the wing) to the connector supplied with the ballast (Red or Blue to + and Black to Ground).

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If you prefer mounting the Ballast on the main mount (I do, especially for the thin ½" thick units): Use the mounting bracket on the Ballast as a guide and drill holes. See the photos – I mounted mine on the plate, using the 4mm x 10mm x .7p screws (supplied) for the ballast and Wire Ties for bundling all the cables. Effective and Compact. Use Loctite to secure the screws.



For INITIAL setup, with the screws/washers in but loose, push the mount all the way back in the holes, then pull the bottom forward. Hold it in this position and snug up the screws. Note – adjustment is easier if the reflector/lamp is Not installed in the mount. The lamp can be easily installed later.

NOTE - While it may *seem* incorrect to some builders to fit the mounts against the stiffening rings pressed into the ribs, this is not a problem and the uneven surface helps to hold the mounts in place. Don't tighten the screws too tight of course!

2.6. Trim the Plexi Lens

It may be a good idea to cover the lens with masking tape to protect it while working with it. Also, if the temperature is below 70 degrees, some slight heating before use is recommended to reduce the brittleness of the cold plexi material.



Lay lens over opening (see photo). BEING SURE to leave the same overlap on each side of opening, trace a trim line on the lens, approximately ¾ inch from top and bottom of cutout, including curves. Some may be trimmed from the sides as well. Ideally, you would end-up with a lens about ¾ inch larger than the cutout on the top and bottom ends, 5/8" on the sides. (See section 2.9 prior to completing this step).

Trim lens to line (see the FAQ on our website for working with plexi). This can be done easiest with a band saw. Otherwise, by clamping a thick straight-edge on lens, with the trim line along the edge of a table. Using a linoleum or razor knife, score plexi with several firm strokes along straight-edge, then snap it off by applying pressure downward. If too firm of pressure is required, score deeper. This works for the long cuts and for an angle cut on a tangent to the corners.

Finish lens edges on a disk or belt sander. Be sure to fully smooth the edges. Any sharp nicks can start cracks later. Use fine sandpaper to finish the edge.

2.7. Fit the Plexi Lens

Using fiberglass strapping tape, make a 'handle' for the lens. Cut 16" and 8" lengths of tape, then put the sticky sides together, centering the small piece in the large. Leaving a gap for your hand to fit in, lap tape over lens top and bottom edges, sticking tape to inside of lens.

Slide lens into hole (this will take some squeezing and jockeying). Be sure contour of lens matches shape of skin. Pull lens out into hole as snugly as possible to create a smooth seam between skin and lens. BE SURE that lens is centered in the hole, both side to side and top to bottom (ie pulling too hard on the top will force the tightest part of the bend out of place and leave a gap). **(NOTE)** - Some builders have attempted to push the lens in from behind. In some cases they have not gotten a good fit as it is difficult to do. In other cases,

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they have come-up with ways to jam the lens in SO TIGHT that they are unable to get the screws in! *Please try the strapping-tape method.* If you use strong tape, you can get excellent results. I have installed several of these kits using strapping-tape and gotten good results).

NOTE - Whenever drilling Plexiglas, try to drill SLOWLY to prevent the drill from splitting the plexi. Don't use sharp, split-point drills (especially when enlarging an existing hole!). Uni-bits work well. WARM PLEXI won't crack as easily!

Using #40 drill (hold that lens tight!), drill bottom-center hole (holes in skin should be drilled/cleaned first, see 2.3). Insert a clecoe. Make sure that all alignment still looks right, then drill and clecoe other 2 bottom holes (always maintain firm pressure on the tape to insure tight fit between lens/skin). Use same procedure to drill/clecoe top 3 holes. Remove clecoes, clean cuttings, then re-install.

DO NOT expect clecoes to hold the lens as tight as screws will. The lens fit will not look tight enough if it is only held-in by clecoes. Use the tape to drill ALL 6 holes to insure the best fit.

Now CAREFULLY enlarge the holes using a #30 drill and clecoes, and don't be afraid to use the tape to maintain the tight fit. Remove lens from wing.

2.8. Enlarge and Countersink Holes in Plexi Lens

Drill-out the screw holes (*in plexi, not in skin*) with a 5/32 drill. Countersink just enough for a dimple in the skin to fit. Use a scrap piece of .025 and dimple it to test fit the countersinks in the plexi lense.

2.9. Rivet Nut Plates to Retaining Strip

Countersink the rivet holes on the strips for AN426 flush rivets. Enlarge the screw holes in the strips using a 5/32 drill, then debur.

Rivet **6-32** nut-plates to strips, using AN426AD3-3.5 rivets. Attach strips to inside of lens **using 2-sided tape** provided. Alternately, 2 soft countersunk pop rivets could be used to hold the strip on, but be very sure their holes in the plexi are oversize, and that they fit loosely, with some 'wiggle'. Else, they will put pressure on the plexi and cause cracking.

NOTE - Some builders have needed to trim a little more off of the bottom edge of the lens to help prevent interference between lens and mount when sliding it in after the installation is complete. You can trim the lens *almost* all the way up to the nutplate strip if needed (not necessary on the RV-9)(see photo).



Trim the corners of the Retainer as shown to improve the fit in the curve of the lens. This is for the TOP strip only.

Note – This photo shows pop rivets holding the strip to the lens. This will work, but it is very easy to crack the lens, unless you make the holes large enough that the pulled rivets still 'rattle around' in the holes in the plexi. If the rivets get 'tight', the plexi breaks! Use the black double sticky tape strips if

you're at all unsure.

2.10. Clean and Dimple Holes in Skin

Skin holes should still be #30 size. THOROUGHLY deburr the holes, preferably using a countersink style deburring bit. Leave a nice bevel on the inside of the holes, to prevent splitting during dimpling.

Dimple holes for 100°6-32 screws (a #30 dimple-die will work. If **you use a screw-specific or a larger die**, enlarge the hole slightly and test on a scrap piece to see how the screw head fits). **RECOMMENDED** - Install the small strip of adhesive-backed foam (as a moisture barrier), about 1/8" inside of the lens opening.

2.11. Prepare the Rectangular Lamp/Reflector

For the Rectangular lights - **CAUTION** - Make every effort to **NOT TOUCH** the reflective surface or the bulb of the Rectangular light. The reflector is very difficult to clean and the oil from your skin will cause a hot spot on the bulb, reducing it's life. Sometimes we ship the rectangular lights fully assembled. To disassemble the driving-lights &

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remove the reflector/bulb, first remove one screw from the glass lens, then pull the lens off. Pull the reflector part way out and cut the outer end off of the ground (black) wire. Pull the reflector the rest of the way out, remove the rubber gasket and discard. The reflector can now be fit into the mount (in the wing) and secured using 2 flat head screws and 2 washers.

NOTE - Only the metal reflector and bulb will be used in your 55w Rectangular light. The plastic housing and glass lens of the rectangular light are not used.

2.12. Install Lamp/Reflector in Mount

For the standard Rectangular reflector, pull the aircraft power and ground wire(s) thru the hole in the mount and attach them to the bulb. Insert the reflector in the mount and secure with the 2 10/32 screws and aluminum washers, being careful to center the reflector in the hole.

For the Round reflector, pull the aircraft power and ground wire(s) thru the hole in the mount and attach them to the bulb. Insert the reflector in the mount (make sure the tab is in the cutout on the top or bottom of the hole) and secure with the retaining bracket and 2 10/32 pan-head screws. If the lamp is a little loose in the mount, this can be fixed by placing the smaller retainer flat on the table facing up and carefully but firmly press down on the inner ring.

For the HID lamp, pull the power cable from the ballast thru the hole in the mount and attach it to the lamp. Insert the lamp in the mount (make sure the tab is in the cutout on the top or bottom of the hole) and secure with 2 10/32 pan-head screws. For XeVision HID Lamps, install the O-ring on the back of the lamp prior to installing into the mount. If the lamp is a little loose in the mount, this can be fixed by placing the smaller retainer flat on the table facing up and carefully but firmly press down on the inner ring.

2.13. Install Lens

Slide lens in place and install stainless screws. **NOTE - Be sure to use some oil or grease in these small plate nuts (6-32) when first installing the screws. If you don't, you will break some of the screws off, they are too tight initially.** Start with the 3 screws on top and install most of the way, but not snug yet. Put some tape on the lens and use it to pull the lens into place where you want it, then snug the top screws. Now use the tape to pull the bottom in and start those screws. Pull the lens firmly into place and snug the center screw first, then the outside screws and tighten until snug (not too tight!). Remove the tape.

Guess what? YOU'RE DONE!

3. SOME FINAL HINTS

Here are some general items that I thought might assist during installation and wiring of your light. Visit our website for more information and some FAQs about our lights: www.duckworksaviation.com

3.1. Wire, switches, fuses, and connectors

Because every builder has his own preference for wire and switch type, we didn't want to attempt to make that decision for you, so there are no wires or switches included in the kits.

For each 55-watt bulb use a 7A breaker (15A for 2 on one circuit). Use a 10 amp for a 100 watt bulb (20A for 2 on one circuit). For each HID use a 10A.

16 gauge wire may be used for the 55W halogen, otherwise 14 gauge wire should be used for any of the 100W Halogen or HID lights,

DON'T forget to ground the light properly. Use a ground wire from the screw that holds the bulb in the rectangular reflector, or one from the TAB on the 100W unit. The HID units use a RED wire for Positive and a Black wire for ground. The ground wire should then be attached securely to a rib or the spar.

3.2. Glass Reflector Cover and Cosmetics

Although we intend to NOT use the glass reflector cover that came with the RECTANGULAR lights, some builders may find them cosmetically preferable. We were able to make it fit easily so you can use it if you wish. It will add some weight, MAY affect the cooling of the bulbs, and will reduce **by 50%** how far the beam goes out in front of you! It is up to you

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whether or not you use them. Use the plastic pieces that come on the driving light stock mount and some longer 10/32 screws.

Many builders will want to paint the bay where the light is installed. If you decide to do this, mask-off an area about 4 X 4" directly above and in front of the reflector/bulb, on the underside of the top skin. Leaving this area silver will not be visible to admirers of your beautiful RV, but it will help reflect more light out the bottom of your lens, providing more ground area lighting during taxi. That will allow you to aim the main beam well-out in front of you, where it should be for landing. (Note that in my own RV-6, the inside of the wing is painted maroon in front of the light, and I still get adequate ground lighting for taxi).

Check our website, we will offer a joggled aluminum retainer rim for the rectangular light soon.

3.3. Aiming Options and Methods

The lights are biased for a nose-high final approach attitude. Much adjustment is available. Note that I originally flew my RV-6 500 hours with a wood prop. When I changed to a constant-speed prop, the approaches became so steep that I needed to re-aim my lights. So, aiming them thru trial and error seems to be required. See the paragraph below for aiming recommendations.

If your RV is a TriGear version, taxi coverage will be excellent due to the attitude of the wing during taxi operations. In some cases, taildragger pilots have opted to aim one light down in more of a 'taxi' orientation. I do not do this on my RV-6, but your experience may differ.

To aim the lights, position your RV about 10 feet from a wall on a level surface. For tailwheels, raise the tail to a level attitude. Use a string to find a spot on the wall level with the leading edge of the wing and straight in front of it (perpendicular). Mark the spot with tape in the form of a + sign about 6 x 6 inches. Loosen the end screws on the mount, turn on the light, and adjust the mount until the beam is centered on the '+'. This initial setting will get you close.

After you've had a chance to taxi your RV or do a high speed tail-up taxi (Tailwheel) you will have a better idea if they are where you want them. For fine adjustments, go back to the wall, turn on the lights and mark them with the '+'. Now adjust them around the + sign according to where you observed them in use. For example, if you want the light a little closer to centerline, shift the mount. REMEMBER – a very small adjustment at the light will mean a large movement several hundred feet in front of the aircraft.

For my Tailwheel RV-6, I like the lights to hit the runway either side of centerline roughly 100 feet in front when my tail is up on the takeoff roll. This allows me to track the centerline during dark takeoffs, gives me good view of the runway on final, and adequate taxi light on the ground. My lamps hit the middle of a hangar wall from 40 feet away.

3.4. More Light?

We use the 55W Rectangular light because in testing it provides excellent output for it's LOW COST/WEIGHT. It has been tested on an RV-6 at night, into an unlighted grass strip, with good results. In the event that your needs change and you would like more light, one of the real advantages to the Duckworks installation is the options you have available:

- You can replace the 55W bulb in the rectangular reflector with a 100W bulb.
- We offer 100w Round Halogen units that are an easy update to the look and light output of the base 55W units.
- We have 35 and 50W D1S Type Round HID lamps with incredible light output and very low power draw.
- We have 35 and 50W Low Cost HID lamps that directly replace just the 55 or 100w bulb in the Round and Rect Kits.

See our website for details.

4. TELL US WHAT YOU THINK

We hope that you have found the installation of the Duckworks Landing Light not too difficult nor time consuming, and that the finished light looks as nice as we think it does. If you have any suggestions on how we can improve the lights, the instructions, the installation, or anything, please give us a call, or drop us a note, so we can improve our product for the next builder.

There is a Parts List on the last page. Send orders to the address below, being sure to include your return mailing address.

Duckworks Aviation LLC
51936 SE 5th Street.
Scappoose, OR 97056

Please include a check or money order made payable to: Duckworks Aviation LLC

Mailing Address: _____

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PARTS LIST

This is a list of all parts included in the kit and their prices should you need a replacement (it is also an order form).

Item#		Description	Price each	Qty ea.	Ext. Price
		PARTS COMMON TO ALL KITS			
1	1	Main Mounting Plate Single (SP)	25.00		
2	2	Retaining Strips (LB) 2 required	4.00		
3	1	RV-4/6/7/8 Pre-Formed Plexi Lens (PL1)	15.00		
4	1	RV-9/9A Pre-Formed Plexi Lens (PL9)	20.00		
5	2	2 sided Adhesive Tape Strips	0.40		
6	8	6-32 x 3/8 100°Stainless Screw	0.25		
7	4	.75" Aluminum Washer	0.35		
8	4	10-32 x 1/2 Flat Head Stainless Screw	0.45		
9	7	K1000-06 Plate Nut	0.45		
10	6	K1000-3 Plate Nut	0.40		
11	15	AN426AD3-3.5 Rivet	0.05		
12	10	3/32 x 1/4 100°Pop Rivet	0.40		
13	1	3/16" x 1/16" Adhesive Foam Tape (2ft)	.60		
14	1	Instructions	2.00		
15	1	Wing Cutout Template	.75		
16	1	Rib Template	.75		
		PARTS ADDED FOR RECTANGULAR KIT			
1	1	Rectangular Reflector	12.00		
2	2	.75" Aluminum Washer	0.35		
3	2	10-32 x 1/2 Flat Head Stainless Screw	0.45		
		PARTS ADDED FOR ROUND 100W KIT			
1	2	10-32 x 3/8 Pan Head Stainless Screw	0.45		
2	1	Round Light Retainer (RLB)	15.00		
3	1	100W Round Reflector with Bulb	30.00		
		PARTS ADDED FOR HID KIT			
1	5	10-32 x 3/8 Pan Head Stainless Screw	0.45		
2	1	Round Light Retainer (RLR)	15.00		
3	3	K1000-3 Plate Nut	0.40		
		Subtotal			
		*Shipping (per order)	8.00		
		Total Check or Money Order (Payable to DUCKWORKS)			

NOTE – Prices can change over time. PLEASE check our website for current products/pricing prior to submitting an order.