SKYBOLT

AEROMOTIVE CORP.

Vans RV Cowling Installation

Featuring Skybolt's VLoc™

Cowling Fastening System

Diamondhead® Fasteners

Rev 22 September 13, 2017 US Patent 8,490,358 B2

Other US Patents Pending

New for 2017.5 –

In 2015 Skybolt introduced the SK-OSG1-8 high shear grommet to further reduce cowling movement. To prepare for even more innovations in the future, Skybolt will change the receptacle style to our cage configuration. The cage receptacle allows user options without de-riveting the receptacle. This opens the door for even more fastener innovations planned in 2017.

The new SK245A162A receptacle is a non-floating receptacle that can be easily converted to a floating receptacle. This has enormous value to the builder in that the cowling is limited in movement but an individual hole can be converted to a floating option if the fastener does not line up properly. The effort to convert the hole is as simple as removing the retainer and exchanging the barrel/insert assembly to the new **SK245A162-INS** part number that is included in each kit (2 each per kit). A handful of floating inserts will not impact the ability to keep the cowling from shifting in flight.

This new receptacle also gives us the options to produce even more innovations in fasteners that are on the drawing board. We can introduce new designs that easily interchange into this cage assembly when they become available later in 2017.

Here is what is new in Rev 22. We made adjustments to the SK245A162A insert to make it easier to remove and install via the wire retainer. We eliminated any float on the ends such that the end edges contact the buckhead of the rivet with little to no movement. Our SK-RVC1 Magnet Inserts allow easier center hole finding in the cowling skins.

So what is a Diamondhead® Fastener?

Beginning in 1982, Skybolt began searching for the most ideal fastener for aircraft engine cowlings. In our earliest days, we were at the mercy of accepting whatever version of a stainless fastener provided by Camloc®. The only stainless 4000 series Camloc available was 40S41SC (Phillips). Although we were happy to source and distribute a stainless Phillips head fastener, it did not take long to experience one disappointment after another. First, from lot to lot, most parts had bad finishes and the stainless was dull. We invested in jewelry polishing equipment in an attempt to bring out the head finish worthy of the market we served. Then we discovered that the 400 stainless material would corrode, almost rust, like it was bare steel. 40S41SC might be OK for Boeing because of the suggested strength (actually the head hardness) but it was a poor performing fastener in our market for two reasons: (1) it corroded easily and (2) the pins kept falling out from overtorque. It remains an OEM spec item in many GA high end aircraft, surprisingly.

Camloc® answered our call by providing the 40S5S series 300 stainless. Now we had a true 300 series stainless Phillips head part with excellent corrosion resistance properties. But we still had issues with dull finishes and pins falling out, not to mention head galling….which was the first sign that the fastener was over torqued leading to pin failure. Skybolt built a business around the Camloc® 40S5S fastener but we still were not happy with the properties and performance plus we replaced thousands of fasteners due to the overtorque and pin loosening/falling out issue.

In 1993, Skybolt created a manufacturing entity specifically to address all these issues that were presenting challenges. Our prime mission was a consistent supply of quality finished parts that also address the overtorque problem and pin failure. Our first production run resolved some of these important problems. But we still had challenges remaining to manufacture the perfect all-in-one fastener. We wanted Phillips head fasteners with the corrosion resistance properties of 300 stainless but the strength properties of 400 series stainless. In fact, our goal was to surpass the performance properties of Mil-Spec standards such as MIL-F-5591C and NASM5591 for *steel* fasteners. This proved to be difficult.

In 2011, we blew past the steel performance ratings with our 40S5S series CLoc® constructed of 300 series stainless. Now we had a fastener with a superior finish, no pin failures, strength properties of steel. But we were not finished. The head galling challenge became our next goal.

With a hardness of Rc29, the Diamondhead® fastener featured in all Vans RV kits will outperform any product on the market by addressing every performance criteria important to aviation applications. What you will discover is that the Diamondhead® fastener will look as good on your airplane years from now as the day you removed them from the bag. *Not so* for any other brand.

Industry Standard Phillips Head	Material	Tensile	Shear	Torsion	Head Hardness	Typical Rc	Corrosion Resistance
40S5	Alloy Steel	1050	1050	Good	Good	29	Fair
40S5S	300 CRES	735	735	**Poor**	Fair	29	Excellent
40S41SC	410 CRES	735	735	Fair	Good	29	**Poor**
40S45	300 CRES	735	735	**Poor**	Fair	29	Excellent
Other	300 CRES	Varies	Varies	Poor	**Poor**	90b*	Good
Diamondhead®	300 CRES	1050	2000	Excellent	Excellent	29	Excellent

Note: All Skybolt data and critical data of competing fasteners have been independently tested by accredited labs and/or performance numbers derived from published drawings. *Rockwell B scale (90b) results in head galling and failed pins.

History – In 1990, Skybolt installed one of the first ever Camloc® cowlings on our RV4. This RV4 became our test bed for another Skybolt original, the adjusting fastener receptacle that would allow one stud length to cover a wide range of panel thicknesses. Without this concept, we could have never sold the concept into this market. Although the Skybolt CLoc® system was more expensive than the hinge design, to date, we have never heard or read about any builder regretting the effort or expense. From Oshkosh to Sun'n Fun, Skybolt took our innovation to market beginning in 1993 and continuing through 2006 when we shifted our customer interactions to a forum venue. This customer interaction has helped us to better understand our own product as perceived by the builder. This has led us to what we believe is our best ever innovation to serve the emerging kit plane market. Skybolt may be a prominent name in fasteners for the Airbus A380 or the Army's latest and greatest MRAP or JLTV that protect our troops, but our roots remain where it all started, the Vans RV marketplace. We walk the Vans flight line twice a year to see how our product grows in acceptance; just like we see NASCAR depend on Skybolt for the absolute lightest and best quality fasteners for all their cars; or how the NHRA depends on Skybolt products to protect drivers in 300 mph "track diversions". We learn. We innovate. In 2011, we unveiled a new interlocking flange that makes cowling installation and functionality better than ever. So much better, we feel that the hinge option may be something of the past. One has to wonder why Cessna, Beech, Boeing, or Airbus do not use hinge for their cowlings. Surely they would want the "clean" look or the cost savings. Only they know the end cost and it basically ends up spending a quarter to save a nickel. All said, we respect that the beauty of the builder market is choice. Vans designed this magnificent aircraft to fly for less than $20,000. Back in the 1980s, there may have been a Vans aircraft that flew for less than $50,000. Today, the popularity of the aircraft lends itself to much higher investment dollars. But what a tremendous bang for the buck in every new RV6, 7, 8, 9, 10, 12, 14 and beyond!

We are so convinced that the interlocking flange will change the way a cowling is constructed, we applied for a US Patent to protect our devotion to our product and in the end, our customer. One thing is for sure, you can depend on Skybolt to be the *Rolex* of panel fasteners.

See Fastener Tips Page 21-22

There are several builder choices for installing the cowling. These instructions assume a complete cowling installation using the Skybolt VLoc™ fastening system. Although some experienced builders may have developed an approach or process somewhat different than Skybolt, we acknowledge that there are several ways to achieve a common goal. The first and foremost objective is to define the objective.

1) Obviously, we would like to complete the cowling installation phase with perfection; something to be proud of.

2) Maximize utility. By selecting the Skybolt VLoc™ option, it is also obvious that utility, the efficiency of installing and removing the engine cowling is accomplished.

3) Insure that the fastening system is everything it is supposed to be.

Let us first address an issue that is unique to a fastener versus hinge: The chance of the cowling skin bulging in flight. The hinge is a continuous fastener; the VLoc™ fastener is a concentrated fastener in that the loads are isolated to the area of the fastener itself. All aircraft manufacturers have to deal with this. Look inside any production cowling, aluminum or composite, and you will either note doublers spanning the cowling axis either at the fastener line or adjacent to the fastener line. The later allows for a much improved cowling trim with the airframe and accomplishes the same load carrying ability. Some older production composite or fiberglass cowlings simply used bulk as a substitute for doublers. The latest and greatest Vans cowlings or Sam James cowlings use much lighter materials bonded into the cowling skin that create good load carrying properties. Sam James uses a special capillary material that greatly increases structure without adding unnecessary weight. The evolution of the Vans cowlings plus the

standard of 3-1/2 inch fastener spacing should eliminate any skin bulges in flight. We highly recommend bonding a support strip adjacent to the fastener line around the firewall.

Before you begin –

1) If you are building a Vans aircraft, review the Vans installation instructions and drawings to note many references and similarities of mounting a VLoc™ cowling versus the hinge cowling.

2) We assume the engine is mounted. Otherwise it would be a bad gamble to assume the center of nose of the cowling in respect to the engine and spinner.

The other important factor is to determine exactly how close the cowling nose is positioned to the immediate aft surface of the spinner bulkhead. This is for engine cooling issues. Too close and the spinner contacts and rubs the cowling; too far and it may lead to engine cooling issues. There are some excellent topics in this regard available at www.vansairforce.com. By the time you have reached the "Finishing Kit" stage for the RV series, you are most likely familiar with the informative website. If you are building anything besides a Vans RV, again, this site is jammed with excellent information. Skybolt suggests posts by

Rudi Greyling, www.RudiGreyling.com,

Dan Horton, regular guru on Vans Air Force

Darwin Barrie, www.jdair.com

Ivan Kristensen, http://ivankristensen.phanfare.com/2292606_4268126#imageID=690905 , to mention a few.

We will assume that you have determined the exact trailing edge of the spinner so that the cowling mounting process can begin.

Step 1 - Construct a mockup wooden flywheel/ring gear extension that will locate the most forward edge of the cowling and serve as support for the upper and lower cowling.

1) Level the wings.
2) Place the Upper Cowl into position and obtain a level reference between the two inlets.
3) Make a reference mark on the rear surface of the Upper Cowling extended aft of the firewall onto the fuselage skin.
4) Cleko the Upper Cowling, behind the firewall trim line, to a few locations where the fuselage skin and the firewall attach (3/32" rivet holes).

5) Position the lower cowling (trimming may be required for the landing gear) using a strap or an appropriate stand in order to center the air cooler scoop (not all aircraft), then drill and Cleko the rear of the Lower Cowl. Drill a hole in the face of the Lower Cowling (to later fill) and anchor it with a long sheet metal screw.

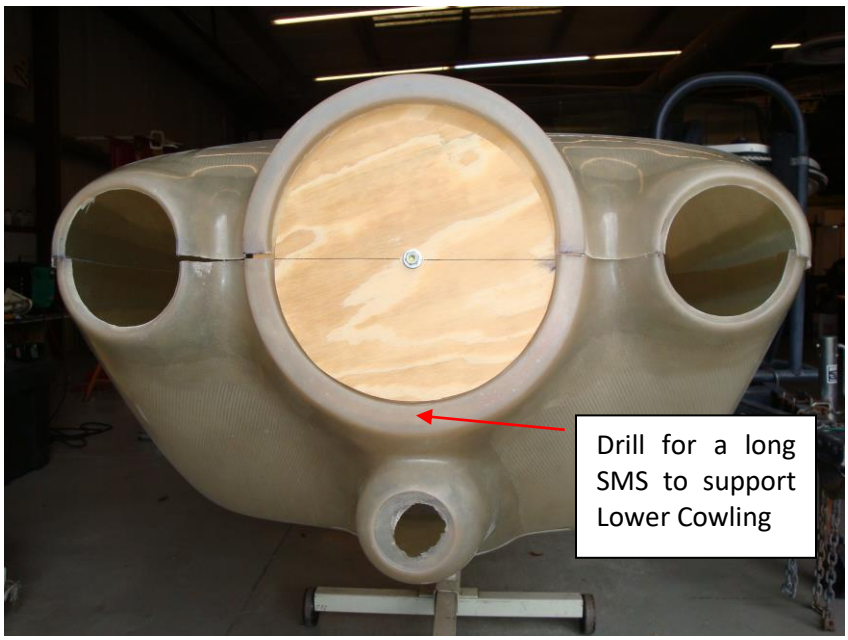


Figure 2 represents what you will be looking at before any cutting.

Figure 3 Use a die grinder to carefully remove material to achieve the desired fit.

Figure 3

Figure 4

Figure 4 represents initial trimming to establish the forward location of the side trim line. (Note: This RV8 mockup places the intake holes and spinner split on center. The hole split can be located off center as shown in Figure 5 versus centered in Figure 6

Figure 5

Figure 6

Figure 7

This option represents a new approach to cowling configuration worth noting. We will provide more information in a later revision.

Figure 8

Step 2 - Scribe Firewall Trim Lines

Now that the forward split trim line has been established, we can move to the rear and trace the firewall trim line.

Figure 9

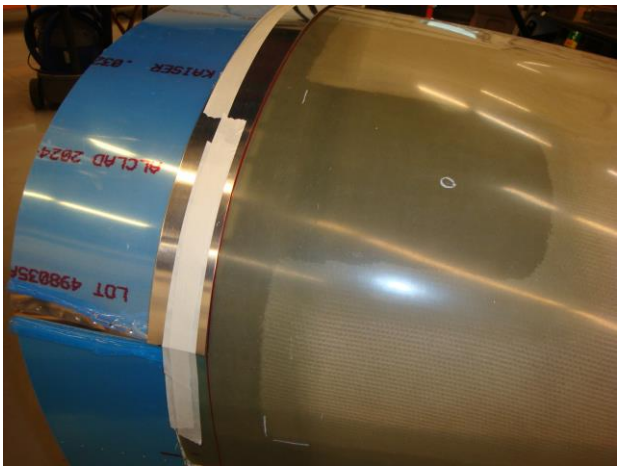


Figure 10

Looking at the cowling skins in Figure 9, it is obvious that a cowling split line has some leeway starting at the front working toward the rear. The firewall trim line, however is well defined. In Figure 10, I found that a strip of aluminum (sheared perfectly straight) is the best possible way of scribing a perfect line around the firewall. Note that the firewall has an 8 degree break adjacent to the fuselage skin break. Therefore the trim line changes angles at this point. For obvious reasons, I was very conservative on locating these lines. My plan is to make the first cut, then check all the lines again followed by smaller cuts until the trim line appears to be a perfect fit.

Step 3 – Determine the Cowling Split Line

The forward most split location is now defined. To determine the rear split line, a couple of thoughts come into play:

1) Note the inner doubler material clearance relative to the perceived location of the split line flanges (the flanges along the sides).
2) The rear most fastener flange is really a firewall flange if we plan it correctly. This should give the most cowling support where it is needed. Looking ahead, Figure 11 illustrates what we want to achieve:

   Ideally, this flange (labeled FSF-L (Firewall/Side Flange-Left) ends up perfectly in line with the side mounted flanges.

Figure 11

Figure 12

So for planning, we need to determine an approximate rear split line. With wings level, mark both the right and left sides as shown in Figure 12. Scribe a line forward to the nose.

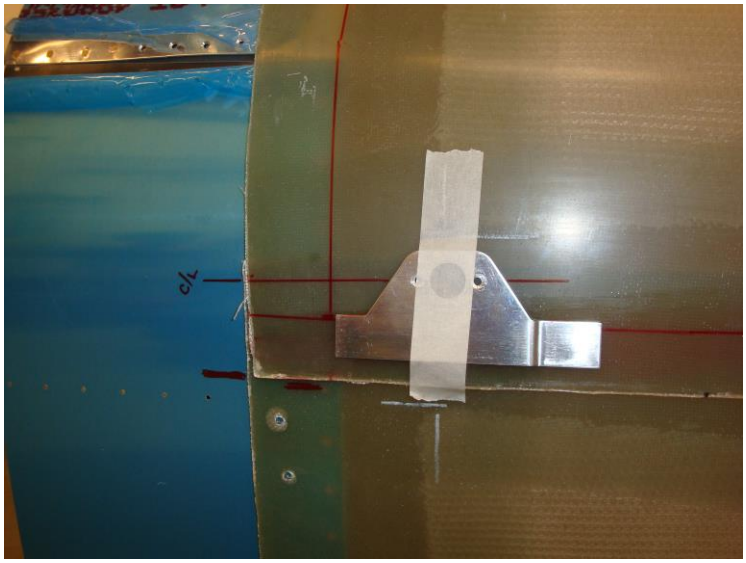


Figure 13

Position a flange so that the top of the tabs are about .230 to .250 above the scribed split line. Then scribe a line rearward to indicate a centerline of the fasteners along the side. Marked "C/L". This gives a preliminary planned location for the center of a firewall tab that will be centered with the horizontal tab.

This, however will change slightly in the next steps. So far, nothing is absolute.

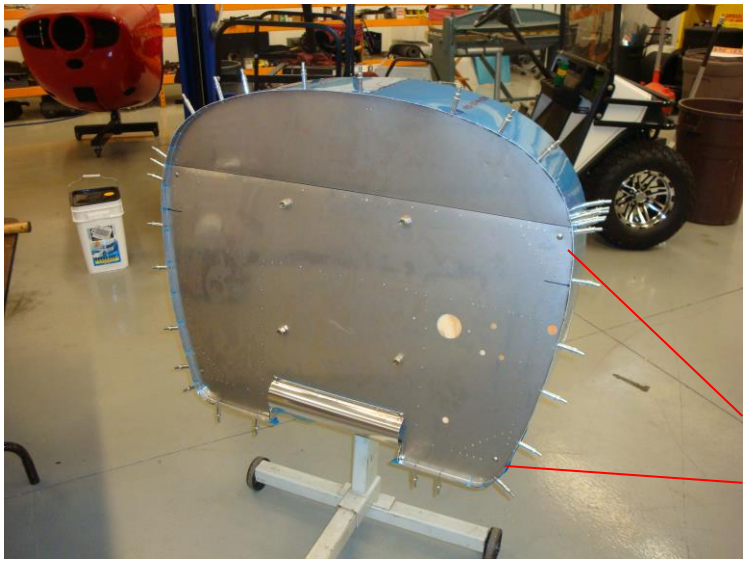


Figure 14

Remove the cowling skins in order to install firewall flanges.

Step 4 – Firewall Flange Installation – See comment on page 19 referencing shims

First, countersink all flange rivet holes.

In this photograph, there are 4 small screws located where the engine mount bolts to the firewall. As the

mounts are installed prior to installing the cowling, I will simulate the engine mounts and plan my flanges accordingly.

In the previous step, we determined where FSF-L and –R will be located. Then, beginning with the Upper Engine Mount, we can determine the next obstacle.

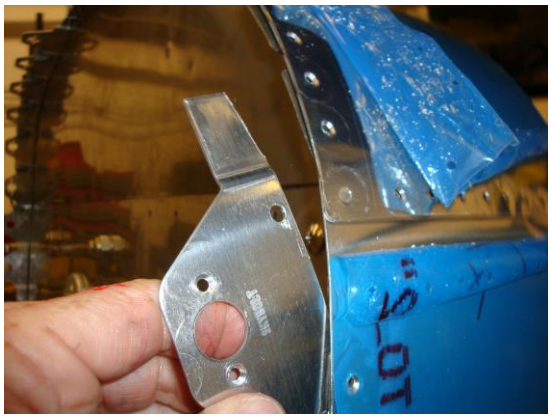


Figure 15

It is very easy to experiment with various flange spacing in order to achieve a target of 3-1/2 inch spacing as we work our way upwards from FSF-L and R. Some adjustment for engine mount clearance is easily accounted for.

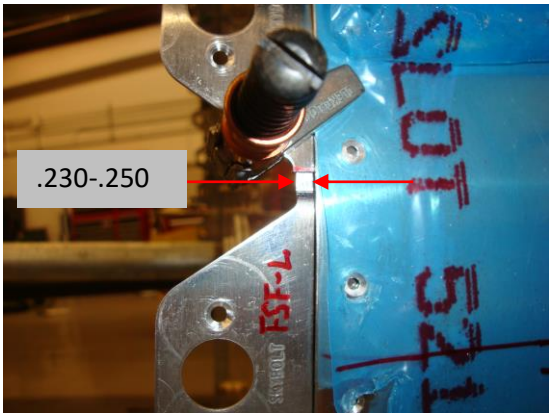


Figure 16

Plan to leave some adjustment to FSF-L and R as noted. There is a good chance that the C/L mark may change ever so slightly once the actual split line is cut and the skins come together. With some allowance for up or down adjustment, we can keep the flanges in alignment. Also note approximately .230-.250 tab spacing from the firewall skin. You will find that good eyes can set this throughout the cowling very efficiently. Measuring never hurts if in doubt. Note: The .230-.250 spacing prevents any "see through" in places where the cowling skin is not perfectly mated to the fuselage skin.

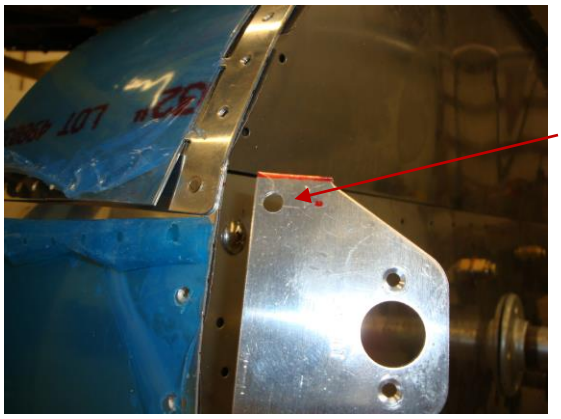


Figure 17

If you riveted the skin as shown prior to installing the engine mount, simply cut a relief hole in the flange at this location.

Figure 18

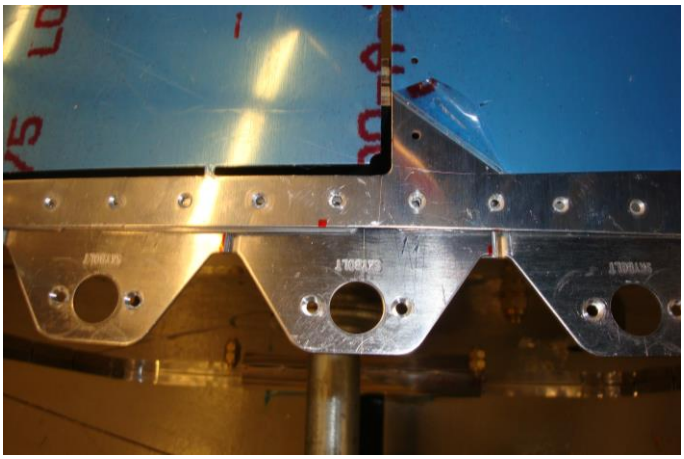


Figure 18 shows the top center flanges. For spacing, note that the end tabs have been cut, thus the spacing at the top center was reduced to 3.0 inches.

The top flanges are ready for riveting (except for FSF-L and R).

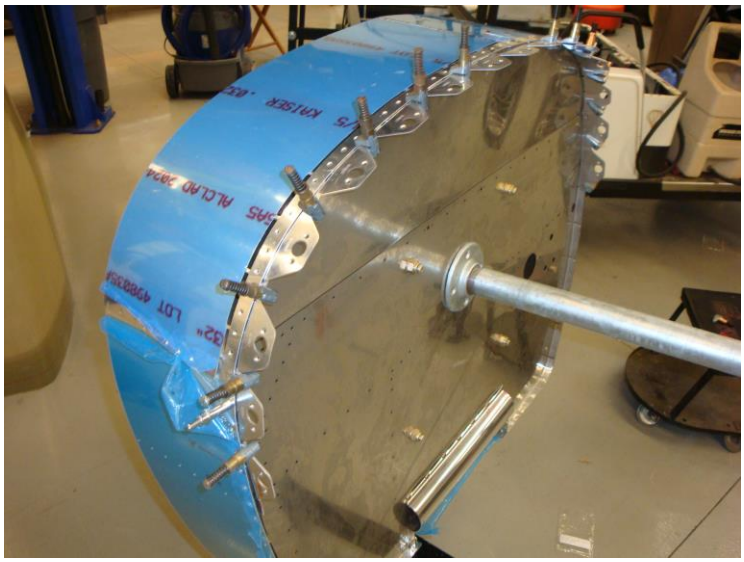


Figure 19

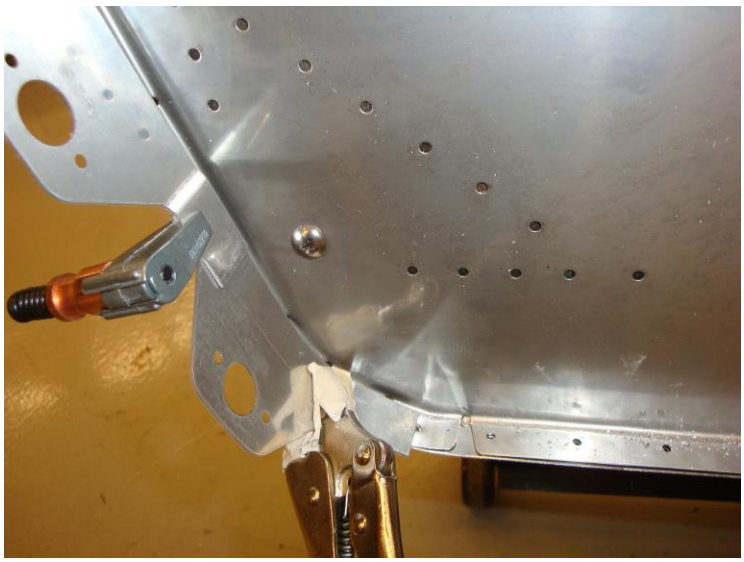


Figure 20

On to the lower portion and bottom, use the same logic as the top. The lower engine mount defines the starting spot. I chose to work from the bottom flanges and work my way back towards the top.

Figure 21

The firewall flanges have been positioned and riveted.

Step 5 – Trimming the Cowling

I used a die grinder with great success. I also had the luxury of a fork lift to elevate the cowling for a comfortable handle on trimming a straight line.

Begin with the Lower Cowling Firewall first. It took 3 or 4 trips back to the grinder before I was happy with the trim and the firewall skins mated quite nicely.

Now that the firewall trim line has been cut, the next challenge is how to support the cowling to check fit.

Figure 22

Figure 23

Skybolt has included Cleko adapters for this purpose, **SKRVC**. The idea is to only drill a 1/8 inch hole in a couple of places to secure the skins so that accurate hole location can be established. To secure the Lower Cowling, it is easy. For the Upper Cowling, tape the adapters in alternate holes, drill the tape and install the cowling and Cleko. (See Page 23 for instructions for hole alignment when retrofitting opaque (painted) cowlings).

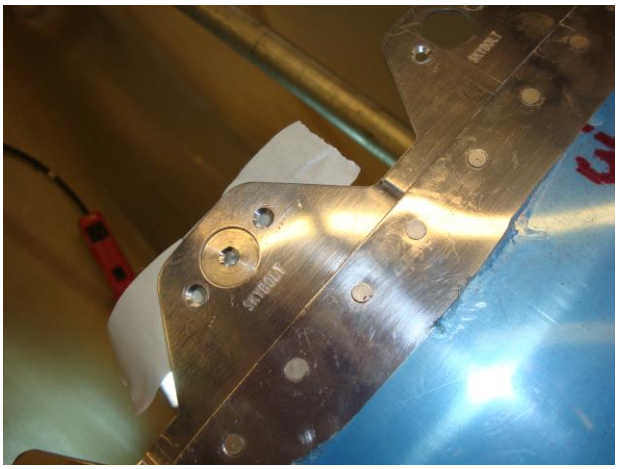


Figure 24

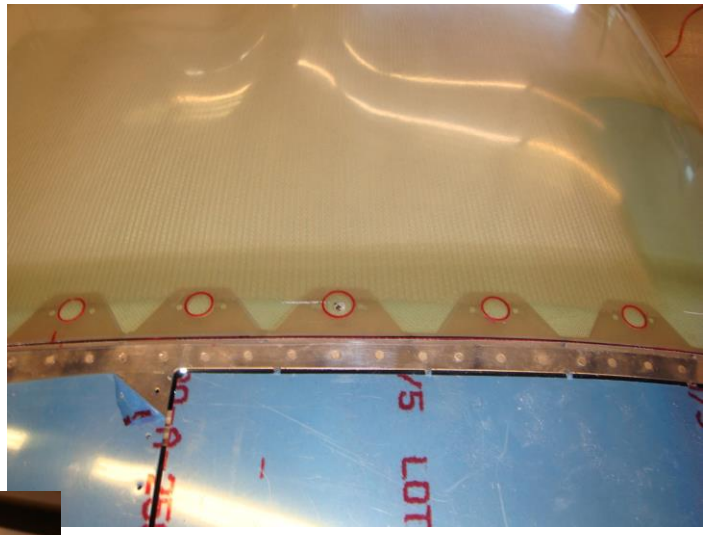


Figure 25

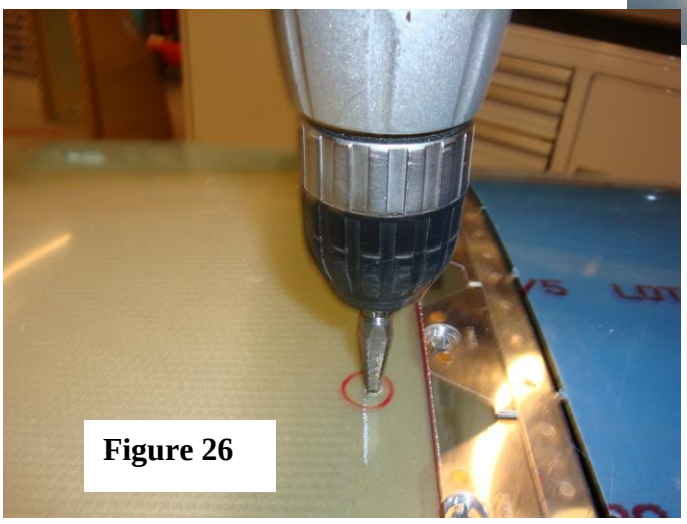


Figure 26

You may find that a light inside either helps or hurts in sighting the center holes. Either way, carefully trace each center hole. Cleko alternate holes to insure that the skin is drawn down onto the flanges.

Work from the top toward the sides.

Note how the flanges extend into areas of buildup on some cowlings. These areas can be easily ground on the inside so that the flanges fit correctly to the skin inner surface. This does not alter the cowling structure.

Using the Unibit-1, drill the marked holes to 15/32 of an inch. (If the grommet will not fit (thicker skin areas), drill to ½ inch). Stop every 2-3 steps to determine center. You can "walk" this drill to find center prior to the last step

Step 6 – Install SK245A162A Receptacles

Be certain to orient the antilock pins toward the outside (forward around the firewall; up along the sides) for access to the locking clip. Once the pins are removed, a curved pick tool is inserted in the same groove as the pin to raise the locking clip allowing adjustment of the insert.

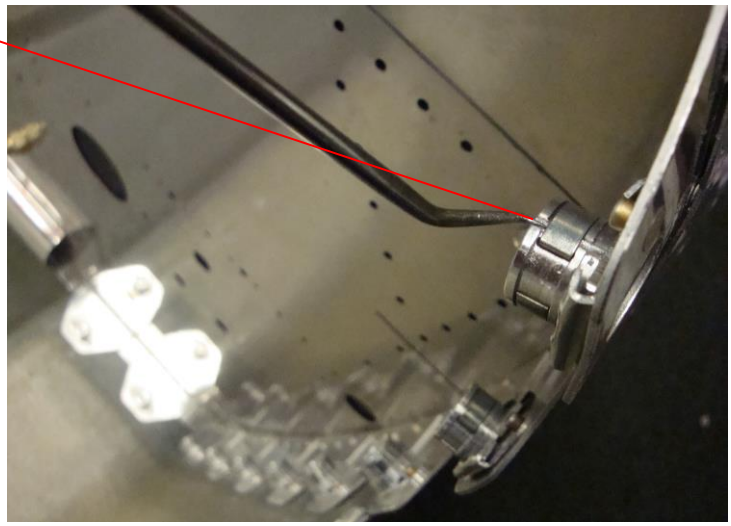


Figure 27

Later in this process, if you determine that a floating receptacle would help alignment in the next step(s), *the receptacle barrel/inserts can be swapped for a floating feature, (SK245A162-INS).*

Rivet all firewall receptacles with MS20426AD4-4 rivets.

Figure 28

Install SK-OSG1-8 Grommets.

Note: Normally, we install the grommets then retainers, then the studs as shown. The R4G retainers install very easily with the Skybolt SK-T26 tool. But for painting, to remove the grommets, it can be cumbersome to remove the retainers.

To hold the grommet/fastener assembly in place, this kit includes temporary retainers, (SK-RET012) that slip onto the back side of the grommet.

Tip – To install studs with 4P3 Pliers, turn the stud 90 degrees (pin to pliers) as shown in Figure 28. Also align the pin with the insert slot as viewed through the grommet center hole. This makes initial stud engagement so much easier.

Figure 29

Engage the studs into the receptacle noting that the stud is locked but loose (heads are protruding). Continue turning as if the stud is a machine screw. The antilock pin will allow the insert to turn thus drawing the stud down to the proper flush-locked position. To gain access to the pin, you must unlock the studs and remove the cowling. To unlock, use a sharp push-turn motion that should unlock the stud with little disturbance of the insert. With the cowling removed, pull all antilock pins.

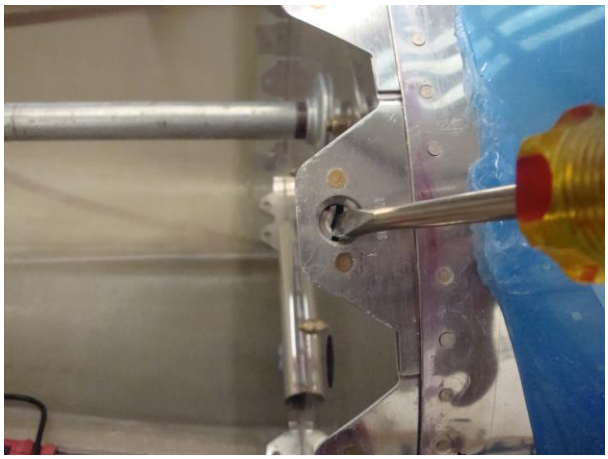


Figure 30

Using a flat blade screwdriver (See Figure 30), turn each insert to the 1:00/7:00 position and you will see/hear the locking clip lock the insert.

Install both cowlings and lock all firewall fasteners. Recheck both side split lines.

1) Cut the Upper Cowling Split Line
2) Reinstall Upper Cowling and lock all fasteners.
3) Scribe the Lower Cowling split line.
4) Remove both Upper and Lower Cowling and cut the Lower Cowling split line.

Figure 31

Install both Upper and Lower Cowlings noting that all trim lines are to your satisfaction. Chances are only you and the Grand Champion Judge will ever know a minor error.

If any portion of the firewall trim line has more than about .040 gap, try shifting the cowling to eliminate this gap. The floating receptacles will allow this.

In Figure 31, the horizontal trim lines have not yet been trimmed. At this point, the lower cowling trim line should be established and then trimmed.

Step 7 – Install Side Flanges

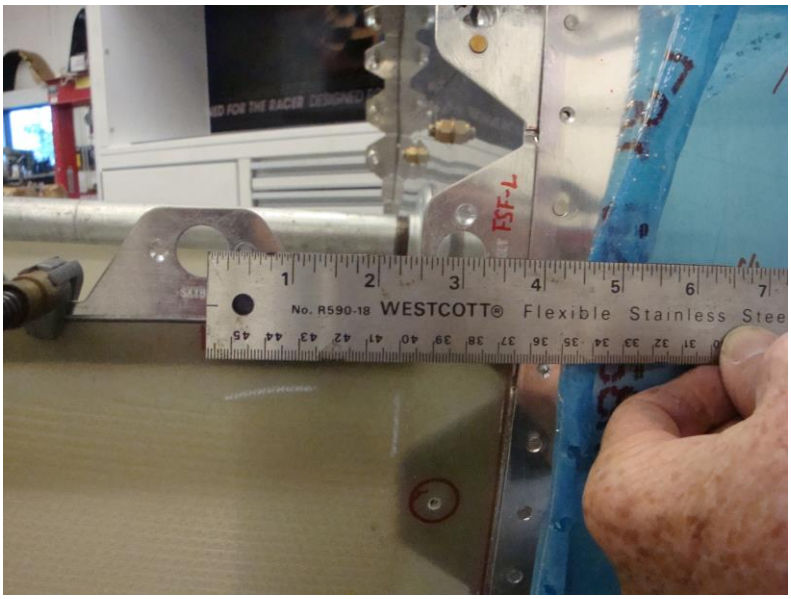


Figure 32

Begin with the rear flange. Position the rear side flange 3.0 inches from the center of FSF-L(R). Adjust FSF-L(R) to align and rivet it to the firewall.

Move forward with each flange; as far forward as practical. In the case of the RV 8, 3-1/2 inches worked out perfectly.

Another consideration unique to the RV8 is the IO390 Angle Valve Engine. The rocker box covers come very close to the cowling sides. Adjust receptacle spacing to not interfere with the covers. If a receptacle is close to any rocker cover, place a sized neoprene type hose over the receptacle to provide a buffer.

Figure 33

This drill jig is the absolute best for locating and drilling side flange holes. Once drilled, I made a deep countersink so that the rivet heads can be filled with paste; sanded; and painted.

Figure 34

I ended up with a slight gap at the lower left rear. By shifting the cowling, I closed the gap nicely.

Mark and drill all side holes to 15/32" as before.

Tip: To remove the barrel/insert from a cage, see Tips on Page 21.

Remove Upper Cowling and install SK245A162A receptacles.

Figure 35

Install Upper Cowling. Install grommets and studs as done previously. Adjust as noted in previous steps. Remove antilock pins; set inserts; install cowling for the last time (not really); and MARVEL!

Note: This kit includes extended depth SK-O18S Grommets for thicker sections closer to the nose.

Figure 36

Figure 37

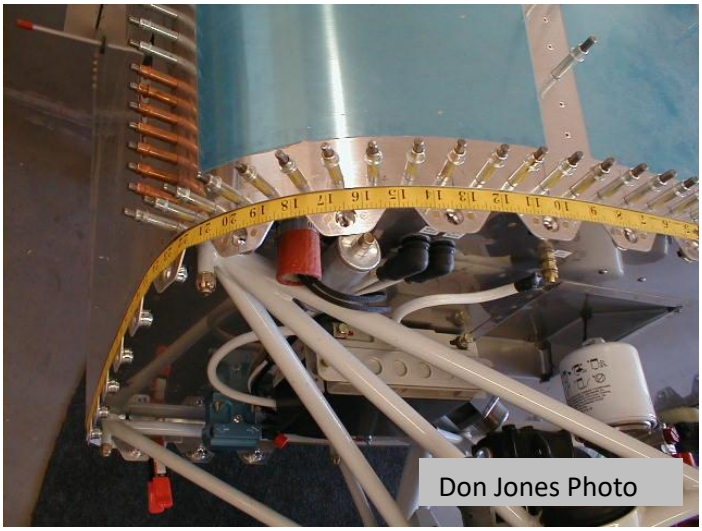
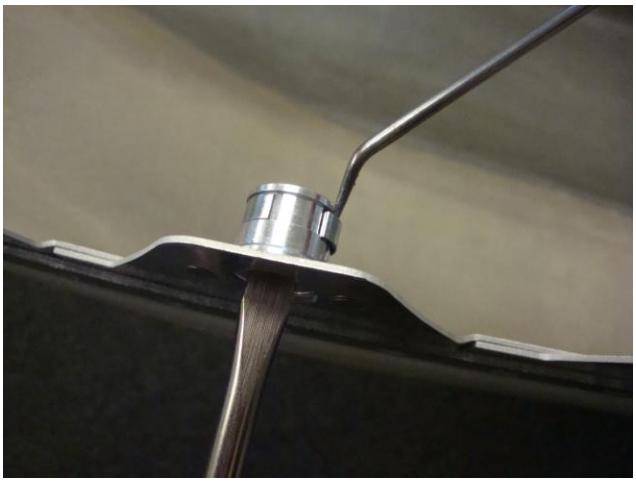


Figure 38

Figure 39

Step 8 – Nose Cowling Screws-Nutplates – The nose area between the spinner air induction holes…and on some cowlings the inside of the outer portion of the induction holes is a very stressed – high pressure area best suited for a solid clamp up screw. This kit includes the hardware for screws and the nutplates. It is required that the builder fabricate .032-.040 backing plates to mount the nutplates used in the nose.

Step 9 – Re-Adjusting the VLoc™ Adjustable Receptacle (after initial adjustment and pin removal)



The easiest method of re-adjustment is with a curved pick tool (part of any pick tool set). It allows access in tight spaces and is much easier to use than a straight pick tool.

Locate the locking clip tab (the reason we orientated the receptacle in Step 6, Figure 26). Insert the pick and lift the tab, unlocking the insert, adjust with flat blade screwdriver. One half turn adjusts the fastener .015; one full turn adjusts the fastener .030; the equivalent of a stud dash number.

Comment: Shimming flanges - Having checked the cowling skin thickness prior to installing the flanges; and noting the Vans instructions referencing an optional .020 shim between the flange (hinge) and the firewall lip; because the skin thickness varies from .005 up to .030, it is almost easier to think about placing a .032 shim beneath all the flange mounting surfaces. Then, shim the top surface of the flange where it mates with the cowling skin by a flange by flange basis. One easy way of shimming the flange to skin surface is with aluminum HVAC tape available at any ACE/Home Depot/Lowes store. This will provide that final touch of perfection. For the RV8, there is no need for a shim between the mounting surface of the flange and the firewall because of the baggage door strip (F-821B). This increases the allowance for all tolerance variations for the cowling skin; for the thinnest variation, it is easy to add shim material to the flange surface.

For the cowling nose, the VLoc™ fastener will work if not retained (you remove them to prevent hang up when attempting to install cowling). Because of the high load area, many production aircraft use Platenuts and machine screws for maximum clamp force. Vans instructions briefly describe this installation.

For the Oil Door, we suggest doing a search on Oil Doors on www.vansairforce.net. There are many suggestions on how to install the Oil Door including various “Kits”.

Skybolt wishes to thank all Vans builders for their support, input, and suggestions.

Vans RV4 Supplement

The RV3 and RV4 have a “Cheek Cowl” that presents challenges for the hinge fastening system, but lends itself ideally for the Skybolt VLoc fastening system. Although the traditional side hinge used an extended pin to lock into the cheek cowling, aerodynamic stress loads at the cowling split and at the sharp angle between the firewall and the cheek cowl are testimony that an improved fastening design is appropriate. The RV4J-C1P-C and RV3J-C1S-C kit includes 8 fastener sets to properly fasten the cheek cowl.

As there are options as to how to mount the SK245A161A Receptacles, note that the Levold photograph removed the fiberglass end piece and installed a fabricated flange (prior to the SK-RVFS1 flange design).

Fastener Tips

1) **Installing receptacles** – Reference Figure 27 – Be certain to install receptacles with the locking band access facing outward our upward for easy access when re-adjusting.

2) **Using the SK-4P3 Piers** – Reference Figure 28 – It helps to position the stud cross-pin 90 degrees to the pliers when installing studs. This gives your wrist more freedom of movement.

3) **Removing Barrel/Inserts from Cages** – The unique SK245A162A creates some challenges over the standard SK245A161A parts.

a) The easiest way to remove the barrel/insert is to spring the retainer with a pick tool as shown.

b) Insert the tool as shown with a slight prying motion and the assembly will release from the cage. Trying to depress the ears with needle nose pliers does not work.

c) For the standard floating assemblies, the float allows the ears to be depressed, move the assembly to one side and remove the assembly. The SK245A162A assembly restricts the float, thus the alternate method is required to remove the assembly.

4) **Installing SK245A161 or SK245162 Assemblies**

a) Place retainer onto the barrel as shown.

b) Depress the ears with the retainer located in the upper groove.

c) Slide assembly into cage and release ears. Check that the retainer is engaged in cage slots.

5) **Adjusting Retainer tension** – Place a slight concave bend at the location shown.

Optional SK-RVCI Inserts

July 10, 2017 Rev 1

The Skybolt SK-RVCI Flange Insert was originally included in our Vans RV Kits as a method to Cleko the cowling for the initial build. The popularity of our fastening system is seeing a movement to retrofit existing hinge cowlings. Where we used to assume the cowling skin was transparent, to convert an existing cowling that is painted creates more of challenge to locate the established hole center of the flange.

(While it has been suggested that we provide flanges with no holes, we know from experience, this actually creates more problems than it solves thus more work and a less professional result).

By redesigning the SK-RVCI Insert, we incorporate a magnet while allowing clearance for a Cleko to be inserted. The SK-RVCI assembly combined with the enclosed D188C magnet solves the hole finding challenge. Once a 1/8-inch pilot hole is drilled, the insert then serves as a receiver for the Cleko.

From the Skybolt Vans RV Instructions (available Online at www.skybolt.com), after the flanges have been installed (be sure to countersink the receptacle rivet holes before installing flanges) -

1) Simply tape each SK-RVCI to the back side of each flange, either for the bottom cowl or the top cowl.
2) Position the cowling and strap so that the skin fits perfectly as desired (initial build or retrofit).
3) Drop the spare D188C magnet in the vicinity of a flange center hole.
4) Place four marks around the magnet.
5) Repeat the drop process to insure the magnet centers in the same location.
6) Remove the D188C magnet and mark a center hole.
7) Drill a pilot hole of 1/8-inch.
8) Check that the hole is close to center with the SK-RVCI.
9) You can expand the hole to the limit of the Cleko barrel in order to walk the hole to center. Remember, the Skybolt Grommet will require the final hole size of 15/32 to 1.0 inches. This gives you plenty of drill “steps” to end up right on center for each location.

   Tip – mark a small arrow as to which way to expand the hole when you remove the cowling; then use the Unitbit-1 to expand and walk the hole. It pays to do this in steps so as to achieve perfection.

10) Cleko that hole and move to the next.