

James Aircraft

Important Notes:

Please read all instructions prior to starting your project and supplement our mounting instructions with a thorough understanding of Van's instructions contained within the builder's manual.

*The inside of the cowl should be painted prior to engine run-up to avoid oil or water intrusion into the core. Epoxy paint is recommended. **If you are installing a plenum chamber, make sure that you fit the cowling to the airframe before fitting the plenum to the engine to verify proper alignment. Please verify whether a propeller extension is recommended for your cowling. Builders must verify adequate clearance between propeller blades and cowling prior to engine run-up. Some propellers may require longer propeller hub extension due to chord width.***

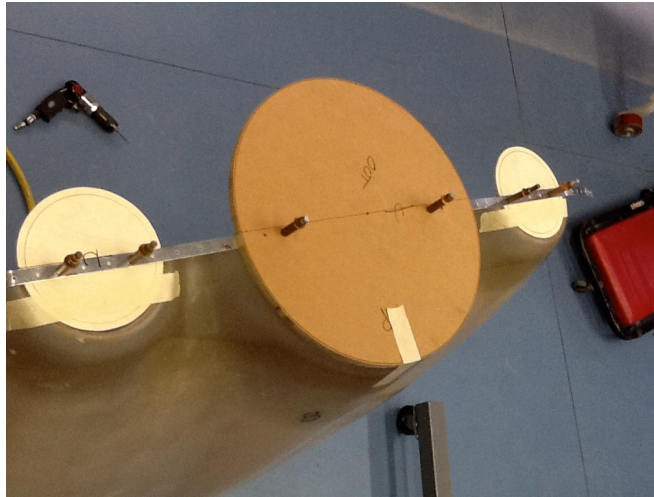
COWL KIT INCLUDES

2 Cowl halves
3 Aluminum inlet rings
Neoprene Rubber
Seal Cement
Fiberglass cloth
Cotton flock thickener

ADDITIONAL MATERIALS LIST

Flat stock aluminum approximately 0.032" thickness, roughly 5x8"
Aluminum duct tape
Proseal
Mill Spec 20257-5 (Aircraft Spruce: MS20257P5)piano hinge for lower half of cowl, (1) 3' length (on 4 cyl engines)
Mill Spec 20257-4 (MS20257P4)piano hinge for upper half of cowl, (1) 3' length (on 4 cyl engines)
Hinges for firewall attachment (as per Van's instructions)
Rivets (as per Van's Instructions)
Skybolt Fasteners (if used)
Mold release wax (good quality car wax will do)
Acetone
West System Epoxy or equivalent (Do Not Use 1:1 mixtures)
K&N model E-0995 air filter (available at Advance Auto Parts)
2" Dia. scat tube (for alternate air inlet nozzle connection to heat muff)
6" length of 3"Dia. "scat" or silicone hose
Hose clamps sized for intake ring and plenum inlets (sizes vary according to aircraft)

COWLING INSTALLATION INSTRUCTIONS



Trimming Cowl Bottom

Place the cowl halves on the floor, nose up. Place one aluminum inlet ring as a guide, on a piece of paper, leading edge down, and scribe a line around the circumference. Make two more patterns from cardboard. Fold the paper circle in half, lay it on top of the cardboard circles and draw a line across both, dividing them into equal hemispheres. Discard the paper template and carefully position the cardboard cutouts on top of the cooling inlets on the bottom half of the cowl. Position them so that the hemisphere lines are parallel when viewed from above and **verified** with a straightedge. With a straightedge aligned with the inlet hemispheres, mark a line across the spinner boss (flat area). Continue and complete a straight line to connect the inlets with the spinner boss. The segments of the line between these areas can be completed using a straight edge of flexible plastic. Be careful not to simply lay the plastic directly on the cowl or errors will result due to the compound curves, and the final line may not be entirely straight.. There will be a small trim area below the hemisphere line. The trim area should be fairly level and minimal. The inlet openings should be well described.

Using the tool of your choice (a flat sanding board works well), remove the area below the line (leave the line). Do not open or trim the cooling inlets at this point. Leaving this until later may offer a needed option.

Using a sanding board, carefully level the trim line laterally out to the outboard sides of the inlets. This operation will provide a forward end benchmark for trimming the cowl sides.



Note remaining flange strip tied into mount

The next step is to position the bottom cowl on the airplane. The cowl may be supported with a bench and some spacers beneath while a cargo ratchet strap works well around the firewall. Be careful not to distort the cowl by over tightening. The cowl should be positioned to be parallel with the spinner or spinner spacer facsimile. Cut a ¼" x 4" piece of thin sheet aluminum and put a ninety degree bend in the last 1/8" of the 4" length. This will be used as a gauge to help determine trim length of the cowl at the firewall. Slide the gauge, bent end down, under the cowl until it drops off of the fuselage skin at the end of the firewall. Mark the gauge where it emerges from the trailing edge of the cowl. Withdraw gauge and transfer measurement to top surface of cowl. This will provide an accurate measure of the required trim length. Trim gradually until a correct fit is achieved; it's hard to add if you cut too much. Compare the thickness / height of the cowl and fuselage skin at top surface. If there is a difference noted, measure this, as a shim of the same thickness will be added beneath the hinge to bring these two surfaces to a flush position.

Beginning at the front outboard corners of the cooling inlets, move aft and mark the side edges of the cowl for level, parallel with the centerline of the airplane. Before cutting, lay the top half of the cowl on the fire wall and verify sufficient overlap. A drop light placed inside the cowl will help illuminate the division, top and bottom. Make the cut and follow it up with a sanding board to get a straight, even line.

Fasten the hinges to the firewall. Trim the cowl for length, at the firewall end. An initial tentative "short" trim will allow a second, more accurate finish cut. With the hinge pin installed, drill and cleco the hinge to the cowl. To reduce vibration or to raise position of the cowl relative to the fuselage skin, hinges may be bedded in pro-seal or fiberglass mat saturated with epoxy. If using other types of fasteners, mount according to manufacturers instructions.

Lay the top half of the cowling on the firewall. "Ratchet" straps can be carefully used to support and prevent side-sagging. If the sides are allowed to sag or are warped because of over-tightening straps, the final cut may not be accurate

Trim for length, using the same method as for the bottom half.

Place a lamp inside the cowl to illuminate the next step. Using the lower cowl half as a guide, draw a cut line on the upper half and then trim less than is indicated. Several more careful, gradual trimmings will yield the desired end. Taping the halves together with short lengths of aluminum duct tape may help to verify a good fit.

Install the left and right vertical hinge on the bottom cowl. Prior to riveting the firewall hinge to the cowl, make sure the surface is flush with the fuselage skin. If not, shim with either glass mat saturated with epoxy or aluminum shims (use Pro-seal between hinge and cowl).

Remove the cowl and install a M.S. 20257-5 hinge along the sides on the lower half of the cowling. With some cowls, it may help to grind the forward area of the hinge into an ellipse to assist fitting into the rounded section forward, near the cooling inlets. Place the hinge pin $\frac{1}{4}$ " above the horizontal split line. After final assembly, this will eliminate any gap between the upper and lower cowl halves. Cleco, check, and rivet. Install hinge or fasteners on bottom, adjacent to lower exhaust outlet area.

Make sure all areas of the hinge are bedded evenly in a smooth, even, glass surface. The hinges may be bedded in pro-seal or epoxy.

Position lower half of cowling and slide in vertical hinge pins. It helps to sharpen the end of the pins prior to insertion. The lower half will now be self-supported. Slide in the horizontal hinge pin from the front. If you desire to install the pins in the "through the firewall method," follow instructions below through step 17. With the RV-4, the pin will hit the cheek.

With the lower cowling on, run the hinge pin from the front to the rear in the hinge until it hits the firewall....mark this spot. Drill a small pilot hole then enlarge it for a section of brake line that will be used to guide the pins from inside of the cockpit (don't use fuel line, it is too large in diameter). Cut a straight piece, long enough to go through the firewall from the first hinge eyelet and $\frac{1}{2}$ " back to the vertical bulkhead under the panel. This is the pin guide tube. Attach the pin guide tube to the bulkhead with a cushion clamp. Put some JB Weld around the protruding part of the guide on the forward side of the fire wall to keep it in place and seal the opening around the tube. To put the cowling on, insert the pins from the cabin and slide forward until they are in the first eyelet. Put on the top cowl and insert the pin.

Position the upper cowling and recheck fit. It should contact the hinge evenly along the full length of the hinge. Tape the sides together accurately and, reaching through the cooling inlets position the M.S. 20257-4 hinge in place, hinge pin installed, and drill and cleco the hinge to the upper cowl half. You may find that the -4 hinge is a slightly thinner material than the -5. If this is the case, you may need to shim between the hinge and cowl to insure pin alignment. A 5.5 oz. strip of fiberglass cloth (provided with cowl kit) will have an approximate thickness of .008. Aluminum shims may also be used.

The hinge may be ground to a narrower shape near the cooling inlets.

Recheck fit and rivet hinges in place.

Mark the oil access door. A door can be carefully cut out of the existing surface and re-used or alternately, a small square of trash liner or other plastic sheeting may be taped over the door area and a new door fabricated using eight layers of the included 5.5 oz. glass.

To cut the door from the existing surface, use a coping saw blade and a fine tooth hacksaw blade. Pull them backwards with lock grip pliers. Minimum size for the door should be 4 1/2" x 5".

A custom joggle flange about an inch wide, is required between the spinner and cooling inlets. This flange will secure the upper and lower halves together at this point.

Remove cowling and, on the inside of the lower cowl half, sand the curved area between the spinner ring and cooling inlets, extending down about two inches. Roughen the area to remove all gloss with course paper. This will assure adhesion. On the top half of the cowl, apply a piece of aluminum tape on the inside, in the same area, extending up about two inches. Allow the tape to wrap around the lower edge to insure that the halves don't get glued together. The epoxy will not adhere well to this tape, but a coat of car wax on the tape helps for easy separation later. If you do not use the tape, apply at least five thick coats of wax.

Position cowl halves together and install hinge pins. The flange is going to be made from eight strips of the provided 5.5 oz fiberglass cloth. Cut strips of fiberglass about three inches long and two and a half wide.

It will help to suspend the cowl from a ceiling or supporting overhead framework with small 'C' clamps at the firewall end. The flange area may be accessed through the cooling inlets to apply the glass strips. Check the alignment of the front surfaces of the cowl. Any misalignments may be temporarily corrected and held in place with small clamps, aluminum tape etc. Saturate the first layer in the prepared area and let it cure. Follow up for a total of eight layers of 5.5 oz. fiberglass. When this sets up, drill one counter sunk hole at the bottom of the concave depression in the top cowl for a #8 screw. Nut plates work well here. A putty knife will help separate top and bottom halves.

Cut outs for nose gear leg may be accomplished with rotary tools or fine toothed saber saw. The cutout section can be hinged and reused to close the gap behind the nose strut. A bridge, to span the gear leg opening, at the trailing edges of the exhaust outlet area, is recommended to avoid potential flutter. Flat aluminum stock approximately 0.045" may be used for this purpose. Fasten the bridge to the flat glass flange area aft of the core.

Ring Installation



With all pins and screws installed, place the cowling nose up on the floor. Trim and gradually enlarge the air inlet holes until the aluminum rings slide through. Press a small bit of clay into the split line to avoid adhesion in this area.

Wax each ring (5 coats) and tape in place keeping top of ring *flush* with cowl external surface.

Mix up a slurry of epoxy and provided cotton flock to oatmeal consistency. With the cowling suspended from the overhead, reach through the inlet and press the mixture into the keyway in the ring. At this point, only enough to insure proper ring location is necessary. Allow the "first layer" to cure overnight and later, lower the cowl and remove the pins for easier access to the rings. Place the cowling on a bench and replace the rings into the newly created keyway and complete the job. Make certain that the rings are completely seated in the keyway prior to adding more epoxy.

Wipe away all residue prior to cure using acetone or alcohol.

Check to make sure the rings are still flush and let cure overnight.

The injection ring is installed permanently in the same fashion. No wax is used. Cut opening to allow flush fit. Sand adjacent areas. Add epoxy mixture.

The top rings are not bonded to the cowling so that they may remain in place when the cowling is removed. The rings have an attached flange for a hose clamp. The included neoprene is used to form a custom fitted tube, which is clamped to the ring and the cooling plenum for a complete seal. The tubes are formed using industrial strength neoprene cement (included). When forming the tubes, the nylon cloth face is outside the tube to resist abrasion from the clamps. The rubber is butt joined following glue package directions. When the cowling needs to be removed, the upper and lower halves are removed with the rings left suspended by the rubber tubes. This way you never have to loosen the hose clamps or disturb the seal on the neoprene.

For Repair or Modification

If any openings are required in the Para-glass core or to repair damaged areas, cut a clean margin around the perimeter of the opening or damaged area.

Mix an epoxy resin and force the mixture into the open spaces between the face plies. If necessary a thickening agent, such as cotton flock, may be added to the resin.

Fill an area approximately ¼” back from the edge of the opening and allow to cure. If an attachment flange is desired for fastening to another component, use a sharp tool to score the inside surface of the cowl.

Insert a knife or chisel between the face plies and sever the interconnecting weave. Remove the inner face.

Backfill the perimeter with an epoxy mixture and after curing, sand for a 45 degree angle feather edge.

Sand the surface adjacent to the perimeter approximately 1-1/2” each side of the bevel.

Clean residue with acetone and lay on enough layers of epoxy saturated glass to form a flange of sufficient strength. Mark cut out for opening allowing at least ½” flange area from the perimeter of the core area from the perimeter of the core. Prime and finish as usual.

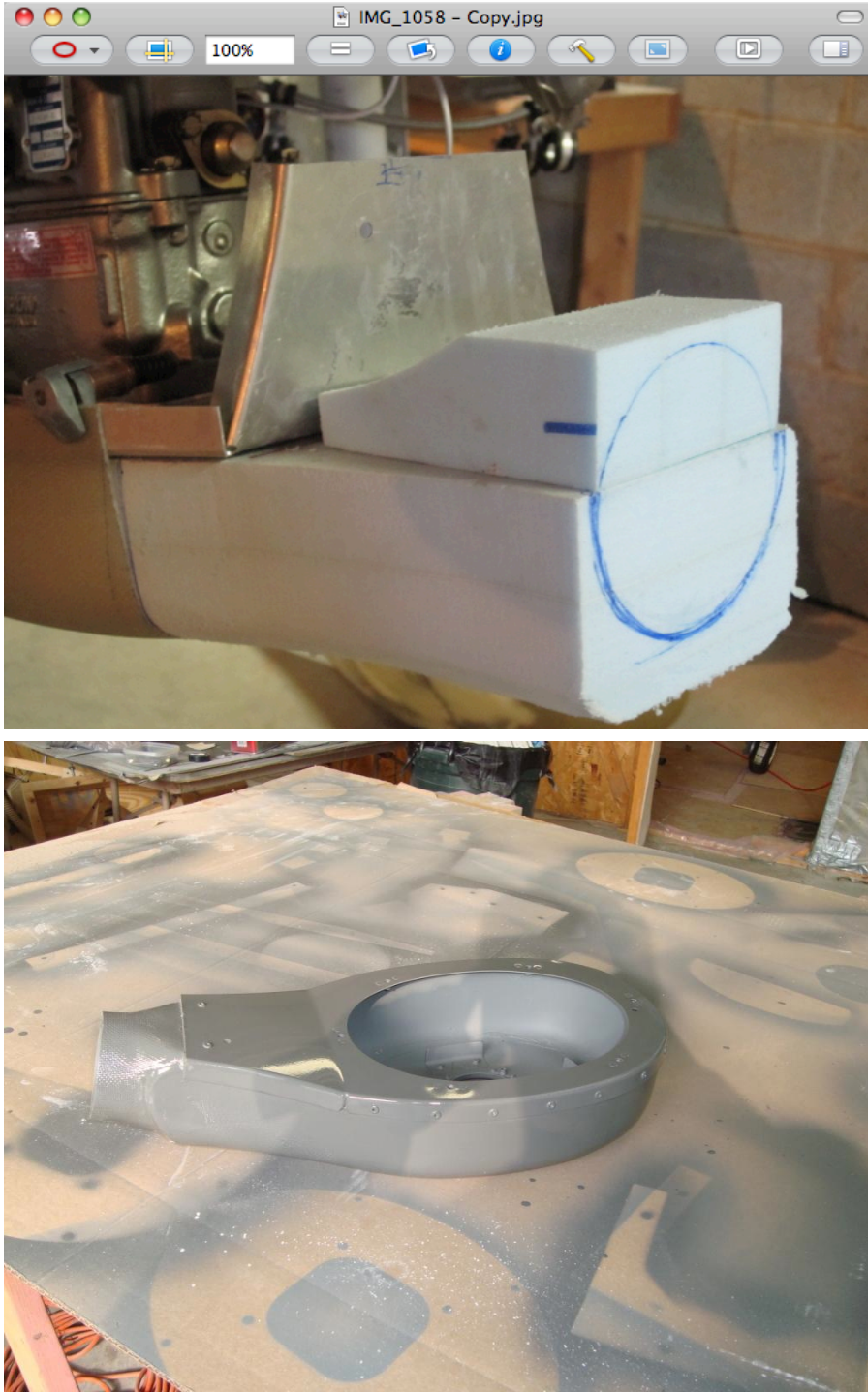
FAB Filter Adapter

(For Use With Van’s Air box)

For those using the Van’s induction filter system as with the RV-4, RV-10, and all “shorty” cowls, an induction adapter is included to transition from the circular cowl inlet to the “D” shape at the van’s air box inlet. The adapter will have to be trimmed for length and orientation angle.

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Short Updraft



Bottom box used the supplied inlet adapter. Top photo, builder shaped inlet.