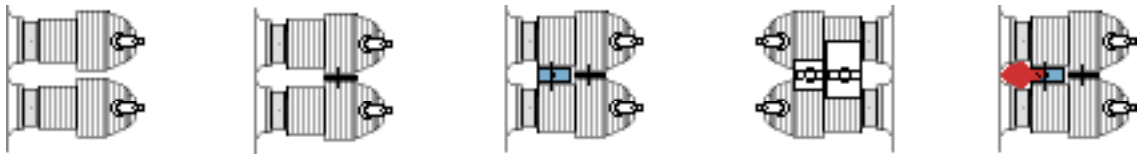


Continental C-85/C-90/O-200 Engine Intercylinder Baffles and Oil Tank Baffle Cessna 120/140/140A

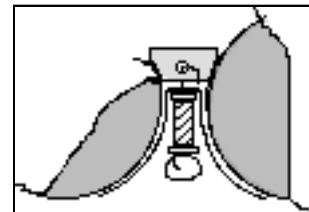
Purpose and History:

Any cooling air that is not forced to contact a cylinder fin as it flows past is wasted energy and wasted cooling. The purpose of the intercylinder baffles is to guide the air, force it to contact the fins, and not allow it to escape unused between the cylinders. These simple sheet metal intercylinder baffles used for all our engines are seldom noticed or spoken about but they are very important for good engine cooling. Over the years, Cessna has made few changes to them, and only one change, initially optional, is noticeable in the older parts manuals, but in the later manuals it is absorbed into the assemblies such that it is not treated as special or optional, just necessary. A lot of the high temperature problems are due to poor baffling, and the experts state that even small openings make significant changes in the local temperatures. To equalize cooling and keep the temperatures as low as possible, the often-overlooked intercylinder baffles need some attention at annual time, too. They wear from vibration, many still have not had the recommended extension added, and the music wire and springs used for retaining them often succumb to rust. Some who read this will find that the bottom baffles shown here are missing.



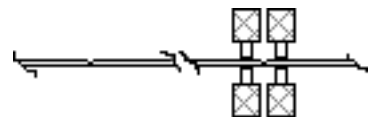
The intercylinder features Cessna forgot to include in the manual become easier to understand when looking at the sketches above. 1. Bare. 2. Top side, outboard baffle only. 3. Top side, both baffles without the later extension. 4. Bottom side, both baffles, with the longer tail on the inboard set to the rear. 5. Both baffles from the top, including the extension added by the service bulletin to the inner baffle.

Whether inner or outer baffling, the setup is similar: A) the retainer at the top side rests on the walls of the cylinder, B) the music wire is formed to support the spring at the bottom and connect to the top retainer, C) the spring which provides force to keep the pieces in position against the pressure of the airflow, D) the baffle itself, and E) the washers which serve to lock the music wire and act as sacrificial buffers at the top and bottom.



The topside retainer is made up of thicker aluminum than the baffles, with dimensions chosen to fit between the cylinders, resting the curved portions of the retainer on the cylinders. The hole is slightly below the center point and is made large enough for the music wire to go through. The curves indicated should be formed so as to fit against the matching curvature of the cylinders.

The next piece in the stack is the formed music wire, starting with lengths of 8 or ten inches because some of the length will be used as a "handle" when forming the loop. Cutting music wire is unique because the material is so hard it will damage almost every type of shear cutter made. Please don't try to prove me wrong because your cutters will suffer. The best way to cut it is to retain a length of it in a vise. Take a fine-toothed triangular file or the corner of a fine toothed file and make a gouge in the wire as close as possible to the vise jaws. It will take several cycles of the file to make the gouge. Next, with safety glasses on (the music wire is brittle and tends to expel extremely sharp shards when broken), break the wire. If you made the gouge while holding the wire in the vise, slide the wire so that the gouge is as close as possible to the vise jaws, and then take a pair of pliers, position them as close as possible to the gouge and bend to break.



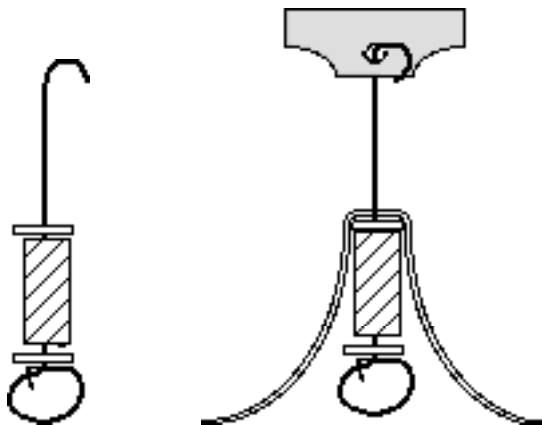
If you have no vise, take two pairs of pliers and place their jaws as close to the gouge as possible and twist away from each other, expecting the wire to fracture at the gouge with only one or two twists. The ends will be unbelievably sharp and have a tendency to “jump” into fingers. If possible, round the ends with a fine sander or on a piece of sandpaper.

Form the bottom end loop first. To apply the compression force of the spring, we have to slightly compress it and that is done by forcing the loop of the music wire against the spring bottom. The loop has to be larger than the diameter of the spring so it does not get pulled through. The loop is best formed around a mandrel which can be made of anything round or square about 3/8ths of an inch in its major dimension. With the mandrel in a vise, hold one end of the wire with the pliers about an inch from the mandrel and pull the other end tightly around the mandrel to make a loop and a half. As soon as you let go, it will spring back somewhat. If done properly, you will end up with slightly more than a full loop and the loop will be larger than the diameter of the mandrel. Put the loop in the vise and shape it as shown, and then tie off the end with one or two complete loops around the vertical portion or wound around to form half a knot. Remove the excess music wire.



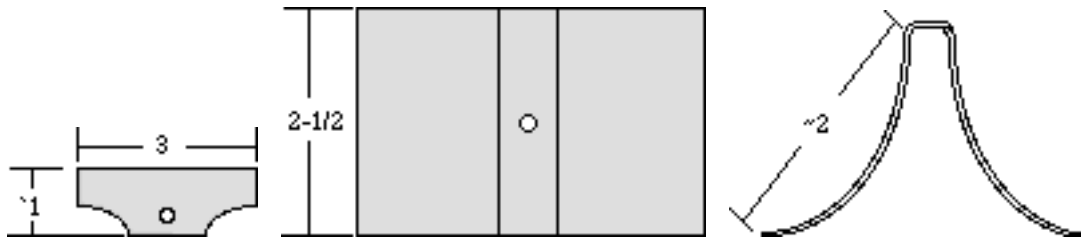
The top half loop is shown formed here as well but it will actually be made at the time you fit things together at the plane so as to adjust tension. It is a half loop made at the time of installation so as to provide some spring compression against the baffle. You will make the half loop at the plane with pliers and the amount of tail is not critical but have the file and pliers sets there to trim if you desire.

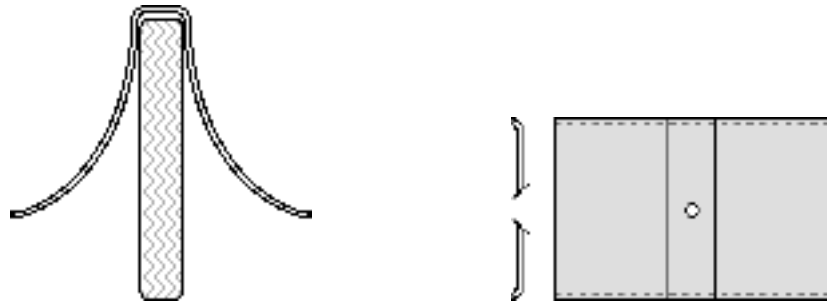
The spring, steel washers, and music wire form a subassembly such as this and the assemblies look like the next figures. The washers ensure that the loop at the bottom does not pull through the spring, and both washers serve as the sacrificial items because the vibration and pressures will otherwise let the spring wear through the baffle.



Outboard baffles:

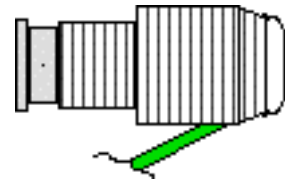
The outboard baffle dimensions are about as noted, with the top formed over a mandrel of wood held in the vise. With light tapping on the top and on the corners, a flat top surface and nicely rounded corners will result. The exact shape at the top is not important except it must fit between the fins of the cylinders and that dimension is actually less than your recollection will suggest. After forming, drill or punch the hole in the middle of the new spine to a diameter of about 1/8th inch. If you are good at keeping things aligned, the hole can be drilled first and used with a screw to keep the unformed piece in place on the mandrel while you do the forming.





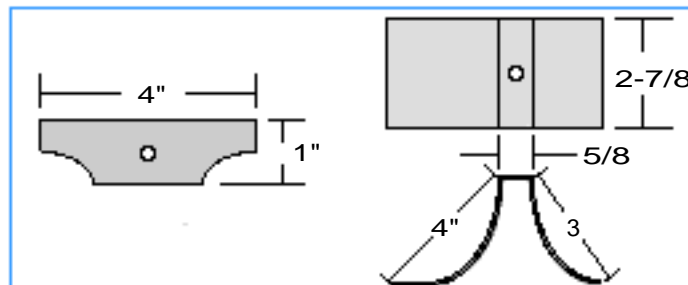
The “wings” of the baffle can be partially shaped on the bench if you wish, by hand, but the final shaping will take place at the engine, fitting it by hand to mate closely to the fins. After you have formed the final shape, you also have the option of using pliers to bend the edges so as to strengthen the baffle but this step does not seem necessary, based on those non-stiffened baffles observed after long service.

The fabricator should avoid the temptation to make the baffles “longer or wider”, because you will create a conflict; longer means the extra material will strike the pushrod tube such that you won’t be able to install the baffle and will have to trim it at the plane. Take the sheet metal cutter and a file along to the plane just in case because something always seems to need a trim.

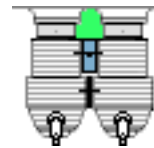


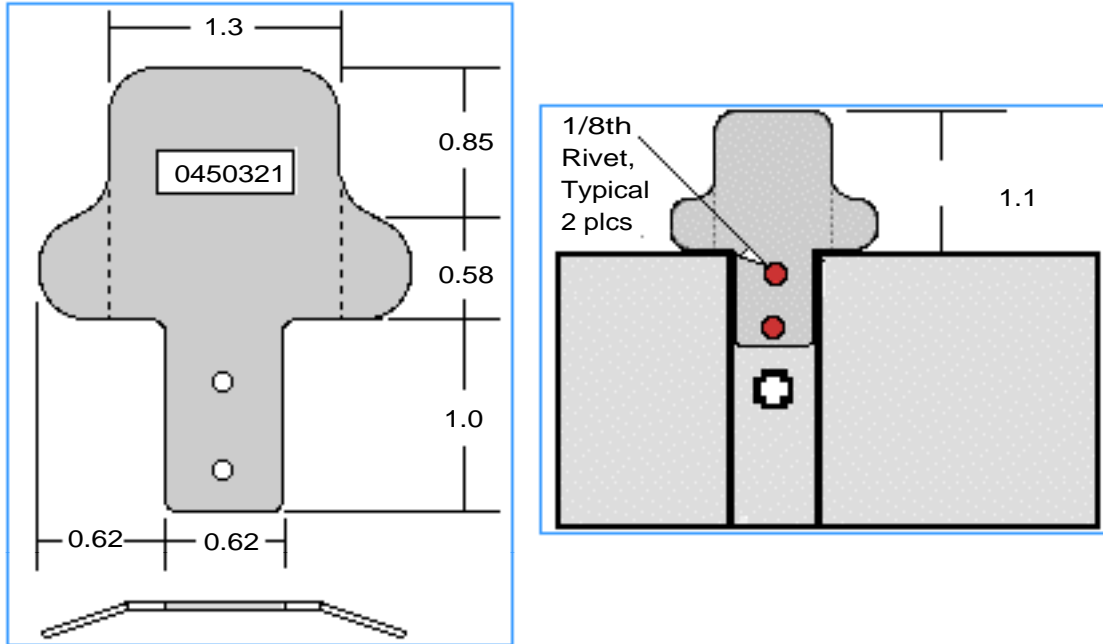
Inboard Baffles:

The inboard baffle pieces are larger because the inboard cylinder fins are shorter and the base diameters of the inner portion of the cylinders are smaller. The dimensions of the pieces are about as noted for the retainer and the baffle. The longer tail goes to the rear of the engine. Do not add to the dimensions in the interest of making them do “better”, because the extra material will interfere with the outer cylinder fin or the outer baffle or the bolts which hold the cylinders to the block. You will be surprised how many things are waiting to interfere if you change the dimensions to “make them better”. It will seem odd that the top retainer is bigger for the inner baffle but it will make sense when you see the later sketches.

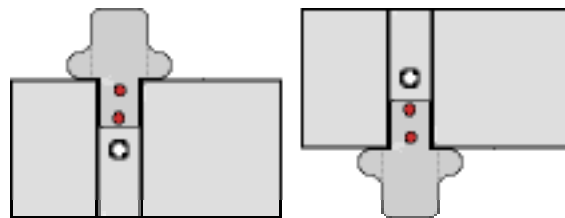


As a “summerization” kit, the odd space inboard of the original inboard baffle (shown in green in this small sketch) was to be filled in with a tab; for later manufacture, the tabs were made standard for the inboard baffles. It seems to be a good idea to incorporate the tabs whatever the status of your baffles. The approximate dimensions are as shown and you need to take the sheet metal cutters and file to the plane when fitting this baffle set as well. Although the tab was initially attached with screws (it started as part of the "summerization kit so could be removed) and nuts of some sort, many later units were attached with rivets and left on year round.





The Cessna part number for the tab is noted on the sketch. In order for the baffle with this tab attached to fit in the space, the ears must be bent as noted and no two seem to be the same so plan on “fitting as required”. This sketch is nearly to scale as I have drawn it so that readers could use it as a pattern but make sure your computer/printer combination did not seriously change its dimensions.

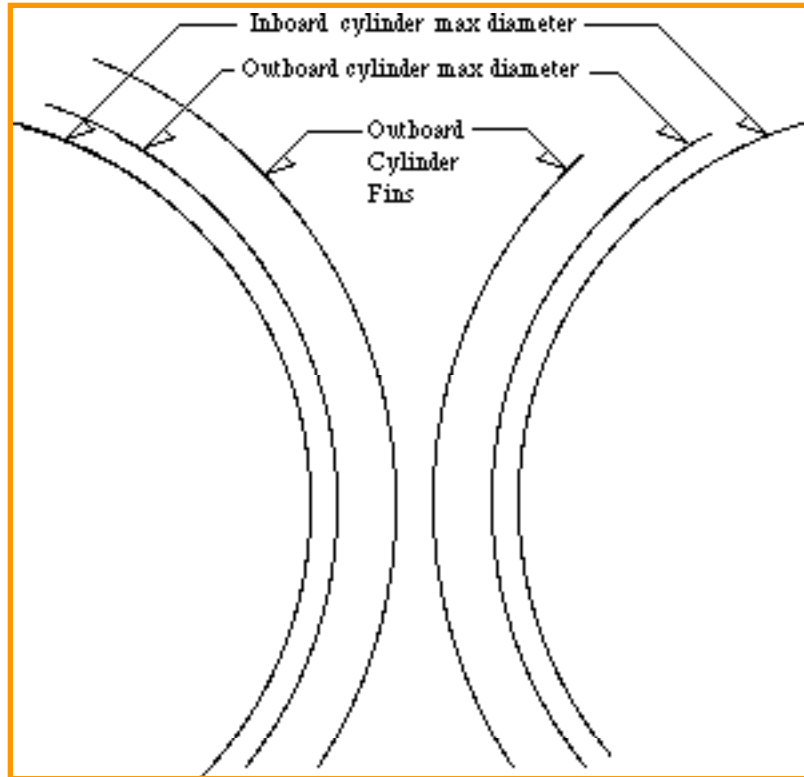


The baffle for the left is on the left and that for the right is on the right, long tail to the rear in both cases.

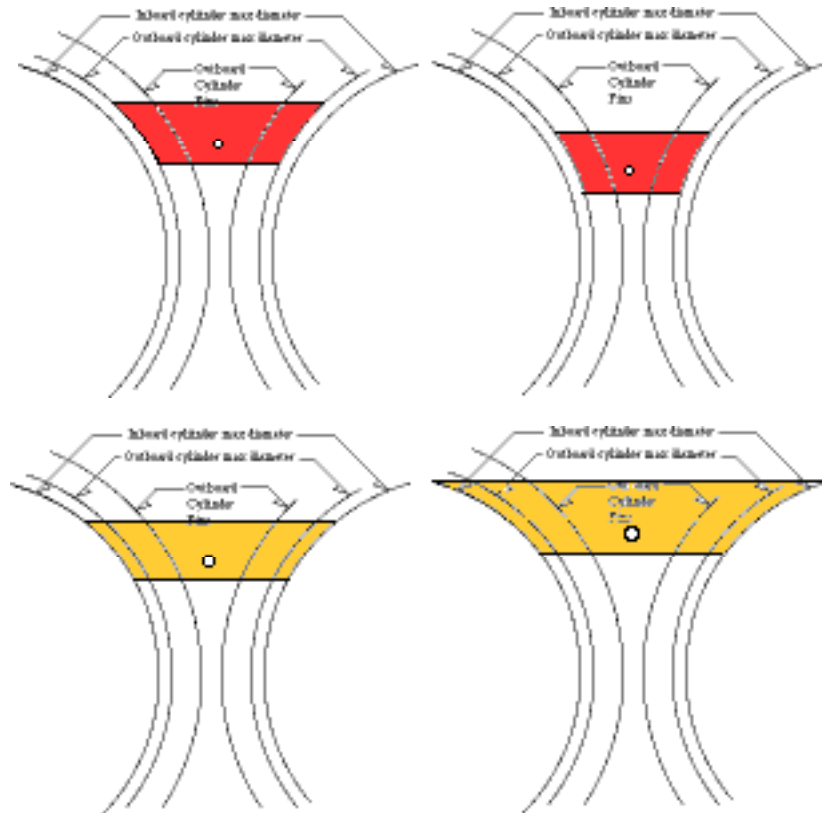
When installing the replacement topside retainers, the “assumed” curved cutouts made at home did not work at all so these sketches are made with the intent to guide you to avoid what I did. These curves and distances between approximate the cylinders and some study will indicate to you that the outboard fins are closer than memory would have put them, and that is why the top side flat of the outboard baffles have to be formed over a quarter inch thick mandrel. The second and third sets show you why the width of the topside retainers so drastically affect the matching curves of the retainers, and how (note the middle set with the red retainers) the baffle will pull up against the retainer before there is any compression of the spring if you choose a top retainer which is too narrow. The other point in matching the curves as well as possible is to avoid having such a poor contact between the top retainers and the curves of the cylinders that fretting from a sharp point of the retainers will induce a depression in the very expensive cylinder walls.

From the parts list manual, the intercylinder baffles are items 4X of figure 37 on page 71 for the ‘46 planes and items 5X in Figure 38 for the ‘47/’48 planes.

The curves on the next page approximate the big fins of the outer portions of the cylinders and the inner diameters as well. To provide clarity, the fourth curve of the fin/cylinders is not indicated. When printed, the size of the simulated cylinder circles is close to reality, so you can use them to roughly gauge how big or small you want your hangars to be.



The figures below are not to scale, but are here to illustrate how the width of the hangars make such a large effect with respect to how long/short the spring needs to be to attach to the baffles.



Material:

Whether inner or outer, the baffling is usually made up of 0.025 aluminum, and making a set is relatively easy without special tools since the curving of the pieces can be done by hand. Compression springs from many sources are usable, and music wire is available from most hardware stores.

Aluminum sheet, 0.025 for the baffling and 0.040 or 0.050 for the topside retainers.

Music wire, about 0.040 diameter.

Springs.

Washers.

Rivets or screws/washers

Tools:

Sheet metal cutters.

Vise

Mandrel for shaping the music wire

Pliers, two sets, for breaking the music wire and manipulating it

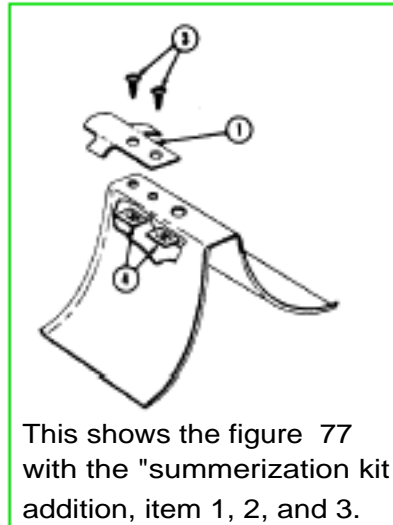
Drill and bits for the holes in the retainers and the rivet holes.

Rivets, soft or sheet metal screws and Tinnerman nuts as the picture from the manual shows

Sandpaper

Finally:

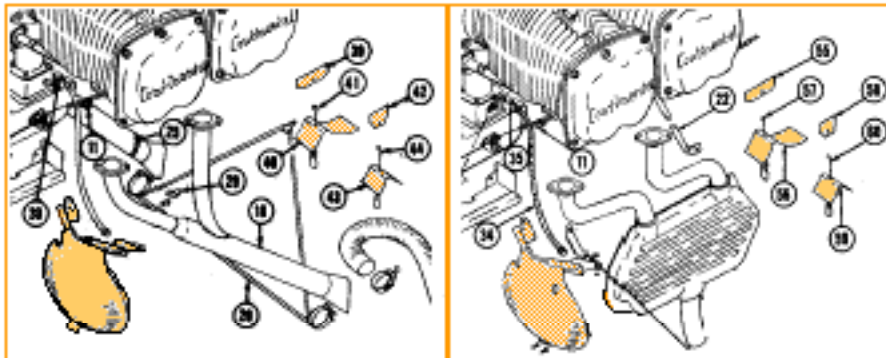
Use a file or the sandpaper to break the edges of the sheet metal pieces because manipulating them while making them fit to the engine will otherwise cause cuts.



Most who add the extender of the winterization kit install it with rivets and leave it in; the 140A figure shows it permanently attached. This figure indicates screws and Tinnerman nuts for a temporary attachment. I have yet to see one installed with the screws.

Oil Tank Baffle and Intercylinder arrays:

The oil tank baffle is supposed to be on all the 120/140's all year round; the 140A parts manual does not show one. Following, the three versions of the intercylinder array; note that the 140A view shows the springs and piano wire hangers and permanently fixed (red) extender for the first time.

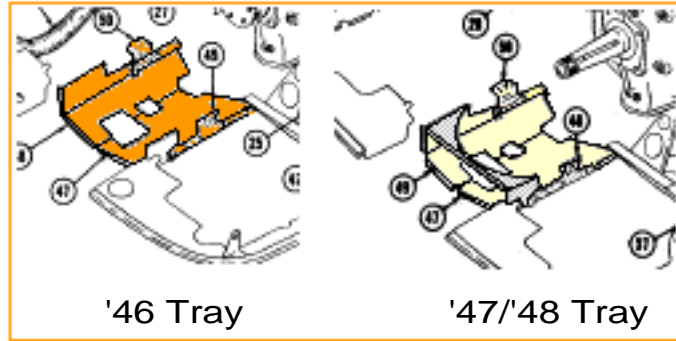


'46 Intercylinder baffles and oil tank baffle on the left, with like items on the right from the '47/'48

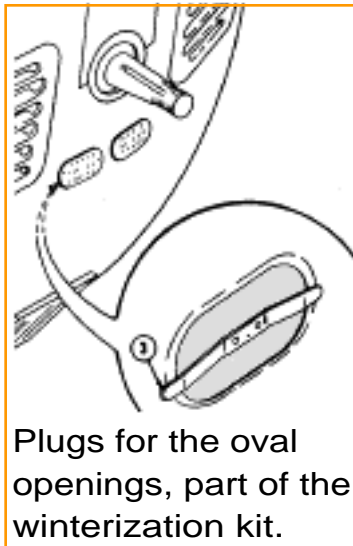


Concerning the 120/140's, item 45 of page 71 and item 36 on page 75 show the oil tank baffle for all the of the planes through '48. Note that there is no coding which suggests that it is a part to be taken off in the summer and put back on in the winter.

The intent of the baffle in front of the oil tank is this: the air forced into the two oval-shaped openings in the front of the cowling below the crankshaft opening travels along the channel formed by the engine and the sheet metal tray (items 47 and 49 of figure 37). The cooling air is routed past the case where the oil galleries (yes, galleries, not galleys) are, removing heat from the case which encloses them and then that cooling air stream is forced between the oil tank baffle and the oil tank, assisting in reducing the oil temperature of the oil in the tank.



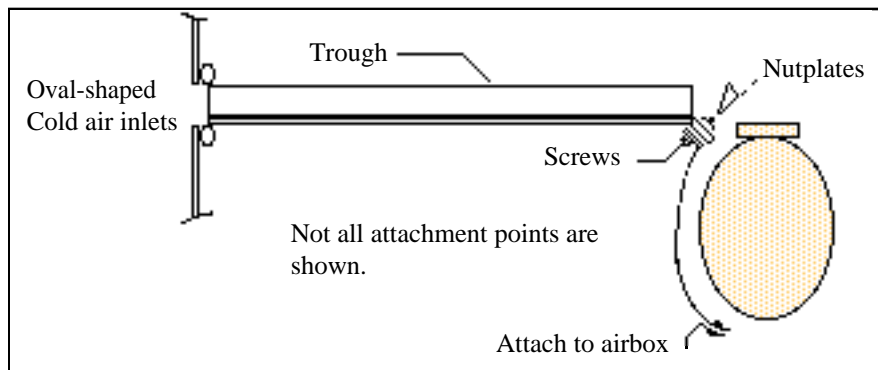
One of the hardest to kill old wives' tales is that promoted so strongly over the years which nobody dared defy, stated pontifically by the mechanic during annuals: "the oil tank baffle is A) ineffective and therefore should be removed, or B) its a winterization thing and you don't need it in this weather so I took it off without asking you because I, the A&X, KNOW". But they (or you) never looked up or confirmed whether it was true, so off they came, to the hot oil owner's detriment. Back in the days when I let the FBO's experts do all of the annuals, one of them took it off, handed me the baffle, and then put it back on after being shown that it should be there.



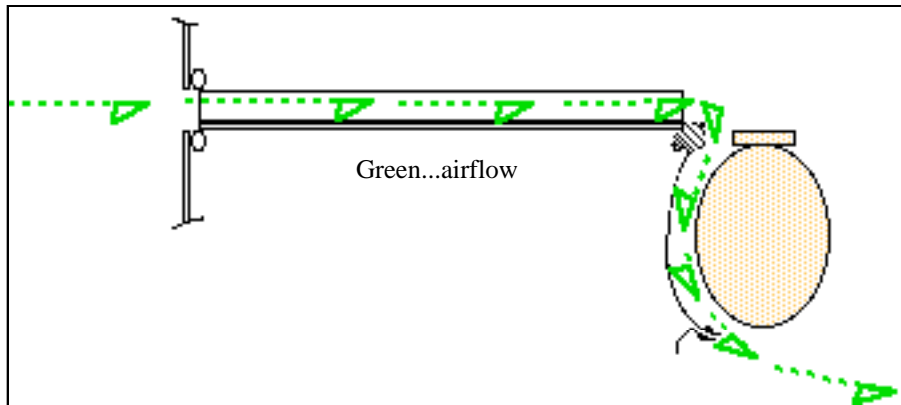
Go to page 64 of the parts manual and note the "winterization" kit. The oval inlet ports are plugged so no cooling air goes past the galleries or between the oil tank baffle and the oil tank. An important part of the kit is the asbestos (back then it was) blanket which goes over the oil tank.

The oil tank baffle is neither a summerization kit part nor a winterization kit part...it is supposed to be on the engine all the time.

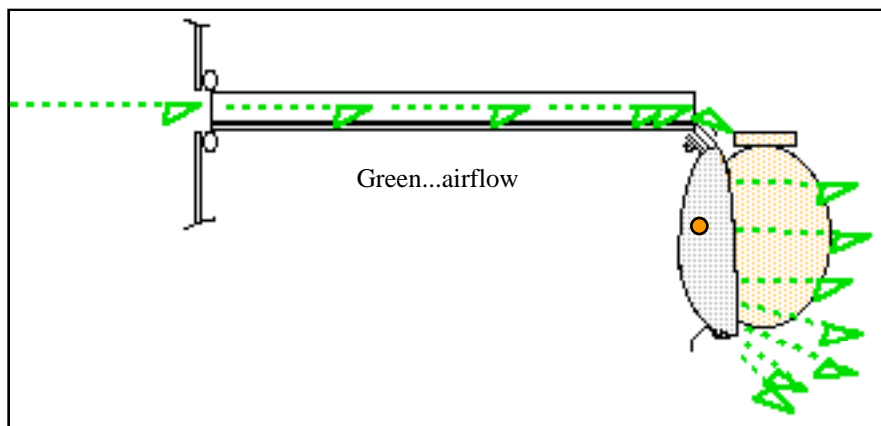
In 2009, I added the winterization kit to the last page and where to buy it.



This figure is a simple diagram showing the oval-shaped cold air inlets on the left, and the sheet metal trough which guides the cold air past the case with the oil galleries and the oil tank baffle and oil tank. The next figures show the intended flow.



The figure above suggests the intended the air flow which directs and controls the airflow around the oil tank...for clarity, I have shown just the center curvature of the baffle.

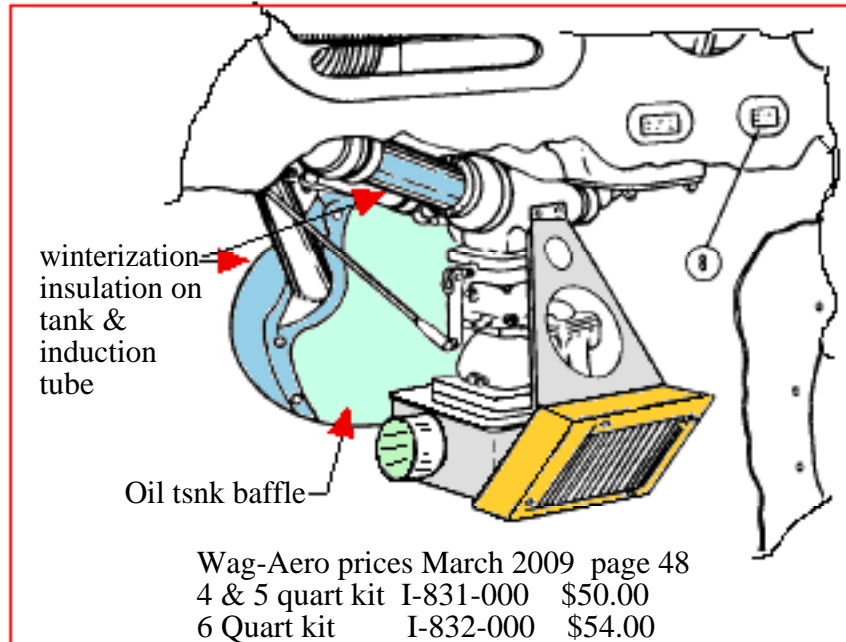


In the view above, a truer view of the intended cold air flow past the oil tank. I can't indicate in 3D that the air tends to "stick" to the curved surface of the tank so that some of the air curves around the sides and a slightly around the back before it breaks away.



Front view of the baffle on the left, rear view in the center (the Florida-shaped cutout is for the throttle cable, and the round hole is for the carb heat cable) and the top view on the right. Between the views, you can see the five attach points.

For the expansion of what is becoming a baffle article, the next figure shows the insulation kit installed on the tank and the induction tubes, meant to be installed in cold weather and removed after the cold. Wag-aero is the only catalog it has been presented in recent years, so I copied their ad and colored it a bit.



Filed as: Intercylinder/ OilTank Baffles Revised 28 Mar 2009 cougarnfw@aol.com
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