2- REDUCED COOLING LEAKAGE/DRAG FOR ALREADY FLYING AIRCRAFT

This is the big payoff area for all aircraft. As noted elsewhere, engine baffle installations leak like sieves. Attention to detail can provide substantial rewards.

**Baffle Modifications**

There are dozens of leakage paths around the engine baffling. Below I present photos showing how I patched some of these leaks with some explanatory captions. My most useful tools: sharp scissors, thin cardboard with which to make patterns, orange silicone baffle tape which I cut to shape, and high temperature silicone rubber adhesive (the stuff that smells like vinegar) to attach the silicone strips into place.

The photos below show most of the patches I made to control leakage. The first shows the right front metal baffle from the Lancair baffling kit which sits in front of cylinder five.

![Image of baffle modifications](image)

The modifications highlight two major leakage areas. First, the alternator discharges its cooling air to the low pressure area below the engine through a round exhaust pipe extending out the bottom of the alternator. The hole in the baffle did not line up with this exhaust pipe and so had to be made oval. Then I used silicone rubber sheet and some foam to make a tight seal around the exhaust pipe. There were also significant gaps around the crankcase which I remedied with more silicone sheet, scissors, and a lot of patience yielding the complex rubber shapes on the edge of the baffle (right side of figure). The small slot admits cooling air to the front of the cylinder. Ultimately to cool the cylinder a bit more, I added more area by drilling a line of three ½ inch diameter holes to the right of the slot in the picture (closer to the aircraft centreline).

The photo below shows the back side of the same baffle plate before I fitted the foam rubber around the alternator exhaust pipe. Note aluminum extension below the rubber (vertical section).
If you look at the left end of the metal baffle you will see the region under the crankshaft where a large gap exists because the left and right front baffles do not meet at the front. I made a piece of fibreglass molded in place (using modelling clay as a support mold and release tape on the crankcase) to close this gap. It is riveted to the left side baffle plate. The resulting piece is fairly complex in shape but closes a sizable hole, perhaps as large as two square inches right where it is most difficult to see and fix. Pictures are presented later.

The figure below shows more baffle modifications.

The part at the top is the right hand side baffle that runs along the top of the cylinders above the valve covers. Rubber sheet was added to close off gaps found along the tops of the cylinder heads. The pieces in the front are the baffle pieces that go across the rear of the engine across the top of the accessory case. You can see that some sizable gaps were found and plugged.

Below is the baffle that sits behind cylinder two and in front of the oil cooler. Note the oil cooler door at the top. The baffle does not permit air to pass from the top rear of the cylinder to the bottom rear so I made a fibreglass blister that allows the cooling air flow to bypass to the lower cylinder fins. Note also the lower cylinder baffle (bottom) includes addition of an aluminum angle to hold the air flow closely to the cooling fins at the bottom of the flow path, and rubber strips (painted white) to prevent leakage out the side. These serve as a “dam” to force the flow through the fins instead.
To eliminate the leakage that is common with conventional rubber baffle sealing strips, I constructed a fibreglass plenum that attached to the aluminum baffle pieces after they were cut down to a suitable size and shape. The plenum seals against the cowl inlets by pressing foam rubber rings against flat flanges that are formed into the cowl. Streamlined intake ramps carry the flow to the plenum area above the engine.
To streamline the flow after it enters the cowl inlets, I formed fibreglass parts attached to the baffles as illustrated below. The V openings are to let some of the flow to pass through the front fins on the cylinder six cylinder head. Note also that the hole where the spark plug wires pass through the side baffle to the lower plugs is also sealed with rubber pieces to eliminate leakage.
Also visible above is the alternate air inlet which provides a small increase in manifold pressure by bypassing the air cleaner. A portion of the circular seal assembly that prevents air from exiting out the spinner gap is also shown. This design, also shown elsewhere, was required to accommodate the magnetic pickup ring for the electronic ignition.

A similar fairing was installed on the right side and is shown unpainted below.

Note the cut outs to allow air to pass to the cylinder, head, and alternator hidden on the right.

The figure below provides a bird’s eye view of both cooling air inlet areas nearing completion. The induction air configuration is clearly visible with air cleaner on the left of the photo and alternate air intake on the right. Note again spark plug wire seals.
Top of plenum cover.  The upper right hole provides access to the oil dip stick.  The surrounding foam provides a seal to prevent higher pressure air above the engine from escaping to the lower pressure zone inside the cowl.  The lower left hole and seal were required because when I re-contoured the cowl and inlets, I got the top a little too low and too close to the intake manifold tube on the left side.  I had to put a little bulge in the top of the cowl, and even then there was not enough clearance for the plenum cover, so the hole and foam seal were required.
The aft portion of the plenum top that covers the engine is sealed with a foam strip as illustrated above.

There are a lot of leaks around the oil cooler. The picture shows one leak closed with the addition of some aluminum and rubber sheet.
The tip of the Allen wrench points to a white-painted rubber strip bonded to the baffle to seal off a slot that appears on each cylinder above the valve covers.

The original baffle kit had a hole for the air/oil separator, but it did not work for me. I cut a new hole. After I mounted the separator, I found that the bolt on the top interfered with a reinforcement rib I put into the top cowl. So I moved the separator down. This left me with two surplus holes. Rubber strip and silicone adhesive to the rescue! Note also the oil cooler door on the left which I adjusted to be fully open leaning forward slightly. The engine cools so well that the extra effort required to gain the full travel was not necessary. I fly with the oil cooler door closed most of the time.
Looking up at cylinder six (front left). I added the angle segment that covers the fins on the left to force the air to follow the pathway between the fins rather than just taking the short cut straight out. This replicates the function of the Continental baffle shown doing the same thing to the right of the right hand push rod tube. I added such angle deflectors on the four extreme corners of the engine where the Lancair baffle kit did not include such a feature.

Looking up at cylinder no. five, right front. Double layers of rubber sheet (painted white) are visible around the cooling fins to hold the air flow into the fin passages (two locations). The angle added to the bottom of the baffle is clearly visible. Also, the rubber sheet sealing around the alternator exhaust air duct is visible lower right.
This is cylinder no. one, right rear. Note the rubber air dam strip along the edge of the baffle to hold the air into the cooling fin channels and the aluminum angle riveted to the bottom of this same baffle to direct the air across the fins at the bottom.

Close up of baffling in front of cylinder no. six (front left). Behind the thermocouple wire you can see a couple of strips of silicone rubber (painted white) that act as an air dam to force the air flow past the fins rather than letting it take the short cut by squirting out the side.
Looking down at the front, base of cylinder no. five. The alternator base is peeking out under the air cleaner, but is largely hidden by the intake ramp I built. The key point is the rubber seal which closes a reasonably large hole as illustrated.

Looking down at cylinder no. 1, right rear. Rubber pieces close a crack and a hole. The bug splats on the back baffle show that the raised cowl air inlets and inlet ramps provide for a reasonably straight shot for air to enter and then circulate above the engine.