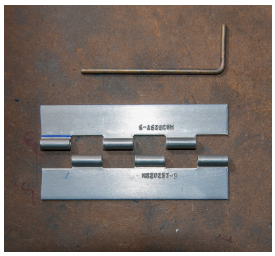
Fuel Tank Sealing - 25/03/2012 - 10h

Category: 2.5. Fuel Tanks
Published: Monday, 09 April 2012 08:47
Hits: 1672

I wasn't quite happy with the first fuel trap door I made. So I decided to restart. Because many sites fail (as well as the manual) to give a good explanation of how to make such a trap door, I decided to put some detailed pictures here of the process.

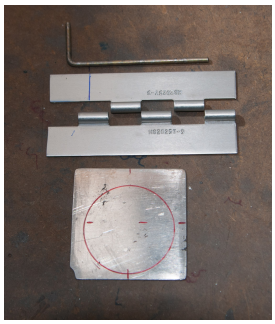
The function of the trap door is to slow down the flow of fuel from the inboard compartiment to the outboard fuel compartiments.When low on fuel, it will avoid that fuel flows outboard with gravity. The fuel trap door is installed on the first inside- inboard ri.

First cut a piece of hinge from the aileron hinges. There is sufficient hinge there, so don't worry. Then bend the hinge pin. Make sure you get a thight bend with a small radius. I failed the first time doing this. The hinge pin will need to be secured by safety wire and there is not much space between the tank baffle and the hinge. The flat (longest) portion of the hinge pin should cover 4 eyes. A little more is also good. You don't want the bend of the hingepin to be too close to the hinge eyes or friction will occur and your trap door won't travel by itself anymore. There should be no friction so the trap door can move freely.



Mark the top line of the hinge pin to the middle of the bottom eyer, leaving 2 eyes in the top portion and half the flat side. This will provide enough room for the hinge pin to go up and be safety wired.

Don't cut away this portion. You should draw a line from the left bottom to the top of the blue line and cut away the triangle at the top. The rest will be bend to create the 'door stop'.



Here is the result after cutting away the triangle and bending the

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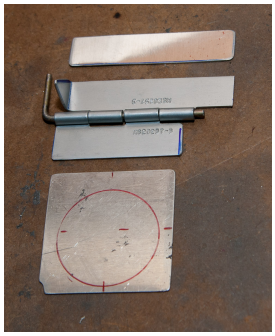
leftover to 90 degrees.

Now mark the right eye of the bottom hinge. We will cut this away as the hinge is now to longe for the 2 inch door. The bigger, the more friction.

Here is the result. The reason why the top hinge is longer is because it will go over the punched area on the rib. You need the distance to be able to set a rivet outside of the punched area in the rib.

Don't forget to make a doubler in the same gauge material as the trap door.



Now drill #40, dimple the tap door and countersink the hinge pin.

little test fit after drilling to the rib. Note that I left a small gap underneatch the door. This is both for the clearence to the fuel tank sealant but also to allow little quantities of fuel still to flow left to right or right to left.

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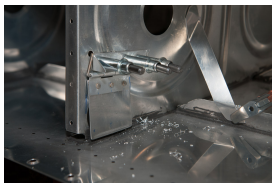
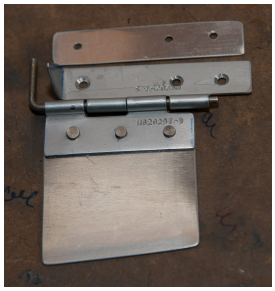
In case the fuel trap door gets blocked for some obscure reason, fuel will still be able to leak through at slow rate.

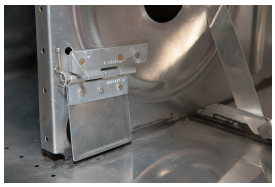


Then, set the rivets using a squeezer for the fuel trap door. AN426AD3-3.5 shoud do.

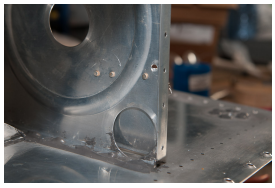
Note in this picture that the fuel trap door is not fully horizontal. I actually put a little angle in it to follow the shape of the rib.



Then rivet the top hinge to the rib and installed a .032 safety wire to secure the pin.
Securing the pin at this point is not really necessary as the baffle will lock the pin in place. There is no way it can get out of there once the baffle is in place. The secondary function of the safety wire is to remain distance between the pin and the hinge (to avoid friction locking as mentioned above).



A view from the backside.



I also installed and pop rivetted the anti hangup guide on the inner rib. The purpose of this anti hangup guide is to prevent the flop tube

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of getting stuck between the rib and the stiffener. I gave it a little twist and the curve makes the head of the flop tube nicely slide down. Two lp4-3 pop rivets hold it in place. No need to get noisy with solid rivets. Make your life easy where you can.

A close up of both installed.

After making a first attempt of making a simple anti hangup door on the inspection door side, I got interested by another design on a couple of builder websites for an alternative way of installing the anti hangup guide without obstructing the inspection door entry when removed. I made and remade the angles and finally came up with the design in the picture below. This would probably work for installation but a long discussion with buddy builder Fred convinced me not to do it and go for the simple anti hangup as vans described (blocking the entry mid way). This is again a place where you don't compromise builders ease for safety. A weak point in the design as in the picture is the top side of the tank (right side in picture) the distance from the last support Z angle to the top of the tank is still quite high which makes that the wear and tear may make this part bent, creating a new possible safety hazard by locking up the flop tube.

I started thinking then about the reason for this anti hangup guide. It looks like there is no real reason for an anti hangup here when

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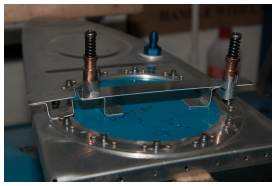
using floptubes. The only reason I could come up with is that the antihangup guide creates a distance between the soft flexible flop tube maze and the bolts sticking out of the nutplates. If these would touch, it would always be at the same place and in the long run this could create leaks there that could lead to air suction on low fuel levels possibly leading to fuel starvation. a big no-no. So you want this anti hangup guide. I remade my original one (seen in a few article back) in a thicker gauge as I thought the .025 was too light and flexible and would de-form after time.

So again, before you get the wrong idea, the picture below is a no-go. eventhough it's easier for maintenance. My final piece is visible some pictures below.



Some days later, I went to buddy builder Hugo for cutting the whole that will pass the AN6 fitting of the flop tube through the nose of the inboard rib.
I don't have a drill that is big enough for this hole and Hugo had just the right tool for it. Another one for your shop list at Avery or cleveland tools : the Rota-Broach set

The problem with this assembly is that the combination of the support angle, the reenforcement plate and rib is just too thick to use the unibit. The rota-broach cutters make a nice deep and precise burr free hole through all three at once.
Pay attention when positioning your rivet holes around the big hole. Keep in mind that the nut will come on top of the elbow for the fuel flop tube and that it needs to be able to spin. Keep enough distance from the support angle vertical part and from the rivets so the but can spin.

Remade that anti hangup in .032 sheet, the old classic way with limitted accessibility.

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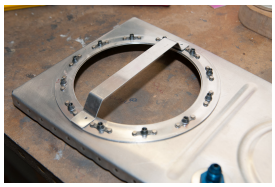
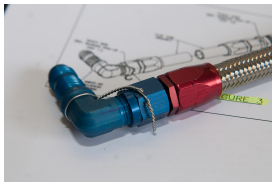
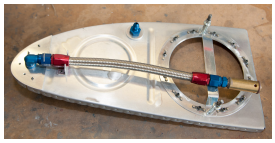


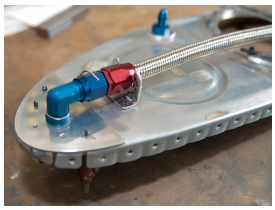
There is a service bulletin of vans that says you have to safety wire the flop tube nut to the elbow. Safety landings have occured with people that complained about fuel starvation with a half empty tank. The nut slided off the elbow leading to a high point fuel pickup.

This was my first safety wire job and I am quite proud of it. It turned out well.

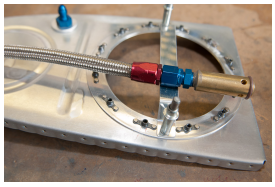


I saw on some websites a good idea to avoid rotation of the flop tube elbow by vibration. Many builder have used the fuel pickup support angle from the fixed fuel pickup to support the flop tube. I did the same. Just cut off some teeth from the support and position it nice and horizontal on the rib. Once rivetted on, the flop tube can no longer have the tendency to pivot on the elbow. The only moving part will be the flexible part of the tube.





Position of the flop tube when installed towards the anti hangup guide.



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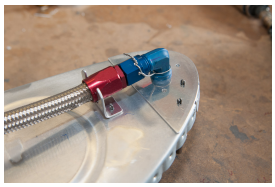
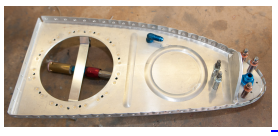
Another view at the flop tube elbow attachment.



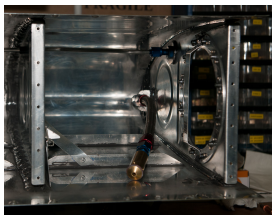
Outside view. Middle is the air vent elbow outlet. Make sure this points slightly downwards as you will still have to install a aluminum tube on that later. Setting it straight would make it difficult to build on to it later.



Then, it was time again to start mixing fuel tank sealant and put the outer rib in place. The outer ribs are much easier then the inner ribs since you can do these using the pneumatic squeezer.
First installed the modified T-715 anti rotation bracket. Then rivetted the anti hangup guide on the inside of the inspection door.

Then installed the rib and made fillets on the edges making sure there is a nice bed of sealant on the side.
Then applied sealant to the rib reinforcement doubler T-410 and to the T-405 attach angle.
Bucked the AN470AD4-7 rivets and then torqued the AN924-6D nut on the AN833-6D elbow using 150inch/lbs. Put some sealant on the elbow before inserting but make sure there is no sealant on the threads.I used masking tape to insert the elbow as the sealant makes a mess upon insertion.

Add a lot of seanant on the leading edge side of the rib as that seems to be the place where most leaks occur.



This is how the tank looks with all ribs, vent line and fuel system installed.

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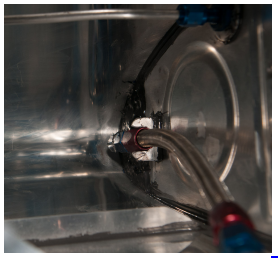
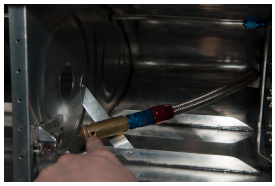
Close up view of the end of the flop tupe.



Position of the flop tube in relation to the anti hangup guide.



Flop tube over stiffener.

Left tank is ready for closure. I will first do the same now on the right tank.

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