The proseal game is on - 25/02/2012 - 8:30

Category: 2.5. Fuel Tanks
Published: Sunday, 26 February 2012 08:17
Hits: 1762

It took long to get here, but I can proudly say that :

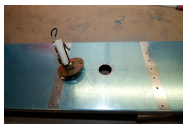
I am now an official member of the 'Black Death Society' !

For the non builders reading my site: before you think I joined a sect or so. I did not. Black death is the nickname among builders for ProSeal. ProSeal is a fuel tank sealant. It is a paste that hardens within an hour and then seals all openings between two aluminum parts. It is used to assemble the fuel tanks and make sure no fuel leaks out.

Sounds easy, doesn't it ? The paste is terribly sticky and uncomfortable (to say the least) to work with.
Well, it's to difficult to explain, but just check the pictures below and you'll soon catch my drift.

I didn't have a weight scale that was accurate enough so the Mrs went to buy a digital weighscale that is up to 0.1gram precise. It's special for people on a special diet. In the meantime, while waiting, I started drilling a hole in the baffle plate for the Stewart Warner fuel senders. These fuel senders operate using a float cork that is mounted to a bent metal wire. The metal rod is inserted into a small plastic slot that moves in a range of 70 degrees. The metal rod is actually inserted into the gauge from the side and the little arm has some support points that click onto the arm. I didn't catch that at first look and the manual is pretty poor in this area.

Since I'm using flop tubes in both tanks, the fuel floats can not be installed in the same bay as the flop tubes. With fixed pickup, the fuel senders are normally mounted on the cover inspection door.
In my case, the fuel senders have to move to the second bay in the fuel tank (next to the flop tube from inboard). The sender is then mounted in the middle point of the bay on the tank baffle plate. The instructions are pretty bad for this.There are clear instructions on bending the float arm, but nothing on locations for the sender.
I located the center of the bay between the two ribs and the center in height. At that location, I made a hole using the step drill in multiple locations, then enlarging it using the die grinder.



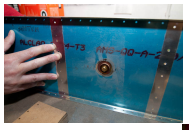
The next pictures are temporarily mounting the sender. At this point, I was still thinking that the sender goes completely inside the tank.

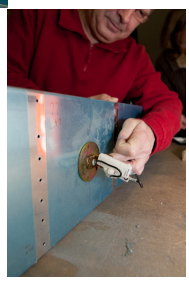
This is not true ! The whole mechanism has to go through the hole but

Phoca PDF

the metal disc stays on the outside of the tank. I will explain the details of this mounting in the next article as I will continue working on this tomorrow.

Why ? well... my wife just arrived with the weight scale... jihaa...





Let's break out the pro-seal.

The introduction ritual to become part of the black death society is to perform a ritual which is called: backrivetting the stiffeners to the fuel tank skin.

Jacques came by to help me with the rivetting. You would probably be able to do this part by yourself but it is so much easier with a second pair of hands around.
In the next picture, I'm holding the proseal paste, Jacques is holding the hardning agent. Pro-seal is mixed in a ratio of 10 to 1. 10 parts of the white paste and 1 part of the black paste.

I found that for the stiffeners, batches of 30 grams were easiest to handle. Proseal starts to get harder after 30 to 35 minutes. It is still workeable then but it starts to harden and the viscosity drops making it harder to make fillets or to cover rivets with it.

I aimed for 45 minutes at each batch and that works fine with 30 grams. 30 grams will allow you to rivet 3 long stiffeners.

Look, at this point we were still smiling...

Phoca PDF

The proseal game is on - 25/02/2012 - 8:30

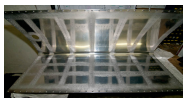
Category: 2.5. Fuel Tanks
Published: Sunday, 26 February 2012 08:17
Hits: 1762

Some people on the forum say: "I don't understand all that fuzz about the proseal, it really isn't that bad..."

Forget it ! It really IS that bad... proof is in the next pictures. The guys who say that are mostly professionals that do this day by day. We -poor first time builders- don't have the skills or habits yet of working with this sticky mess and believe me... you will be happy when your first day is over.

Let's have a word about the procedure.

First you start by scuffing up the skin and touching sides of ribs and stiffeners with the maroon scotchbrite pads (very fine). Score them well ! This is important because the small scratches you make will increase the adhesion of the product to the metal.



Then clean the metal very well. I used the silicon entferner of spiess hecker (the same agent as used when applying corrosion protection). The skin and parts must be very very very very clean. You don't want any risk here of doing all the messy work to find out later that the sealant didn't connect because of grease of dirt.
Once cleaned. Use surgical gloves so that no more grease from your skin is transferred to the metal.

The next step is to apply electric tape next to the location of the stiffeners. Allow 0.5 to 1 cm next to the stifferener so you can easily make fillets. Once rivettted, we will remove the tape and a nice line will form.
If you decide not to do this, you will end up with a mess... believe me.

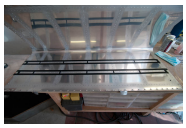
For the next tank, I will also apply butcher paper in between the skin parts that keep clean. The way that I did it now leads to too much cleaning work because of proseal getting smeared all over the place.

Phoca PDF

The proseal game is on - 25/02/2012 - 8:30

Category: 2.5. Fuel Tanks
Published: Sunday, 26 February 2012 08:17
Hits: 1762

It's a mess... really... it is !



Is everything ready now ? Think now, because time flies once the proseal is mixed and minutes tick away with no mercy once the hardning agent is mixed.

- paper towels cut in 4 inch squares - check !
- aceton (in large quantities available) - check !
- popsickle stick - check !
- small syringes - check !
- squeezer ready with dies on, backrivet set on gun, pressure on air hose - check !
- 3/32" rivet gauge - check !
- clecoes and cleco pliers - check !
- rivets cleaned in aceton and dried on paper towel - check !

Now it's time to mix the sealant. As said before, I used batches of 33 grams. 30 grams of the white paste, 3 grams of the black paste.

Mix carefully. No more white color in the corners. Don't be too fast, mix until you have a nice uniform and dark greyish color.

I also opened up the garage door to cool down the place to about 15°C. This gives you a bit more time to work.
The proseal that Vans sells is of type B2.

The first letter indicates the viscosity class of the sealant. Class B sealant is the paste consistency sealant that is most commonly used in sealing homebuilt aircraft tanks.
The figure 2 means that the paste has a working time of 2 hours. It is tack free (no more sticking) after 64 hours and cured after 112 hours. (see also this link)
The time is based on a temperature of 77°F (25° C) and 50% relative humidity. Variations in emperature and humidity will affect the cure times.
Higher temperatures and higher humidity will decrease these times, while lower temperatures and lower humidity will increase these times.

Time to put on the first stiffeners. Using a popsickle stick, applied a layer of about 2-3mm sealant on the bottom side of the stiffener.

Phoca PDF

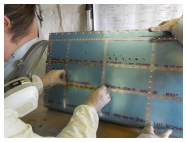
The proseal game is on - 25/02/2012 - 8:30

Category: 2.5. Fuel Tanks
Published: Sunday, 26 February 2012 08:17
Hits: 1762

Then put it on the dimpled holes and pushed it down.
You'll need some force to push it down as proseal is quite pasty.
Proseal squeezes out all over, including through the rivet holes.
That's good ! don't clean it off, the paste will be squeezed in and around the rivet both sides.

Did I already say it is a mess ??? oh yeah... It's a mess !

Then put the acteon cleaned 3/32 3.5 rivets in and used backrivetting tape to secure them in place. Make sure they are dry ! The aceton will affect the proseal if it's not.
I gave each of them a little push in the dimple (the paste will already ooze out a bit).
I'm not a big fan of the expensive rivetters tape and usually use paper masking tape which works as well. But in this case, you really need the good (and expensive) plastic stuff.



Now backrivet them. More proseal squeezes out as you rivet. (although I expected more to come out).
It is very hard to check the quality of the set rivets. The rivets are all covered with black paste and height and diameter are hardly visible.
My gun pressure was set too hard for the first stiffener making the heads a little over-set. Adjust to 40 PSI which is for me a good setting.

I recommend making a test plate upfront and practicing 10 rivets before starting so you get the right rhythm.

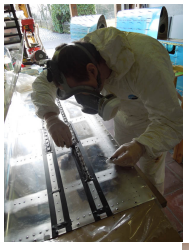
Used the rivet gauge (which is all covered in the black stuff to check diameter). On the picture on the right, you can see some set rivets, see how hard it is to evaluate quality.

Phoca PDF

The proseal game is on - 25/02/2012 - 8:30

Category: 2.5. Fuel Tanks
Published: Sunday, 26 February 2012 08:17
Hits: 1762

Now, put the gun aside and use popsickle sticks to make nice smooth fillets on the sides of the stiffener. Add some paste where you think it's too thin but usually there is plenty of product that squeezed out.



Last step is to cover the heads of the rivets with a dab of sealant.

Phoca PDF

The proseal game is on - 25/02/2012 - 8:30

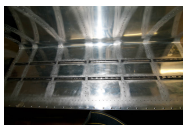
Category: 2.5. Fuel Tanks
Published: Sunday, 26 February 2012 08:17
Hits: 1762

Jacques took care of this. We tried different approaches. The syringe didn't work too well. A plastic bag with tip cut off didn't work as the paste is too thick and difficult to move in the plastic.
He had the best results with two simple popsickle sticks.

To make nice round heads, you can put some vaseline on your fingers and touch the head to make it smooth. The small amount will not affect the bonding (says the guy who hasn't tested his tanks yet).
The vaseline does not allow the paste to stick on your fingers. Just avoid using it on the sides where the paste really bonds to the metal. Some people do this too but better not take risks on this.

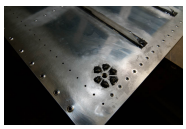
With batches of 33gr, you will repeat this 4 times before all stiffeners are on.

In between batches, clean the skin with aceton. It removes easily when wet. I also removed the masking tape after each batch.
Make sure there is enough room between the stiffeners because there will be a rib there soon.



I had enough sealant left on the last batch to rivet the drain valve ring on the skin.
Applied a similar load of proseal on the inside and put cleco's in.
Used the pneumatic squeezer here to set them (the only tool that wasn't dirty yet)

Then spent quite a bit of time making sure that on the coverage of the rivet heads, there was no obstruction between the rivets.
This is important to check as the water that found it's way to the lowest point of the tank has to float easily to the mid point of the drain valve. Making a small wall around it may lead to dangereous situations of cummulation of water that can finally be picked up by the flop tubes and choque the engine.
On the outside, made a nice filet around the valve as well.



Phoca PDF

The proseal game is on - 25/02/2012 - 8:30

Category: 2.5. Fuel Tanks
Published: Sunday, 26 February 2012 08:17
Hits: 1762

7 hours later, the stiffeners and drain are done.

Oh no... another hour to clean the mess of the tools, clecoes,...

This goes way slower then expected....

Phoca PDF