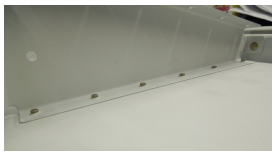
Flap Rivetting - 01/12/2012 - 16h

Category: 2.7. Flaps
Published: Thursday, 06 December 2012 16:24
Hits: 1886

It's been a while since my last webblog status update. That does not mean activities are low. On the contrary ! The plane factory is operating at full speed to reach the end of the year wing finishing deadline. Some important customers are awaiting the first flight (3 years from now) so we better make sure to execute that flight reservation.

In the last weeks, the focus has been on priming and rivetting the flaps. Overall, this is more of the regular work but I have to admit I've been having some ups and downs in the process. After the priming was finished. I started to rivet the left elevator. In the first steps, you rivet the small inner ribs to the bottom skin plate and the back tabs to the rear spar (if you can call it that way) of the bottom skin. What I noticed is that by the gauge of the primer on rib tab and skin, it was not necessary anymore to insert the small shimies I made. When you rivet the rib tabs, remember the golden rule: shop head goes on the side with the thickest material. If you have a 3" yoke, you can squeeze 3 of the 6 rivets on the flange of the rib to the skin.

the shop heads turned out quite nice. Also the other ones that were shot worked out nice. I have been getting very good result with my setup with the pressure of the 3x gun set to 36PSI. One warning looking at the picture below: the rivet near the flange (right side in the pic) should not be set now. I actually had to drill them out again. This is where the skin overlaps. I was working with my buddy Fred and we had a bit too much of alcohol the evening before so we didn't pay close attention to the plans. Never a good idea to work in those conditions.



Then you rivet the nutplate to the inner rib. First you set the rivet with the nutplate ear that only goes through the rib. A little warning again here. Don't rivet the other one now. I did it for the left flap and you will see in a couple of pictures why it is a bad idea. Then rivet the reinforcementplate on the outer rib with AD4 rivets. They can all be squeezed.

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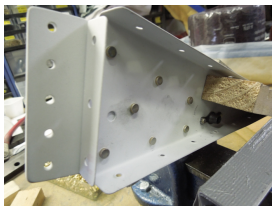
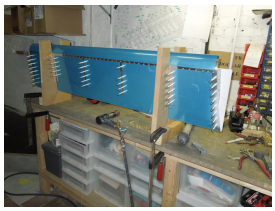


Then installed the outer ribs and clecoed the whole structure to the top skin. Cleco only to the bottom side.This way, you can still stretch the skin open to put your hand in for bucking the line of rivets where the top and bottom skin connect. (don't forget to remove the excess blue plastic protection wrap) when you overlap the skins. Once rivetted, it's impossible to remove it. After messing around for a bit with a loose hanging flap, I adapted my V-block jigs from the elevator so they match the flap sizes. (flaps are a bit wider than the elevators).



Then I rivetted the inner rib to the bottom skin. And that's where the first misery occured. Since the nutplate was already installed (as Vans tells you to do so in the manual), you can hardly reach the rivet that is just underneath the nutplate. No way to squeeze, it has to be shot with the gun. I have a very thin nose bucking bar but -out of experience- I knew that it doesn't work nice and that is has the tendency to slip off and have not enough of mass when bucking. There was no way around it, I had to use that one or drill out the rivets from the nutplate.. The result of the rivet was not very goodlooking. But it sits thight and I don't want to remove it since the chance that I do it any better a second time is close to zero. On the other hand, I would have the risk of enlarging the hole and be in even deeper shit. Read on... there is an easier way to overcome this problem. I wish I would have thought twice and not drunk that much the day before... Once the rear row is finished, rivet the other side of the inner rib flanges to the top skin. You can then proceed to the inner rib and shoot those rivets in.

Next, squeeze the second reinforcement angle to the rear spar.

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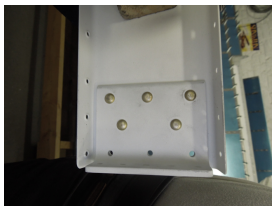
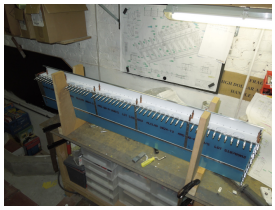


I clecoed the hinge and spar in the flap but had to remove it again as I realised I had forgotten to take out an eye of the hinge before installing it. It's an option that many builders use to secure the hinge pin to the wing. The other option makes you drill a hole in the aileron bracket to install the flap hinge. I don't think this is such a good idea. I hate to drill holes in structurally important parts, certainly if there is an alternative way to do and achieve quality wise the same result.



once the hinge was prepared, I installed the rear spar in it's final position and clecoed it all together.

The next shot shows a better picture of the rivet I mentioned under the nutplate I also had to set an oops rivet just behing this nutplate. When setting the oops rivet I paniced a bit when I saw what looked like a little crack in the dimple. Worried about it, send some mails out and finally removed the spar and clecoes again to realise it was only a bit of the primer that got loose. I was able to peal it of nicely and there is no harm on the dimple.

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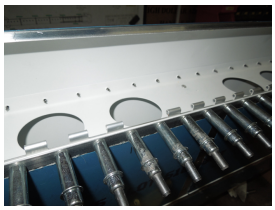
You can also pull the MK319BS pop rivets at the trailing edge of the inner rib. The other side can be squeezed but on the inner side, the flanges point inward and there is no way you can access them. The plans are not really clear on this but you need pop rivets on top AND bottom side. They were easy to set with the pneumatic pop rivetter. Just elarge the holes to #35 because the MK319BS rivets are a bit wider than the AD3 rivets. Next picture shows an inside shot showing the pop rivets from the inside.

Next picture shows the hinge with the middle eye removed. To locate the good position where to remove the eye. Mate the flap to the flap brace and see where you have a location near the middle where the hinge can be guide to the flap brace of the wing.



Next, pulled the LP4-3 pop rivets which hold the spar to the ribs.The ones near the hinge can be done with the pneumatic pop rivetter. The ones near the top skin are more difficult to set as the skin overhangs the location of the rivets. Have a second pair of hands help you to hold up the skin overhang and pull them with your smallest manual pop rivetter. Bending the stem of the pop rivet may help a bit too. Justs make sure somebody helps. I tried to hold it myself while pulling and the skin bend got a little distorted while setting one of the rivets. Fortunatly I could straighten things back out. Next picture shows some of the pulled outboard pop rivets.

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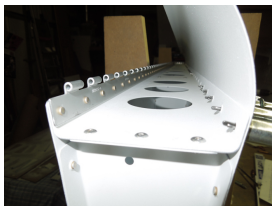
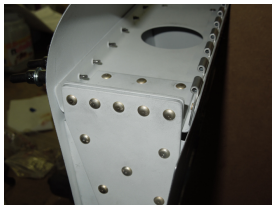
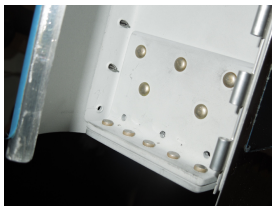
Next, squeeze the AD3 rivets that hold skin to spar to hinge. Very easy and fun work to do. I keep wrestling with rivet sizes. The primer I use takes away some available gauge of my called out rivets on the plan. Anyway I had to use the -4 rivets because the next length would have been just too long and have to much risk of overbending while squeezing. They just look fine as is.



Then I squeezed the rivets that connect the reinforcement bracket and angle. Here I used the next length rivet. Nicely set without problems. Just one tip, don't set all of them. Keep the ones open where you still need to set the pop rivets. They become impossible to reach ones the rivet is set. I found a good technique that helps in case you didn't pay attention (like I did).





I'm missing a good bucking bar to set the line of rivets on the top side and I'm waiting to cut of a small angle of my tungsten so I can overcome the height difference due to the hinge. All my other bucking bars don't work well. So better to be patient until I have the right tools. Decided to start the same work on the right flap. This time, I did some things more intellegently. For example the rivet that sits under the inboard rib nutplate. When you set the nutplate rivet, only

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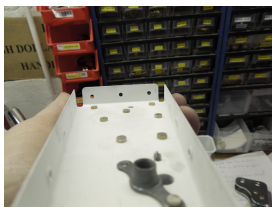
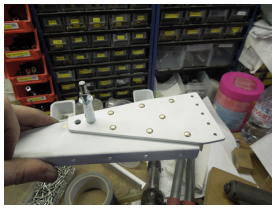
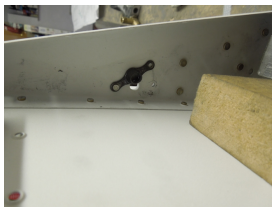
set the one that is only attached to the rib. wait to set the one that passes also through the reinforcement plate. This allows you to slide the nutplate up slightly to give you enough access to reach in later with a more normal bucking bar.

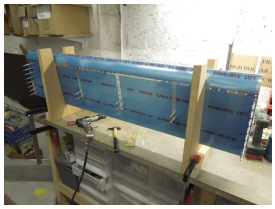




The next picture shows that idea well



Once that rivet is set, bend the nutplate back and squeeze the other ear while you can still reach it. Flap goes in the V-blocks and we can start shooting rivets again. I learned how to rivet these rib to skin rivets by myself. I used to be stuck in building each time I needed to do this and nobody was available. The easy ones, I now shoot and buck myself. It's not simple as the gun tends to walk away (normally you hold the rivet gun head with your second hand). Working with low pressure like me 36PSI and doing small bursts helps to better control the position of the gun head while setting. It's kind of difficult to shoot blindly as you may want to keep looking at what you are doing on the shop head side. Some are just too difficult to set by yourself (like the ones in corners and in thight spots or where you have to reach in deeply). In this case seek help and be patient. it's easier to do it by yourself in a jig than doing it on the loose.



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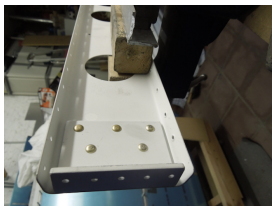
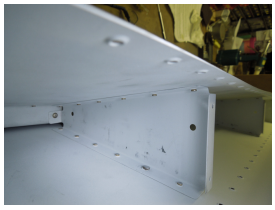
squeezed angle on

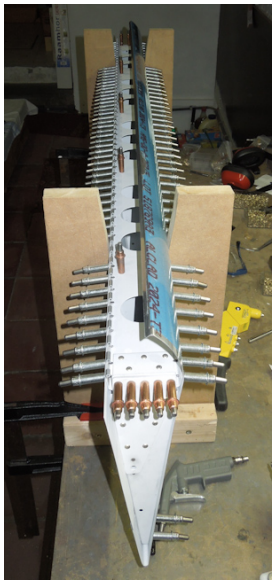


removed hinge and smoothed the edges with sandpaper you can still see the minimum edge distance lines I used to position the hinge when drilling. The holes are well off of the minimum distance line.

On the outboard rib, had to use an oops rivet due to an enlarged hole when drilling out a bad rivet. The oops also is not set ideally but there is plenty of metal holding the things together so I'm not worrying about it.



clecoed the rear spar in.



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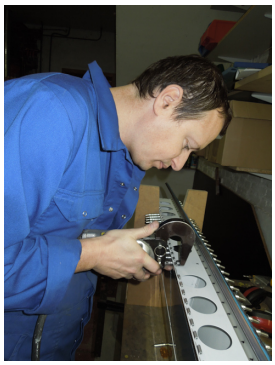
Ah... the master at work with the squeezer. My favorite job.



-ft25- At last, some tip on a new technique you can use when you can't reach some pop rivet because it's too close to an edge, or if you -dumb as I am- already have set the adjacent rivets that block the access to the stem of your pop rivet. In the image below, you see how I managed to pull a close quarter rivet with the normal pop rivetter when the normal head can't reach in because it's too wide. Looking at the picture below, you see that the nose of the pop rivetter will sit over the edge of this angle. You simply extend the grip. It works nicely but I advice you to test it first on some scrap parts. I made a small bushing where the hole just fits the pop rivet stem and slid the bushing over the pop rivet. Then, put the pop rivet head over the stem and pull it in the normal way. The bushing works as an extention of the manufactured rivet head where you normally pull against. It's also a possibility to give a little tap on the rivet to ensure it matches thight by putting an even longer bushing over the stem that is longer. Give it a light tap with a mallet.

The final result looks good.

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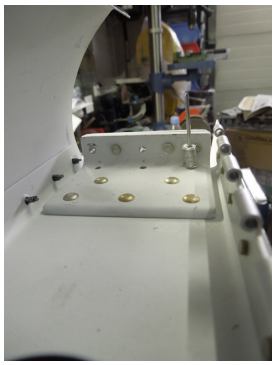

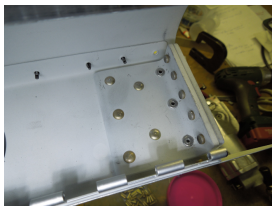

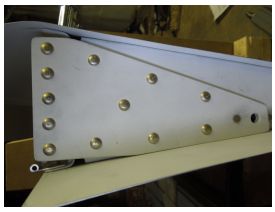

Next session will be to rivet the top rivet line holding spar to skin.

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