

Tie down rings - 10/09/2011

Category: 2.3. Main Spar

Published: Sunday, 02 October 2011 14:50

Hits: 1858

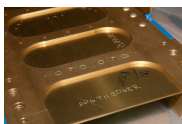
All nutplates have been rivetted on the main spar. I am still fighting the doubt about the diameter of the screw holes that was required. In the previous pages I made a test piece with a correct size dimple and fit it to match correctly. However... in the meanwhile I have discovered that the tank skin is actually 0.032 instead of 0.025. testing with a new test piece looks like the countersunk screws will not be large enough.

No panic, it's always possible to remove extra material. Once you removed too much the damage is really done. I will take a final decision on these sizes when I match the tank skins to the spar.

I also matchdrilled, deburred, countersunk and rivetted the two nutplates that go on the inboard side the main wing spar. My eye keeps falling on this green sticker that Vans has put on the spar. Do NOT bore or ream these holes ! No... just take a hammer and jam those suckers in there. I heard many stories in the meanwhile about mating the wings.



This is how it looks on the aft side. One of them may be a bit deeper but the rivet sits nicely in it's countersink.



The next phase of main spar work involves the tie down ring assembly.

This assembly is quite smart. The tie down assembly also holds the attach horns of the aileron hinge assembly.

The tie down assembly does exactly as it sound, it ties down the plane to the ground using 2 rings that will be screwed in the wing.

In case you might doubt if tie down rings are really required: [See this link on youtube.](#)

The place where this ring is screwed in is the aluminum tie down plate.

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For the tie down assembly, you need to make some support spacer plates that will fit between the spar web and the tiedown plate.

You have to cut 4 equal pieces out of a stock aluminum bar and then drill a 1" hole in this. I realised that my flycutter was to large and that the minimum diameter of it is over 1".

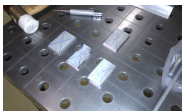
Therefor, I visited my friend Geert who has a lot of large machinery and equipment. First, we cleaned the edges of the aluminum bar so they are 90°. Then cut them off on a saw roughly to bit larger then required dimension.



Then passed the part again in the opposite direction in the machine and scraped of the remaining excess material to again a nice 90° cut.



Once cut, this is how they looked like. Then draw a center point on the piece and mark the point with a center drill.



We did not have a small enough fly cutter or a hole cutter so Geert brought out the heavy equipment... yes you see that correctly, that is a 2.5cm drill. (that's close to 1 inch)

Gently stepping up in drill size, this gave the required result. I will enlarge a little bit using 1" 3M deburr wheel in my die grinder for the final finishing.

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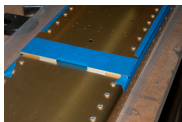
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Now that the spaces are ready, align them with the end of the inforcement bars on the main spar, that's the location of the tie down rings.

I used painters masking tape to keep the spacers in place while drilling.



Also add the tie down plate over this and clamp all together to prepare for drilling. Protect that spar ! Use blocks under the clamps !

In RVator, in the wings section there is a nice story about main spars and how they resemble to those movies where a cliff climber falls and hangs on his survival rope and then you see the rope breaking string by string and then bang... down he goes.

Every scratch, every dent, every oval or enlarged hole, every hole that was not necessary is one of those strings breaking out. So pay attention and be carefull with those main spars.

First mark and centerpoint one of the holes in the tie down plate. Then align the tie down plate and run a AN3 bolt through. You will notice that there is a bit of an overhang eventhough you measured well.

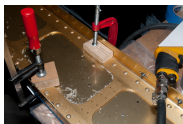
This seems to be common and I found that remark on many other websites. I did measure very acurately and I also have the outboard side overhanging the spacers and reinforcement part of the spar by a mm.

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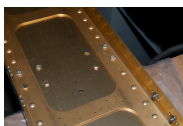
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Turn the spar around like in the picture above and start drilling using the predrilled holes in the main spar as drill guide. Keep that drill perpendicular and don't use too much force. Let the drill do the job. Use Boelube !

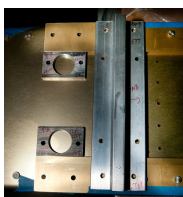
I temporarily put some AN3 bolts in there to see how it looks. The middle 2 will hold the aileron attach hinges.



From the back side, you can notice the small overhang on the upper right side of the tie down plate.



Mark the spacers with the sharpie pen so you can put them in the same position again later. Deburr all holes.



The holes you just drilled through the spacers will accept the AN3 bolt to run through. This AN3 bolt will fit in a nut place that is attached to the tie down plate.

So what is needed now is 2 rivet holes #40 that will run through the tie down plate and the spacer. The flush rivets will sit on the back side of the spacers and not pass through the spar.

I first inserted the bolt in the nutplates through the spacers and tie down plate to align the spacers. Then drill through the eyes of the nutplates to make the holes.

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This is how it looks like after drilling, edge prepping and countersinking the nutplate ear attach rivet holes.



I was not very happy about 2 of the holes that were not perfectly perpendicular. I might remake one of them. In the end, this is what attaches the aileron brackets and if there is one thing I do not want to malfunction in flight , it's the ailerons.