Rudder work - 12/02/2011 - 6h

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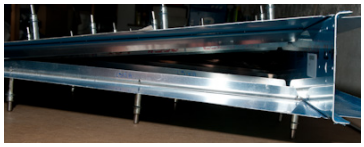
In the passed days, I have been preparing and cutting the stiffeners for the rudder

The rudder has 2 very thin skins that need some reinforcement using aluminum angle. Study the Isometric view on the plans carefully to see which side need the flange up and down. If you invert them, you'll see that the prepunched holes don't match.

Vans delivers aluminum angle pieces out of which you have to cut 2 stiffeners. Depending on the place on the rudder, you have to trim more from the forward end.

Always cut from the forward end. The reason for this is because Vans has made your life easy in making markings on the angle material where you should cut down to the base in order to give clearence for the thinnest side of the rudder.

Ths is how it looks like when they are fitted to the rudder structute. I fear that my stiffereners are still a bit too high on the forward end so I will further grind them down so there is more clearence between them at the front.



Started the day with matchdrilling the stiffeners to the skins. You do this best in a wood block you don't mind drilling into. It fixates the assembly when you run the cleco's in the table and it cleans the drill bit.

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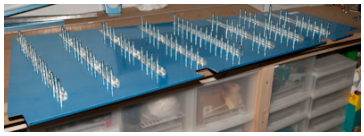
Fully drilled



As always, remove only the required amount of plastic as to protect the aluminum skin from scratching. The soldering iron did it's work again.

This gives access to the drilled holes so they can now be deburred the skins. Also deburred the stiffeneres. Carefull on those skins !!! It's extremely thin. One turn of the deburring tool with NO pressure is plenty ! Doing more will create an knife edged hole and cut your rivets with vibration.

The plans call for priming skins and stiffeners at this point. I prefer to minimise the priming effort and will prime them all at once.

Next step is construction of the spar and supporting ribs.

First you attach R904 bottom rib to the R902 spar. The drawing wasn't completly clear at first. The spar comes at the point where the larger hole for the nutplate comes. The 3 holes above them only serve as rivet holes for the reinforcement plate R606PP.

Once clecoed. You need to enlarge the 0.125 whole to 3/8 (0.375). This is quite a big hole. I first enlarged it to 1/4 using a dril en then using a unitbit drill to 3/8. A good advice is the put some tape over the unibit drill where you want to stop.
The difficulty here is that since the rib is attached, you cannot put

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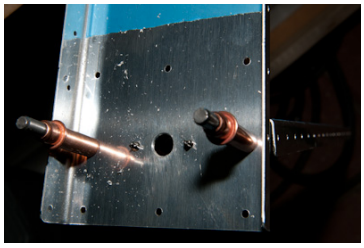
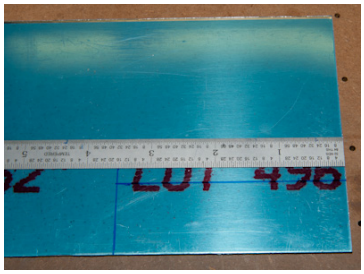
it in a bench drill, so you do this with a hand drill. Make sure that you don't enlarge the hole in the spar. Mine turned out fine but I took my time for it.



The next step is to make the R-917 Shimplate. You have to construct this yourself according to the dimensions given on the plans.
I first cut the piece with the bandsaw, then put it to size on the bench grinder.



Then drilled the 4/32 at 1/4" from the corners. I only did one which will allow to fxate it using a cleco the the spar.

I then attached the back reinforcement plate and rudder horn to the spar with a rod end bearing bolt and two nuts in the enlarged hole. Then ran 2 cleco's on the side, drilled the inner holes to 4/32" and then switched the cleco's and drilled the outers.

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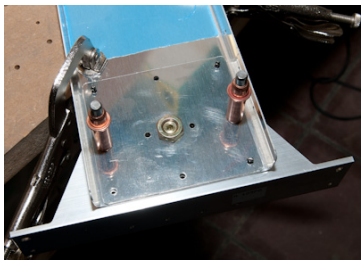
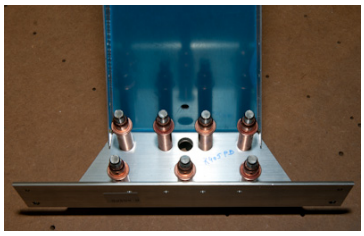
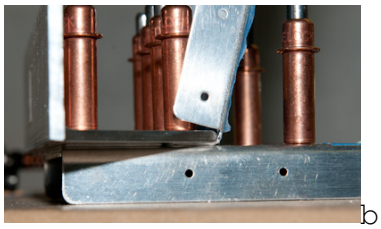


Once these are drilled, it's time for the bottom 3. This is where you fit in the just constructed R917 plate. Align it with the left hole that was drilled and run a cleco in it, then further align the bottom of the shim with the spar.
Now you can drill the 2 other remaining holes using the reinforcement plate as drill guide.

It is very probable that you have to grind down the top of the rudder horn to make it fit in the rib flange. This is normal.



In the image below, you see the small tab and the forward rib tip. The little plate on the left is the shim. This image explains why you need to make this plate. It serves as support for the rudder horn.

 b

Finally started to make the top section.

Here you need first to flute and straighten the rib and counterweight support rib.In order for the skin to fit, you need some forming action on the front sides of the ribs.

This top side of the rudder will hold a lead block in the little skin casing that will neutralise the rudder weight.

Enlarged the holes where the ribs attach, then clecoed on the small skin and matchdrilled it to all ribs. Do not matchdrill the spar and

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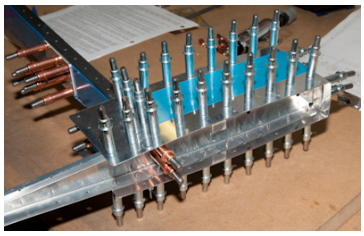
aft-top rib yet. This will be done once the large skin is attached.



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