

10/08/2019 - Rudder stops - 4h

Category: 3.11. Empennage mounting

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The final step in the process of mounting the empennage is making the rudder stops and setting the max angle of the rudder.

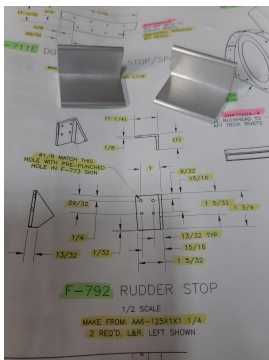
These are one of those small parts you completely have to make by yourself. "Make From....". I love those parts.

There are some alternatives on the market which make nicer looking rudder stops that sit on the rear spar of the vertical stabilo. I opted for the standard way of doing it.

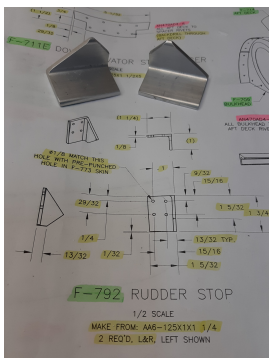
I saw some people in Oshkosh who made a locking mechanism that locks the rudder bottom horn with an extra hole in the rudderstop which was also a nice modification.

You first cut some AA6-125 thick angle little bit oversize and then start using your crafting skills to make the shape required as per dimensions specified.

Not very difficult at all. I would advice one being generous on the dimensions where the rudder butts. You will have to file away bit by bit to achieve the proper angle on the rudder later on so better to be conversvative now than to be sorry later.



Here are my initial parts after cutting, using the vixen, deburring, rouding and sanding.



Next I measure the whole according to plans and duplicated the second one from the first hole pattern.



At this point, I was thinking of giving the rudder an initial try with my rudder stops.

Now comes the big question, how to measure the 35 degrees max deflection angle of the rudder. In my enthusiasm, I came up with a splendid idea using a cardboard.

Now before you read any further: this is what YOU SHOULD NOT DO !

But I want to explain the result of what you get using this faulty method and I'll explain the correct way in the bottom.

I found myself a cardboard and measured a 35° angle on this and made a nice and straight cutout. The angle in the measurement angle show s perfectly 35°

The manual says "The **proper 35 degree swing** is attained when the **clearance between the inboard trailing edge of the elevator skin and rudder skin is 1 1/8"** when measured **perpendicular to the rudder skin** with the elevator in the neutral position. File the rudder stops if necessary to achieve this dimension."



Next I held my cardboard against the rudder and held it at the proper 35° swing at the cardboard. You also see that I keep the ruler perpendicular to the rudder skin from the trailing edge of the elevator skin.



To my fear and big surprise I hardly measured $\frac{3}{8}$ of an inch between rudder and elevator skin which is way too little.



On the other side I measured $\frac{17}{32}$ ".



I got really puzzled on this and couldn't figure out what was wrong until I started reading a bit on the forums.

The error is quite obvious as you think about it. The 35 degree maximum swing of the rudder is supposed to be along the centerline of the rudder.

The centerline runs through - surprise surprise - the center of the rudder bottom triangle R-904. There are two tooling holes in this rib which indicate that line.

What you can do is hold a plumb bob on this tooling hole when the rudder is centered. Then draw a line on the floor which is the rudder

center line. Now on the ground, measure a 35 degree angle like I did on the cardboard.

Hold the rudder in 35 degree deflection and check with the plumb bobs again according to the 35 degree line. Use a file to reduce the rudder stop thickness until you get proper max deflection.

My error in measurement was due to the fact that the rudder in itself had of course a deflection angle and measuring along the skin of the rudder is totally wrong ! You end up with a bigger angle measuring this was.

I also asked the question to Vans Support to make sure I got it right, this was their answer:

"The acceptable range is 30-35 degrees (ref section 15). However - forget all that. The best way to measure it is to keep the gap between the elevators and rudder skin to >1". That is much easier to measure. No one will care about the "correct" travel if they have a hole punched in the rudder skin...."

Lesson learned.