

Pietenpol Air Camper - Empennage

The empennage drawings are a bit open to interpretation. That's one of those engineering terms that means "not very good". The details, however, do provide "enough" information to build the tail.

The confusing part is that there are several locations where different thicknesses of wood come together, and a flat plywood gusset is supposed to sit flat on top of the joining pieces. There are two different approaches used by builders for dealing with the rabbets and the plywood gussets. One method is to keep the rabbet intact around the entire perimeter, and have the plywood sit behind the spruce edge. The other method is to trim away the "lip" in the areas where the ply gussets sit, and run the plywood right out to the edges of the fins. I chose the second method, and I believe that is what the plans show. If you use the first method, the corners all need to be mitered, and tapering becomes much more challenging.

From the plans, the basic thicknesses of the sticks (ignoring the "lip") are as follows: 1/2" for the leading edge and the trailing edge, 5/8" for the main beam, and 3/4" for the center beam and the diagonal brace. My approach was to assume that at any point where two or more sticks come together, the smallest thickness was the governing factor, and all thicker pieces must be tapered to meet the thinnest piece. I made the assumption that the "leading edge" sticks would be used for the outboard edges of the H stab and elevators and top and bottom edges of the rudder (since the plans don't specifically say what to use). On these leading edge profiles used for the outboard edges of the H stab and elevators, I trimmed away the "lips" at the corners where the ply gussets are, and tapered the main beam from 5/8" down to 1/2" where the two pieces come together in the corner. That way there is a flat plane for the plywood to sit on (and make glue contact). The method I used was to pre-cut the gussets, and then cut the sticks to the proper length and angle for butt joints as shown in the plans, and sit the sticks into the jig. Then lay the gusset on top, and trace the outline of the gusset. Then I removed (using a scroll saw) the lip where the gusset would lie. The next step was to carefully draw some reference lines to be used for tapering the main beam from 5/8" down to 1/2". Then I used my disc sander to make the taper (next to the table saw, that disc sander is the most useful tool in building a wooden plane). Then put the pieces back in the jig (using shims as required to properly align the different parts,) and glue the gusset in place. At the end of this description is a series of images to illustrate what I just tried to explain.

All of the gussets are 1/8" thick plywood, and there are three different depths of rabbets (1/16", 1/8" and 3/16") but don't worry about it. After everything is glued up, you either sand down the lip to match the gusset, or sand down (feather) the gusset a bit to match the shorter lip.

Although the plans are not clear about this, I mounted the 1/2" x 3/4" diagonal brace with the 3/4" dimension vertical - that way it matched up with the center beam. Also, this is the orientation with the greatest strength. The diagonal brace gets tapered at the sides. It is much better to do a gradual taper than a notch. Notching introduces stress risers, which will likely be where the part will fail, if overstressed. The center beam also gets tapered, as it approaches the sides, and gets covered by the front corner gussets.

Here are the illustrations mentioned above:







