The Magic of Wood!

When I decided to scratch build an aircraft I took a real good look at what tools and equipment would be needed to complete such a project. The one area I really looked at was the flanging dies needed for strengthening the wing, spar and bulkheads where the holes would be cut out to reduce weight. I felt that with the help of some basic woodworking tools I should be able fashion something that would/should work... maybe!

To build the dies I used both 1" x 6" solid oak and 3/4" spruce plywood... whatever scrap material that I had at hand. I used a drill press, band saw, 3 hole saws, and a good old flycutter and don't forget the router/table with a 45° chamber bit to make a 3/8" chamfer.

I used imperial units as I did not have metric hole saws. The hole saws used were... 2+1/2", 3+3/4" and 4+1/2".

The construction of the dies were made in several layers of plywood and then glued and screwed together.

The typical common first layer(cap) is a 3/4" piece of oak or plywood. Cut both the male and female caps the same size and drill a pilot hole on the center... for alignment purposes later. Next cut a piece of 1/2" plwood, a piece of 1/4" and a 1/8" all the same size... for the female die(the male die layers are different and will be covered later) and drill pilot holes through the center of them also. Stack all the plywood layers and put some screw holes ... one on each corner to be used correct alignment... I used a 1/4 bolt, nut and washer in the center pilot hole to hold together.

Now the fun begins... the first set took me a little while as I had to do a lot of thinking as I went. I started with the 3+3/4" female die. A hole was drilled through the 3 thinner layers of 1/8", 1/4" and 1/2" plywood with the hole saw. Now take the 3 layers of 1/8", 1/4", and 1/2 plywood and screw together... the screw must be flush set on plywood. Now set the 45° router bit to a height of 3/8"... this will give you the neat clean chamfer to form the aluminum hole flange. Take the layered pieces of plywood and using the upper 1/2" layer as a template... chamfer the inside of the 1/8", and 1/4" plywood inner circles until there is a perfect 3/8 chamfer all around the inside. When finished, take a part and sand and you are ready for the final phase in finishing the female die. Take wood glue, epoxy or whatever you got handy and glue each layer together and then screw to the 3/4" cap... using the screw corner pilot holes for alignment of the layers.... done. Things went together quite well... so well I forgot to take pictures as I went along.


The male die is not as easy, a few more steps are required... this took a little more in the thought process along with the good old flycutter. Take a piece of 1/2 plywood and cut a 3+3/4"... less 1/16" circle... must fit into the female die. Next take and cut a 4+1/2" circle of 1/8 and 1/4" plywood(3/4" is needed to form the 3/8" chamfer). Also cut a circle of 1/2" plywood(template) to the same size... 4+1/2". All these circles will have a pilot hole in the center... check alignment with the 3/4" cap . This is where it the fun starts. Pay attention now... stay with me. Take the 4+1/2 circle of 1/8" and 1/4" plywood and screw to the 4+1/2" circle of 1/2" plywood (this now the template used on the router to form the 45° chamfer... 3/8") Now you are ready to form the male chamfer completely around the outside of the 1/8 and 1/4 circles of plywood. Nearly done! Take a part and sand finish. Now to put it all together... take the 3+3/4" ... 1/2" circle and line up with the chamfered layers and and 3/4" cap. I used a 1/4 bolt , nut and washer to hold together. There you have it... the male die that is a perfect match to the female die. Again take apart an glue each layer together and screw. Just about done. I trimmed the corners to 45° and made the 2+1/2" die narrower so that it would fit between the wing rib flanges. Final step is to epoxy a 1/4" bolt(dowel) in the female dies for alignment purposes and then gave a few coats of varythane. Done.....have fun.


The first one took a while the other 2 were a breeze. Simple, cheap($15), and fast... used 3 blows from a dead blow hammer on the 0.030 bulkhead, made a perfect chamfer with with little noise and no press needed. Remeber don't forget to add 3/4" to the diameter of the male layers of 1/8" and 1/4" plywood and 1/2" chamfering template for the male die... that is the hardest part when it comes to making the male chamfer.

Ron D Leclerc
CH701 Plans Builder
Porsche Power, Belted Redrive
Winnipeg, MB Canada
infow@mts.net