

MAKING WORLD WAR ONE WHEELS

By Rich Adams

Editor's note: Rich is one of the finest craftsmen in this game, an aero engineer who's father still flies models.

Tools needed:

Dremel with 3/32 collet
Dremel drum sanding attachment
Emery Boards
400 grit sandpaper
3/32 dia. Aluminum tube
1/8 sht balsa
3/32 sht balsa
Thin CYA glue
220 grit sandpaper
Ambroid or Duco cement
Good pencil compass
Straightedge
Ball point pen
X-Acto Knife with no. 11 blade
1/16 dia drill
3/32 dia drill (one or two number sizes smaller if you have them)
Drill Press (if You have it)

This is the process I used to build a set of 2 1/8" diameter wheels for a 24" span Sopwith Pup I made recently. The concept is to build each wheel and tire from three layers of balsa. Start with two pieces of sheet of 1/8" very light sheet balsa slightly larger than the diameter of the wheel and tire, and use a pencil protractor to draw the inner and outer diameters of the tires on both sides of each piece. The purpose of doing this is to define the areas to which the 3/32" sheet will be glued and which will later form the tires. Do the same on one side of each of four pieces of 3/32" balsa. Rough cut the outer diameter of all six pieces to slightly oversize and then using a drill press if you have it or some suitable method, drill a slightly undersize hole in the center of all pieces to accept a piece of 3/32" diameter aluminum tube.

Using the Ambroid or Duco full strength, apply a first coat of cement in the spaces marked for the inner and outer diameters of the tire on each disc and let it dry. You'll have glue on both sides of the two 1/8" discs and on one side of each of the four 3/32" discs. While that is drying, prepare two lengths of 3/32" aluminum tubing about 1.25" to 1.5" inches long. File the ends to a slight bevel so they'll enter the holes in the balsa without catching an edge and file and sand the outside to roughen. Make the scratches go lengthwise on the tube so that the glue has a space to fill.

Apply a second coat of cement to both sides of the 1/8" sht. balsa disc and using the aluminum tubing as a guide, cement the three pieces together lining everything up on the tube. Make sure that the tube is 90° to the discs and that the grain of each piece runs in a different direction from the others for strength. At this point, the tubing is NOT glued to the balsa so it is allowed to slide in the holes. Pin or clamp this assembly to dry thoroughly.

Once dry, you can now center the aluminum tube between the assembled disc so that an equal amount extends on each side, and using thin CYA fasten the tubing to the balsa. I generally make a few small holes in the balsa close to the tubing using a pin to aid wicking down to the center of the disc. Let this dry well (five to ten minutes or more). The CYA will wick slightly outward to strengthen the hub support area describe below.

Place the disc in your Dremel tool tightening the collet down just enough to clamp the tubing without deforming it. Using a rough emery board, turn the wheel outside diameter to almost the finished dimension of the wheel. Go lightly on the pressure so you don't break the glue joint at the tubing. Let the sandpaper do the work. If you have sandpaper from a belt drive sander of some sort, use it because it can handle the high sanding speeds.

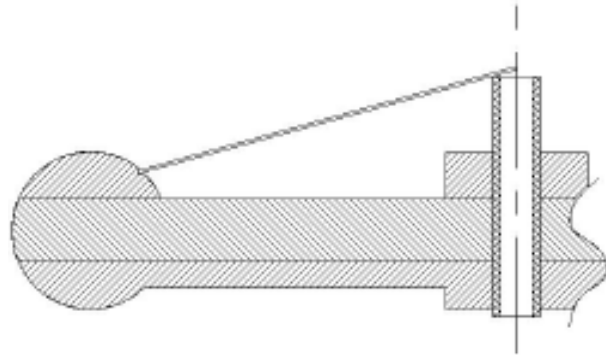


Figure 1 – Cross Section of Finished Wheel

The next step is to form the tire by removing the portion of the 3/32" balsa sheet discs which won't be used. Use a little Dremel drum sander tube (which also does well with high speed sanding) as a sanding tool, held between your fingers. Leaving about a 3.8" hub support area around the aluminum tube as seen in Figure 1, start removing wood from the hub and work your way out to the inner diameter of the tire. The idea here is to remove wood and shape the hub and inner surface of the tire to the point where the 3/32" sht. wood that didn't receive any glue basically gets sanded away. On the Sopwith wheels, as you can see in Figure 1, I only removed half the thickness of the 3/32" disc on the inner side of the wheel, but removed all the 3/32" down to the 1/8" disc for the outer side where the spokes will be. You could just as well remove both 3/32" sides, leaving just the 1/8" disc as the basic wheel. (Ed note: If you do this, you might be wise to start this project by laminating two sheets of 1/16", cross grained, to form the initial 1/8" disc in order to have more strength) After doing all of this, you can shape the tire out nice and smooth and the trim the aluminum tubing to the lengths needed.

Finally, I added the wheel covers. Take a pencil compass and put the needle end through the hole in the tubing and adjust the compass so that it comes right up to the edge of the tire. Run the compass around the tire portion, scoring a nice clean edge in the inner portion of the "tire" as seen in Figure 2.

Measure the distance from the center of the tube to the edge you just made in the tire using the compass. This dimension is the outside diameter of the paper disc you are going to make for the cover.

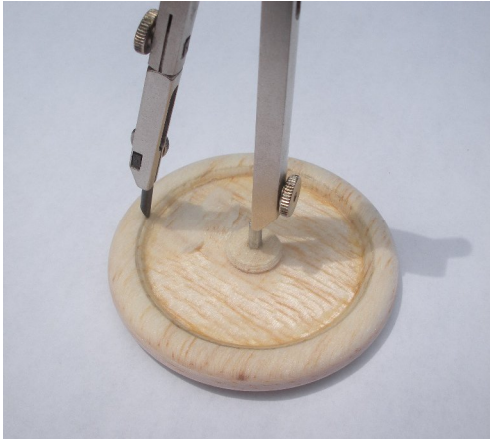


Figure 2



Figure 3 Outer Side, Showing Edge Groove

Mark out two discs on 20 lb copy paper. This next step is optional but adds a nice touch to the realism. I take a 45 degree triangle and mark out 18 equally spaced points on the outside edge of the paper disc per Figure 4. Using a ball point pen and placing the disc on a piece of smooth cardboard (cereal box quality), firmly draw lines on the paper which will emboss the “spoke” lines in the other side of the paper. Cut out the disc and cut a slit in the paper from the center out between a set of spokes.

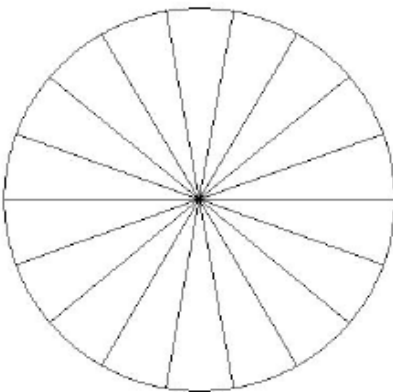


Figure 4

Apply Ambroid or Duco, thinned to 50%, around the perimeter of the tire in the edge you formed with the compass.

Do the same with the edge of the paper disc and the ends where you think they will overlap. Let this dry for a few minutes and then re-apply to the tire only. Take the disc and starting with one of the edges nearest the slit, align the edge to the tire and lightly press the center of the paper disc against the center tube. Now, rotate your thumb around the center tubing applying very slight twisting pressure to the paper. The disc will form itself and align to the edge in the tire. If necessary, apply light amounts of pressure to the paper to get the glue to tack to it. You may have to add a little dab here and there to get everything to tack down and settle. Let this all dry. Apply a drop of CYA at the point of the cone to harden it and then drill it out using a 1/16” dia. drill or other suitable tool.

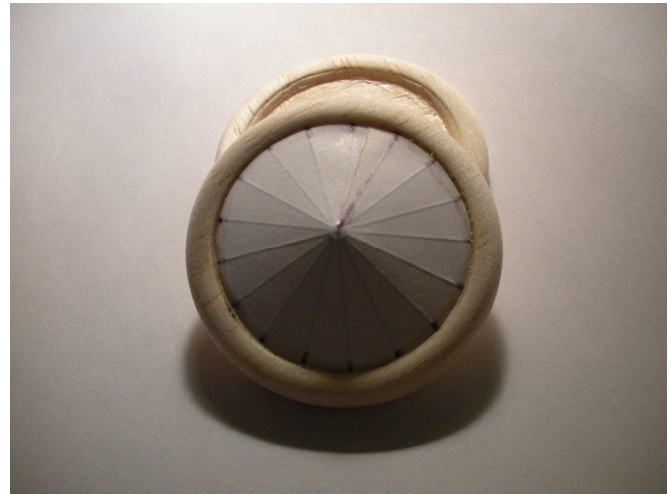


Figure 5 — Finished Wheel Ready for Paint

The problem to this method is that you start with 18 “spokes” and end up with 17 depending on your wheel configuration. I figure no one is going to sit there and count spokes so it really shouldn’t matter. If it bothers you, then you can run the calculator to determine the exact spacing required (yeah, I didn’t think so). A circle divided into 18 sections has been provided for you to use.

Have fun and just take your time.