Laminated Fins

By John Brohm – NAR #78048

I enjoy building model rockets of all types and sizes, but when it comes to flying, my preference lies with mid-power rockets. I find it easier to track the bigger models during flight, and I like the lift off spectacle that a D/E/F motor can provide. And given the parameters of our particular flying field, this impulse range pretty much sets the upper boundary of what one can fly and still hope to have a reasonable chance for recovery.

Mid-power impulse usually dictates a more robust construction regimen; thicker walled airframes and plywood fins are typically the norm. As it relates to fins, most kits include good quality plywood, but it's not all that uncommon to find warps in the material. When scratch building one's own design, the options essentially consist of shopping the fin design out to BMS for laser cutting, or making the fins by one's self. I've got into the habit of doing the latter, as this process gives me some freedom over the fin design, the choice of material, and an opportunity to eliminate warps. This PSC Shop Talk installment shows you how I go about making my own warp-free plywood fins.

Photo 1 shows the tool set I use. Of note are the 1/16" aircraft plywood and the fin template; not shown is a roll of waxed paper, which will be used during the laminating process.

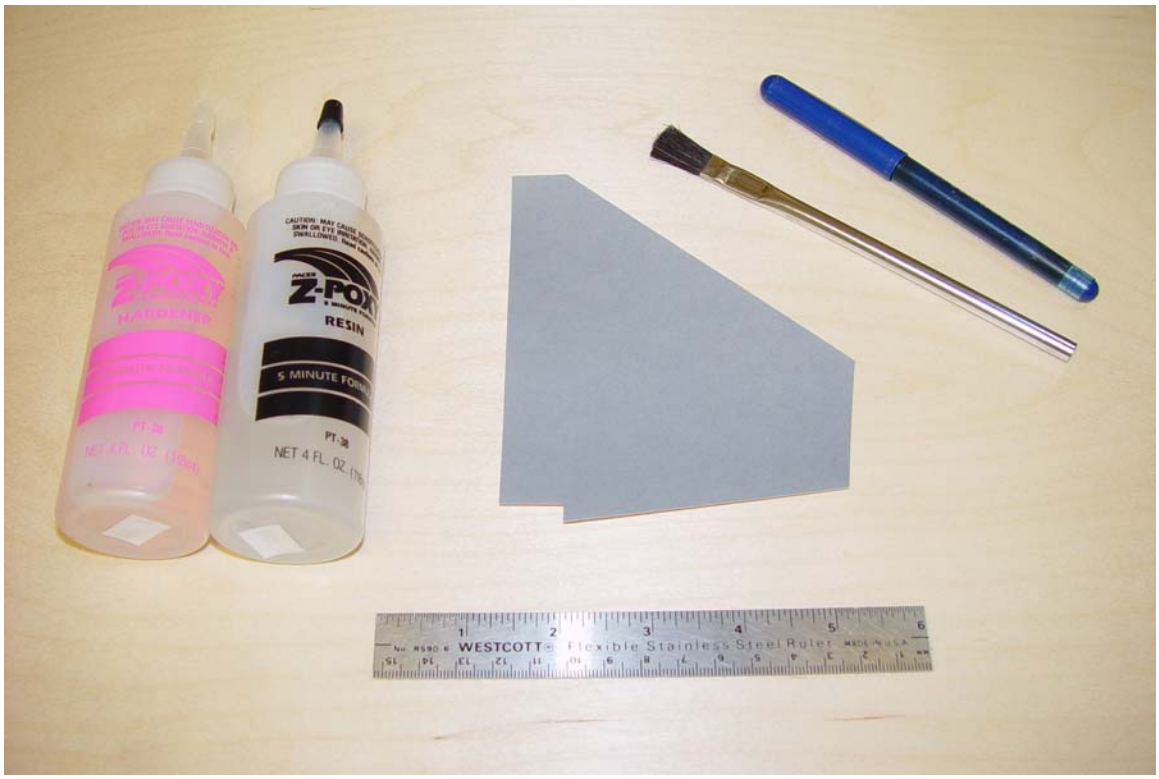


Photo 1: The Tool and Material Set

I happened to generate the fin template from Apogee Component's RockSim software (RockSim makes the accurate sizing of the TTW fin tab a snap) for a scratch built rocket I wanted to make from a drawing tube container I received in the mail.

Before we start, it's important to remember and apply safe shop practices. In my case, I use a power saw when working with plywood, so keeping track of fingers, jewelry, and loose clothing is vital; so is safe eyewear. Also make sure your work item is safely clamped while cutting. Later, we'll be using epoxy to laminate the fins; make sure you wear vinyl (not latex!) gloves while handling epoxy to mitigate any exposure to this material.

With our safety practices aptly reviewed, let's get on with the making of our mid-power fins.

Earlier, I had mentioned that the fin material in this example is 1/16" aircraft plywood. We're going to cut the plywood into pairs of blanks, each pair then laminated together to create a final fin stock 1/8" thick (the desired thickness in this case). The reason for laminating, rather than simply cutting the fins out of 1/8" stock, is to eliminate warps in the material. We achieve this by gluing the halves together with the curved/warped surfaces facing each other. Photo 2 shows the layout process.

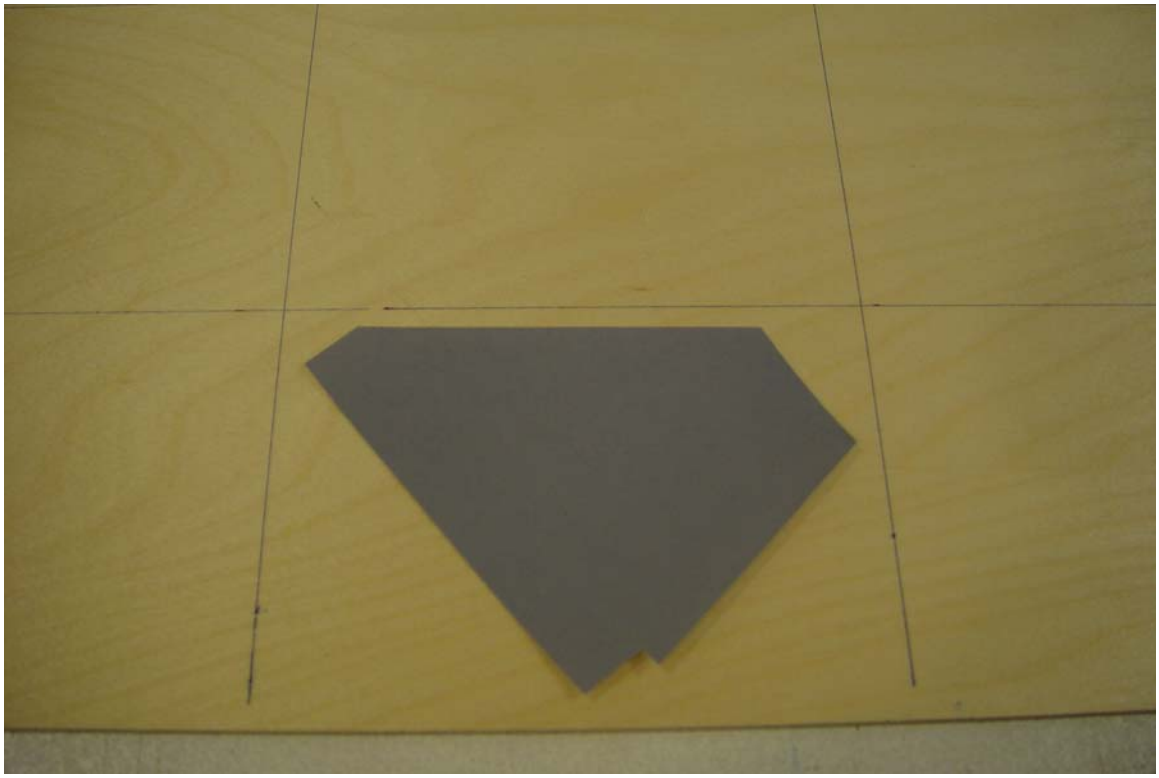


Photo 2: Sizing the Plywood Blanks

Note that the fin leading edge has been set parallel to the grain of the outer ply surface. Keep in mind that 1/16" plywood typically comprises three plies; this means that there will still be a grain preference in the material, and this preference should be respected when the fins are laid out on the material. When sizing the blanks, make sure to leave some cutting room to allow for the kerf of your particular saw.

Photo 3 shows a pair of blanks. Take a look along an edge of each blank to determine which way the material is warping. Remember that we want to mate the blanks with the warps opposing, like this:) (. Mark the faces that will be glued together so that the right sides get mated.

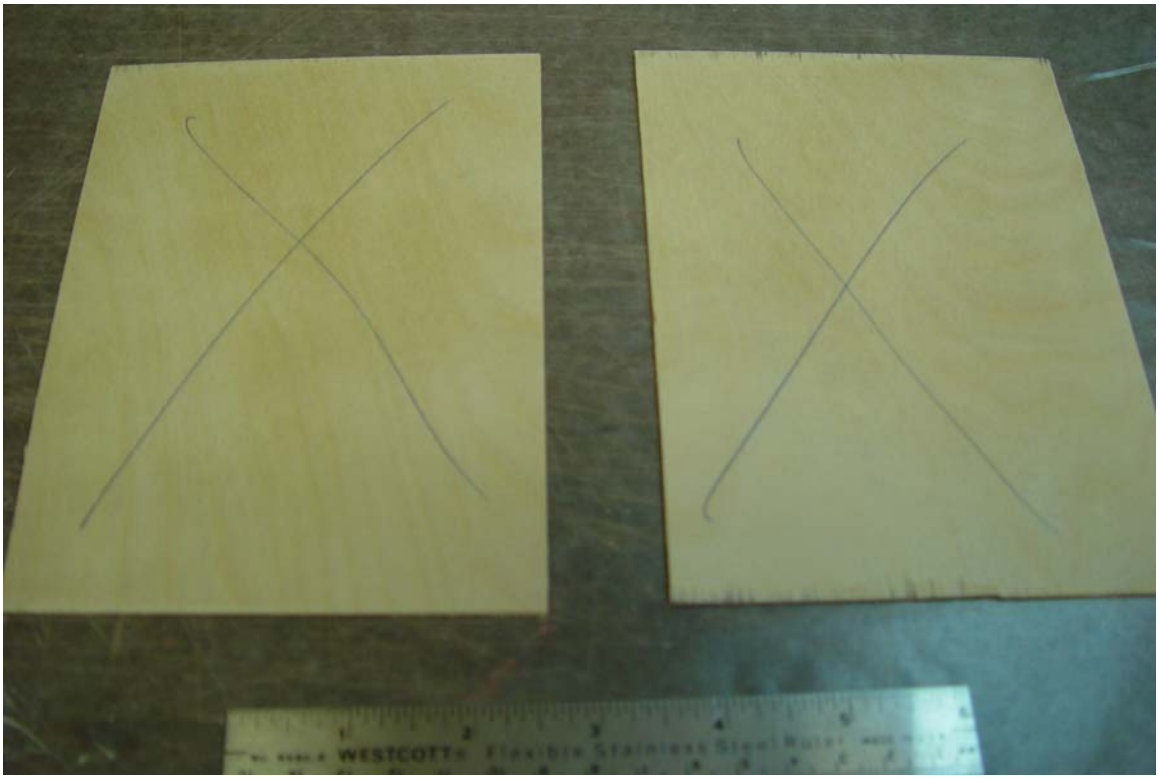


Photo 3: Plywood Blanks, Ready for Lamination

Before laminating the blanks, first set up a flat work surface; having taken the pains to eliminate warps, we don't want to add them back in by using a non-flat work surface. Mix up a suitable quantity of epoxy, and with the disposable brush paint the epoxy onto one of the marked sides. Place the painted blank onto a sheet of waxed paper (epoxy side up!) and then press the second blank on top, mating the two 'X' surfaces. Place another sheet of waxed paper on top of the sandwich and then add weight to squeeze the excess epoxy out. Leave the weight in place until the epoxy has cured. Photo 4 shows this; in my case I used a stack of encyclopedia volumes to provide adequate pressure.



Photo 4: The Weight of Knowledge being applied

After the epoxy has cured, remove the weight and peel off the waxed paper. Trace the fin onto the laminated blank with the template, keeping the leading edge parallel to the grain of the blank. Photo 5 shows this step complete.

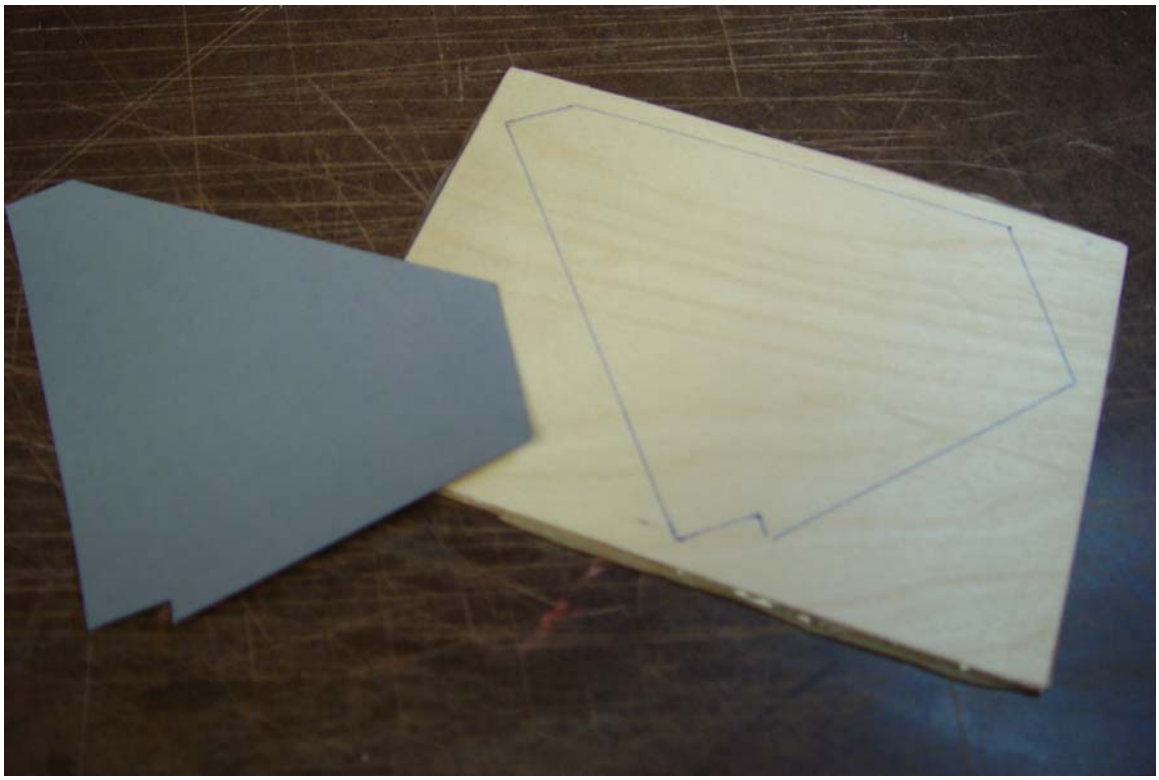


Photo 5: Cured Laminated Blank, ready for cutting

Cut the fin from the blank, repeat for the number of fins required, and finish them according to your needs. Photo 6 shows my fin sanded and ready for installation.

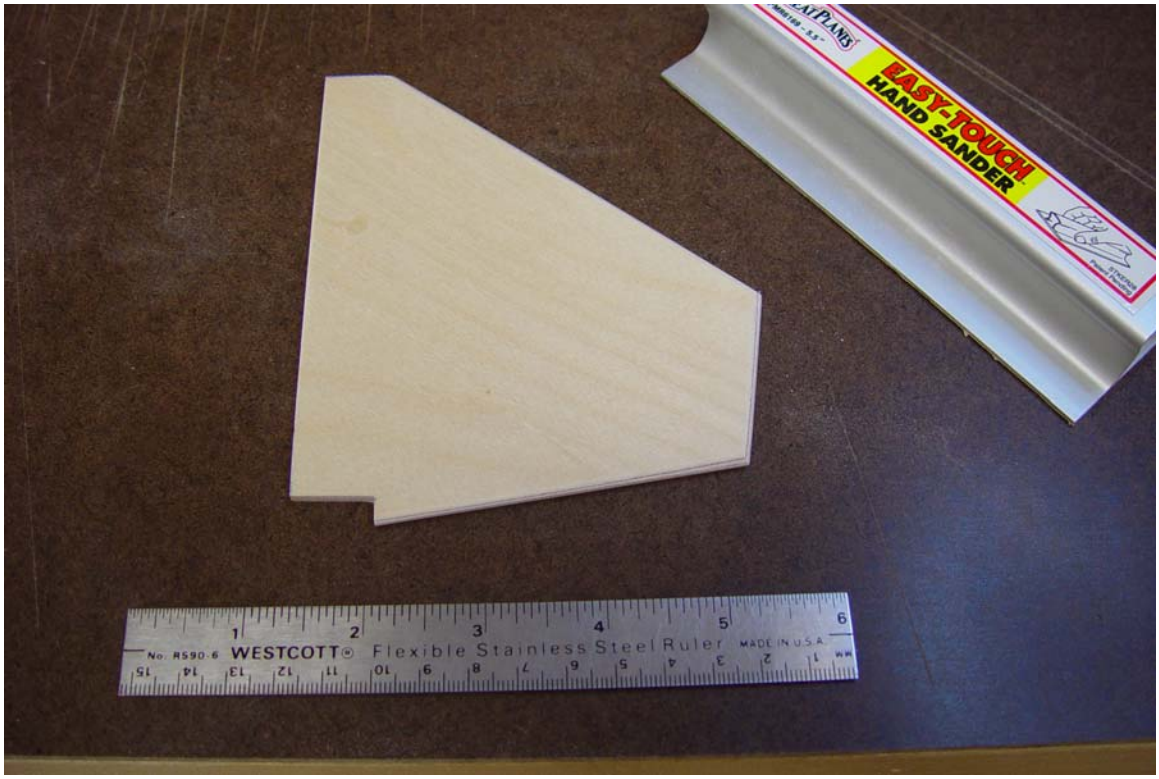


Photo 6: The Finished Fin

And there you have it; a robust, warp-free, laminated fin, ready for installation in your mid power rocket. In my case, this fin found its way into a scratch built project I call 'Priority Mail'; Photo 7 shows the finished result.



Photo 7: Priority Mail - When it absolutely has to get there...