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NEWSLETTER

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Build A Fin Spacing Guide

Cover Photo: QModeling Mega Viper rocket kit. Get yours at: www.ApogeeRockets.com/Q-Modeling_Viper.asp

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Build A Fin Spacing Jig

Steve Landry

Although the process of building a fin spacing jig is easy, it does add steps, which for you may/may not enhances the building experience. I used to be in a hurry to build my rockets so that I could fly them, not worrying that much about the finished product...like if the fins were straight and true, or if the finish and paint job were done to their best. Now when I get a kit in, I really do read the instructions a couple of times like most of them say to. Before I start any step in the process, I sit back and look at the whole picture. Is there an easier way, a better way, a way that will make the finished product look and fly better? I still get a thrill out of watching something that I built leave the launch rod and fly high into the sky and come back down in one piece, ready to fly again.

My last two rocket builds have been the Sunward Gravity Glider (www.ApogeeRockets.com/Sunward_Gravity_Rider.asp) and the DynaStar Firefox (www.ApogeeRockets.com/Firefox.asp). Neither of these rockets have the standard "three or four fin equally spaced" fin design. I came up with this idea and fine-tuned it as I built both of these rockets. When I came to the step of gluing the fins on to the body tube, I saw it wasn't going to be an easy task. I sat a while and tried to figure out how I was going to get them right where they needed to be and hold them there while the glue dried. Having the fins at a right angle is a rather important part of the build if you want it to fly straight. One of the first things I did was to comb the internet.

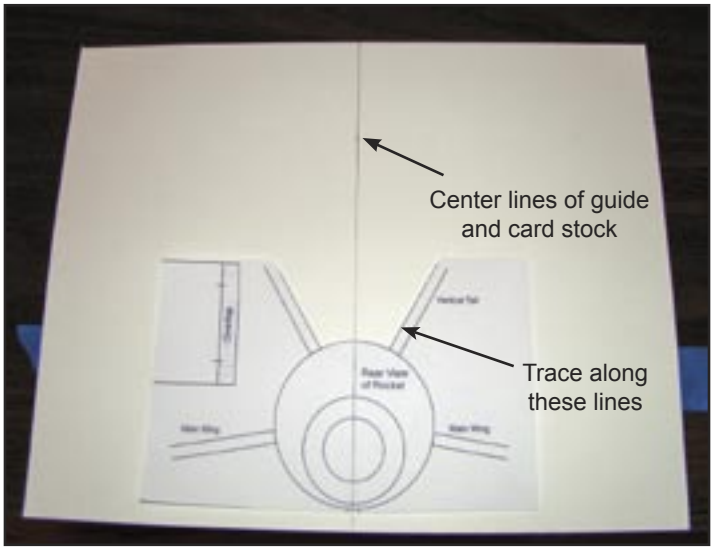
What I came up with takes a little time and work to build but I find it works very well and is inexpensive. You will need some 8" by 11" card stock (It is just like printer paper but the heavier stuff), some of the balsa wood pieces left over after you take your fin piece out of the sheet of balsa wood they came in, wood glue, scissors, a metal ruler, and a hobby knife. I used wooden clothespins and some blue painter's tape to hold the fins to the jig. The most important thing that you will need is a couple of copies of the fin alignment guide that came with the kit.

Step #1. You will be working with two fins at a time. You can take, for instance, the two top fins or the two bottom ones, or even a top and side fin, whichever works best for your situation. Take one of the copies of the fin alignment guide and cut out along the lines of the body tube and on the inside lines of the fins (the line facing each other). Take your time and do a good job cutting these lines because you will be tracing along this line later. For my project I started with the two top fins. Pictures #1 and #2 show where to cut the fin alignment guide for both the top and side fins.

Picture 1

Picture 2

Step #2. Take one of the pieces of 8"x 11" card stock and measure 5 1/2" from the side, top, and bottom. Then draw a line down the center of the sheet. Next place the fin guide that you just cut out over the card stock lining up the center lines on the fin guide with the center line you just drew on the card stock. Picture #3 shows placement. Tape the fin guide down to the card stock. Trace along the fin guide following the lines that you just cut in Step #1.



Picture 3

Next use your ruler and extend the lines that you just traced showing the fin placement further down the card

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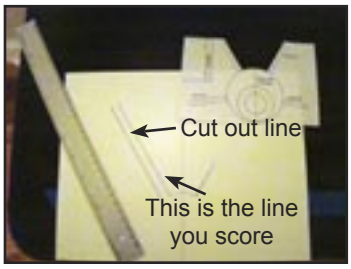
stock. See Picture #4. This is the line that will rest against the fin to hold it at the right angle.

Step #3. Next measure 3/8" down from each of the lines you just extended out and draw a line along these marks. Cut along these lines and along the line marking the body tube. Lay your metal ruler along the line that marks the fin edge (the line you just extended out) and using your hobby knife score along this line. You don't want to cut too deep but try to be right on this line because this will be the edge of the jig that the fin will rest against. The reason for scoring this line is to make it easier to fold the 3/8" tab along the line.

Picture #4 shows one fin placement line extended down the card stock. It also shows the line I marked 3/8" below the actual line of the fin. That is the line that you will cut on. When you cut out the jig, cut along this line and then back up to the line of the body tube line that you marked from the fin placement guide. This half circle will rest against the body tube when you set up the jig.

Picture #5 shows the card stock jig with one of the tabs folded and the other still flat. (Tip: After you fold the tab, cut a little of the corner off where the fin line meets the body tube line. If any glue seeps out from under the fin in the initial gluing it will not grab the card stock fin jig.)

Step #4. The next thing I did was to set the jig on the fins. I put one fin on the line marked on the body tube and set the jig up against it and held it in place with the clothespin. Next I set up the other fin and clamped it in place with another clothespin. I did have a little trouble with sag in the card stock jig, so I glued a piece of balsa wood across the upper part of the jig to stiffen it. Remember the centerline you drew on the card stock and used to align the fin alignment guide when you traced the lines? It should line up right on top of the top centerline you have on the body tube. This assures that your fins are in the right place. I used a small piece of blue painter's tape on the side of the jig opposite of the tab to help hold the jig in place. I like using the painters tape because it holds well and also comes off of the fin and body tube easily. Pictures #6 and #7 show the jig attached to the fins.



Picture 4

Picture 5

Picture 6: Clothespins holding the folded tab flat against the fin.

Picture 7: Notice the two center line meet assuring perfect line up of fins.

Step #5. The hard part is over. Now it is a snap to glue your fins perfectly in place. I then set the fins attached to the jig upside down on my work table and applied a thin coat of glue to the fin root. This is one of the things I picked up while browsing on the internet, the double glue technique. After letting the glue set for a few minutes, I applied a small bead of glue over the first application of glue and let that set for just a minute. Next I took the fins and jig and

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flipped them right side up and set the fins right over the lines marked on the tubes for them, making sure that the center mark on the jig and the top mark on the body tube were lined up. If you cut and folded the jig correctly, the lines you marked on the body tube for fin placement should be at the center of the fin. Press the fins down firmly onto the body tube. Make sure both ends of the fins are centered on the lines of the body tube. Set it aside and let it dry. Now you don't have to worry about them sagging to one side or the other. Pictures #8 and #9 show the jig holding the fins right on line and at the right angle.

For the Firefox's side fins or wings I repeated Steps 1 through 3. I made this jig a little bigger allowing me to use it as a stand to hold the rocket while setting the fins and allowing them to dry. The only difference was that I didn't attach the jig to the fins before gluing. I set the body tube with the top fins glued in place in the half circles cut out for it in the jig. Pictures #8 and #9 show how the side wings lay on the jig ready for glue up. Line the center mark on the body tube and the center mark on the jig. In Picture #10 you can see that when the center marks are lined up, the edge of

Pictures 8 & 9: These pictures show the 12" long wings resting on the jig tabs right where they need to be, ready for glue up.

Picture 10: Jig tab is 1/16" below body tube fin placement mark.

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the jig tab that holds the fin is 1/16" below the line on the body tube for the fin. That puts the center of a 1/8" thick fin right where it needs to be, which is the fin placement mark on the body tube. Then I glued one fin at a time putting the fin on the jig and sliding it up against the body tube. On this jig I actually had two tab surfaces to rest the fin on. It was a little more work bracing up the bigger jig but it was nice not having to worry about keeping everything steady. Picture #11 shows how well the jig holds everything together.

Picture 11: You can see the wing is resting flat against the jig and the body tube is in the saddle cut out for it, with no way to move. I did have to tape the end of the wing down to keep it flat.

The Firefox has a 5th fin. There is a dorsal fin that sticks straight down from the bottom center line. To align this one I used the same jig that I used for the side wings. I marked 1/16" on both sides of the center line of the jig and drew lines along these marks. Next I cut this 1/8" slot out of the jig which is the width of the balsa fin. I cut it just deep enough for the dorsal fin to slip into. After applying glue and putting the dorsal fin on the body tube I set the whole thing back in the jig and the dorsal fin was held right in place (Picture #12).

After everything is completely dry, it is time for the

Picture 12: Bottom dorsal fin snug in slot cut into the jig.

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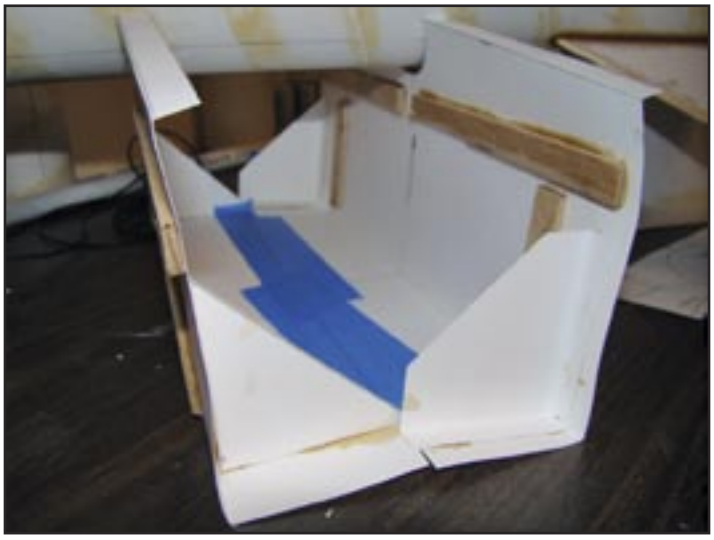
fillets. I found that one problem with fillets is keeping the rocket on the right angle until the wood glue dries enough not to sag. I used the big wing jig for this also. Picture #13 shows the rocket taped down to the jig. After applying the fillet I leaned the jig against the wall to keep the fillet flat until the glue set.

Picture 13: You can see the blue tape holding the rocket in the jig while it is leaning against the wall.

To some people it may look like a lot of work building these jigs. But it really isn't. The double jig I made is actually two identical pieces taped together. I needed these to glue up the large side wings on the Firefox. It took me about a half hour to cut, glue, and brace up this jig. In Picture #16 you can see the scrap wood stiffeners and the cardstock corner braces. Those were simple to make. I just cut the four corners off of one of the pieces of card stock, measured for my 3/8" tab, and scored that line. After folding it at the score line I glued them in the bottom of the jig. A readymade 90 degree angle bracket! When you think about the time I saved and the lack of trouble I had gluing up those large wings, I think it was well worth the time I spent building the jig.

I have a couple of pictures of the Sunward Gravity



Picture 14: Card stock corner bracket, and tape holding two jigs together to create a cradle.

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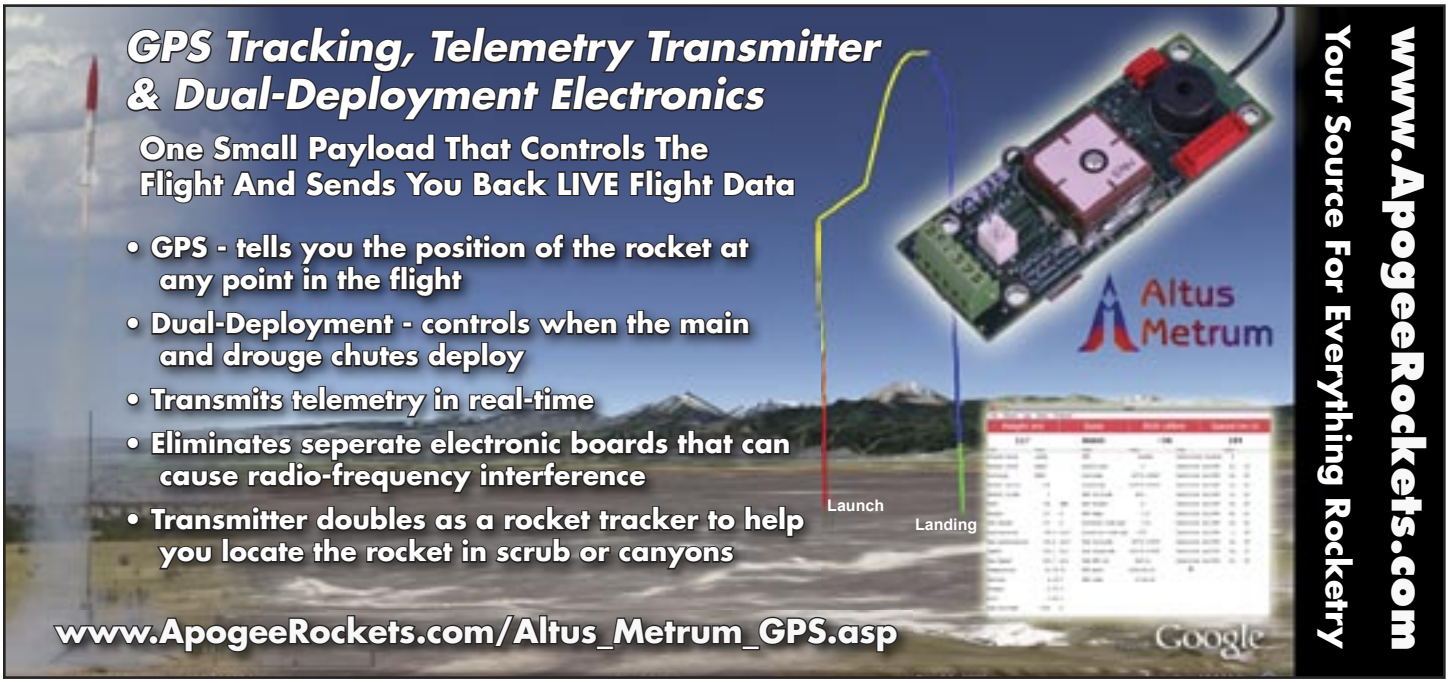

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Rider. I figured I needed help aligning the rather non- conventional fins. I didn't us the clothespins on this one. I learned a couple of lessons while doing it the first time. Practice makes perfect. You can see in Picture #15 that the cardstock jig is a bit longer than the fins. In Picture #16 you can see why. It is a stand to hold my rocket flat and steady on the table. The aft end of the Gravity Rider has 4 different body tubes cut on a 45 degree angle which means there is no way of getting the rocket to stand straight up. I made a wrap just like you would use to mark fin placements and wrapped it around the angle cut tubes. Now I had a round flat surface that I could use to stand my rocket up while I worked on it.

Picture 15: I used only tape on my first try.

Picture 16: You can see the bottom jig is acting as a rest holding the rocket flat.

These pictures show how I used these jigs to work on the two rockets I built. But this idea can be used with just about any build. I think it is more useful for odd shape designs like the Gravity Rider and the Firefox, but with a little imagination and planning I think this could help you with just about any fin placement project. Hopefully this idea may help some of you out there on one of your next rocket build projects to get those fins on the body tube a little easier and may be even a little straighter. Then when you slide it down on the launch rod it will fly straight and high.

Additional References

Free fin alignment jig: www.ApogeeRockets.com/education/downloads/Fin_Alignment_Tool.pdf

Video: how to make your own fin spacing jigs. Found in *Building Skill Level 2 Model Rockets* (www.ApogeeRockets.com/skill_level_2_book.asp).

About the Author

Steve Landry hails from South Central Louisiana. His rocketry career began as a teenager, and after a long hiatus, he built rockets with his sons Chris and Jeramy. This past summer his nine-year-old grandson came for a visit, along with a starter kit from Aerotech Rocketry. It was the biggest rocket that Steve says that he has ever seen. After seeing that rocket fly into the sky on a G powered reloadable motor, he was hooked again. Based on his experience and status as a two-timer BAR, Steve recommends getting kids into rocketry early, "The memories last forever!"

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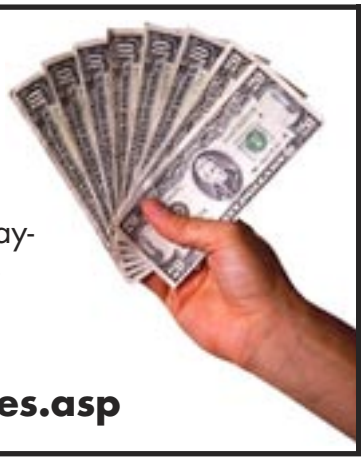

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