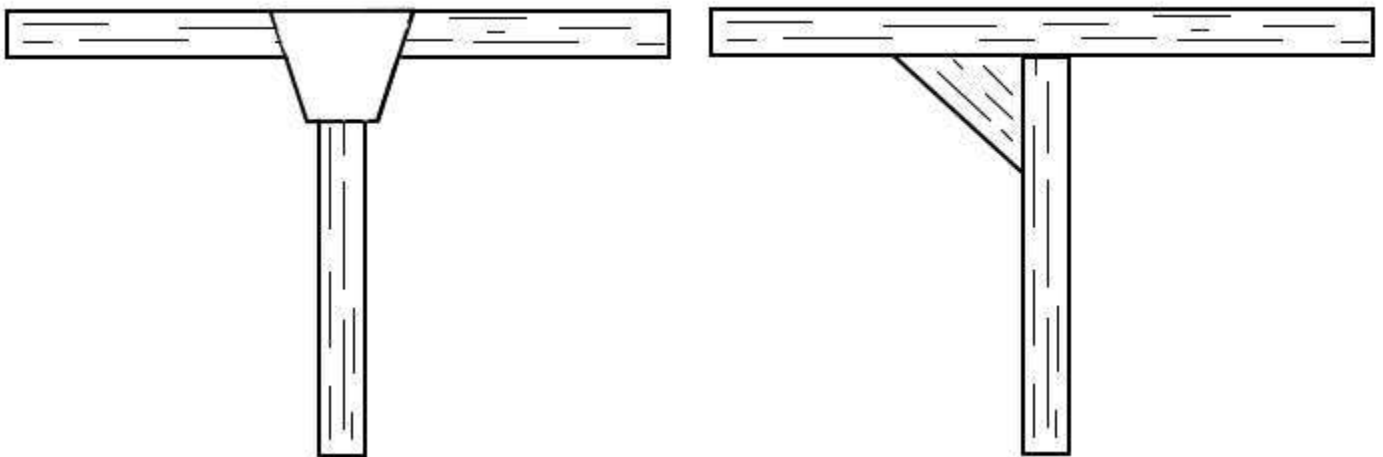


Understanding Gussets

by Mike Chilson

When I speak with other modelers, gussets are probably one of the most misunderstood and underused concepts we have in our building bag of tricks. I was very lucky as a teen my best friend's dad was a very active and winning competitor in several classes of free flight duration. He got me involved and I learned some really great methods of making something very strong without making it heavy. Gussets are one of those things he taught me about.

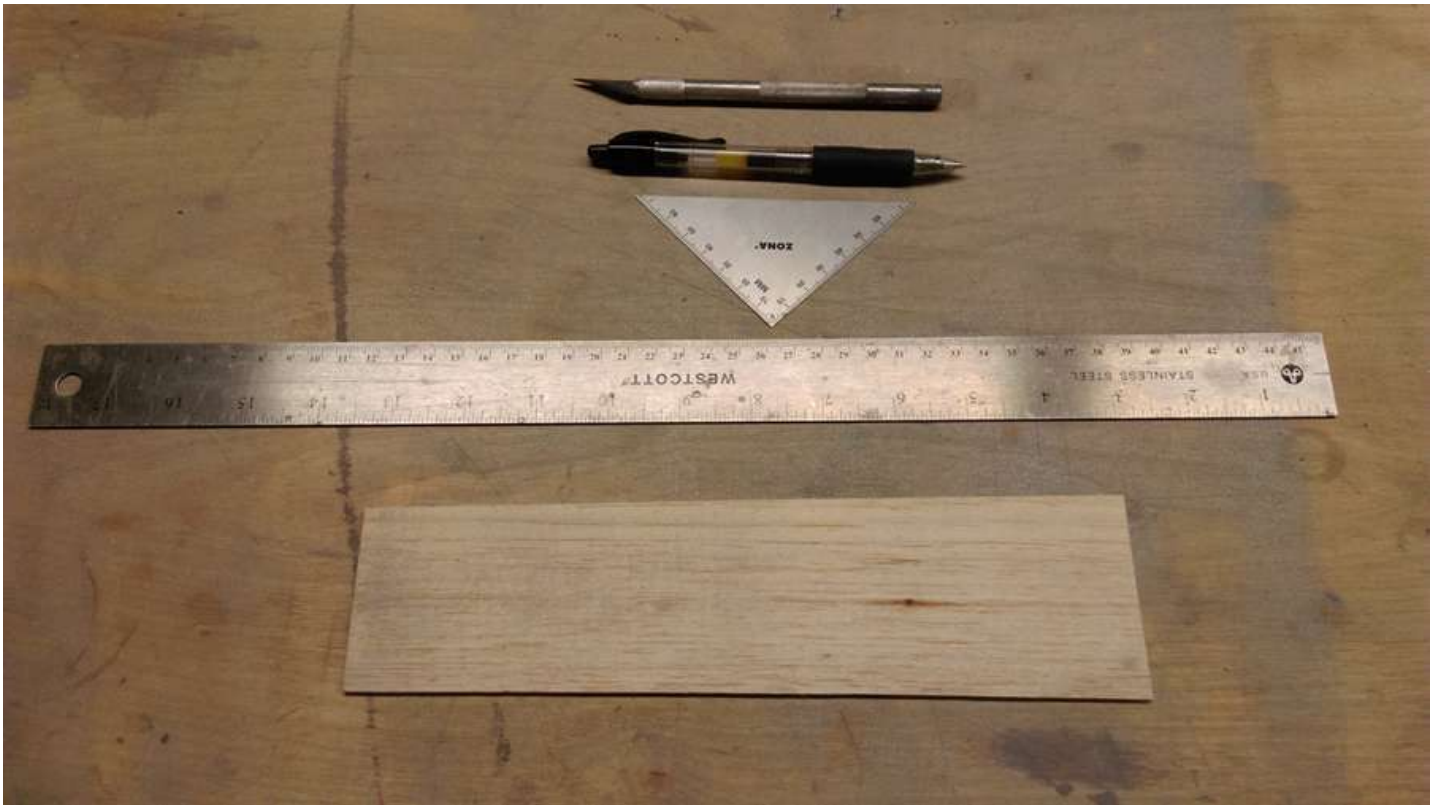
First, what exactly is a gusset? Dictionaries have the following description: "a bracket strengthening an angle of a structure". This is spot on but it takes a bit more explanation that that to understand why you want to use them and how to use them. Why use gussets? Basically a gusset solves a problem; it allows you to strengthen a butt joint without adding a lot of weight. There are actually two types of gussets, overlay gussets (left) and corner gussets (right) as illustrated below.



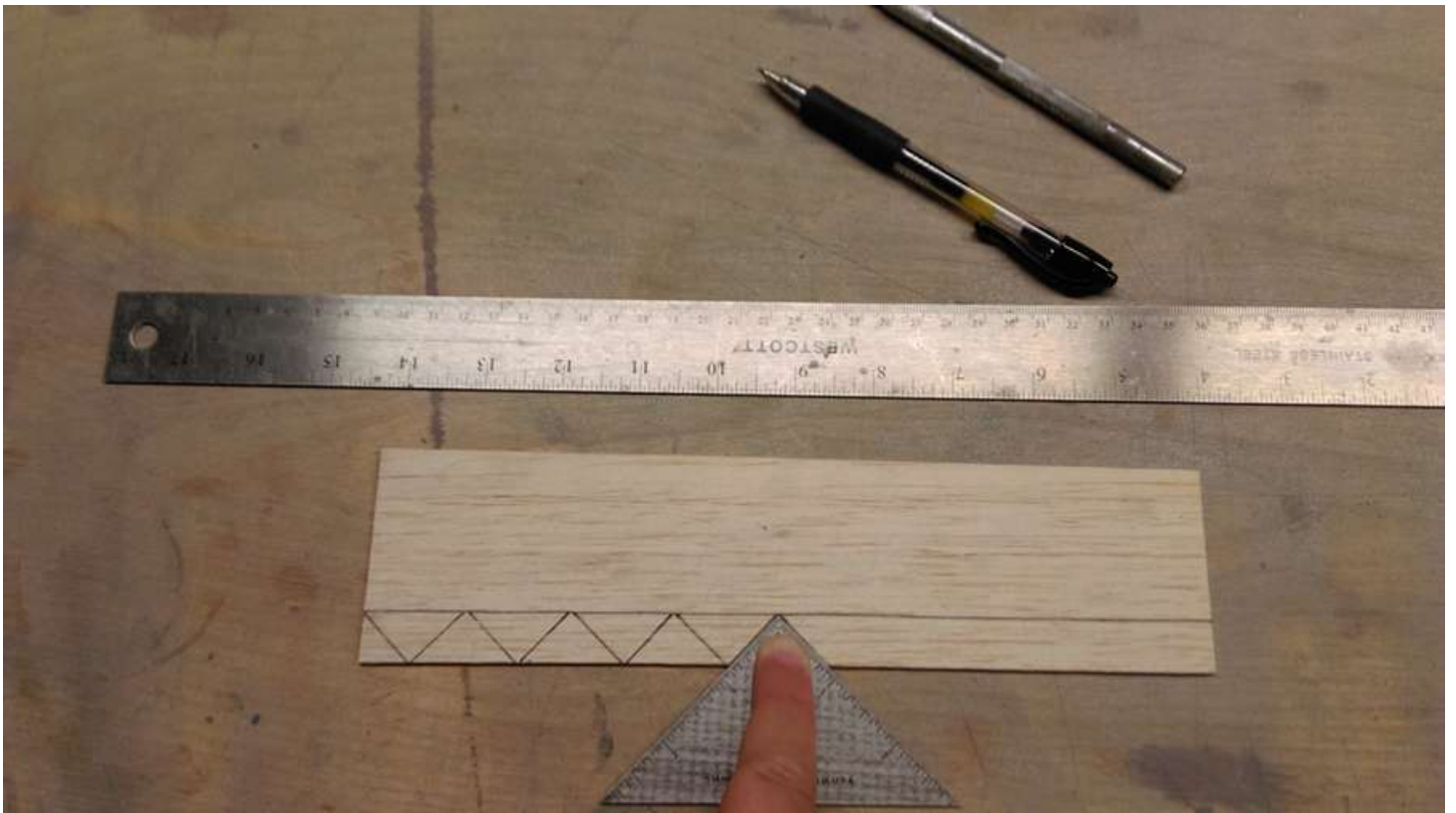
In our hobby, overlay gussets are primarily used when constructing fuselages from sticks and are usually made from 1/64th ply, adding little weight but lots of strength but not having to worry about a flush surface. Corner gussets take care of the situations where you can't overlay a joint, they are generally made of light balsa and butt glued to the two pieces of the butt

joint. The most important thing to take away about the corner gusset is the grain direction, it HAS to span from one piece to the other at 45 degrees or you are just wasting glue, wood, and time. With the grain in that direction you are using the tension force along the wood grain to provide a strong joint that will not flex, even with soft balsa.

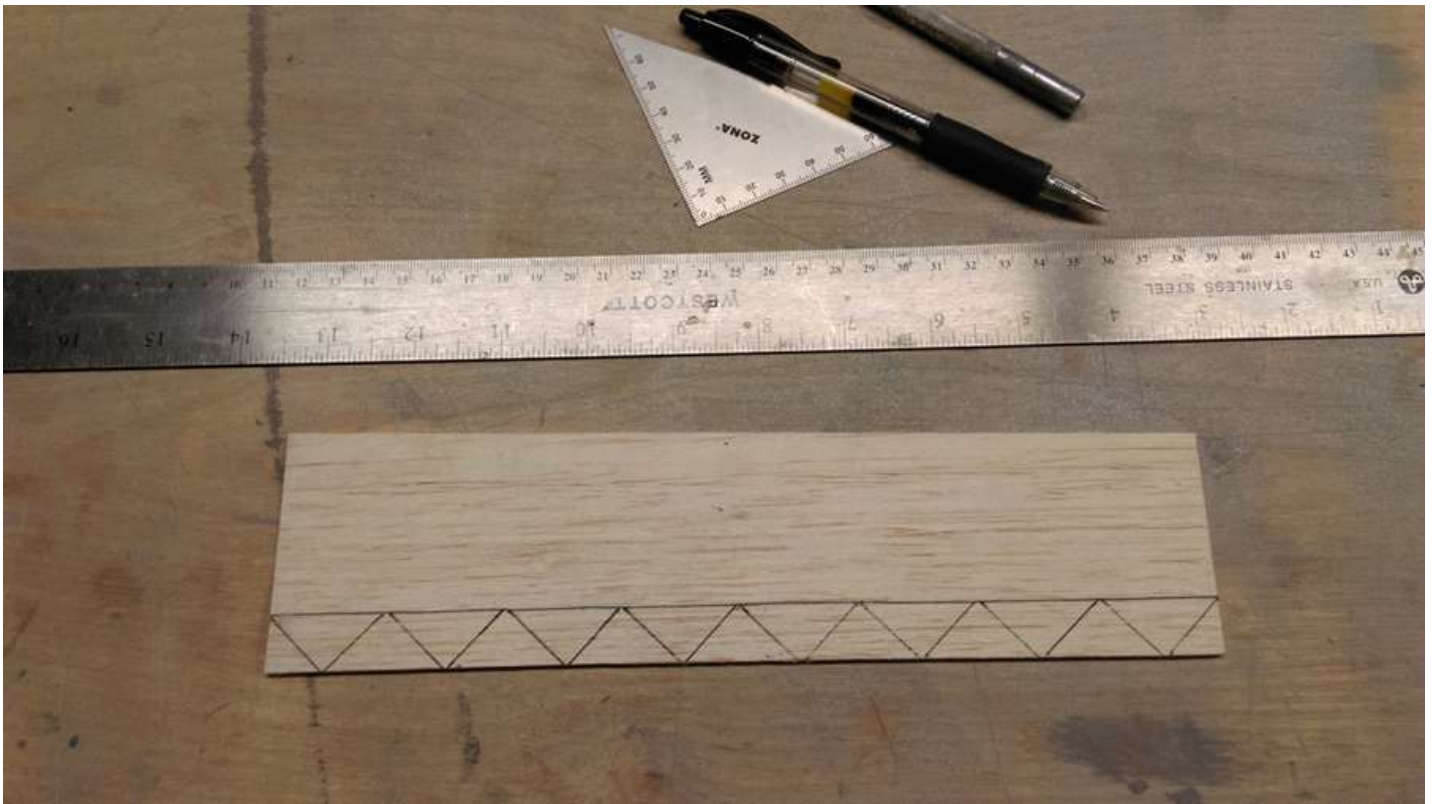
With all that said, let's get to work making these control surfaces stronger without adding any measurable weight. First let's round up the materials and tools we will need. You will need a straight edge ruler, a 90 angle, pencil (I'm using a pin here so you can see the lines in the photographs) and a sharp xacto knife. I am going to use a scrap piece of 1/8 thick light-medium balsa to make the gussets. again you don't need heavy hard balsa to take advantage of this strength. It's all in the grain.



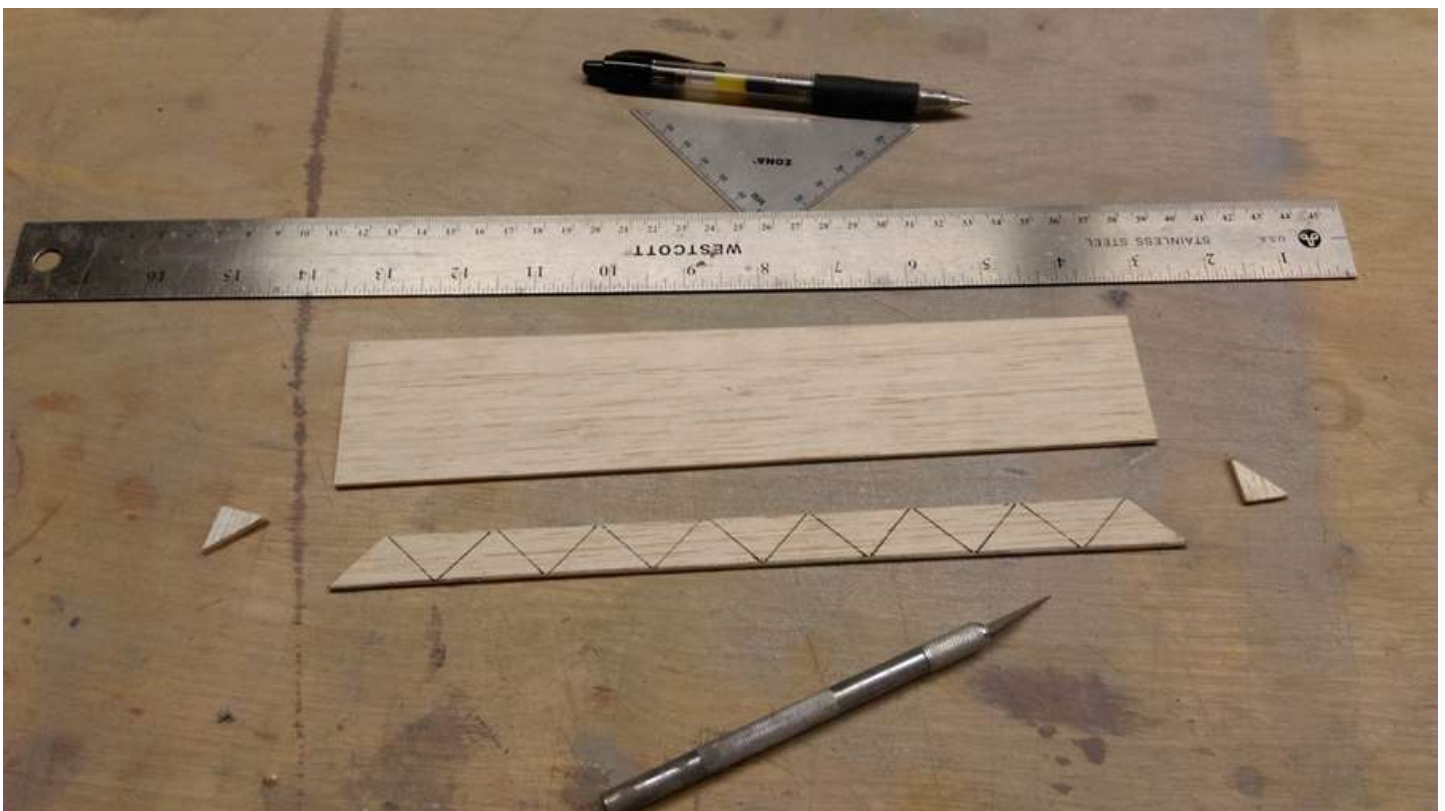
First, using the straight edge and the triangle, we draw the gussets so they have the grain crossing between the two sides. I am making these just a bit larger than I normally would so they will be easier to see. It really doesn't matter though, all 15 gussets we cut out of this one strip will not even total 1 gram.

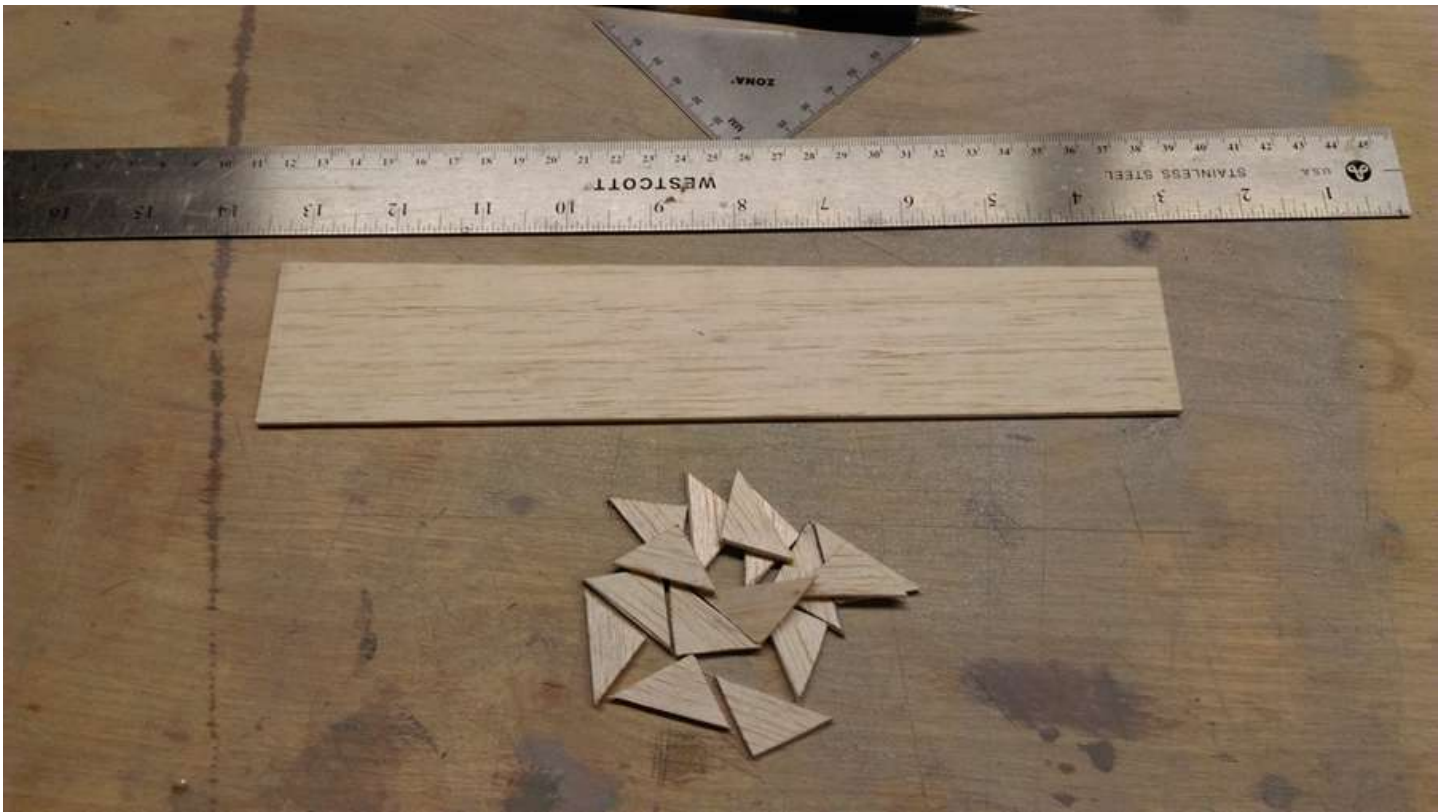


Again it's VERY important to stress you HAVE TO HAVE THE GRAIN CROSSING THE JOINT at 45 degrees. Here is the gussets all drawn out and ready to cut out.



Next I cut the gussets out being very careful to keep the cut lines perpendicular to the surface and not angled. We will discard the two 90 degree triangles on the ends as they are useless with the grain running wrong.





Here you can see how the gusset should look with the grain running in the correct direction.



I use a Popsicle stick with some 220 grit sandpaper glued on it to clean them up and "fit" the

gussets before gluing them to the desired location. Then I fit and glue them in place with medium CA or PVA wood glue (whichever you desire) where there are 90 degree butt joints are on these control surfaces. You could put a gusset on each side but realistically that's overkill for our use. Here is the final product. Before the gussets it was twisting pretty easy. Afterwards, it will not twist at all.



I hope you found this short tutorial helpful. I use gussets on just about every butt joint if I can fit one there. It's a great piece of knowledge to have when aiming for a stronger lighter model.

Good luck and have fun building!

Mike