

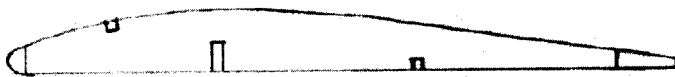
# Wing Construction: Put on your bibs and let's talk ribs!

*This is one of a series of articles by Mike Isermann on weight saving ideas. While Mike is obviously talking about FAC models, there are ideas here that everyone can use.*

We're not talking BBQ pork ribs here we're talking sliced, cracked and slab-sided ribs.

That's slab-side not a slab o' ribs. I tell you I need a bib when I see some of the beautiful wing structures that are produced when sliced and cracked ribs are employed. I drool with envy! It's without wonder that a number of the consistent winners at FAC events have done so well with these great weight-saving/structurally sound techniques. I'm an old slab-side rib user but have slowly been moving to the other side of the fence. Now don't get me wrong, I'm not saying that slab-sided ribs are no good or even a thing of the past, (although they might be for some) I'm saying be open minded here. So what are the benefits and the drawbacks of each system? Let's examine the different types of construction and then you can decide.

I'll start with the old standby, slab-sided ribs.



This method is the one most of us are familiar with and have used for at least part of our modeling careers. Not a bad way to go. You are afforded an infinite number of airfoil possibilities and a solid rib gives you reasonable strength as long as you don't use too thin and/or too light of wood. One of the problems building with slab-sided ribs is that your spar notches seldom line up. This is commonplace in kit wood. If you do not take the time to straighten them out you will build reflex stresses into the wing that will show up after covering. Ever wonder why no matter what you do, some warps keep coming back? Try sanding your notches in after construction. Second drawback: Weight. Someone told me a long time ago that when building a model airplane you should try to build it as light as you can and when you think you have achieved just that, cut the weight by another 20%. Face it, wood is weight. So it stands to reason that any reduction in structural mass will reduce weight. Some people cut holes in ribs and that helps, but is there a need for all that wood? Bottom line is that weight is the enemy and if you can save a few tenths of a gram here and there, before you know it you are dropping grams translating into lower wing loadings. And that's a good thing!

Let's move on to cracked ribs.



Crack rib construction utilizes a full chord-depth spar that is notched top and bottom at each rib position to accept 1/16"X1/16" square balsa strips. The top strip is "cracked" at the spar and then glued in three places; the leading edge, Trailing edge and the spar notch. This leaves an airfoil profile that looks more like a wedge than an aerodynamic shape. The addition of a turbulator spar adds some shape to the business end of your airfoil; however, the drag and lift coefficient is not going to be optimal. The shape does produce a lifting wing but I think the air is dirtier than that of a smooth camber airfoil. Dirty air is just another word for drag.

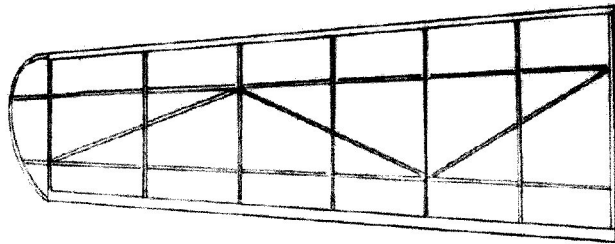
Thin wings (10% chords or less) seem to be best when using the cracked rib approach. I have seen plenty of planes with these wing designs fly away. You can't argue with success. But then I've seen thermals lift tents 100 ft into the air. The true test of an airfoil is in dead air. If you choose this form of construction you will yield a low weight structure that is reasonably strong. Drawbacks include less efficient wing profile and a very limited selection of airfoils. Airfoil design variables will be limited to maximum chord height or camber height and chord length. A flat bottom profile with strait taper from maximum chord/camber height leaves a

lot to be desired if you like to try different airfoil designs. You're kinda stuck with a modified Clark Y. Some people swear by certain airfoils and some say Reynolds Numbers are too low to matter at the scale we work with. I will let you be the judge.

Now let's look at sliced ribs.



(I saved the best for last.) Sliced rib construction seems to take the best from both worlds. The easiest way to make a sliced rib is to trim the camber off the top of a slab-sided rib. Continuing development of this technique has yielded some innovative structural improvements. 1/32" balsa sheet wood is now being laminated on forms to create tried and tested airfoils. These laminations make for a stiffer structure and they allow the builder to cut uniform ribs. Sliced rib construction often uses two full-depth spars located at about 30% and 70% chord. The spars are not usually notched, but I like to do it that way. Strips are laid at rib positions between the leading edge and trailing edge of the wings. The spars are dropped in and then cambered ribs that have been sliced from the lamination are glued over the spars completing the profile.



Geodesic cross-bracing is then installed from the nose radius of the root rib to the rear taper of the third rib passing through the center of the second rib. Bracing is installed in an alternating pattern (much like a truss) out to the tip rib. The rigidity of this type of construction is truly wonderful and talk about light! You can try more airfoil designs including semi-symmetrical types. I'm not sure I would try undercambered designs, but there is no doubt someone is doing it. That would be the only drawback I can see other than the time factor. This form of construction takes twice as long to build. If time is a concern then this construction technique may not be for you.

All of the construction methods we looked at are sound systems that offer different options as well as differing results. I'm sure there are other pros and cons that can be thrown in the mix. These traits are what I look for when choosing a method of construction. Each aircraft is different and one system may suit your subject better than another. Hybrids are also possible. I combined slab-sided rib leading edges with cracked rib tapers on my latest aircraft the Blohm and Voss P.193.01. The possibilities are truly endless. Let your imagination run free. Give sliced or cracked ribs a try. You too will need a bib when you see how light and strong your structures come out. My friend Bruce Findley knows all about the benefits of slab-sided ribs, smoked ribs, cracked ribs, marinated ribs, sliced ribs... I bet he is slicing some right now! Hey Bruce, you got some BBQ sauce on your cheek there...

Light wing loadings to all, OOS Mike