

# Bending Balsa

*from the Net, by Joe Wagner*

From what I've seen on this net lately, I'm unsure whether anybody here still builds model airplanes out of balsa wood, except for me and Randy Randolph. But if there are such artisans existent on the net, here's some information that may help.

Contrary to common belief, ammonia doesn't really make balsa easier to bend. True, ammonia has long been used by industrial "wood formers" to soften hardwood for forming tennis racket frames, chair seats, and that sort of thing. However, (1) the ammonia is in concentrated gaseous form, so strong that one breath of it would sear your lungs; and (2) it works by temporarily plasticizing the lignin "binder" in the wood.

Household ammonia doesn't really help in forming balsa because (1) it's merely a weak solution of ammonia gas and (2) balsa contains practically no lignin anyway. (That's one reason it's so light.)

Household ammonia appears to soften balsa. That's because its detergent action makes its water content soak into the wood fast. Few modelers realize how slowly plain water penetrates balsa. It wets the outer surfaces fast, all right—but in doing so, the wood cells swell up and produce a barrier against further moisture penetration. At Veco in the 1950s, we used a wet process for die-cutting that eliminated nearly all "die-crunching" problems. But to make it work we found that the wood had to be soaked all the way through. For 1/8" x 3" x 36" medium-hard balsa sheets, that took at least 24 hours.

We tried an ammonia/water solution to expedite the soak-through. That worked! However, we also found that ammonia makes an excellent fertilizer for various molds, mildews, and fungi. They thrived gloriously between many of the wet sheets of balsa—which, as you might suspect, took about as long to dry out as they had to become saturated in the first place.

One further detriment to the use of household ammonia for model-building purposes is that some if not all brands you can buy at your supermarket contain other "ingredients" besides NH<sub>3</sub> and H<sub>2</sub>O. Bobrick's Cloudy Ammonia (for example) has detergents and stabilizers added, which cause polyvinyl type cements (e.g., white glue and "aliphatic resin" glue) to curdle rather than cure.

Plain water seems the only sage "bending enhancing" fluid for balsa. True, it takes a long time to thoroughly penetrate the wood. Hot water works faster, but even that requires about four hours to truly saturate 1/16" sheet balsa. But when balsa is really soaked, you can just about tie knots in it without its breaking or splitting. I've formed severe compound curves with it—such as a one-piece fuselage top for a 3/4" = 1 ft. scale Lockheed 10A "Electra"—that would have required strip-by-strip planking by conventional construction methods.

True, there's a drawback to working with soaking wet balsa. It expands when wet and shrinks back again as it dries. For medium-weight wood, the lengthwise expansion of saturated balsa is about 3/4 of one percent. That's not enough to make trouble, at least in the size models I build. But across the grain can be a different story! There the expansion can be as much as ten percent.

That's more than enough to cause problems. I once made the mistake of sheeting the leading edge of a big control line stunter with sopping wet 1/16" x 3" balsa sheet. When it dried out, the shrinkage produced "scallops" between the ribs, almost as bad as if I'd covered the wing with wet Silkspan.

All this goes to show that model building is an art form, requiring knowledge, patience, finesse, and even a modicum of good luck. But to me that's the fascinating part of the activity. (I'd rather spend time constructing my own models than cash buying craft built by others. As far as I can see, there's nothing educational in spending money . . .)

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