A DIFFERENT WAY TO BUILD STRUTS
by Stew Meyers

The following is a heavily edited, with permission, article by Stew published in the January 2009 issue of MaxFax, Stew Meyers, editor. Although he refers to a specific model, much of what he discusses here is universally applicable to any biplane model.

I don't know about you, but I go to sleep at night designing structure in my mind. Also, I go over design details and my mind when I drive. And while driving to contests in Pensacola and North Carolina, I had a lot of time to do this. When I got home, I was eager to try some of these ideas out. I had ordered two rather nice kits from DPC Models, Ltd.: a Sopwith Pup and Albatros DI. I decided to build the DI kit as a technology demonstrator for some ideas I had for strut design using carbon tube.

I favor plug in wings with monofilament rigging to allow the energy for crash landing loads to be absorbed by stretching the rigging and bending soft pins rather than breaking structure. These days I use small magnets to hold the wings on rather than a rubber band. Even if damage results, repairs are much easier to make if the wings can easily be disassembled. A word here on the pins that are used for the plug in wings. These must be soft wire not hard music wire. If music wire is used, it may bend in a crash, but can never be re-bent to the correct angle. Whereas, soft wire is easy set at the desired angle and easily reconfigured.

The combination that I had been using on Dime Scale models was a rolled tissue tube formed on 0.020 music wire and a paper staple wire pin which is about 0.018 in dia. Now there are a couple of new options.

Thin wall brass tubing 1/32 OD x .020 ID with a .006 wall thickness KS5035 from www.shortysbasement.com weighs 0.058 grams/in.
Hollow pultrusion carbon epoxy round tube, non-woven, non-wrapped DPP Carbon
Tube .040"x.020"/1.00mm x 0.5mm from www.peck-polymers.com weighs 0.022gm/in.

Brass wire is available at model railroad shops in a 0.019 dia. The carbon tube in particular allows self jigging struts to be made with soft wire ends. I find this much easier than trying to bend music wire. The carbon is easily cut accurately to length by rolling a single edge razor blade over it. It helps to keep a staple wire in it as a mandrel to prevent splitting of the tube. This is also the way I cut the thin wall brass tube. Small length adjustments can be made on assembly before cyanoing in the soft wire ends. Even I can make a single, accurate, in plane bend in soft wire, and furthermore the angle is readily adjustable.

I have long used monofilament pins to provide a flexible removable mounting following Walter Eggert’s lead (see article elsewhere in this issue). On this model I tried using a 1/16” wide tab cut from Sig hinge material (see photo of a full size piece of this material) in one end of the strut to prevent strut rotation.

I formerly had used a dab of Ambroid on the end of the strut to prevent rotation, but this tends to tear the tissue in the vicinity when the wing pops off in a crash. I put slots in the lower wing ribs for strut ends and inserted the hinge tab into them and but didn’t glue them to the rib. (See photo)
At the interplane strut position on the upper wings, I added a piece of 1/16th square on the inside the upper strut rib. I drilled #77 (0.180 dia) holes in the rib using a templet to get the correct angle. I then reamed the hole a bit to get it near 1/32 dia. Finally I chased it with a 1/32 drill. The then inserted a 1/4" length of 1/32 od brass thin wall tubing in the hole and cyanoed it in place. I then cleaned the hole with a reamer and #77 drill.

The kit is designed with plug in lower wings with 1/16 square spar extensions. The corresponding wing support panel on the fuselage has laser cut holes to receive them. Not a bad way to achieve the three degree angle of attack, but not a good wing mounting. Those 1/16th balsa spars will shear right off and if you glue the root rib in place, you just shear outboard of them in a crash.

However if we use soft wire pins bound to the spars and have a tube glued in the fuselage to receive them the wings will pop off in a crash with no damage. (Ed. Note: Holding the wings in place with small magnets of course) Monofilament rigging is used. This will stretch in a crash and absorb energy leaving the structure intact. The soft pins may bend, but are easily bent back to the correct alignment and reinserted into the tube.

Hard music wire on the other hand will take a set and work harden. It can never be reset properly. Over the years the lower wings on my WWI models have survived very well with this scheme after some spectacular prangs. Whereas models with glued in spars or root ribs have often sustained damage. This is also a good way to tame the famous mystery wing mount present in many old designs.

Upper wings in the past have been solidly affixed to the cabanes. These have not fared so well. The cabanes often get clobbered and are hard to replace.

On this model I intended to use a scheme similar to that on the lower wings. Except the wire would now be on the cabane and the tubes embed in the wings. I had used this approach on an Albatros B2 with success. Here however, I used one mm carbon pultrusion tubing from A to Z for the cabanes. I made the upper part of the "V" from two pieces brass wire silver soldered together. The lower ends I made from staples. The staples have a coating that make them less easy to solder than the brass wire.