

Biplane rigging techniques

I hope this will make rigging biplane models easier for anyone interested. Please understand, what I've illustrated here isn't THE way, or even perhaps the BEST way to rig a model of a biplane. It is however MY way, and it works well for me. It may for you as well. At least I hope so.

Rigging Line

You'll want to note that I only rig with monofilament line such as fly fishing line and invisible thread. I find this medium the easiest and most realistic. As for realism, you'll find that once your rigging is pulled taught, it serves exactly the same function the rigging does on the real thing...it makes the whole structure more rigid. Also, like the real thing, if you've managed to assemble something like the upper wing or under carriage a little cockeyed, you'll find that by pulling the appropriate line tighter than it's counterpart, you can often pull the offending part back into alignment. And also like the real thing, if you pull something too tight, you can warp or break something, like interplane struts. Pull it taught, not tight.

I use different sizes of line depending on the scale of the model, and the use of the line on the real plane. For the few 1/72 biplanes I've built, I've just used a standard .004" Invisible Thread which can be picked up in most any good craft, sewing and quilting shops, and can even be found in many grocery stores, at least in the US. If you have the patience, and can find it, you can get monofilament in .002" size from some fly fishing shops. I just haven't bothered.

For 1/48 scale, I typically use the Invisible Thread for both the structural rigging and the control lines. However, for 1/32 scale, I will use different sizes of lines for the control lines and the structural wires. For an aircraft with wire structural lines, like German aircraft, I'll use .006" line for those wires, and .004 for the control lines as they were under less load and therefore smaller than the structural lines.

British aircraft of course introduce another level of complexity. First off, they had double flying wires (the wires that support the wings in flight. They are the diagonal wires that run from the lower wing, inboard to the upper wing outboard). Second, 90% of the time the structural wires were actually extruded "rods" known as RAF Wire with an airfoil shape rather than the simpler round wire cable. The RAF wires didn't use turnbuckles as such, but rather the ends of the wires were rounded off and threaded. The ends were then threaded onto nuts built into short rigging terminals at each end of the wire. There are photo etch RAF wires and terminals available in 1/32 scale from RB Productions. I have some, I just haven't had the guts to use them yet. See the pictures for examples of double flying wires and the RAF wire terminals.



British RAF wires and the terminals they thread into. Note the double flying wires in the picture above.

Instead, I've used slightly oversized monofilament, either .008" or .009". They aren't noticeably oversized to me, and they probably replicate the RAF wires better than a more scale .006" or .007" line would. For the control lines, I tend to use either .004" or .005" line.

Turnbuckles

A popular and very good material for simulating turnbuckles is brass or nickel tube. Albion Alloys makes a variety of tube sizes, the most useful for rigging are probably the .3, .4 and .5 mm diameter sizes. While the brass tube is pretty easy to cut with a hobby knife, the nickel is easier.

However, another modeler on-line (and I'm sorry, I can't remember who) mentioned a product called Polyimide tubing. This stuff is primarily used in lab applications and is available in sizes down to seemingly hair size and is still hollow! It is also very easy to cut with the tip of a hobby knife, much easier even than nickel tube. While not completely rigid, in short sections, it will hold a straight length. I honestly don't know what size I've used for 1/48 rigging, but with my most recent WWI completion, the 1/32 scale Wingnut Wings Fe2b Early, I used tubing with an inside diameter of .0201" and an outside diameter of .0221" (note these are imperial units, not metric).

Polyamide tubing is available at Amazon Supply:

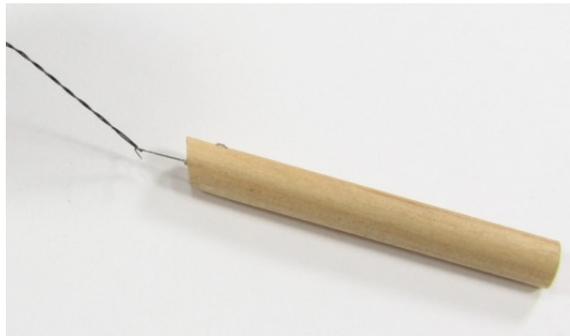
http://www.amazonsupply.com/translucent-amber-miniature-polyimide-tubing/dp/B003TLNL5I/ref=sr_1_1_seeall?sr=1-1&qid=1352419900&filterBy.feature_seven_browse-bin=5485625011

I generally make turnbuckles 4-6 scale inches long.

Wire loops

I often make wire loops for attachment points. You can of course, buy them from Bob's Buckles, but in all honesty, with a cheap home made tool, they can be spun in about 3 seconds each. I use some small copper wire from fly fishing suppliers. I don't know what the size or gauge is, but it's labeled small and x-small.

That home made tool? Here it is, a short piece of dowel, with some small steel wire with a hook set into the end. Fold over a piece of wire over the hook, pinch the ends with one hand, and spin the dowel in the other. Presto chango... a little wire loop.



A couple more notes on rigging. Make sure you think about things. You can pull a line all the way through a hole drilled into a wing, but you can't pull the other end through a hole in the fuselage. So make sure you start the line by gluing it into the fuselage, and then you can pull it tight through the wing. And work "inside to outside", meaning if you have a wing with two sets of struts on one wing (double bay) rig the cross bracing between the struts first and then work on the flying and landing wires. If you have double flying wires, rig the inside one before the outside. And remember not to pull lines too tight. Plastic struts bend. If you pull the rigging too tight, you'll bend the struts. You want the lines just tight enough that they don't sag. If they loosen up later, you can tighten them up by carefully applying heat. But be careful. Too much heat, or getting the heat too close to the rigging line and you'll melt the line. Go ahead, ask me how I know...



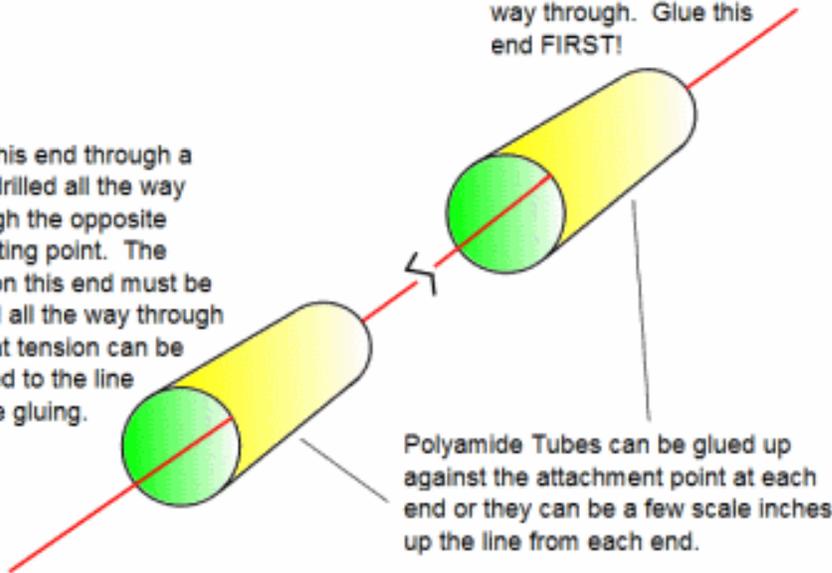
Here are a couple of pictures showing a “typical” closed body turnbuckle used in rigging biplanes. Closed body refers to the turnbuckle being a tube rather than a generally rectangular shape, open in the middle. It would be adjusted by inserting a spike or rod into the hole in the center and turning the tube. The copper wire seen running through the turnbuckles serves to prevent the turnbuckle from turning accidentally. As can be seen, using brass, nickle or polyimide tubing as illustrated below can very convincingly replicate closed body turnbuckles.

Now, for the following diagrams, please cut me some slack...I’m not a computer illustrator.

Diagram 1 - easiest turnbuckle

Glue this end of line into a hole drilled at the starting point. If it's a wing, don't drill all the way through. Glue this end FIRST!

Run this end through a hole drilled all the way through the opposite mounting point. The hole on this end must be drilled all the way through so that tension can be applied to the line before gluing.



This is the simplest Turnbuckle method I use. It looks a bit plain In 1:32, but looks quite nice in 1:48. I use this technique and short sections of tubing to replicate the rigging terminals for RAF wire.

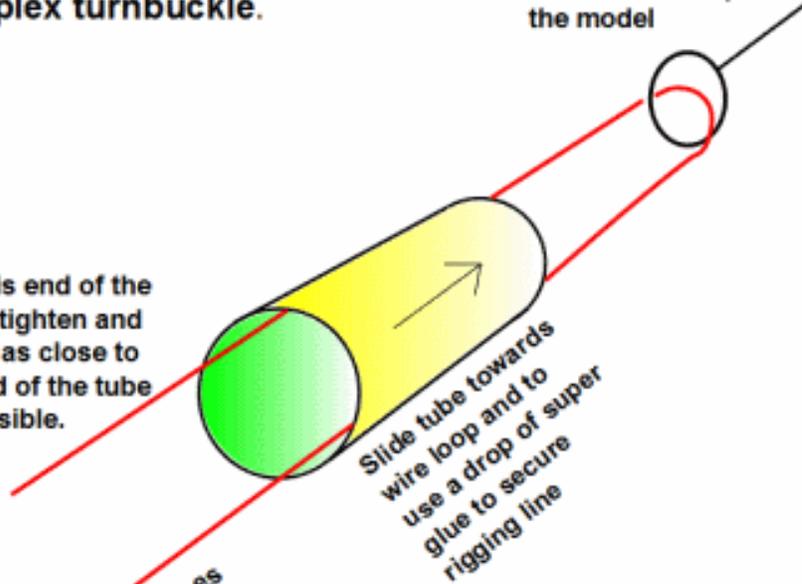
Diagram 2 - a slightly more complex turnbuckle.

Wire loop - glued into a hole in the end point on the model

Pull this end of the line to tighten and cut off as close to the end of the tube as possible.

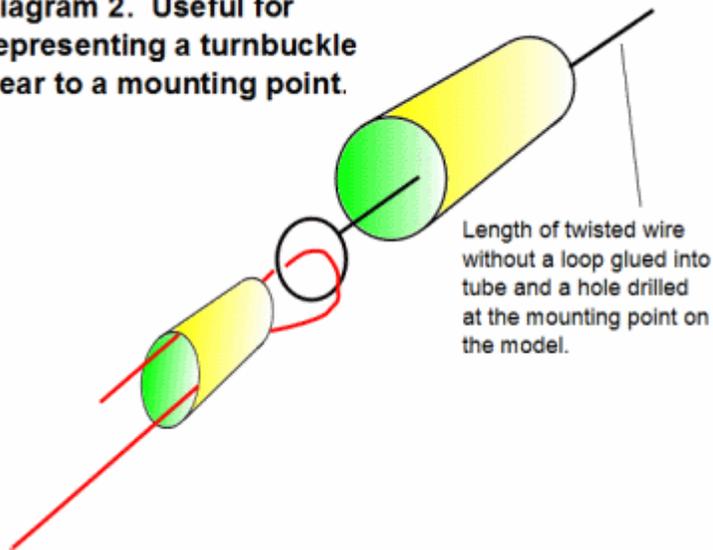
Slide tube towards wire loop and to use a drop of super glue to secure rigging line

This end of rigging line goes to the opposite attachment point. It can either be secured as in diagram 1, or as here.



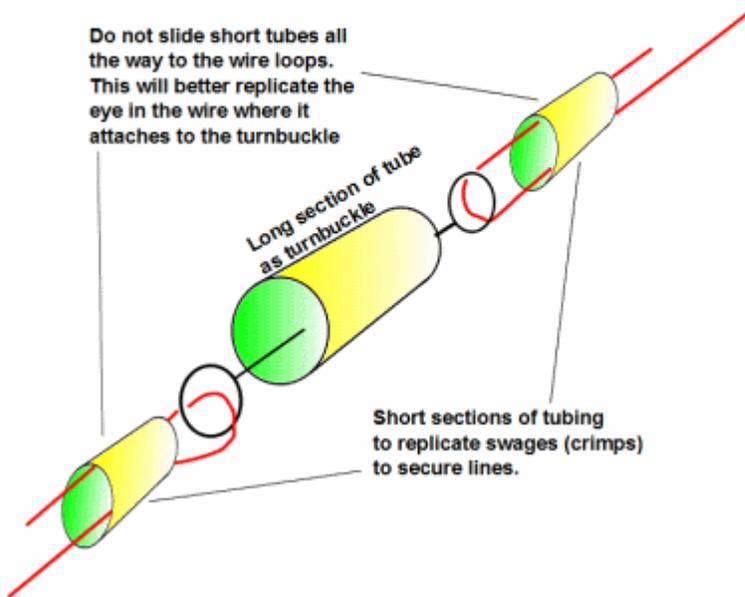
This is also a pretty simple method. I find it very useful when I need to attach the end of a wire to something I can't pull the line through. Pulling the line through the loop allows tension to be pulled on the line before gluing.

Diagram 3 - variation on diagram 2. Useful for representing a turnbuckle near to a mounting point.



This is a slightly more complex variation on the turnbuckle shown in diagram 2. It has a bit more realistic appearance.

Diagram 4 - Most complicated turnbuckle. Best representation of a turnbuckle in the middle of a line, usually control lines.



The most complex turnbuckle I do. Many aircraft have turnbuckles in the middle of a control line. This really isn't any harder to do than those diagrams 2 & 3, just more parts to be hooked together. One note is that the small tubes I use as the Swages were rarely present. The loops for the wire were normally spliced into the wire. I haven't figured out how to really replicate a wire splice in monofilament!

As with the twisted wire loops, you can also buy pre-cut brass tubing sections from Bob's Buckles. But once again, it really isn't much work to buy your own tubing and cut it yourself.

There is also a new company called Gas Patch that is now casting white metal (I think they are white metal) turnbuckles in a variety of configurations. I can't say if I'd recommend them as I haven't actually seen them in person. I've been burned once or twice buying bits based on pictures. I think I'll hold off on them until I actually see them. That said, I've only heard good things about them.

A couple of final things. If you have any questions, please feel free to email me at maxwinthrop@yahoo.com. I may not be able to help, but I'll do my best. But please give me a day or two to respond. Daily life does sometimes intrude.

Good luck, and have fun! Rigging can be a bit tedious, but it isn't difficult by any means. And it can look truly impressive!

Mike Moore

