

## NOTES ON BUILDING PROP SPARS

By Bob Bailey Feb2014

It is essential to make the prop spar in two halves so that they can be made to be identical in stiffness. Weight imbalance is not a problem. These notes are written primarily for F1D props but are applicable to all classes.

### **Wood density**

I recommend the following:

F1D 4.5 - 6 lb

F1R 4 – 5lb

F1L 5.5 – 6 lb

F1M 6 – 8 lb

### **Selection**

**Use wood which has been tested for stiffness via a deflection test The usual problem is to use untested wood which almost invariably will be either too heavy or too flexible.** The best means of testing is to use the article on wood testing in the Forum reports. However, a quick and easy way is as follows:

Select several pieces of up to 100 thou (2.5 mm) thickness, up to ½” wide and about 10” long. This size is enough to cater for a FP or VP prop.

Hold each piece in turn hanging over the edge of the bench or similar. Deflect by hanging a weight on the free end and measure the deflection.

The one which gives the least deflection is the best!

Taper the wood from 2.0 mm at one end to about 1mm at the other. Make the taper as uniform as you can. **Use a micrometer for this purpose.** At the thick end, mark one wide face with a line running diagonally from one side to the other using a marker pen or similar.

With a wood stripper, strip off two pieces 2.0 mm wide (each will have part of the diagonal line) on one face.

Each of these two pieces is now tapered down to 1mm thick at the other end in the same manner as for the first stage to give a double tapered spar half. Use the micrometer to make sure the spar thickness is the same in both directions and for both spars at each distance from the root. 5 points are usually enough. You have made them as nearly identical as you can and this will speed up the next stage which is matching the two halves for stiffness in both directions.

I use a length of 1/8" sq wood with ballast on one end to weigh about 0.3 g for all except F1M. The wood has a small hook on it to allow it to be hung on the spar. To use the weight to measure deflection, mark the weight with a scale above the hook with zero at the hook.

To measure deflection, hold the spar half under a steel rule at about 6" from the end or the rule using the root 1/2" of the spar to clamp it against the rule. Now hang the weight on the spar as close to the end of the rule as possible and measure the deflection ie how much the weight drops. This should not be more than about 6 mm.

Measure each half by holding the spar with the mark against the face of the steel rule. One half may well bend more than the other. Sand the stiffer one over the 6" distance from the root with a few smooth strokes and recheck the stiffness. You are trying to make the two as near the same as you can.

Now repeat this process, holding the spars against the rule with the marks on the side. You are now testing the stiffness in the other direction.

Now you are going to check for the stiffness distribution along the two halves.

Hold the two halves side by side with the marks uppermost between thumb and forefinger so that they are alongside each other all the way to the tips.

Now press down on the two spar halves about halfway along to bend them through an easily seen angle. The two halves should follow the same curve but usually they don't. One section will be straighter than the other over part of the curve. Sand the straighter piece on a deflected face to make it bend a bit more. One or two gentle strokes are usually enough. Now retest and repeat as necessary.

Repeat this process by holding the spar halves in the middle and repeat for the tip sections.

Now turn the two spar halves so that the marks are now on the sides and repeat the entire deflection tests.

So, why bother with all this?

There is a very good reason; you are trying to make sure that the two prop blades bend equally under load, particularly at launch. If they don't, the prop will wobble badly.

All this effort will reward you with props that run nice and smoothly, look good and will give you better flight times!

Good luck!

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