It's Easy!
Order all your supplies for this project on-line or at Tech Support:
661.823.0108
Mon - Fri
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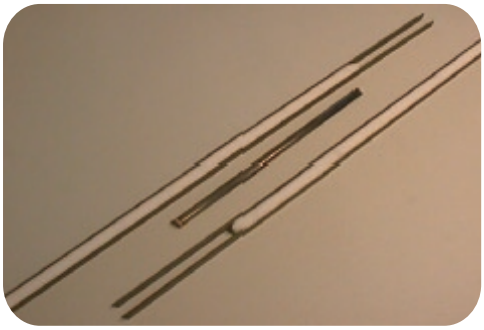
Build a Carbon Fiber Spar

The performance in many model classes has reached the point that wooden spars and other components can not carry the loads generated by the models or the launching techniques. Over the years many designs have been tried to build an extremely strong wing spar. This design borrows many proven ideas from others to achieve the best possible strength and stiffness with a reasonable construction time, and no need for elaborate tooling. The spar is constructed using single tapered unidirectional carbon laminate strips for the upper and lower spar caps and Rohacell 71 or end-grain balsa for the spar core. The upper cap on this spar intended for a winch launched glider is .060" thick tapering to .014" at 48" from the root, and the lower cap is .030" thick tapering to .014". The width of the spar for this model is .5".

Step 1

The upper cap is twice as thick as the lower cap because carbon fiber, like all fibrous materials, will carry about twice as much stress in tension as in compression. The spar height will be the full airfoil thickness less a small thickness of filler for final fairing. The Rohacell or end grain balsa core is cut then sanded to the exact height needed allowing .015" for an outer carbon sleeve. The caps are glued to the core with thick CA glue.

The wing joiner is a straight carbon rod. An appropriate sized tube will be built into the spar. Note that the ends of the tube have been closed with a small bit of balsa and CA glue.



Step 2

A simple jig is needed to align the parts with the correct dihedral angle. The jig is cut from a scrap of lumber then clamped to a flat work bench. The core has been cut away at the root of the spar where the joiner rod tube will be located.

It is hard to see in the picture but a layer of plastic film was placed over the jig before the spar was pressed into the slot in the jig. This protects the jig and table from the gluing process that will follow.

Step 3

Mix up two or three ounces of West System Epoxy and add Chopped Carbon Fiber to the epoxy. This will make a thick stringy paste.

Continue to Step 4...

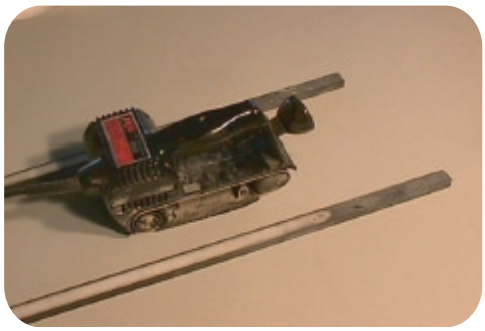
Build a Carbon Fiber Spar, Cont.

Step 4

With the jig and spar held in place fill the cavity at the spar root about half full of the paste. Then press the wing joiner tube in to the middle of the spar, aligning it carefully. Then fill up the remainder of the cavity with the mixture. Be sure there is no air trapped in the cavity, it is OK to over fill it a little.

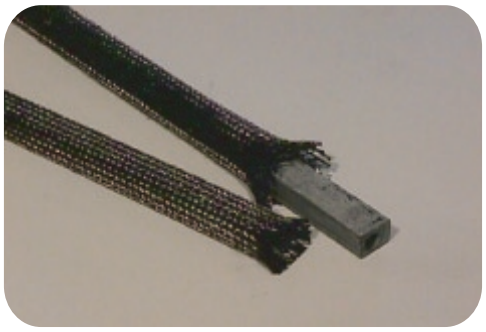
Step 5

The next day after the epoxy has cured remove the spar from the jig, and sand away the excess carbon and epoxy. This is a job that calls for power tools. Be very careful when sanding near the core material. It will sand very easily and you don't want to remove any core material. Next saw the spar in half, and hand sand the rest of the spar to smooth up any rough edges.



Step 6

Slide a carbon braided sleeve over the spar. On this spar I used a 0.5" diameter sleeve made from 3 k tow. As you push the sleeve over the spar the diameter will grow to allow it to slide over the spar but the length will be reduced. Be sure you have more length than you think you will need for the part. When the sleeve is in place tack one end with CA glue and pull the sleeve toward the other end to shrink it to the spar then tack the other end with CA glue. It is a very good idea to close the open end of the wing joiner tube with a small bit of tacky bag sealant this will keep epoxy out of the tube when you glue the carbon braid to the spar.

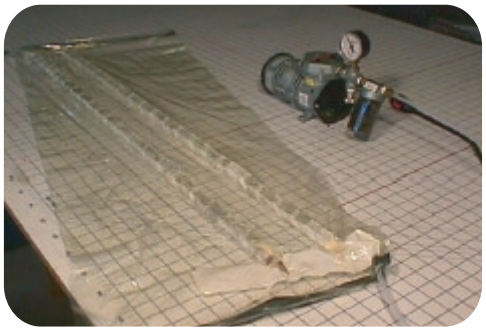


Step 7

Make up a vacuum bag long enough for the spars. Cover the work bench with some plastic film, and don't forget your disposable gloves. This next step is very messy. Mix up about five ounces of slow curing West Systems Epoxy. Liberally coat the carbon braid on the spar with a very wet coat of epoxy. Don't worry about excess epoxy. Next wrap the spar with a 2" wide strip of Teflon Coated Glass peel ply. This is done as a helical wrap starting off the end of the spar with a bit of masking tape to hold the end in place. Be sure to cover the spar completely. Then repeat the wrap with a 2" strip of thick breather fabric. Check the spars for twist that can be caused by wrapping the spar too tightly.

Step 8

Put the spars in the vacuum bag with a small strip of breather material folded over the end of the vacuum line and running to the end of both spars. Set the vacuum to the maximum value and set the bag aside until the next day.

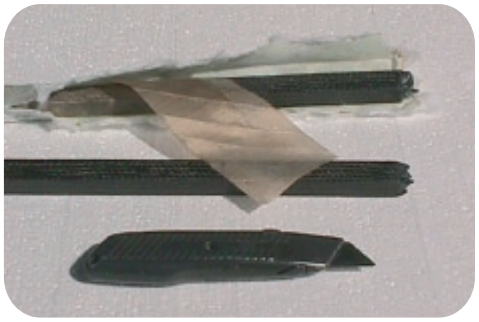


Continue to Step 9...

Build a Carbon Fiber Spar, Cont.

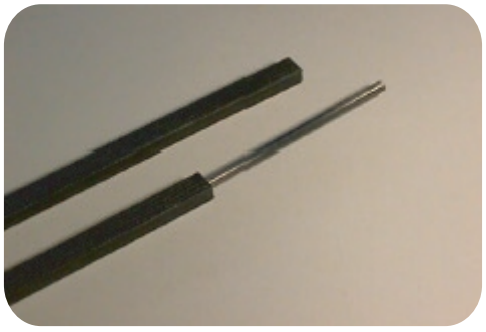
Step 9

The next day before the epoxy is rock hard open up the bag and use a sharp knife to cut away the breather fabric. The breather will cut like leather, but cut carefully so the spar is not damaged. Peel off the breather followed by the Teflon Coated Glass layers.



Step 10

Only a little trimming on the ends of the spar is needed to complete the spar. It is now ready for installation in your next super-strong wing.



Supplies to complete this project:

Click here to buy these products!

Carbon Supplies:	.060" Single Tapered Carbon .014" x 0.5" x 48" C1852
	.030" Single Tapered Carbon .014" x 0.5" x 48" C1842
	Chopped Carbon A4001
	Carbon Wrapped Tube 0.5" ID T150
	Carbon Braided Sleeve 0.5 diameter C9311
	Carbon Rod 0.5" Joiner Rod T250
Core Materials:	Rohacell 71 0.5" x6" x 24" R7112 *or*
	End Grain Balsa 0.5 B155
Epoxy:	WEST SYSTEM Resin A105
	WEST SYSTEM Hardener A205
	(If you prefer a longer working time, refer to the WEST SYSTEM Epoxy Selection Chart, as A206 or A209 will also work.)
	Metering Pumps A300
Epoxy App. Tools:	Reusable Mixing Sticks A804-8
	Reusable Mixing Pots A5001
	Disposable Glue Brushes A803-12
	Disposable Gloves A832-4
Misc:	18" Vacuum Bag Tube V111
	Breather Strip V300
	Tacky Seal V196
	Teflon Coated Glass T231
	Insta-Flex Gap Fill CA A2120 *or*
	IC2000 CA A2000

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