

Balsa-core Carbon Spar

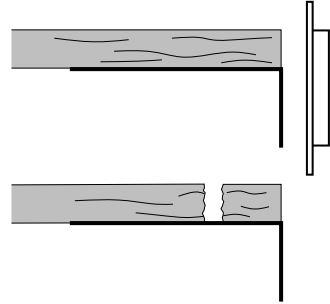
Mark Drela 3 July 00

Advantages

Spars constructed by this method make full use of the extreme compressive and tensile strength of prepreg carbon fiber, compressive strength/weight of endgrain balsa, and tensile strength of fiberglass. Because of their great strength, such spars will typically need to be sized by stiffness rather than strength. A stiffness-sized spar of this type is for all practical purposes unbreakable.

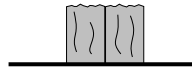
Facing and Cutting the Core

Sand end of balsa sheet perfectly flat and square against end of board. Cut off piece of suitable thickness and continue sanding and cutting. A miter box with a stop at the correct thickness is useful here.



Spar Assembly

Tack core blocks together on flat surface. Medium CA or any high-tack adhesive used sparingly is suitable.



Glue balsa core down on one spar cap, leaving slight overhang. Use thickened epoxy to prevent excessive wicking into endgrain. Apply pressure with foam and weights.



Sand balsa flush with spar cap and sand down to proper thickness.



Epoxy down other spar cap. Hold in position with masking tape strips. Apply pressure with foam and weights on flat table during cure.



Joiners and joiner boxes are now installed in the spar ends (see other sheet).

Shear Skin Application

The shear skin is absolutely essential to realize the full strength of the spar. Round off the cap corners to prevent cutting of the skin fibers under load.



Cut +/-45 glass (or carbon) cloth strip slightly longer than the spar and of the appropriate width for one or more layers. Spray glass lightly with 3M-77, and roll spar onto it. Seam goes on top of cap.



Compact the glass, apply epoxy, blot excess, and wrap with peel-ply or porous teflon release film. Vacuum-bag the spar to eliminate voids and bubbles in the skin.



Installation

Spar can be installed in a built-up wing with a D-tube. Glue balsa strip to top of spar and sand down to sheet contour.



Spar can be installed in foam-core composite wing. Use microballoon/epoxy filler on top of spar to achieve the correct contour. Wing skin should be entirely +/-45 orientation to best complement the spar's bending strength.

