

# SCARF JOINTS FOR WING SPARS

by Bob Bailey

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How many times have you examined the damage of a broken-off wing tip? You may have noticed that the spars have frequently broken at the joint which is usually a butt joint (Figure 1) and the leading or trailing edge just on one side of the dihedral brace. The main reason for the tip breaking off in the first place is the use of butt joints for the spars. They are easy to make but not easy to make well i.e. to have the two faces of the joints mating properly (Figure 2).

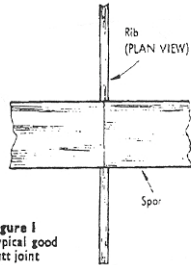
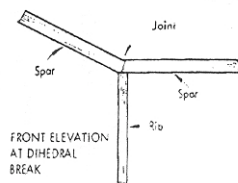


Figure 1 Typical good butt joint

Scarf joints (Figure 3) are easy to make provided that the spars are put in after the dihedral has been set. In addition, the area of the joint is 3 or 4 times that for a butt joint - very much stronger (and scarcely any heavier) since the weak joint is eliminated.



FRONT ELEVATION AT DIHEDRAL BREAK

As a guide for using scarf joints, I suggest the following order of assembly for a typical open Structure wing:

(1) Build basic Structure of leading edge, trailing edge and

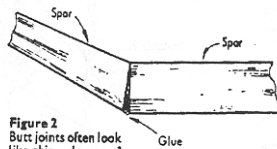


Figure 2 Butt joints often look like this - do yours?

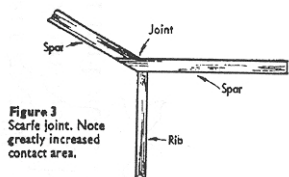


Figure 3 Scarf joint. Note greatly increased contact area.

ribs which have spar slots cut) for all panels (four for polyhedral wing).

(2) Lift panels from board and attach tips to centre panels at correct dihedral angle (only two joints to line up).

(3) Insert one centre panel spar with overlap for scarf joints (make sure spar fits snugly into rib slots and does not stick out above rib outline anywhere).

(4) The other centre panel spar (assuming a polyhedral wing) can be scarf jointed to the first spar - check for an accurate fit - very important for strength (see Figure 4).

(5) Scarf joint the tip spars to the two centre panel spars — you should now have a complete wing spar fitted in, and the wing is now much easier to handle correctly.

(6) Repeat Items 3 to 5 for *all* other spars.

Finally as a further hint on wing construction, I would suggest that the main strength from spars comes from two, one above the other, on the thickest part of the wing section - this follows from simple structure theory.

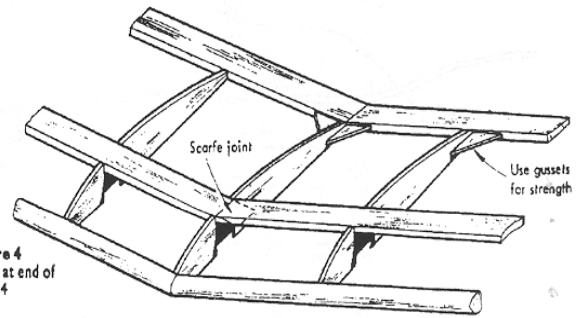


Figure 4 Wing at end of Stage 4