

## Kitemaking

### The Art and the Science

by  
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## The Star Victory

### Introduction

At the Kitemakers Conference in March of 1995, I taught a class on how to build a 2-foot Star Victory, then sold kits to build a 4-foot version. At the conclusion of the class, one of my students gloated, "Never again will you be the only one flying a kite at a festival when the wind is too light for anything but a Star". My response was, "maybe".

But having let the cat out of the bag, it is time to let everyone in on the secrets of construction; besides, I promised the AKA two years ago that I would provide this article for publication. [Thanks Stormy!] I have delayed publication because I wanted to thoroughly wring out the design to make sure that I hadn't overlooked any possible major improvements, but I have found none; the plans given here can be used to build a great kite.

### General Considerations

You may build the Star Victory kites from fabric, Tyvek, Orcon, or plastic trash bags. Some trash bags have creases in them. See to it that the creases run from the leading edge of the canopy towards the trailing edge rather than crosswise. Make sure that the number and positions of the creases on either side of the spine match those on the other side of the spine. Whatever the material used, try to smooth the material out and tape it to the work surface before laying out the pattern.

If you plan to use wooden dowels for the stiffeners, match stick bamboo (from roll-up window shades) or 1/8 in. dowels are fine for the spine, longerons, and wing leading edge stiffeners in kites 2-1/2 ft. and smaller. However, a 1/8 in. dowel should be used for the spar. For kites between 2-1/2 ft. and 4 ft in size, use 3/16 in. dowels for the spine and spar, but match stick bamboo or 1/8 in. dowels are satisfactory for everything else.

If taped-down wooden dowels are used for stiffeners, it is a good idea to encase them in soda straws that have one end belled (with a hot nail) so that they can be fitted together to make a continuous tube. Bar straws have a 1/8 in. ID which will fit over 1/8 in. dowels. Most regular soda straws will make a reasonable fit over 3/16 in. dowels; save the soda straws from fast food places, bell one end so that you can insert about 1/8 in. of another straw into the bell, and make a covering for the dowels. When you cover the dowel and tape it to the canopy, make sure the belled ends of the straws point towards the trailing edge. If you break a spine or longeron, you can slip the broken dowel out from the leading edge end by forcing a new dowel into the trailing edge end. Plastic canopies that have sleeves for the sticks heat welded or sewed kites with sleeves sewn in don't need to have the sticks enclosed in straws.

The following assembly instructions assume that you are taping together a Star Victory kite from plastic sheeting. If sewable material is used instead, the cutting and sewing procedures should be obvious.

### Procedure

1. Lay the canopy material on the work surface, smooth out the wrinkles, and tape it down.
2. Draw the kite pattern onto the material with a marking pen (see the dimension drawing).
3. If your canopy material is plastic, reinforce the leading edges of the nose and keels with 1/4 in. strapping tape.
4. Tape down the spine with 1 in. wide masking tape if your spine is 3/16 in. diameter, use 3/4 in. wide tape for 1/8 in. dowels. *Now, cut out the wings only.*
5. Place the wings on the canopy with the tip ends towards the center of the canopy. Using 3/4 in. masking tape, tape the wing root edges down along the lines marking the positions of the longerons. Fix the wings in position with bits of masking tape about every 6 in., then cover the wing root/canopy junction with 3/4 in. masking tape for the entire length of the junction. Rub the tape down firmly on both the wing root edges and the canopy, then fold the wings outwards, creasing the tape right at the junction of the wing roots and the canopy. Rub or roll down the crease until it lies as flat as possible.
6. Lay the longerons down along the longeron position lines, fix them in position with bits of masking tape about every 6 in., then cover the longerons end to end with masking tape.
7. Now cut out the canopy. When you have it cut out, take 1 in. lengths of 1/4 in. wide strapping tape, center the tape over the ends of the spine and longerons, and tape over the ends so that they can't come out of the soda-straw covering or pull the masking tape loose from the canopy.
8. Make a leading edge stiffener that is 3/4 in. shorter than the wing leading edge. Cut a piece of 3/4 in. masking tape 3 in. longer than the stiffener. Lay this piece of masking tape sticky side up on the work surface. Stick the ends of this tape down with short bits of masking tape, sticky side down. Lay the stiffener on the sticky side-up tape so that it is about 5/16 in. from one edge; rub the stick down so that it will stay in position.

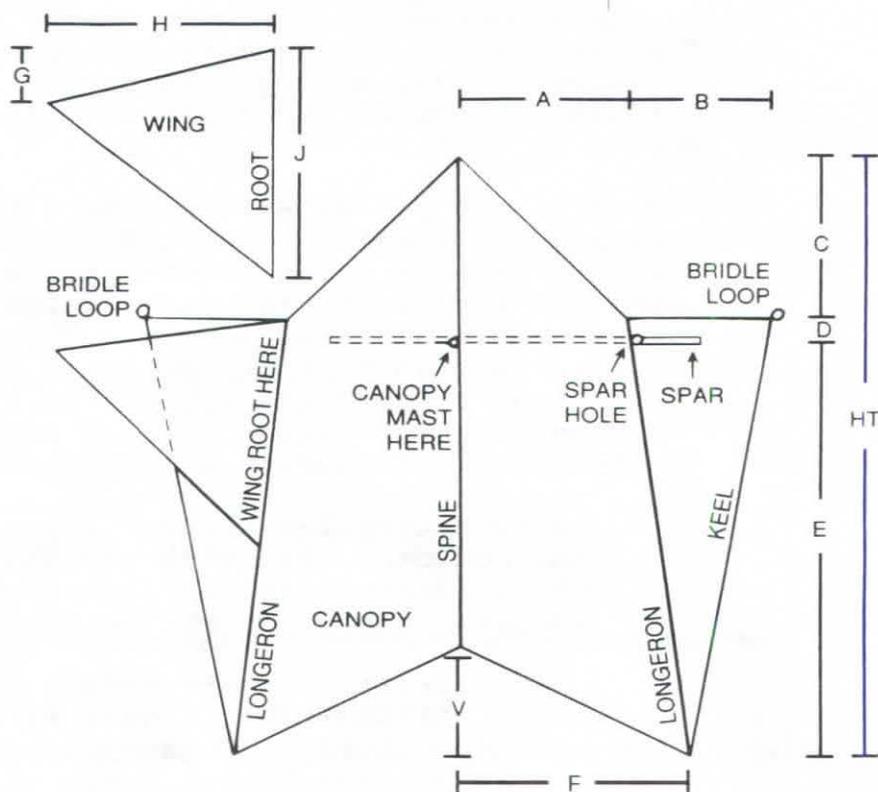
Now carefully stretch the leading edge of the wing so that it is wrinkle-free, position it carefully so that it just touches the stiffener along its length. The inboard end of the stiffener should be about 1/8 in. from the wing canopy junction. Carefully lower the wing leading edge into position on the tape. Now rub the wing leading edge down onto the tape. Fold the other edge of the tape up over the dowel and rub it down onto the wing.

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## Kitemaking (continued)

9. Poke holes through the keels  $1/24$  the height of the kite back from the leading edge of the keels and right next to the longerons. These holes are to permit the spar to pass through the keels. It is probably a good idea to reinforce the canopy at this spot with a  $3/4$  in. square piece of masking tape or duct tape before piercing the keel.
10. Spread the kite out so that the wings are approximately in flight position. Push the spar through the holes in the keels. Slip spar sockets (made from 1 in. lengths of soda straw with one end plugged with a bit of dowel and sealed in by  $1/4$  in. strapping tape over the end) onto the ends of the spar and lay the spar on the kite so that the ends of the spar sockets just touch the outer ends of the wings and the inner ends of the sockets lie next to the leading edge stiffeners. Tape the spar sockets into the position with duct tape or 1 in. wide masking tape.
11. Tape a  $1/4$  in. length of soda straw right at the bottom corner of the keel leading edges. Use a continuous run of  $1/4$  in. wide strapping tape down one side of the leading edge, around that soda straw section, then back up the other side. The soda straw sections makes it easy to fasten the ends of the bridle line.
12. Insert the spar through the holes in the keels, then insert the ends of the spar into the spar sockets. The kite can be flown at this point, but it won't self-launch from the ground and the spar ends will keep slipping from the spar sockets, so...
13. For kites  $3-1/2$  ft. or smaller, take a standard 8 in. (longer for larger kites) soda straw, lay it on the work surface, cover about half its length with wax paper, then flatten about 1 in. of one end with the heated bowl of a teaspoon (use a potholder; dummy!). Tape the flattened end to the spine at a point directly in line with the spar holes in the keels. Now, with the ends of the spar in the sockets and the kite on its back on the work surface, lift up on the spar right at its center while forcing the canopy down with the soda straw (see front end view) on the dimension drawing). Pull up on the spar hard enough to put just a hint of curve in the spar. With the soda straw held against the midpoint of the spar, mark the position of the spar on the straw and put a hole crosswise through the straw at this point so that the spar can be pushed through this hole. Cut the straw off about  $1/4$  in. below the spar.

The soda-straw canopy mast serves some important functions. First, it locks the spar into the spar sockets; second it permits the kite to self-launch from the ground, and third, it takes a great deal of strain off the spar in strong winds. This permits using a much lighter spar, which in turn means the kite takes less wind to fly. If you want to get real fancy, use soda straws with a piece of string up the inside to make a canopy mast that will telescope for about 2 inches. This will permit the wind to form the canopy to a



more wind-compatible shape, but if the spar is under a heavy strain, the soda straw comes to the rescue after the spar has deflected about 2 inches.

14. Finally, the bridle. Take a piece of your flying line twice the height of the kite plus six inches. Tie the ends of this line into the bridle loops on the keel leading edges; tie either bowlines or other non-slip knots and pull them tight. Take another piece of flying line about a foot long and tie overhand knots in 3 in. bights of line in each end so that you have loops about  $3/4$  in. in diameter. Slip one end of this short line around the bridle and slip the other loop through the first loop and pull the line tight. You have just tied a lark's head knot. Slide the lark's head to the exact center of the bridle line so that the two bridle legs are the same length.

Now lock the lark's head in place by grasping the two sides of the loop and pull them in opposite directions. You should feel a "click" as the lark's head locks up and can no longer be slid along the bridle. Mark the position of the lark's head on the bridle line in case you want to try changing the relative lengths of the bridle legs to compensate for construction errors that cause the kite to pull to one side or other. To unlock the lark's head, merely grasp the bridle legs on each side of the lark's head and pull the line tight. Again you will feel a "click" when the lark's head unlocks. You can now slide the lark's head left or right as desired and again lock it.

That's all folks. Go get familiar with your kite.