Shortening Spreaders on Troopers for Strong Wind

Trooper history

The original kite that ultimately became the Trooper was a light wind kite with long, thin ¼" dowels for wing spars. I called it the Zephyr. Its plan is on page 9 of my first book of drawings, below a design based on a Jack van Gilder delta modified by Bob Ingraham (A.K.A. founder member and editor of "Kite Tales") to become the A.K.A 10th Anniversary Delta, and modified further by me. This was in 1974.

Having acquired two lengths of a new ¼" fiberglass rod, and wanting to try them in a kite I put them into the Zephyr. At that time I hadn't yet started using the proper mathematical formulae for calculating towing points, so by coincidence this kite had a towing best suited to strong breezes, and also by coincidence I made spreaders quite a bit looser than I would later for light wind kites. All the delta plans I'd seen to that point in time had relatively long wing spars, too. By that I mean long in proportion to the overall length of the leading edges. All this together made a good strong breeze delta. It had straight trailing edges, no scallops, and no flaps.

About 10 years later I resurrected the design, putting a double-walled pop-fin on it just for the extra strength. The then "Tempest" had wood spine and spreader, with a mini-fin on top to prevent flexing and breakages. The original towing point was revised only insofar as to take into account scalloped trailing edges. The spreader clearance was reduced some.

I wasn't satisfied with the design's landings, and improved this finally by shortening the wing leading edge spars. This meant the kite didn't feel quite as solid in strong winds, but not far from it. It became the Trooper. The Tempest could be scaled up, but not so the Trooper. Its wing spars needed the longer length of the originals.

The current Trooper has a fiberglass center spine to lower the center of gravity, and an over-engineered carbon spreader roughly the same weight as the original wood. But the fit is not as loose as the original's.

Switching from wood to carbon for spreaders meant I could drop the supporting Flex-Stop, which made fitting carbon spreaders quite difficult. Wood is easy to trim so fine-tuning the fit is quick and straightforward. Not so for carbon. Where a sliver could be sawn off wood, carbon has to be filed, because the cutting tool is much thicker than a mini-hacksaw blade - thin slices aren't possible.

Additionally, humidity affects the fit, so that Troopers in different parts of the world fly differently if it happens to be significantly either drier or wetter than it is here when I fit the the spreaders.

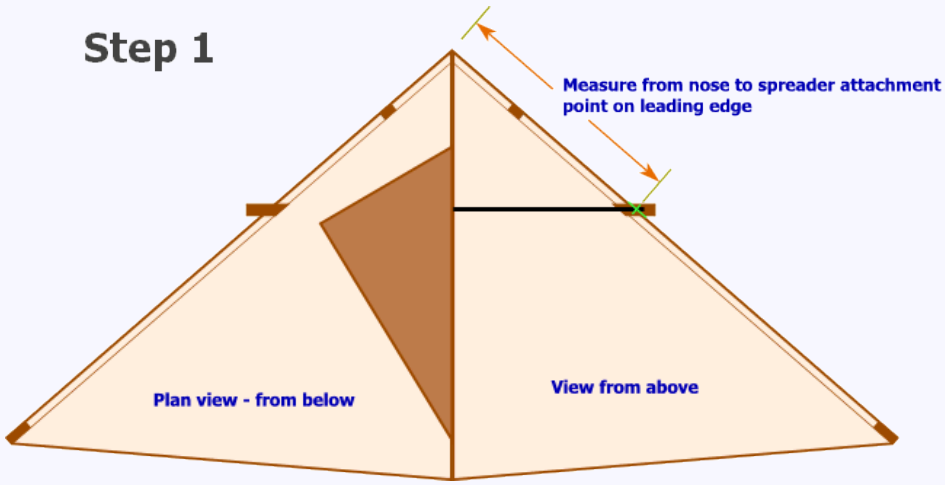
Strong breeze performance

The fit of the spreader has a direct relationship with the range of winds the kite flies in. For light winds, spreaders are a tight fit, and vice-versa. The tighter the fit, the more lift is generated, increasing performance in light winds. But stability suffers. With zero clearance a delta would only fly with a lot of extra drag somewhere, but it wouldn't handle well, if it flew at all. With a small gap for high efficiency, lift can be maximized, but any wind beyond a very low threshold causes a sudden uncontrollable dive. So there's a compromise. Elsewhere on this site I explain this in some detail.

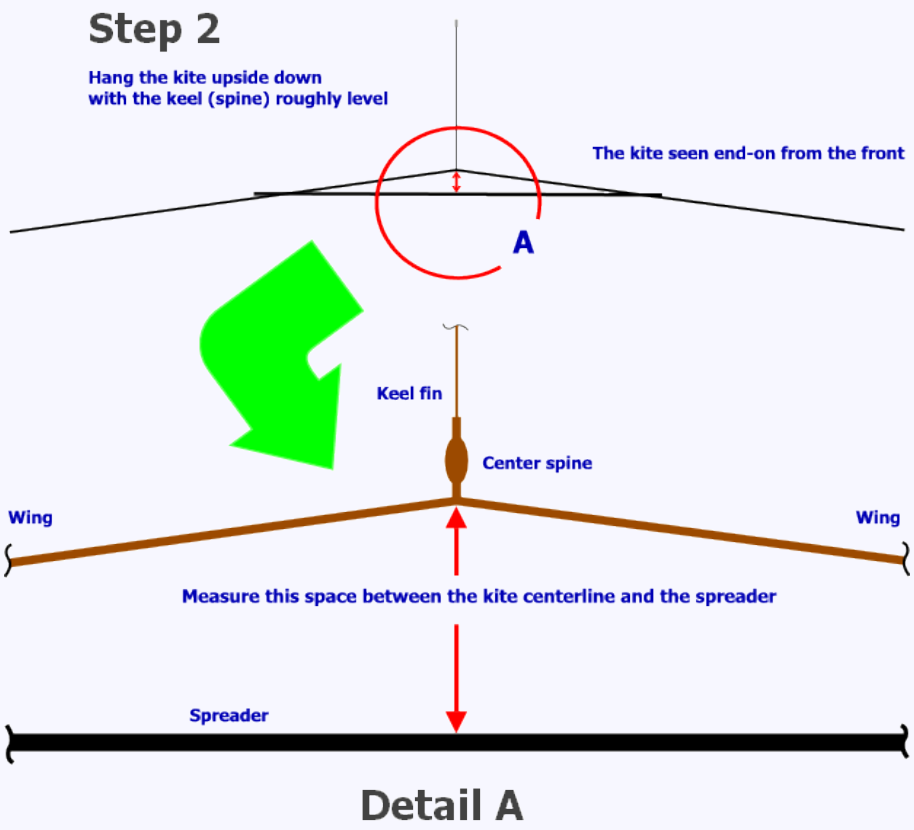
When the goal is purely strong breeze performance the spreader clearance will want to be as deep as possible without ruining the kite's ability to fly altogether. As mentioned above, the original Zephyr had a very loose spreader, and so the next section will show how a Trooper's spreader can be shortened to match local conditions of humidity, and increase the top end of the kite's wind range.

Measuring the spreader clearance

Only two measurements are involved, neither of which is the spreader's actual length. Follow the steps below, and then plug the values into the simple equation that follows. This will give a pretty good picture of where the kite stands, and whether the spreader can indeed be shortened. Old kites may be pretty loose already.



(Not to scale)



To calculate the percentages take the gap from Step 2 and divide by the distance from the nose in Step 1, and express as a percentage.

(Step 2/Step1) x 100

Example: if the nose-to-spreader measurement in Step 1 is 28.75 inches, and the gap from Step 2 is 4 inches, the percentage is (4/28.75) x100=13.9%.

When sparring up a new kite I normally aim for about 15½ to 16%. 18% should be significantly better for stronger breezes. The original (from my notes) is 19.9%. That's really loose by my current standards, but it did fly in strong breezes.

An alternative flexible spreader

More than 20 years ago I designed a 90° fringed delta around 27" fiberglass spars 1/8" diameter. It had a 3/16" wood dowel spine, and although spreaders are as short as they can be on 90° deltas, I felt (at the time) that 3/16" dowel was too thin and that ¼" was a bit too heavy. So I tried a spreader made from the same 1/8" fiberglass as the spars, and the result was interesting and instructive, though I never made much use of it until the R4. (I didn't get many orders for the "Cub", so I never re-ordered 1/8" fiberglass.)

Everything must have been optimum on that design, because the spreader didn't flex too much or bounce uncontrollably like a car with worn out shock absorbers. It sat glued to a spot in the sky - and the winds here are rarely steady. It was content to remain where it was, and wouldn't climb as high as a regular delta with an unyielding spreader. The spreader, along with the wing spars, just "gave" with the wind, in tune with the wind.

So, now I am thinking of trying a few tests of different spreaders on a Trooper, to try to find one that's both flexible *and* in tune with the kite's natural frequency. In other words, one that doesn't get into some wild oscillation, but allows the kite to ride out gusts while staying in one place. Unfortunately there aren't a great many choices available to me, but at least that should narrow down the possibilities one way or the other.

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