

KEVLAR BOWED KITE REPORT

Intro

Where I live the most used material for framing kites is cane. It's not easy to get carbon rods, so we use what we have by hand...

Our cane is a very noble material, very similar to bamboo but smaller. That means you always have one or two knots in a bow, so you have to carve it very carefully. Also it's impossible to have two equal bows that behave exactly the same way.

The other day I got a piece of kevlar rod which was part of a fiber optic cable and I thought it would be interesting to test it as a new material for kite bows.

The rod test

Before making a kite with kevlar I wanted to check the main properties of the rod. I measured the following data and compared it to a 0.05" carbon rod:

Diameter:

Kevlar: 1,40mm = 0.055"

Carbon: 1,27mm = 0.050"

Weight:

Kevlar: 3,37 grams/meter

Carbon: 2,20 grams/meter

Stiffness (product $E * I_x$):

Kevlar: 10,04 kgf*cm²

Carbon: 14,61 kgf*cm²

The ratio between them is: 0,687. That means that if you have a 0.05 carbon rod of a given length and you apply a force to achieve certain deflection; you need to apply 68.7% of that force to achieve the same deflection with this kevlar rod.

The first kite

Checking all the properties, it seemed to me that a kite built with this kevlar rod would be more stable and slower than the same kite built with a carbon rod.

Bruce Lambert suggested me to build a Gooddog with a 24'' bow length to begin with, so my first kevlar bowed kite was a Gooddog made with a cane spine, metalized gift wrap film (similar to mylar) for the sail and of course a 24'' kevlar bow.

I really was surprised at how it flew. The kite was not very fast but very predictable and easy to fly in very light winds. However if wind was a little heavier it was difficult to reach the edge of the wind window.

It was a bit noisy, since the kevlar didn't stretch the sail enough, but got better with a couple of battens.

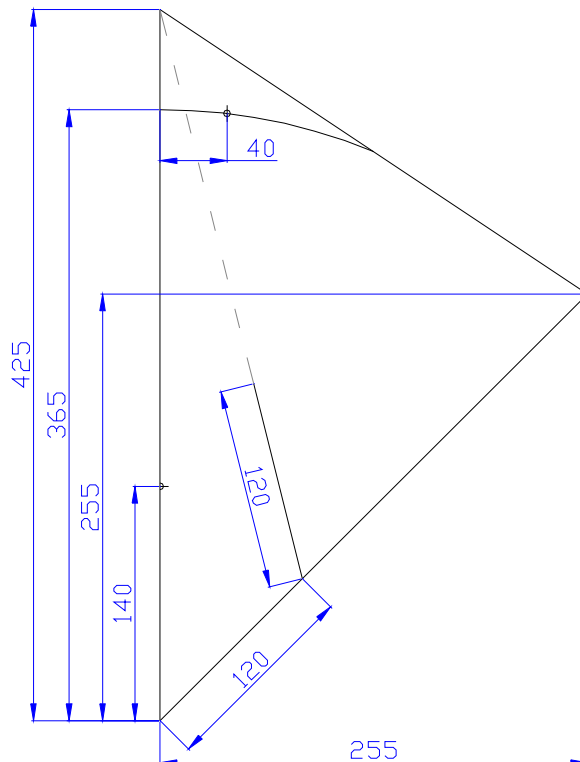
Although it was not a fast kite I liked it very much. Unfortunately I don't have a picture of it to post.

A new plan?

I wanted something more active but I also wanted to keep my Gooddog for those almost-no-wind days, so I draw some lines, checking different proportions and sizes. Personally I like the following proportions:

- high aspect ratio, near to 1,2
- high wing tip location, from the tail, about 60% of the total length of the spine
- high bow crossing point, from the tail, about 85% of the total length of the spine

As a result this is the plan I used, dimensions are in [mm]:



When I first looked at it I said to myself "Oh no! It looks the same as a Publix". I couldn't say it was a new design and I didn't want to plagiarize anything, but finally I decided to build a kite using this plan, in fact there were two differences:

- The bow was slightly more flexed.
- This design had battens.

Materials used were the following:

Sail: cellophane.

Bow: kevlar rod, 574 mm long.

Spine: It was made with a 3 x 2 mm pine rod.

Battens: 1 x 1 mm bamboo or cane.

Bridle: 3 point bridle made in crochet cotton thread.

Flying line: Crochet cotton thread, the same used for the bridle

Bond: Clear packing tape.

This is a picture of the design, it was decorated with a permanent marker:



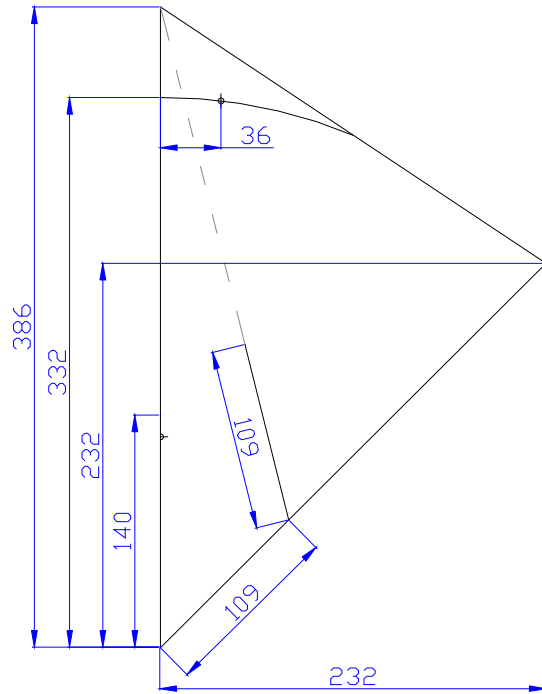
As a result I had a stiffer kite than the Gooddog, but I was not completely satisfied with it...

Scaling down

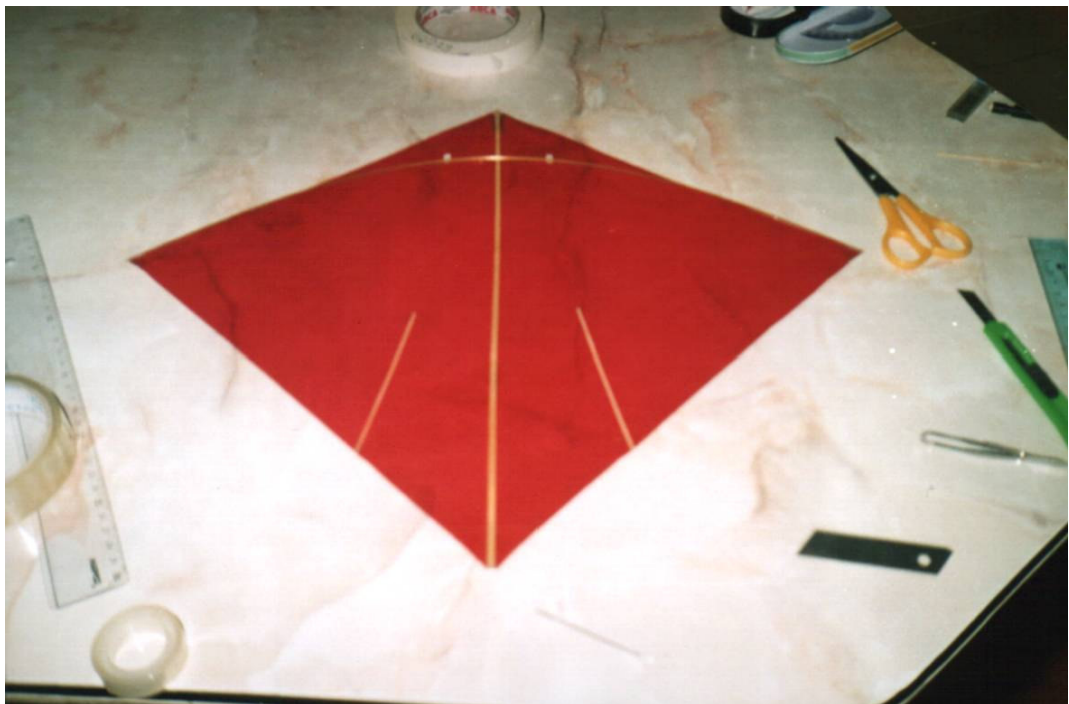
Based on the bow stiffness I determined that the kite should be scaled to $68.7\% ^{1/4} = 91\%$ (*).
With this measurements the kite should perform like if it was at full scale made with a 0.05'' carbon bow.

(*) *About this relationship, visit Simo Salanne's and Dave Lord's sites, they have great information about stunt kites spar flexibility and it's also applicable to fighter kites.*

The dimensions of the scaled plan are in the next figure:



See a picture of the kite taken at the moment I finished it:



At simple sight it was not a big difference in size, but as a result I got a much faster and lively kite. It spun faster but was still very controllable. I could reach the edge of the wind window easily.

Final words.

I learned a lot with this project and also had a lot of fun ☺ . I like testing new materials and I'm convinced that you can make a good fighter kite from almost any material you want.

If any body has experience or is interested in new materials for fighters and wants to share, please contact me. Also I'd like to hear what do you think of this report, any comments are welcome.

Good winds.

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