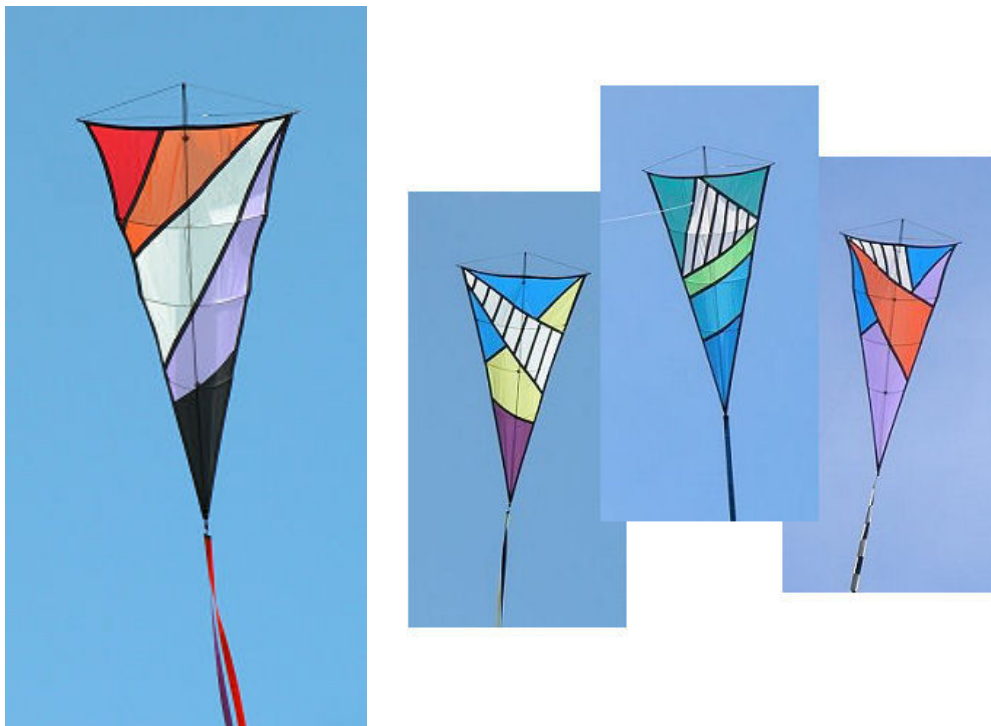


KOOS

KITE DESIGN

PRESENTS

THE SHARD KITE



The "Shard" kite is a triangular, low aspect ratio, single line kite I designed in 2003. It is a light pulling, bowed kite with ribbon tails. Its unique shape lends itself to a range of graphic and decorative styles.

The Shard is an uncomplicated kite to make and fly, and is an easily launched, steady flyer in a wide range of wind speeds. Even in strong winds it develops minimal pull and can be flown on 100lb breaking strain line.

At the flying field, setup time for the Shard is only a couple of minutes. Likewise at the end of the day, pack up time is even quicker! The kite can be packed down to one metre in length for easy transport.

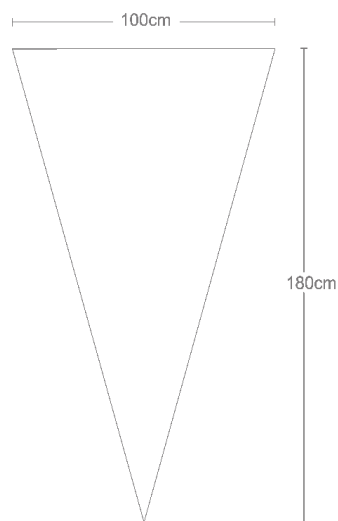
In this workshop each participant will construct a 1.8 metre tall, carbon and fibreglass framed, ripstop nylon Shard from the provided kit.

This kit contains the materials to make a Shard which incorporates a distinctive asymmetric graphic. It is based on a kite I called "Europa", which took first place in the Flat and Bowed category at the 2004 Festival of the Winds in Sydney, Australia.

The Shard is an isosceles triangle nominally 1.8 metres tall and 1 metre wide at the top, however, it can be scaled to suit or even stretched.

If you decide to change the dimensions or aspect ratio, you will need to compensate when choosing spars for framing. But the basic principles of construction are the same regardless of final size.

Finished Dimensions of Shard kite



My Shard is not the only low aspect triangular kite. A number of designers have approached the same challenge over the past 10 years with great success.

Notably, Frenchman Jean-Paul Richon developed his whimsical “Les Yeux” (the Eyes)

These utilize a spine which extends below the bottom of the sail, and a single cross spreader at the top.

Instead of using a bridle, the flying line attaches to a triangular keel



More recently, well known Malaysian kite designer, Ceewan has displayed his famous bridleless “Pointer” kites.

The flying line on these kites attaches to the upper spine, above the sail. The exact towpoint chosen varies depending on the wind speed

NOTE:

In the construction of this kite, there are separate but similar techniques used for the seams which join adjacent panels, and the hems which are used to finish the kite edges.

Both these techniques use double-sided sailmaker tape to accurately hold panels together before any sewing is done. Unlike other methods which utilize sailmaker tape in kite assembly, these techniques do NOT sew through the tape and so do not result in any gumming of your needle or sewing machine.

You can practice these techniques on the provided scrap fabric before assembling the kite.

TECHNIQUE 1 - Seams which join adjacent panels



On the front surface of one of the panels draw a pencil line 8 mm from the edge along the length of the edge to be joined.



Apply sail-maker tape along this line, between the line and the edge of the fabric, leaving a 2 mm gap at the edge of the panel.



Peel away the tape backing and stick the second panel face down on the first panel aligning the edges to be joined.



Draw a pencil line 8 mm from the edge where the panels are stuck together along the length of the join.

Sew a straight seam along the length of the pencil line. If you have aligned the panels carefully, your seam will not pass through any sail-maker tape and won't cause any "gumming" of your needle or sewing machine. You may wish to back-tack the beginning and end of each seam, or you can trim the ends and heat seal with a disposable cigarette lighter or match (or your preferred method).

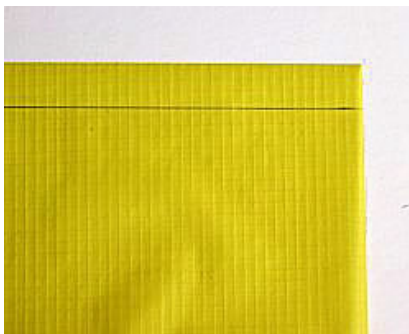


Open the resulting panel out to form a flat panel and place face down on your work area. Press the excess material down so it lies behind the darker coloured fabric, then sew a straight seam along the length of the folded material approximately 1 mm from the edge. This seam should also avoid passing through any sail-maker tape.



The result should be a neat flat seam joining two adjacent panels.

TECHNIQUE 2 - Hemming the edge of a panel



On the back surface of the panel draw a pencil line 16 mm from the edge along the length of the edge to be hemmed.



Apply sail-maker tape along the very edge of this panel. This will leave a 10mm gap between the inside edge of the tape and the pencil line you have drawn.



Fold the edge of the fabric to the pencil line, and crease the fold down firmly.

Peel away the tape backing and stick the fabric edge to the pencil line.



Then apply a second fold to the edge of the fabric along the pencil line.

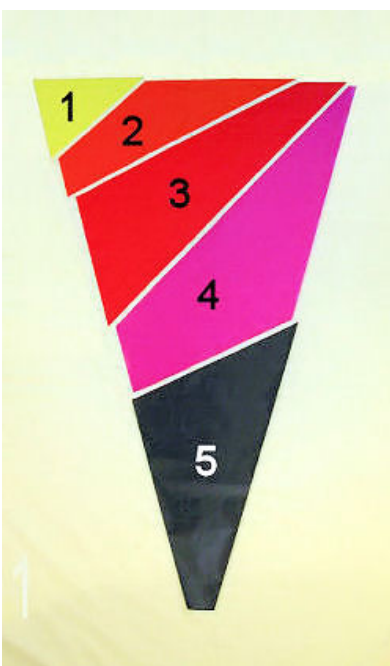
Sew a straight seam about 7 mm from the resulting edge of the fabric (about 1 mm from the inside fold of the hem). This seam should also avoid passing through any sailmaker tape.

When you've been successful trying these two techniques out, its time to make your kite!

Kit Contents

- 5 pre-cut ripstop nylon sail panels
- 1 pre-cut 5 cm x 1100 cm 1.5 oz ripstop nylon leading edge tunnel
- 8 pre-cut dacron reinforcing patches
- 6 pre-cut dacron pockets
- 8 metres thick braided dacron bridle line
- 3 metres thin braided dacron line
- 2 nock caps
- 2 metres 5.5 mm pultruded carbon rod (pre-cut with ferrule)
- 1 length 4 mm fibreglass rod
- 1 length 3.5 mm fibreglass rod
- 1 length 3 mm fibreglass rod
- 1 length 2.5 mm fibreglass rod
- Various sizes vinyl end caps
- 1 roll 6mm double sided sail-maker's tape
- 1 metric ruler
- 1 marking pencil
- 3 x 5 metre tails

Constructing the Kite



There are 5 pre-cut ripstop nylon panels. Sort your panels, so you know which one is which.

Technique 1 is now used to join the kite panels together.

Start the assembly with the top two panels.



Place the larger panel (panel number 2) face up on your working area. Measure and draw a pencil line 8 mm from the top edge.



Apply sail-maker tape along the line leaving a 2 mm gap at the edge of the panel



Peel away the tape backing, then stick the top panel face down onto the front face of that panel, edge to edge



There will be a small section of material overhanging at each end.

The two panels should overlap exactly at the pencil line, 8 mm from the panel edges.



Sew a straight seam along the length of the pencil line



Open the resulting panel out to form a flat panel and place face down on your work area. Press the excess material down so it lays down flat behind the darker panel.



Now sew a straight seam along the length of the folded material approximately 1 mm from the edge. This seam should also avoid passing through any sail-maker tape.



Place the joined panels face up on your work area. The result should be a neat flat seam holding the panels together.



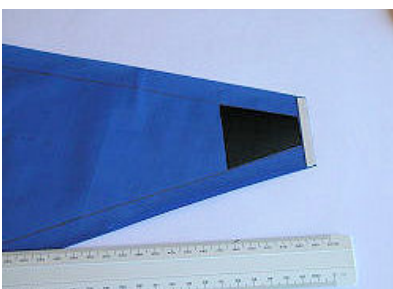
Use the same technique 3 more times to join all remaining panels together. The result should look like this!

Applying tail reinforcing patch

TECHNIQUE 2 is now used to finish the edges of the kite and secure the tail reinforcing patch



On the back surface of the kite draw a pencil line 16 mm from the edge of the long sides of the kite.



Apply sailmaker tape across the bottom edge of the kite, then stick the tail reinforcing patch to the back of the kite above the sailmaker tape, and inside the pencil lines.



Fold the bottom edge up over the bottom of the dacron patch, then remove the tape backing and stick down.



Apply sailmaker tape along the very edge of the long sides of the kite. This will leave a 10mm gap between the inside edge of the tape and the pencil line you have drawn



Fold the edge of the fabric to the pencil line and crease the fold down firmly. Peel away the tape backing and stick the fabric edge to the pencil line.



Next, apply a second fold to the edge of the fabric along the pencil line, and crease the fold down firmly



Hem the edge of the kite using a straight seam about 7 mm from the resulting edge of the fabric (about 1 mm from the inside fold of the hem) as per TECHNIQUE 2.

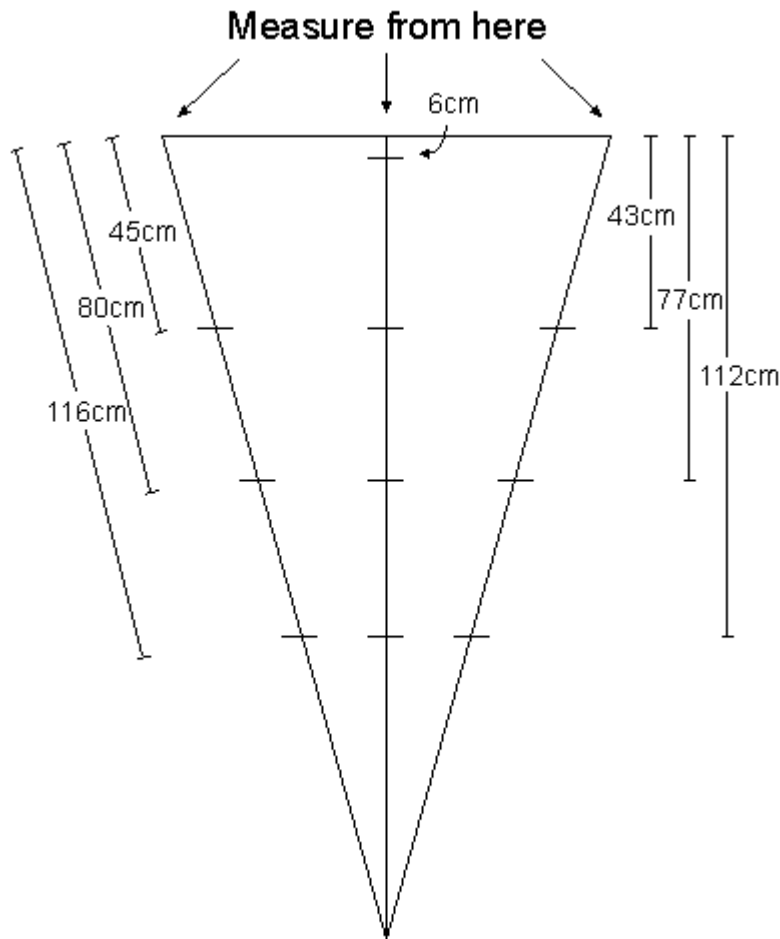
Start this hem at the top right hand corner of the back of the kite, and continue all the way around the tail of the kite to the other top corner.



Sew a straight seam along the remaining edge of the dacron patch.



The kite now looks like this.



On the back of the kite, measure and mark the locations of the bridle reinforcement patches. These are on the centre line, 6cm, 43cm, 77cm and 112cm from the top edge of the kite.

Then measure and mark the location of the spar pockets on each edge. These are 45cm, 80cm and 116cm from the top corners of the kite.

NOTE:
The measurements are taken from the top of the kite, not the tail end.

Applying pockets and bridle reinforcing patches



Stick the dacron pockets at each end of the cross spreader locations using sailmaker tape.

Using a straight stitch set close to the edge of the patch, sew each patch onto the kite. Don't sew along the folded end of the pocket.



This is how it looks on the front side of the kite.

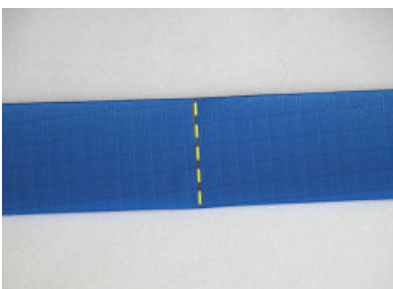


Stick a square dacron patch at each bridle reinforcing location using sailmaker tape. (For a neater look, align each patch with the corners along the centre of the kite, like a diamond.)

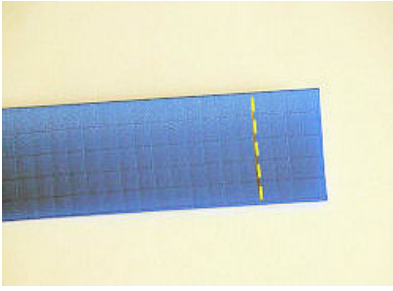


Using a straight stitch set close to the edge of the patch, sew each patch onto the kite. This is how it looks on the front side of the kite.

The final part of sail construction involves preparing and attaching the spar tunnel across the top of the kite. The spar tunnel needs to be flexible, hence the use of 5 cm wide 1.5 oz. ripstop, rather than 4 oz. Dacron tape.



Draw a pencil line across the centre of the piece of 1.5 oz ripstop fabric to be used as the spar tunnel.



Next, draw a pencil line at either end, 50 cm from the centre line.



Using sailmaker tape, stick the three dacron reinforcing patches to the spar tunnel at the centre, and at the two ends to the inside of the marked lines.



Fold the ends of the fabric over the dacron reinforcing, then stick down with sailmaker tape



Next, fold the spar tunnel in half lengthwise.



Place the top of the kite inside the spar tunnel, butted up to the fold line.



Sew the tunnel to the kite using a straight stitch, adjacent to the edge of the spar tunnel.

For a more accurate finish, you can use sailmaker tape to hold the tunnel in place while you sew.

DO NOT SEW THE ENDS OF THE TUNNEL SHUT!!

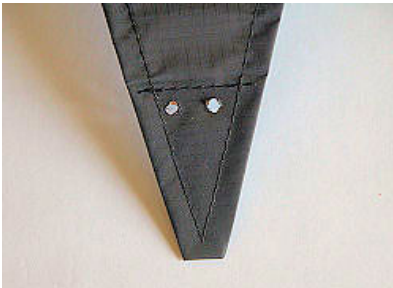


Mark a point at each end of the spar tunnel, then use a heated metal rod to burn a hole through the reinforced area. This will heat seal the hole, strengthening the edges.

A soldering iron or wood burning tool is ideal for burning these holes. An inexpensive alternative is to use a nail that has been hammered into a block of wood. You can manually heat the nail with a disposable cigarette lighter.



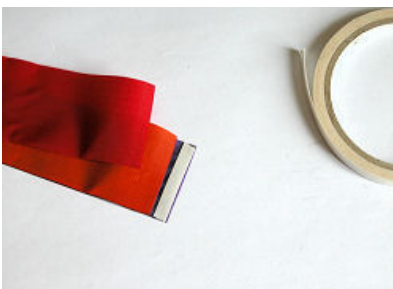
Next, burn holes through the spar tunnel 1 cm either side of the centre, and also burn a hole in the centre of each bridle reinforcing patch.



Mark the tail of the kite 4.5 cm from the bottom, then burn holes 1 cm apart through the reinforced area. This will heat seal the hole, strengthening the edges.

Construction of the sail is now complete.

Making the tails



Stick the three tails together at one end using short lengths of sailmaker tape.

Fold the dacron reinforcing in half, then stick over the joined end of the tails. Using a straight stitch, sew all layers together.



Burn a small hole through the centre of the dacron patch, then tie a short overhand loop of bridle line through the hole.

At the other end of each tail ribbon, double fold the end and hem with a straight stitch.



Next you can move on to the framing and bridling of your kite.

Framing the kite

Cross spreaders

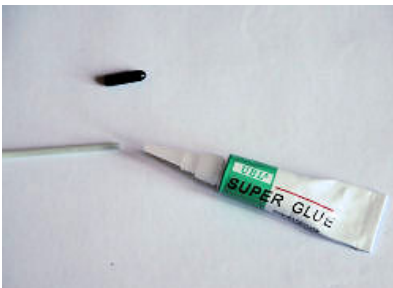
The cross spreaders are all different diameters – the shorter the spar, the smaller the diameter. If we were to use the same diameter spars all the way down the kite, each spar would have much more resistance to bowing than the longer one above it. By using progressively smaller diameter spars, the resistance to bowing remains constant down the kite from top to bottom. This helps maintain an even profile in flight, and has the added benefit of reducing unnecessary weight.

The method for preparing each of the lower 3 cross spreaders is the same.



For each cross spreader there is a length of fibreglass rod, and four vinyl end-caps.

The top spreader is 4mm diameter fibreglass rod
The second spreader is 3.5mm diameter fibreglass rod
The third spreader is 3 mm diameter fibreglass rod
The bottom spreader is 2.5 mm diameter fibreglass rod.



Using cyanoacrylate (crazy glue, super glue, etc.) fix a vinyl end-cap to one end of the cross spreader.



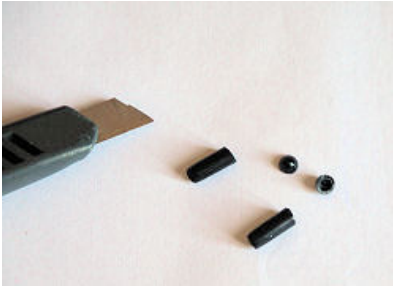
Allow time for the glue to dry, then insert this end of the cross spreader into one side pocket at the correct location on the kite.



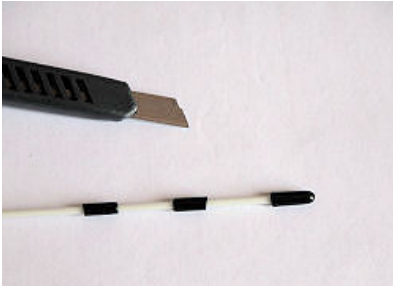
Line up the other end of the spreader with the opposite side pocket, and with the sail under gentle tension mark the required length of the spreader.



Cut the spreader to length, then push the other vinyl end-cap onto the cut end. Fit the spreader to the kite, and check that the spar is not too long. If necessary, remove the vinyl cap and gently file the cut end of the spar until you get the correct length.



Trim the solid tips from two of the end caps to make short lengths of vinyl tubing.



Remove the unglued vinyl end-cap, then slide two vinyl stoppers onto the spreader. Now glue the end-cap in place then refit the spreader to the kite.



Slide the vinyl stoppers 1 cm from each pocket. Mark their location with a pencil, then slide the stopper a short distance back toward the centre of the spar.



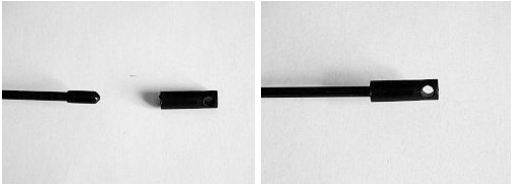
Apply cyanoacrylate, then glue the vinyl stoppers into place at the pencil marks.



When the glue dries, fit the spar into the pockets. Repeat this procedure for each end of the 3 lower spreaders.



Measure the exact length of the top spar tunnel. The top cross spreader should be 5 cm longer than the spar tunnel measurement. If necessary, cut the spar to the correct length



The top cross spreader does not have vinyl stoppers, but has hard plastic nock caps fitted at each end. Glue a vinyl end-cap on each end of the top spreader. Moisten the end-cap then slide the plastic caps over each end, making sure the holes through the plastic caps line up in the same direction.



Take one of the thick black dacron cord loops approximately 7 cm long.



Thread this from the back of the kite, through the hole next to one end of the top spar tunnel. Pass the cord upwards through the cap on the end of the top spreader.

Repeat on the opposite end of the spar.



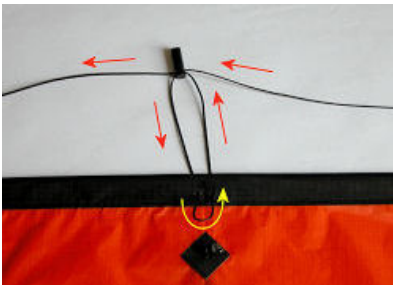
Measure a 200 cm length of thick black dacron bridle cord. Attach a line tensioner to one end using a short overhand loop. This will be used to tension the spine at the top of the kite.

Make a second tensioning line using a 145 cm length of thick black dacron cord. This will be used to bow the top cross spreader.

Make three more tensioning lines, using 85 cm, 60 cm and 45 cm of the thin black dacron cord. These will be used to bow the 3 lower cross spreaders.



Take the tension line for the top of the spine. Thread the free end of the line through one of the loops on the end of the top spar, then thread it through both holes of the line tensioner.



Next, thread it through the top-cap, then through the centre hole on the OPPOSITE side of the kite from the front.

Now pass the cord from the back of the kite, through the other centre hole and back up through the top-cap.



Tie the free end to the loop at the other end of the top spar.
See the example kite at the front of the classroom for clarity



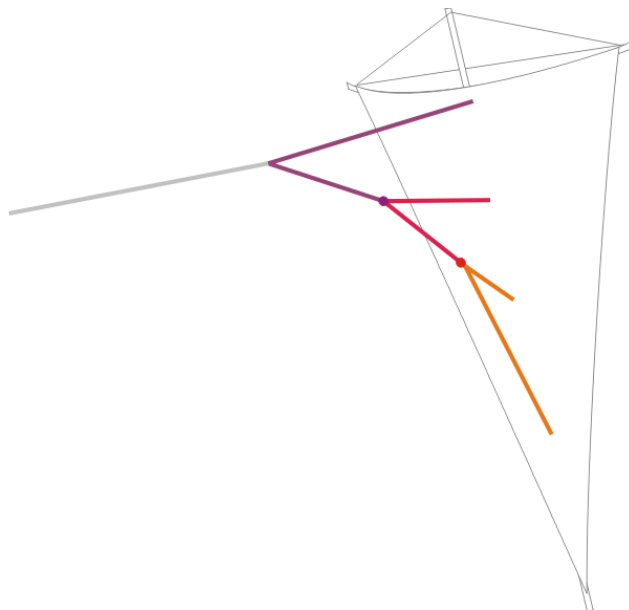
Next, take the tension line for the top spreader.
Thread the free end through the hole in one end cap, then thread it through the line tensioner.



Tie the free end to the end cap at the other end of the top spar.

Attaching the Bridle

The bridle used on this kite is a self adjusting, cascading bridle that comprises three interlinking legs

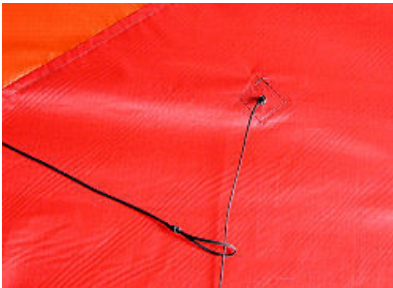




Cut 3 lengths of thick dacron cord – 125cm, 95 cm and 125 cm long. Tie a short overhand loop at each end.

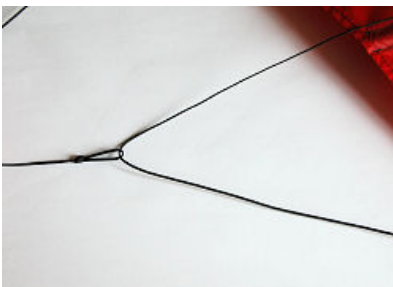


Using one of the 125 cm lengths, thread one end loop through the bottom bridle hole, and pass the lowest cross spreader through the loop. Then replace the spreader into the end pockets.



Thread the free end of the bottom bridle line through one of end loops on the 95 cm bridle line. Then thread the free end loop through the next bridle hole.

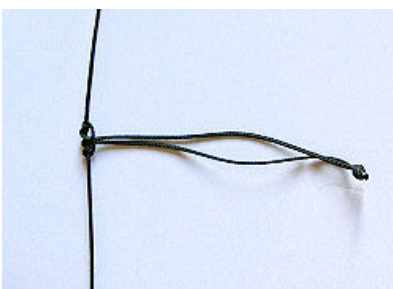
Now thread the next cross spreader through this end loop, and replace the spreader into the end pockets.



Thread the free end of the middle bridle line through one of end loops on the upper 125 cm bridle line. Then thread the free end loop through the next bridle hole. Now thread the next cross spreader through this end loop, and replace the spreader into the end pockets.



Thread the remaining end loop through the top bridle hole. Tie a knot very close to the end of the loop to prevent it falling back through the hole

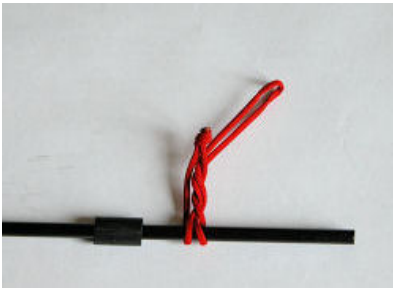


Cut a length of bridle line approximately 25 cm long, and tie it into a large overhand loop. Using a double lark's head (Prusick) knot, attach it approximately 84 cm from the top of the upper bridle line.

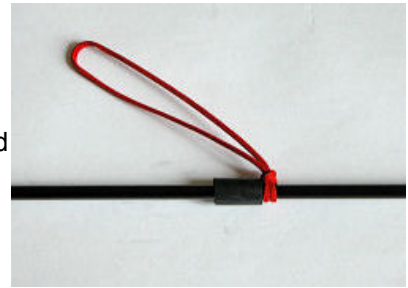
Fitting bow lines to the remaining cross spreaders



On each of the bottom 3 spreaders, place one thin dacron loop behind one end of the spreader. Then pass the loop end through the knotted end.



Pass the loop end through the knotted end a second time, and pull tight.



Next, take the tensioner line and pass the free end through the small loop you just tied to the end of the cross spreader. Then thread the free end through the tensioner, and slide the tensioner most of the way toward the small loop.



Tie the free end onto the other end of the spar, using a slip knot behind the vinyl stopper. Replace the spar into the spar pockets.

Repeat this procedure for the other two spreaders.



Take the short (24 cm) length of **thick** black dacron cord and thread through the holes at the tail end of the kite from the front to the rear.

(Shown here as white for clarity)

Tie the ends together to form an overhand loop



Attaching the spine to the kite



Fit the two spine spars together, then thread the spine under each bow line and through each of the bridle loops on the back side of the kite. Also make sure the spine passes under the top tension line at the rear centre of the top spar tunnel

It is not particularly important whether the spine fits under or over the other cross spreaders.



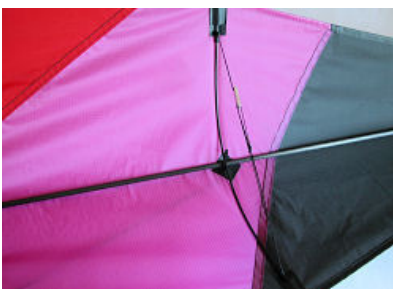
Thread the bottom end of the spine under the knotted part of the loop on the tail of the kite, then fit the end of the spar into the end cap.



Fit the top end of the spine into the top end cap, and tension up the top of the kite.



Attach the tails using a lark's head around the spine.



Tension the bowlines to form an even curve along the length of the kite. This will loosen the tension on the spine, so re-tension the spine to suit.

GO FLY!!

Notes added August 2010

The Shard flies well in light winds, but tends to “sway” as the wind speed lifts. To compensate for this, the amount of bow applied across the back of the kite can be increased. I often fly the Shard with each bow forming a semicircle

Most kites that exhibit a swaying motion when the wind speed increases benefit from the towpoint on the bridle being set heavier (or further away from the nose of the kite). The Shard will react favourably with this type of adjustment, but this will significantly increase the amount of pull the kite generates.

Surprisingly, just the opposite will also lessen the swaying effect. By adjusting the towpoint upwards, so that the kite flies only on the top line of the bridle, the shard will tend to settle into a “floating on the wind” attitude with very little pull.

Ultimately though, there is an upper limit to the windspeed that this kite will tolerate.