

CHAPTER 5:

FIGHTER KITE TUNING

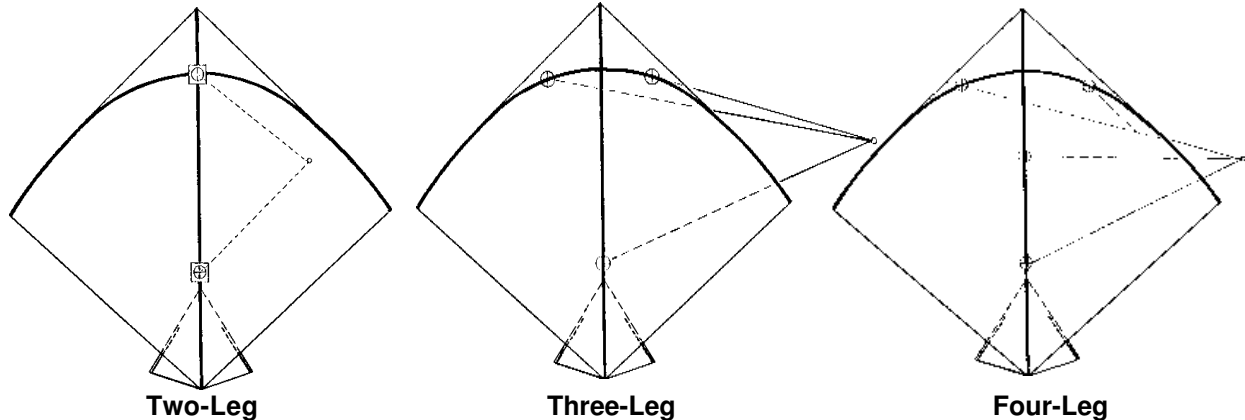
The best musician sounds terrible on an instrument that's out of tune. Just as a properly tuned musical instrument gives good sound and great pleasure, a properly tuned fighter will delight you with its ability.

The main reasons we tune kites is to adjust for wind conditions, to correct errors, and to maximize performance. In stronger or lighter winds, a kite can be tuned to increase speed, reduce pull, or simply stay in the air.

The process is simple if you know what to look for and what to do.

Bridle Adjustments

Most fighters have a two leg bridle system. You will also see a number with three legs and occasionally a kite with four.



The upper end of a two-leg bridle is usually connected to the point where the fighter's center spine and spar cross.

On a three-leg bridle, an upper bridle line "straddles" the spine and is connected to the cross spar at two points equal distance from the spine.

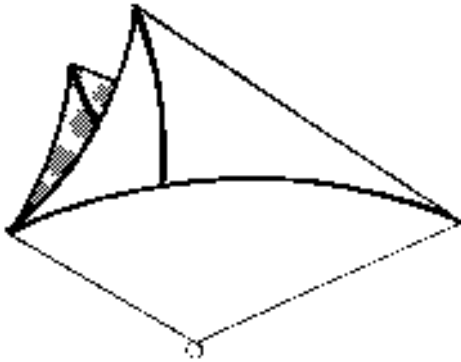
The lower line of both two and three-leg bridles is connected to the spine somewhere in the lower half of the kite. Very few fighters have the lower bridle connected at the bottom of the kite.

A four-leg bridle uses an additional line to spread some of the wind stress to an additional point along the center spine.

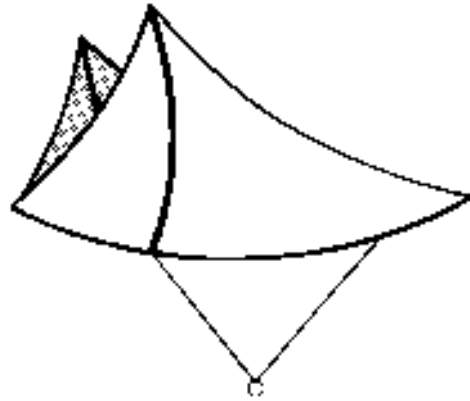
The Bridle is the kite's "brain". This short piece of string attached to the kite adjusts the angle at which the kite heads into the wind. The more squarely a kite faces the wind, the faster it will go.

Dinesh Bahadur
Pacific Grove, California

The purpose of these numerous connection points is to distribute the wind pressure evenly across the frame of the kite. If your bridle points are not properly placed, there's a good chance you'll distort the shape of your kite and its performance.



**Bridle points too far apart:
Spine center bows back**



**Bridle points too close:
Spine ends arch back**

Some people say the bridle lines can never be too long, but long bridles do become a bit unwieldy at times. On the other hand, bridles that are too short make the kite unstable.

Long bridle lines help stabilize the kite and make self-launches easier. More bridle lines, as in a three or four leg bridle also help stability. But please remember that extra long lines also make tangles easier. When the kite becomes unstable in a light wind, bridle lines can quickly become hooked around the edges of the kite and cause a crash.

Makoto Ohashi
Tokyo, Japan

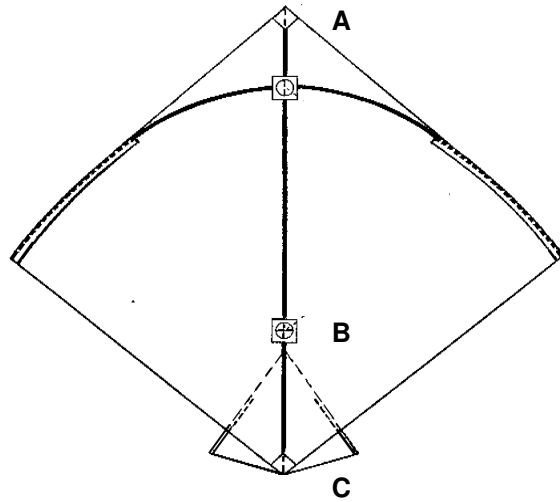
Adjust the Angle of Attack: As you know, when you adjust a fighter's bridle, you're changing the kite's angle of attack. This is something we talked about quite a bit in Chapter Three. The angle of attack is the angle at which the kite meets the wind. As winds change, the angle may need to be slightly adjusted.

Adjustment is a matter of personal taste. Within a certain range, a kite will fly. How it flies depends on where within that range it is adjusted. Some fliers like fast flying and taut flying lines. Others like their kites to float around the sky. Most like a mix of both. It's up to you.

The full range of adjustment will best be found through "trial until error". So adjust the bridle up and fly the kite. Then adjust up some more and fly again. Keep doing that until you're sure you've gone too far. Then do the same thing adjusting down.

This way you'll know what your kite will do through the whole range, and will be better able to decide what you like. And if your next kite isn't adjusted to suit you, you'll know what to do about it.

A good rule of thumb for both bridle length and setting the angle of attack is to place your tow-point so that the upper leg of the bridle is one-half the length of the spine (one-half of the distance from A to C) and the lower leg of the bridle is the same length as the distance from the lower connection point to the nose of the kite (the distance from A to B).

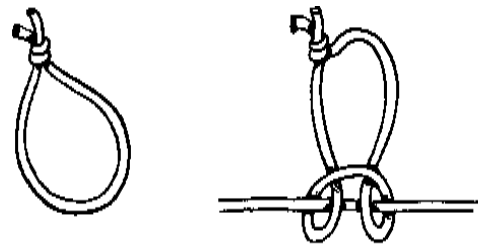


Adjusting a kite to be more responsive in heavy winds can be dangerous. The kite will fly very fast and you will need very quick reactions to control it. The kite is more likely to crash, especially during launches, and if you hit someone while flying faster, you may hurt them more.

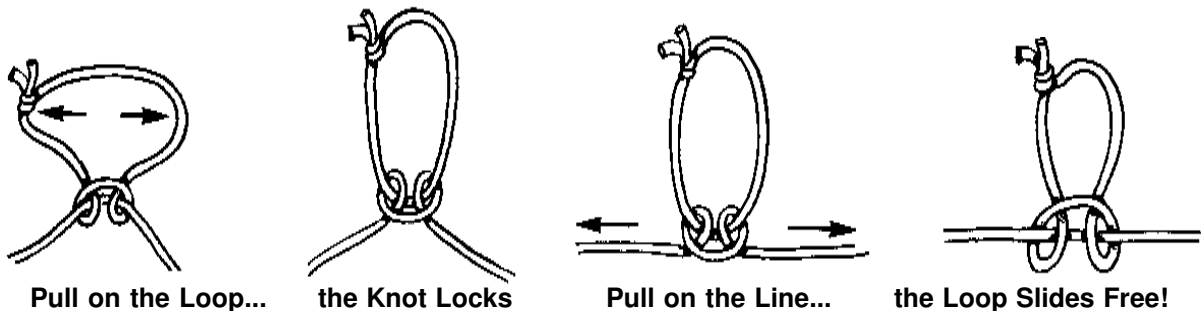
Makoto Ohashi
Tokyo, Japan

There are two basic ways to adjust a fighter's angle of attack. You can either shift the tow-point up or down, or shorten the lines between the tow-point and the top or bottom of the kite. As long as the bridle is long enough, the result will be the same.

Move the Tow-point: One easy way to shift the tow point is to make a movable connection. Tie a small piece of line, similar to your bridle line, into a loop about two inches long. Attach the loop to your bridle with a larkshead knot and slide it to the locations you want to use as a tow-point.



Notice that if you put tension on the loop by pulling it open, the knot will “flip over” and lock itself in place on the bridle. Put tension on the bridle line by pulling on either side of the larkshead, and the knot will flip over again and allow you to slide it to a new position. Now all you need to do is attach your flying line to the loop.



The “locking loop” is one of the neatest tricks we’ve ever learned in kiting. Try it a few times and you’ll quickly see that it is a useful way of adjusting the tow-point on almost any kite.

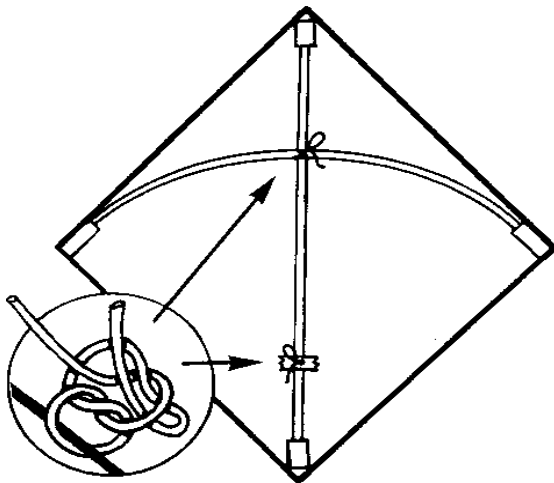
Small adjustments of the tow-point position on the bridle can greatly change a fighter’s performance. This adjustment is made to suit the flier and the performance they want, rather than to suit the wind strength.

Set a higher tow-point and your kite will spin faster and quicker; too high and it will be hard to control or not track well. Set a lower tow-point for a more stable flight and good tracking; too low and the kite will not respond well or fly slower.

Martyn Lawrence
Gwynedd, Wales, United Kingdom

Change Bridle Line Length: Often, a fighter will come with a permanent tow-point already tied in the bridle. In order to adjust these types of kites, you need to change the length of either the upper or lower bridle lines.

Simply untie the knot that attaches the bridle to the kite. Take in a little line and retie the knot. If there is extra line available, you can also let out the bridle to make adjustments.



A good knot that can be quickly untied or pulled snug after the adjustment makes this job much easier.

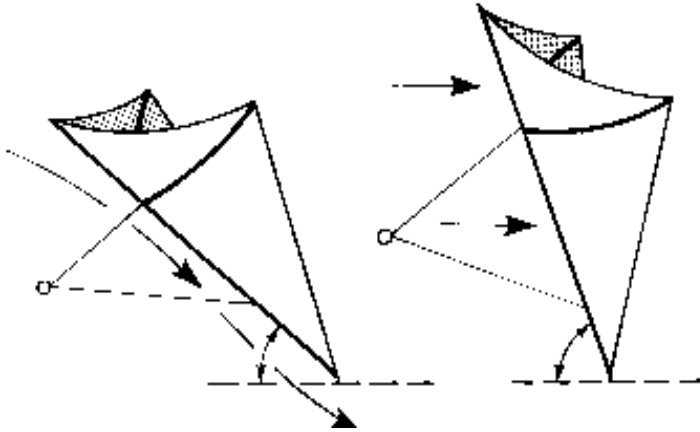
Making the top leg shorter has the same effect as moving the tow-point up. Making the bottom leg shorter is like moving the tow-point down.

On a two-leg bridle, you can adjust either end of the line. On a three-leg bridle, you will probably need to focus on taking in or letting out the lower end. Usually, a little extra line will be available.

A pilot should always handle the control line with a gentle touch. When you begin experimenting, you must adjust the bridle to a beginner’s touch. Once you have good control, readjust the bridle, making it more sensitive and fine for a delightful flight. I often readjust the bridle for my son so that he can get a correct flight control and enjoy his flying time without frustration.

Philippe Gallot
Paris, France

Effect of Adjustments: Adjusting the attack angle up will point the nose of the kite more into the wind, letting some of the wind pressure slide off the sail. Moving it down allows the sail to catch more wind.



In general, when the wind gets **STRONGER**, you'll need to move the tow-point up or shorten the top part of the bridle line. We call moving the tow-point up "**setting heavier**" because it's for heavier wind.

If the wind gets **LIGHTER**, you'll need to move the tow-point down or shorten the lower part of the bridle line. We call moving the

tow-point down, "**setting lighter**".

Contrary to advice I've heard elsewhere, you lower the bridle for higher wind speeds rather than raise it. The classic bridle adjustment for high winds is made in order to reduce stress on the sail and frame - at the cost of performance. If you're more interested in performance than breakage, then your adjustment will be just the opposite of the classic.

Mel Govig
Randallstown, Maryland

Remember, bridle adjustments are a matter of personal taste. Don't be afraid to experiment!

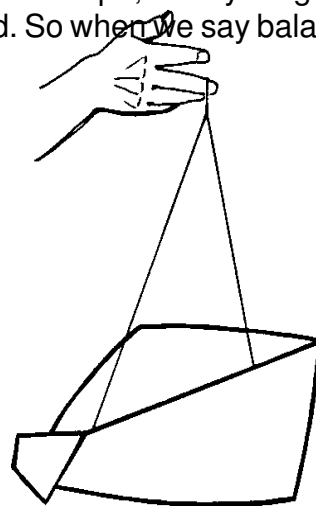
Balancing the Kite

In Chapter Three, we discussed the importance of balance in fighter construction and flying. The kite should be symmetrical in frame and shape, evenly weighted from side to side, and have all sail area evenly distributed. So when we say balanced, we

mean EXACTLY BALANCED.

Check the kite's balance regularly before launching. Remember that crashes can effect the balance and may even have moved your tow-point.

Hold it by the bridle tow-point and look to see if it leans to one side or another. You'll be able to tell if there's a serious problem.



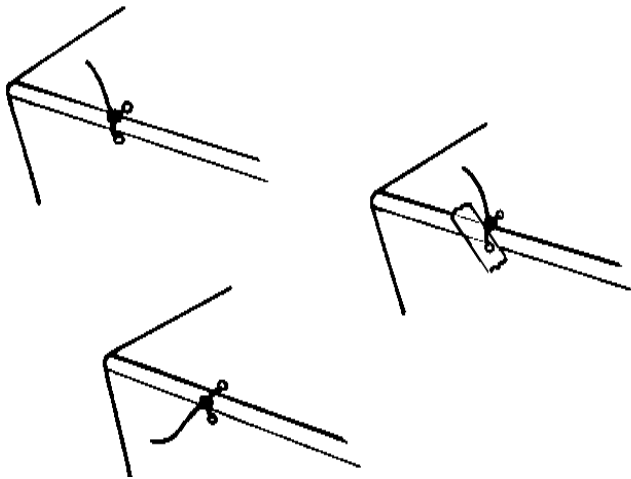
You can also check your balance during flight. A poorly balanced kite has a tendency to dive on the heavy side or loop in circles no matter how much tension you put on the line. The kite should not lean to either side and should fly free and straight with little slack on the line.

A properly balanced fighter will turn left or counter-clockwise when flown to the right of the wind. It will also turn right or clockwise when flown to the left of the wind. If you're properly tuned, you should with practice, be able to turn figure eights directly down wind.

Ric Merry
Seattle, Washington

Adjusting a fighter's balance depends on how the kite was constructed. Two leg bridles are different from three leg bridles. You can also try adding or shifting weight on the kite to correct problems. Let's take a more in-depth look at each of these approaches.

Two Leg Bridles: One effective method of adjusting the balance of a kite with a two leg bridle is to fine tune the bridle connection knots. Over time, the knots may have slipped around the kite's spine and effected sail distribution. This may seem like a minor change, but if the knots are not centered, you'll see the results when the kite goes into the air.



If the kite leans to the right during flight, move the knot to the left. If the kite leans to the left, shift the knot to the right. Test fly the kite as you move the knot in stages. Significant balance changes can be achieved with only minor changes in the knot's position.

If this doesn't correct the kite's overall balance, try the same procedure on the bottom bridle connection. When you find the best position, secure it with clear tape. Be sure you don't actually cover the knot. You may need to untie it later.

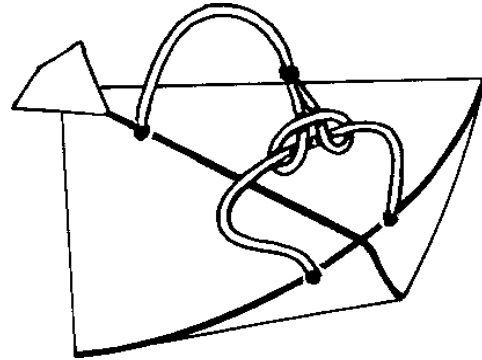
A properly tuned kite will perform a figure eight overhead in a space of three or four feet. For fastest performance, move the bridle point up as high as you can while still maintaining direction and control. The ideal setting for wind conditions allows the kite to track instantly when you retrieve line and to turn immediately when you give slack.

A well tuned kite can be flown from side to side, parallel to the ground, without losing or gaining altitude.

Joel Scholtz
Austin, Texas

Three Leg Bridles: The main reason for using a three leg bridle in the first place is to spread the bridle load and balance the kite better.

If the kite is out of balance, you need to make small changes where the lower line connects to the upper line. Usually, the lines are connected with a larkshead knot. Remember the “locking loop”? Simply shift the connection point and tighten up the knot.



If the kite leans to the right during flight, move the knot to the left. If the kite leans to the left, shift the knot to the right. Test fly the kite as you move the knot in stages.

Remember, significant balance changes can be achieved with only minor changes in the knot's position.

Larkshead and moveable knots are much easier to handle if you rub them occasionally with bees wax. A good wax coating prevents slippage and tangles. Pick some up at a kite store, fabric store -- or from a nearby bee hive.

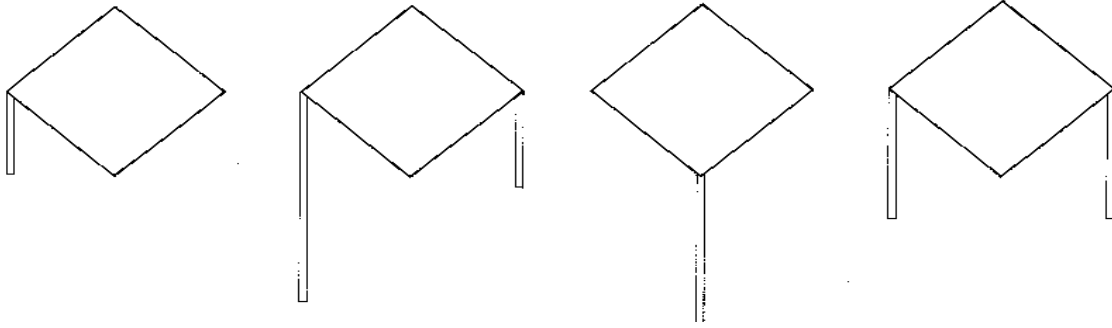
Weight Shifts: A final approach to correcting balance problems is to add adhesive tape or small pieces of fabric to the edges of the kite. Maybe you've already done this while making repairs and suddenly find the kite out of balance. Remember, exact balance is important, so if you make repairs to one side of the fighter, compensate by adding tape or fabric to the other side as well.

There are all kinds of tricks you can use to adjust an unbalanced kite. Some fliers attach paper-clips to the leading edge. You can also use putty or even chewing gum along the center spine.

My favorite technique is to slide a piece of vinyl tubing over the cross-spar. The tube should be about two inches long and roughly the diameter of the spar so that it fits snugly. Simply slide the tube to the appropriate place on the spar to balance the kite. Usually, I cut the tube into a spiral shape, like a cork-screw, so that I can easily snap it on or off.

**Carl Crowell
Portland, Oregon**

If your fighter continues to lean, one simple solution is to put a tail on the kite to provide drag and keep the nose pointed up. You aren't necessarily limited to adding tail to the base of the kite, either. Tails and streamers can be attached to many different parts of the kite.



Of course, the more tail you add, the slower your fighter will fly and the less likely it will be to spin or move freely. A well balanced kite which is easy to maneuver and control is your primary goal.

If you fly near the beach, you should probably check your spar pockets for sand on a regular basis. It's simple but true: sand in your pockets will unbalance the kite. And too much sand in your spine pockets will make the kite spin real fast!

Ric Merry
Seattle, Washington

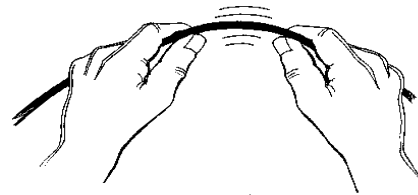
Bowing the Kite

Most fighters come equipped with a bowed or bent center spine. Sometimes a long, smooth arch is centered in the middle of the spine. More often, a sharp angle is constructed between the nose and the cross spar.

A bow in the center spine provides just enough flex or give in the spine to help it withstand Kamikaze crashes. More important, it creates a slight head-to-tail dihedral which increases maneuverability in low winds. That dihedral will also make self launches much easier.

It's probably a good idea to check the shape of your center spine before each flight. If necessary, you can gently flex it to add shape. Just remember to be careful. Too much flex and you'll break your kite!

Hold the kite so that the spine is facing toward you. Bend the spine outward, using your thumbs to concentrate pressure at the desired point.



If a kite tends to fly or turn to one side and other adjustments have failed, check that your spine is straight down the center of the sail cover. Adjustments are easy. If the kite favors flying to the right, carefully massage the spine so it lays more to the left side of the sail cover.

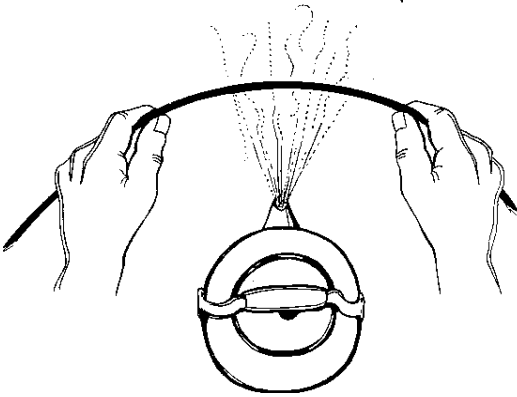
Martyn Lawrence
Gwynedd, Wales, United Kingdom

A kite that leans to one side can sometimes be corrected if the cross-spar is removable. Try reversing it in its pockets - a logical action that works for me only 50% of the time. Also try hand massaging the cross-spar to try and equalize the flex or bow in them.

**Mel Govig
Randallstown, Maryland**

With proper flex in the spine, a fighter's sail will stretch across the frame and more evenly balance the kite. Launching will become much easier. A bowed spine is useful for increasing speed and maneuverability.

If your center spine breaks at some point, be sure and replace it with comparable materials, shaped with a similar arch or angle. You might also experiment with changing the shape or angle of the bow.



Try substituting spines that have been prepared for this purpose. Both natural and synthetic materials can be shaped either by holding them over a concentrated steam source, bending, and drying, or by carefully forming them over a heat source.

One of the more unusual tricks we've seen for shaping spars, is to place them in a microwave oven. Set the temperature for high and the timer to one minute. When the timer goes off, quickly but carefully shape the hot wood.

This is something you may want to try when the person in charge of the kitchen isn't home. It wouldn't hurt to keep a couple of old pot-holders handy either. The reason the wood bends is because it is HOT.

The traditional Indian method of spine shaping is to bend the kite over your head.

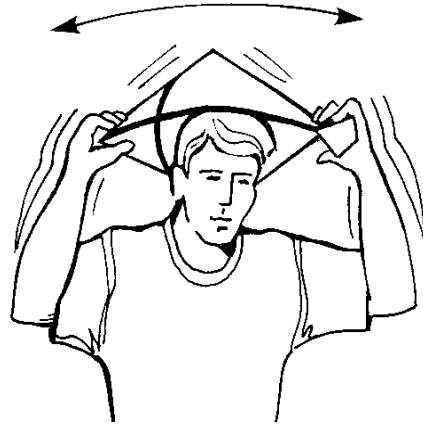
You think we're making this up, right?

It's true. Indian Fighter fliers often tune their kites by shaping them in this way. Put the kite on your head (rib side down) so that you are contacting it on the center spine, just below the cross piece.

Place both palms on top of the kite and press gently on the spine, curving the kite lightly against the sides of your head. The results are increased bow in the center spine, added stretch to the sail, and proper placement of the spine in the center of the kite.

Try it -- it really works.

Besides, this technique will also help keep you dry on rainy days...



The variety of different ways a fighter can be flown and adjusted to different performance, right down to design modifications in proportion, sail shape, and sparring, allows for a lot of self expression in all aspects of the kite. This makes the fighter the most personal of all kites.

Martyn Lawrence
Gwynedd, Wales, United Kingdom

T.L.A.R.

The final piece of advice we have on tuning will probably be a bit frustrating if you are new to all of this. It's a process we call "T.L.A.R."

With experience, there are certain things you will learn to recognize. If a kite isn't flying the way it should, you will become able to look at a bridle or a spar and know instinctively what is wrong. We can't explain how you will know -- you'll just know. You'll move a connection a fraction of an inch or gently flex a spar, and say "TLAR -- That Looks About Right!".

And of course, the kite will fly just fine.