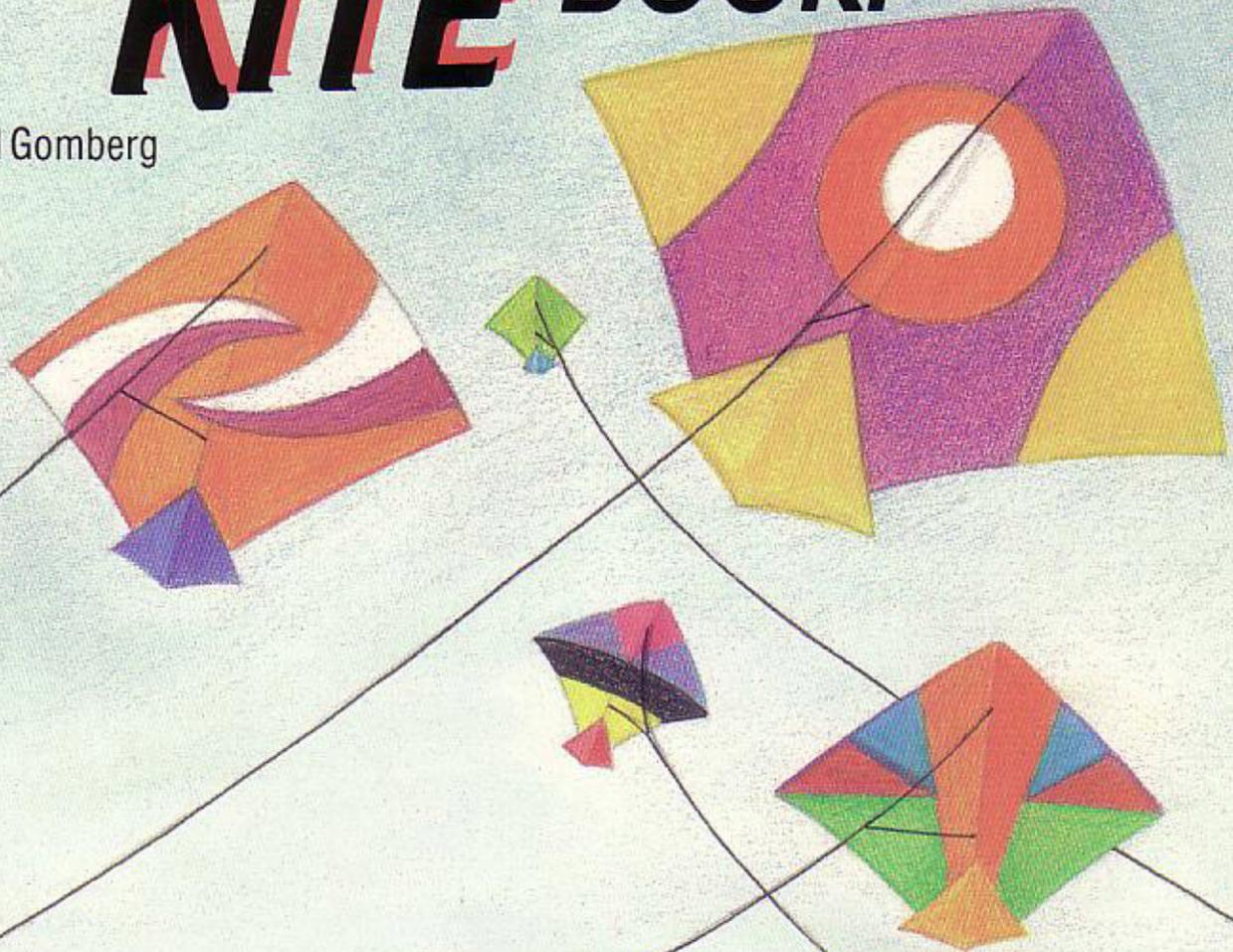




# THE **FIGHTER** **KITE** BOOK!

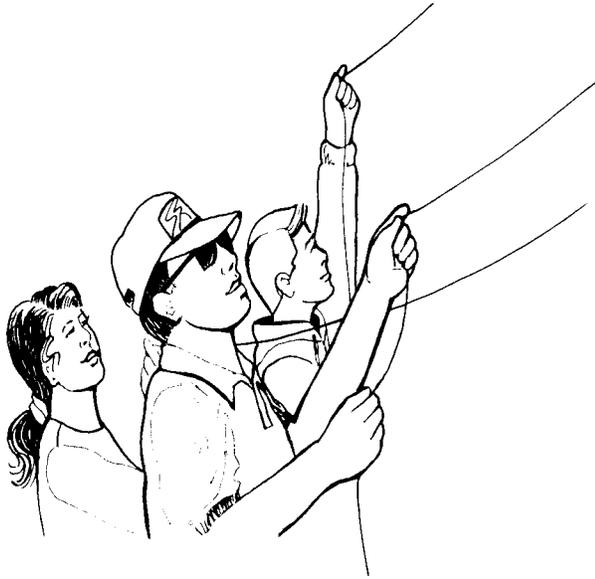
by David Gomberg



*A Complete Flight Manual  
for Single Line Maneuverable Kites*



# ***The Fighter Kite Book!***



by  
**David Gomberg**

illustrations by Kathleen Brady

with comments and contributions by:  
Dinesh Bahadur, Alfred Chang, Carl Crowell, Pierre Fabre, Simon Freidin,  
Mel Govig, Philippe Gallot, Jim Glass, Victor Heredia, Bruce Jarvie,  
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Ron Spaulding, Stan Swanson, Lee Toy, and Joe Vaughan

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comments and contributions to this effort:

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Stan Swanson - Condor Kites  
Lee Toy - Scottsdale, Arizona  
Joe Vaughan - Grandmaster Kites

and the hundreds of other flyers  
that I have talked to,  
flown with,  
and learned from.

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# Table of Contents

## INTRODUCTION

### 1. WHAT IS A FIGHTER KITE 1

General Descriptions	1
Kite Components	1
Basic Control	3
Fighter Development	3
Indian Fighters	4
Designs from the Far East	4
New Designs	6

### 2. FLYING BASICS 7

Before you Leave the House	7
Assisted Launching	8
Prelaunch Checklist	9
Line Handling	10
Maneuvering Your Fighter	11
Solo Launching	13

### 3. SCIENTIFIC STUFF 15

Stability	15
Pitch	16
Roll	16
Spin	16
Dihedral	16
Balance	17
Angle of Attack	18
What Makes the Kite Fly?	19

### 4. ALL ABOUT WIND AND TERRAIN 21

Wind Characteristics	22
Smoothness	22
Turbulence	24
Strength	25
How Wind Effects Your Fighter Kite	25
Picking a Flying Site	26
Safety and Courtesy	28

### 5. FIGHTER KITE TUNING 31

Bridle Adjustments	31
Adjust Angle of Attack	32
Move the Tow-point	33
Change the Bridle Line Length	34
Effect of Adjustments	35
Balancing the Kite	35
Two Leg Bridles	36
Three Leg Bridles	37
Weight Shifts	37
Bowing the Kite	38
T.L.A.R.	40

### 6. MAKING A FIGHTER 41

### 7. ALL ABOUT FLYING LINE 47

Selecting the Right Line	47
Types of Line	48
Waxed Linen Line	48
Cotton and Nylon	48
Stunt Kite Line	48
Cutting Line	49
Line Weight	50
Spools and Reels	51
Indian Spools	51
Halo Winders	52
Japanese and Korean Spools	52
Baskets	52
Attaching the Flying Line	53
Flyline Troubleshooting	53
Tangles	53
"Twist"	54
Fraying	54
Knots	54
Obstacles	55

### 8. ROKKAKU FLYING AND FIGHTING 57

What is a Rokkaku?	57
Combat Fundamentals	58
Cutting	58
Tipping	59
Wind Blocking	60
Combat Rules	60
Construction	60
Size	61
Sticks	61
Bridles	62
Battle Strategy	62
Maneuvering	62
Field Position	63
Tuning	64
Safety, Safety, Safety!	64

### 9. FIGHTER CONTESTS 65

General Competition Suggestions	66
Types of Competitions	67
Cutting Line Fights	67
Line Contact Contests	68
Non-Contact Precision	68
Freestyle	69
Fighting Techniques	69

### CONCLUSION 72

# Introduction

When I mentioned to a long-time fighter flier that I was working on a book about single-line maneuverables, he laughed out loud. "You've got some brass!" he said. And of course, he was right.

Anyone even contemplating a book on fighters is confronting an ominous task. For one thing, the subject is technically broad and complex. There are hundreds of types of kites, steeped in thousands of years of culture and history. As one of my flying friends has said, a small diamond fighter is deceptively simple in appearance - yet embodied in this modest form made from two sticks and a cover, is the whole essence and spirit of kites.

To make matters worse, fighter fliers are an ominous bunch as well. They are drawn together by a distinctly satisfying pastime which sets them apart even from other kites. Some would prefer that I not share their unique secrets. You can try and teach the fundamentals, they say, but people will only understand the "soul" of fighters by regularly flying one themselves.

Others were anxious to help and to see the sport grow. The strength of this new book is, I believe, the unselfish contributions of some of the best fliers from around the country and around the world. My goal was to produce the "complete flying manual for single-line maneuverable kites".

- In Chapter One, we introduce you to the contemporary fighter and cover briefly — too briefly — the colorful history of fighter flying.
- Chapter Two provides basic instructions for launching, flying, and line handling.
- Chapters Three and Four explain the principles of aerodynamics and weather which effect kite flight.
- Chapter Five is an overview of tuning - one of the most confusing and least understood aspects of kite performance.
- In Chapter Six, we present one basic construction plan to start you making your own fighter.
- In Chapter Seven, we attempt to unravel the mysteries of flying line.
- Finally, in Chapters Eight and Nine, we discuss fighter contests with a particular emphasis on Rokkaku flying. We also talk about tactics and strategy.

The most important thing we want to promote is safe and responsible flying.

Obviously, this isn't a fancy coffee-table book filled with stunning photos of kites and kite fliers. We don't apologize for that. It's a book on how to fly kites. It's a book we hope you'll scribble notes in or put in your kite bag and take to the flying field.

Somewhere between its pages, maybe you too will discover the "soul" of fighter flying.

Good Winds!

David Gomberg  
March, 1992

# CHAPTER 1:

## WHAT IS A FIGHTER KITE?

A fighter kite is a maneuverable, one-line kite.

Almost any kind of kite can be controlled by manipulating the tension or pull on the line. Flying objects, by their very nature, are quite unstable. Most kites rely on design features such as shape, frame, bridle lines, or a tail to reduce that reaction.

Fighters, on the other hand, are designed to take advantage of that natural instability in order to produce controlled mobility.

Think of a car with no steering wheel. This particular car is designed to keep turning in a circle until you step on the accelerator. Then it moves off in the direction it's pointed. Let up on the gas and the car starts turning again.

Fighters work pretty much the same way. They spin in the air until you apply throttle. Of course, there is no pedal to step on so you use the only other control you have — you pull on the line.

Try it a few times and you'll see that fighters rely on line tension changes to maximize flight responsiveness.

Controlling the seemingly erratic and random flight of a fighter is one of the greatest challenges and joys a kiteflier can master. The task requires practice, dexterity, and constant attention. But if you can master fighter kites, the skills you develop will make you a better flier of almost any kind of kite.

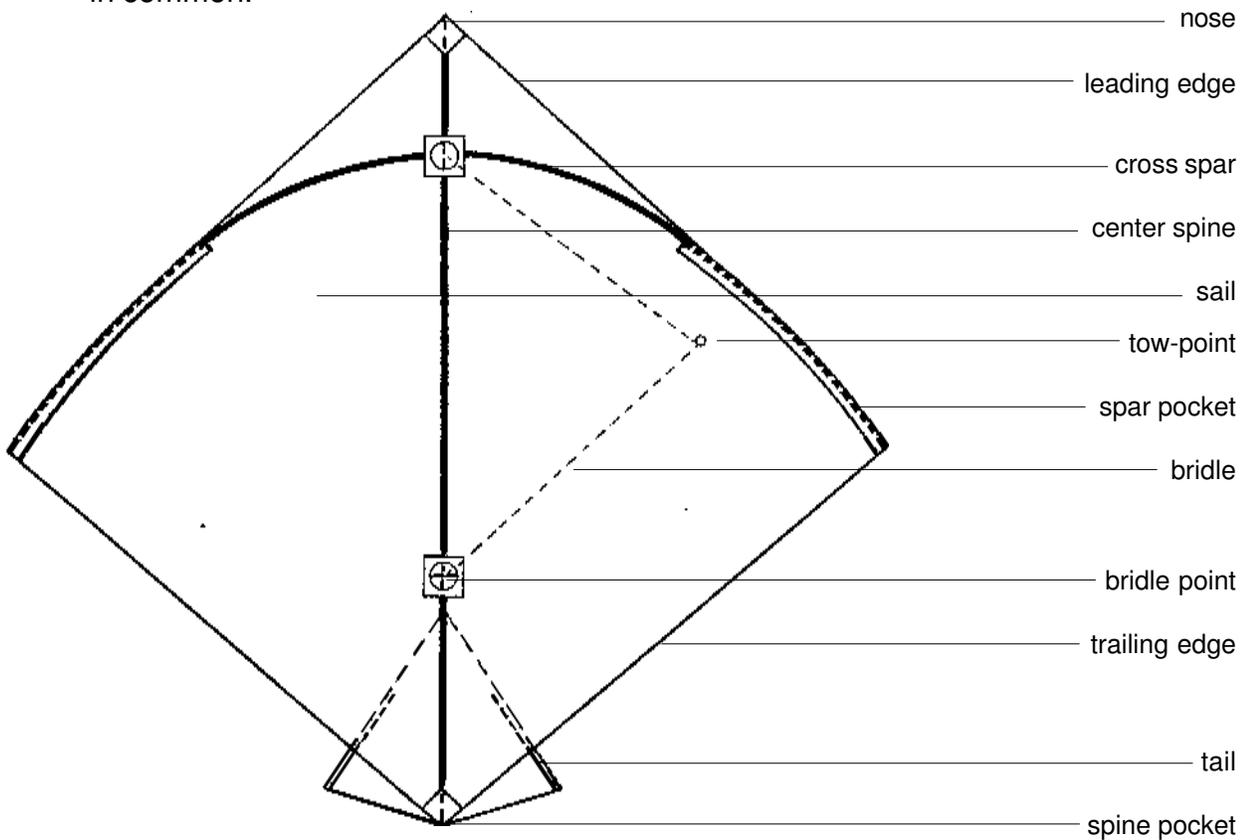
*The best thing that ever happened to me in kiting was learning to fly fighters. Fighters produce a state of mind unequaled by other types of kites. It is the purest form of the sport.*

**Joel Scholtz**  
**Austin, Texas**

### Kite Components

Fighters come in a variety of shapes and sizes. With a bit of research, you'll learn that most of them are based on cultural and historical designs as well as some fairly complex scientific principles. We'll talk more about that later.

For now, let's get acquainted with a basic fighter and the parts that many will have in common.



One basic part of the kite is the **sail**. All kinds of materials are used. Paper, nylon fabric, plastic and mylar are common. It's important for the fighter's sail to be lightweight, smooth, and taut.

Almost all fighters also have a defined vertical centerline which is formed by a rigid rod which we call the **spine**. The spine goes on the back of the kite. Most spines have a slight curve at the upper end. When you assemble your kite, make sure the curved part is at the top, and that it bends back from the sail of the kite.

Fighters rely on a horizontal spreader that we call the **cross spar** or spar for short. Usually, spars are made of thin, flexible fiberglass or bamboo. Spars and spines are usually held against the sail with fabric **pockets**.

The **bridle** is the string that attaches to the kite and is then tied to your flying line. Where your flying line attaches to the bridle is called the **tow-point**. Bridles are designed to set the angle that the kite faces into the wind. They also balance the force of the wind across the kite's frame (spine and spars). Depending on the design of your fighter, the bridle can connect at two, three, four or more places. We call these connections the **bridle points**.

Finally, some fighters incorporate extra design features like tails, battens, or even strategically placed holes in the sail.

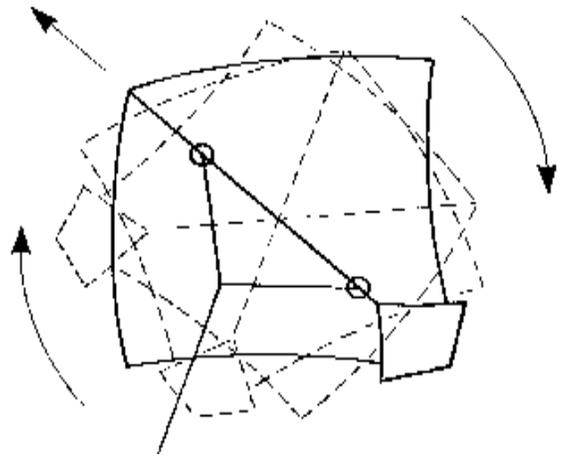
## Basic Control

Fighters are controlled by increasing or decreasing flying line tension. A slack line lets the kite flatten out and lose stability. It begins to spin since it has no built-in stabilizing features. In other words, the kite has no reason to fly in any one direction or another.

When you pull on the kite line, the wind bends or bows the cross spar back and creates a stabilizing feature called a dihedral. The kite stops spinning and moves in the direction it's pointed.

Many kites will respond in this manner but fighters do it more quickly and precisely.

By alternating between a slack and taut line, you direct your kite to spin, or fly straight. To change direction, all you have to worry about is picking the "right" time to pull on the line or let it out.



*The amount of tension and the sharpness or subtlety with which it is applied to the line at precisely the right moment is the key to good control. This can only be learnt through practice which is well rewarded as you get to know your kite and slowly master the skills of flying.*

**Martyn Lawrence**  
**Gwynedd, Wales, United Kingdom**

We'll talk more about dihedral and the other scientific principles that effect fighter flight in Chapter Three. In the meanwhile, let's take a brief look at the cultural development of fighters and some of the different designs history has produced.

## Fighter Development

Kiteflying originated in China over 2,000 years ago. The expansion and development of Buddhism in this area later brought about a cultural exchange between India, China, and Japan. In fact, the introduction of kites to India is credited to Chinese scholars and monks.

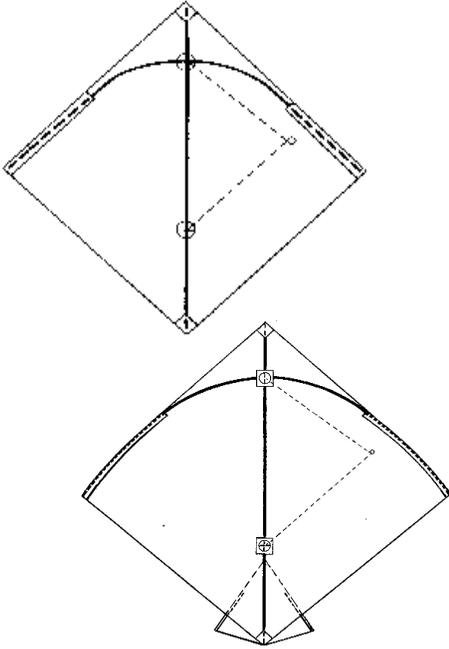
The earliest kites were probably simple fighters. Unstable forms tethered to the ground were gradually controlled by their fliers. Experimentation and experience then led to more easily maneuvered designs.

One reason kite fighting did not come to the West until relatively recently is that it started in Asia and most books that mention kite fighting were written in Sanskrit, Persian, Arabic, and Urdu. Most of us don't read Urdu.

## Indian Fighters

One of the oldest and most familiar kite designs is the Indian Fighter.

For hundreds of years, residents of rural areas throughout India have gathered to join in combat with colorful tissue paper and bamboo fighter kites. In the larger cities, rooftops and terraces are covered with fliers and excited throngs of supporters. Everyone takes time off from work and there is a holiday atmosphere as an incredible number of kites fill the sky.



Most Indian festivals are held in January. Kites are flown on glass coated flying line and fliers search out any available opponent and try to cut their line and then capture the loose kite.

Below, the outstretched hands of children compete for the spoils.

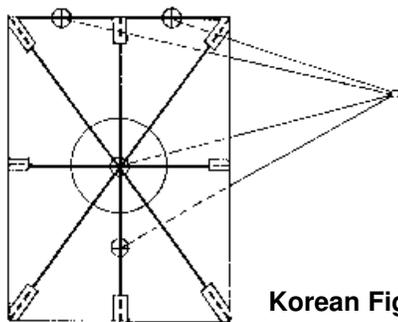
The kites are handmade by methods passed down from master to apprentice for centuries. Deceptively simple looking, Indian Fighters require careful and precise crafting to insure a balanced and responsive flier.

Indian style fighters are now produced all over the world. The design is so efficient that it is still one of the most common models we see.

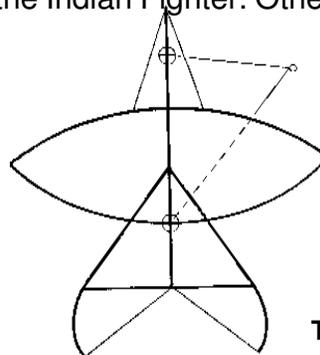
## Designs from the Far East

Fighter kites have long been popular in many Asian countries and a tremendous variety of designs and flying styles have emerged. People in Japan, Korea, Thailand, and Malaysia fly fighters unique to their countries. Each has their own long and colorful tradition of kite fighting.

Fliers in Tibet and Nepal fly kites similar to the Indian Fighter. Other nationalities fly



**Korean Fighter**

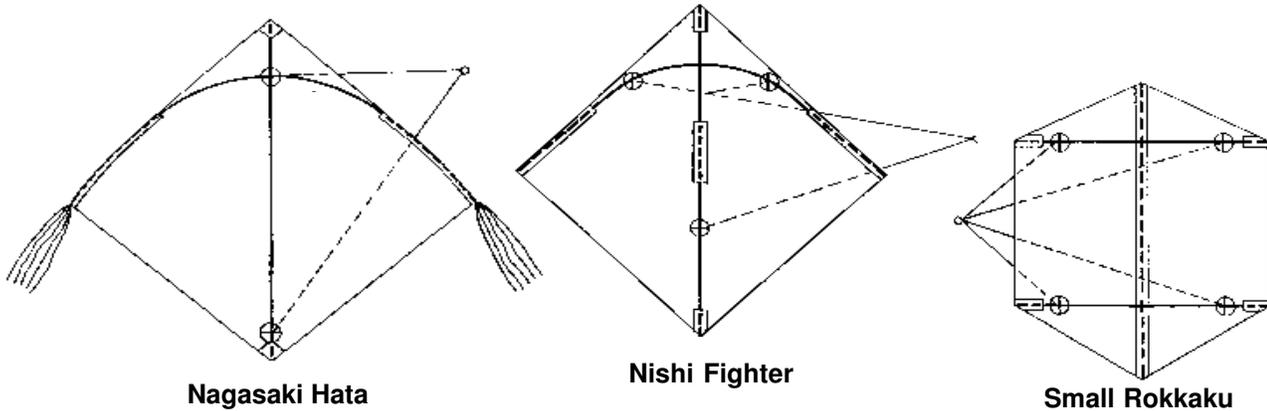


**Thai Chula**

*Every kiteflying competition in Thailand is a symbolic battle of the sexes between the "male" Chula kite and the "female" Pakpao. The former is larger, dominant and aggressive. The latter is flighty and clever. He sets out to capture her; she, though smaller, has many tricks and can ensnare her man with cunning. The outcome of the competition, as in real life, is no foregone conclusion.*

**Ron Spaulding  
Bangkok, Thailand**

kites which are probably derived from it such as Japan's Nagasaki Hata. The city of Nagasaki has a tradition of flying unique fighter kites which dates back



to the 1500's. At that time, the city was the only Japanese port open to European traders. Nagasaki's kites are called "Hata" which means "flag" in Japanese. Usually made of red, white, and blue paper, the Hata is one of the quickest of the traditional paper fighters.

*Nagasaki's oldest record of kite flying is a picture of Indonesian children flying from the trading center. It is interesting that the kites use colors from the Dutch flag, and that we call our cutting line "bidoro" which is Portugese for "glass". There are over 200 traditional designs used to decorate the Hata. These designs are taken from signal flags used on trading ships, from family crests, and from Japanese words or characters. A unique feature of these kites are the "myu" or tassels attached to the corners.*

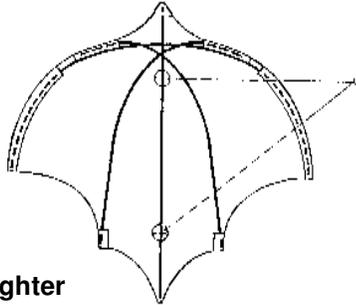
**Seiko Nakamura  
Nagasaki, Japan**

Because of similarities to traditional Indian kites and use of foreign flag designs, we can theorize that the Hata was brought to Japan by traders. Other areas in southeast Asia also fly distinct red, white, and blue kites. They provide an interesting example of the interplay between culture, history, and kite development.

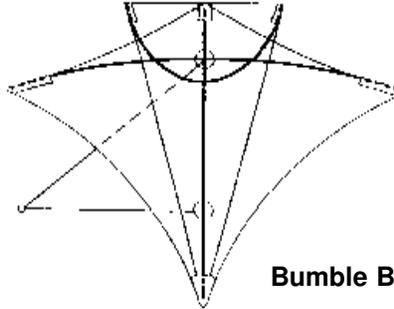
The Hata is distinct from most other Japanese kites which tend to be rectangular. The Japanese kite fighting tradition also moved beyond smaller kites flown by one person to the larger "battle kites" which are maneuvered by teams of fliers.

## New Designs

In America and Europe, most people fly fighters as single line stunters. Modern materials such as lighter weight nylon or plastic and mylar for sails, and fiberglass and graphite for spars have bred a new generation of colorful and unique designs. These fast and sensitive kites encourage sophisticated and skillful line handling techniques.



**Butterfighter**



**Bumble Bee Fighter**

Although traditionally, fighter kites are involved contests and combat, many Western fliers focus more on flying them as a contemplative art.

Contemplative art ... that means for fun.

Glass coated flying line is seldom used and most fliers concentrate on control and precision in a variety of wind conditions. The priority is no longer a competition to vanquish an opponent, but instead, an opportunity to demonstrate your ability while remaining aware and in control as you fly.

*I don't even like to call them fighting kites. For me, these are "dancing kites". Flying is an enriching expression of a beautiful art form. It's a transcending experience. Concentration is essential which makes flying a mind-clearing experience.*

**Joe Vaughan**  
**Mifflinville, Pennsylvania**

If there is a message in this chapter, it's that fighters are deceptively simple. Two sticks and a cover are all it takes to make a small diamond fighter. Yet embodied in this modest form is the whole essence and true spirit of kites!

So now that we've told you a little about the tradition, background and development of fighters, let's get ready to go fly one.

## CHAPTER 2:

### FLYING BASICS

Fighter kites can do things no other kite can do.

Even in the lightest of winds, a fighter in the hands of a skilled flier can amaze onlookers by not only staying in the air, but doing figure eights, dives, twists, and dancing its way to great heights.

And of course, they do it all on only one line which makes those multi-line sport kite fliers awfully jealous.

If you are a novice, your first goal is to simply keep the kite aloft, gradually learning to use your hands and fingers to manipulate the subtle pulse of the flying line so that the kite performs to your will and artistry.

Soon, you too will learn to “talk with the wind”. Like any new language, it requires patience and determination, but the rewards of mastering this skill can never be taken away.

*The first time you fly a fighter, take time to get to know your kite. Watch its movements closely. Feel its pull on the line and on your fingers. Watch how it responds to your control. Don't fly it too high or try fancy maneuvers. There is plenty of time for that later.*

*From the beginning, you should learn to fly your kite. It should not be flying you!*

**Victor Heredia  
San Diego, California**

### Before you Leave the House

Most people who ride bikes remember falling off or crashing when they first started learning. So did they quit trying? Of course not — they picked themselves up and kept on practicing.

Practice is the key to becoming a skilled fighter kite flier. Don't let a few crashes slow you down at the beginning. They are much less painful than falling off a bike.

So let's go flying.

Before you leave the house, there are a few basic things you might want to consider.

1. Many fighter kites on the market come with an instruction sheet. If you have one, read it. If you didn't get one, contact the store or manufacturer where you bought the kite and see if one is available.

Every kite is different. Instruction sheets contain specific information on assembly, fine tuning, replacement parts, and warranties. This is important stuff! You may want to take it with you just for reference, but don't lose it.

2. If your fighter uses a dowel for a spine, buy an extra one now. Shaping and bending can be done a lot easier at home than on the field. Don't let a broken spine cut your day short.

3. Have you picked a flying site? It helps to know where you are going before you try to get there. Better read the Chapter on selecting a location.

4. Check the wind. Fighters perform well in a variety of wind conditions, but for your first few sessions, it should be "clean" or uninterrupted and blowing around 4-6 miles per hour. Less or more is all right, but not as easy.

5. Take a helper if at all possible. Having a "ground crew" eases the process considerably. If no help is available, be sure and read the section on Self Launching .

Also remember to take your kite, any stray parts, and your flying line. We only mention this because we're good at forgetting things like that.

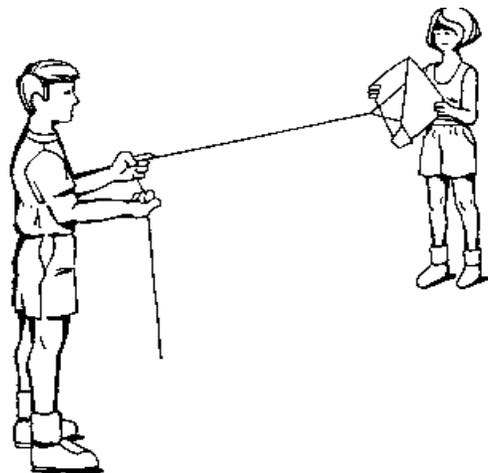
## Assisted Launching

Launching is a lot easier at first if you have a friend to help.

Stand with your back to the wind with about 10 feet or so of extra line beside you loose on the ground. Have your assistant stand about 50 feet away, lightly holding the kite at its outside corners with the nose pointing up.

Positioning the kite is very important. When you launch, the kite is going to move in the direction it is pointing. Make sure it's pointing up at the sky instead of at some obstacle - like a spectator.

Having extra line is also important. You need to let line out to control your fighter. If you use all of your line, you won't have any control.

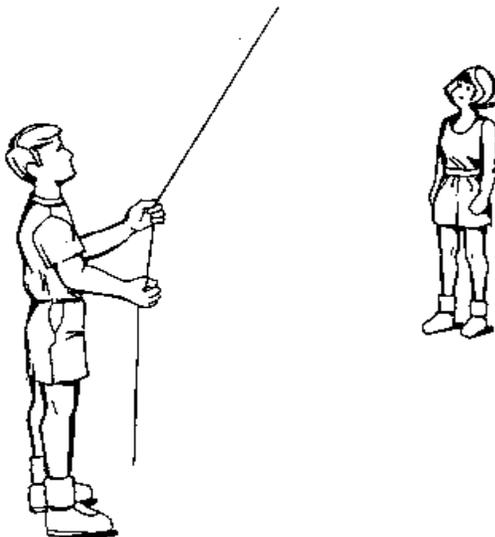


Now complete the “Prelaunch Checklist”. Do everything on this list before every launch.

### Prelaunch Checklist:

1. Check the area under where you will be flying for possible hazards — mainly people.
2. Look behind you to make sure that you have a clear path if you need to back up. Backing up is usually not necessary for fighter kite flying, but most kites are conditioned to move backward as a natural way to get a kite out of trouble. Check around to make sure that, if you instinctively begin to move backward, you won't be moving into trouble.
3. Look around your feet. Make sure that your loose kiteline isn't tangled in itself, in rocks or weeds, or in your shoelaces. Loose line loves shoelaces!
4. If there are other kite fliers around, check the sky for traffic. Fighters are designed for close contact with other kites. But your first flight is not the best time to confront them. Make sure the sky is clear and announce to any nearby fliers that you are ready to launch.

Finished with the checklist? On your signal, your helper should allow you to gently but firmly pull the kite out of their hands and into the air. Think of it as almost snatching it away from them.



Continue a strong steady upward pull on the line to start the kite up and into the wind. Maintain tension on the line to keep the kite climbing.

If winds are light, it may be necessary to steadily pull in line to keep the kite moving ahead. Let any excess line drop to your feet as you pull in.

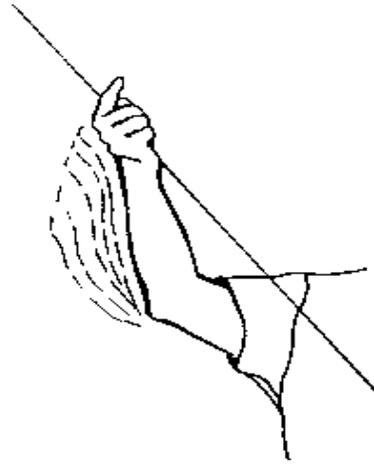
When you feel the pressure of the wind on the kite, slowly let line out. That doesn't mean you can just let the line loose. Remember to keep some friction on the line to maintain control.

*Running with the kite is perhaps the most common mistake that beginning fliers make. Don't run. It causes awkward flight patterns because you are too involved with your feet when you should be watching your kite and thinking about your maneuvers. You can create your own wind for your kite's surface with short tugging motions on your line.*

**Dinesh Bahadur  
Pacific Grove, California**

Try giving the line quick, rhythmic jerks or tugs - line in to climb - line out when you feel wind pressure. Tugging creates extra wind pressure on the kite.

Allow the kite to climb to a height of 50 feet or more where you can practice maneuvering and line handling without smashing into the ground.



## Line Handling

Line handling is a two handed process. Don't ever let one hand free until you have firm control of the line with the other hand. Both hands should work evenly with short, smooth movements.



Hold the line near the tip or first joint of your index finger. Use your thumb as an anchor. Practice pulling in hand-over-hand and then letting line out quickly. Work close to your chest - pulling continuously with rhythm. You should be working at an angle - from right shoulder to left hip, or from left shoulder to right hip.

Once the kite is airborne, it will be easy to let out yards and yards of line using only the slightest tugs. After a certain distance, however, you'll want to stop the kite from going farther. The higher it goes, the less control you have, and if you run out of line, you'll have no control at all.

Losing control of the kite is the most common mistake new fliers make. If a kite flies up at too high an angle, it may "overfly" you, turn nose down with it's back to the wind, and come straight toward the ground.

How do you regain control?? Take in any slack line fast. Tug hard until the kite is airborne again. A kite is "airborne" when it maintains its position in the air, with minimal line slack, and you can feel it at the end of your line.

As you continue to practice, avoid slack line. Loose line leads to bad flying habits.

*I like to use a "corkscrew" technique. Let line out and the kite will loop into a circle. As the kite turns up at the end of that circle, tug line in so the kite climbs a few feet. Then let line out again to start another circle. This is a real effective way to gain altitude.*

**Ric Merry**  
**Seattle, Washington**

## Maneuvering Your Fighter

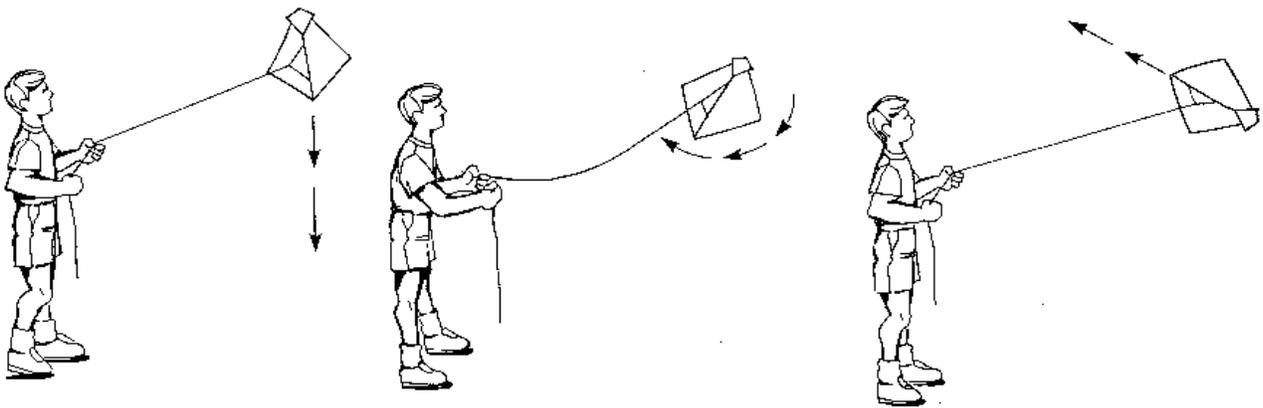
Handling fighters is a matter of pulling in line to make it move, and playing out line to achieve distance and control direction.

*Fighter kites take commitment, practice, and constant attention. The result is a graceful, controlled response to the wind which is like flying a leaf on a string. Each hesitation and thought is translated into motion as your fighter traces your state of mind on the clouds. When your mind and body are synchronized, controlling your fighter is effortless.*

**Jim Glass**  
**Boulder, Colorado**

If the kite is moving in the wrong direction, let out line. A quick loosening of line tension will slow or stop forward motion. Just let the line slide out smoothly through your fingers. Depending on the wind, your fighter will relax and float, change direction, or begin to spin around the bridle tow-point.

When the kite is pointed in the direction you want, put tension on the line and the kite will move in that direction. Pull in - either in a steady hand-over-hand motion for long, sustained flights, or in sharp tugs to make the kite quickly dart a few feet.



*When the wind is adequate to basically keep my kite in a stable overhead position, yet not so strong as to make it stick there, I like to use a "guitar strum" to maintain position. Reach up as far on the line as you can with one hand. Bring the line in to the other hand where you can slowly let it out while reaching up again.*

*It's great to strum and pick your kite into squares and triangles in the air.*

**Ric Merry**  
**Seattle, Washington**

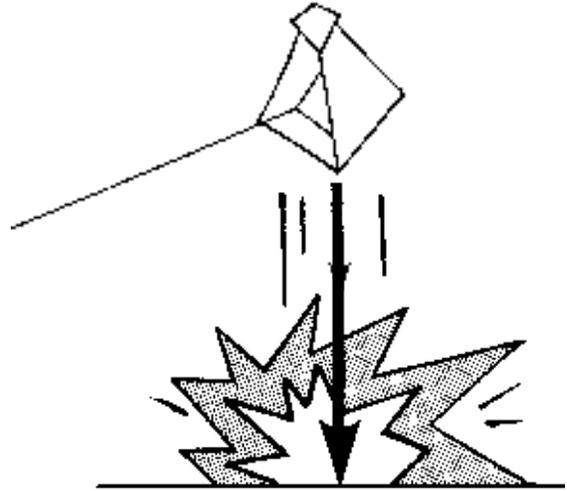
A good practice exercise is to move the fighter left and then right across the sky.

Use line tension to fly the kite into the air. Then begin to let out just enough line to make the kite stop rising and begin to turn. When it is pointing to the left, provide tension again by pulling in. Then make the fighter unstable again so you can turn it back to the right. Now practice repeatedly turning left and right.

Another good training routine is diving and recovering. Go lower - then lower - then

LOWER. With practice, your reactions will become quick enough that you will be able to fly within a few inches of the ground without crashing.

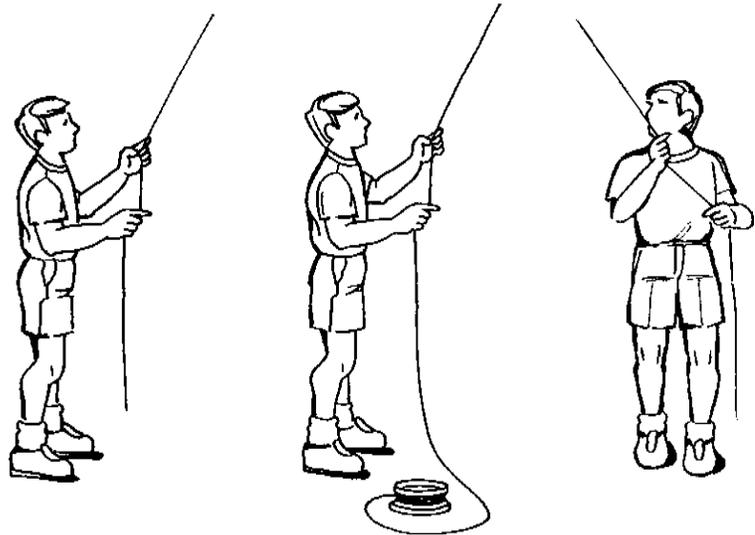
If you think the kite is going to nose-dive into the ground, let out some line. Don't panic and pull in - that will only make the kite fly faster and hit harder. And a hard crash could break the spine or damage the nose section.



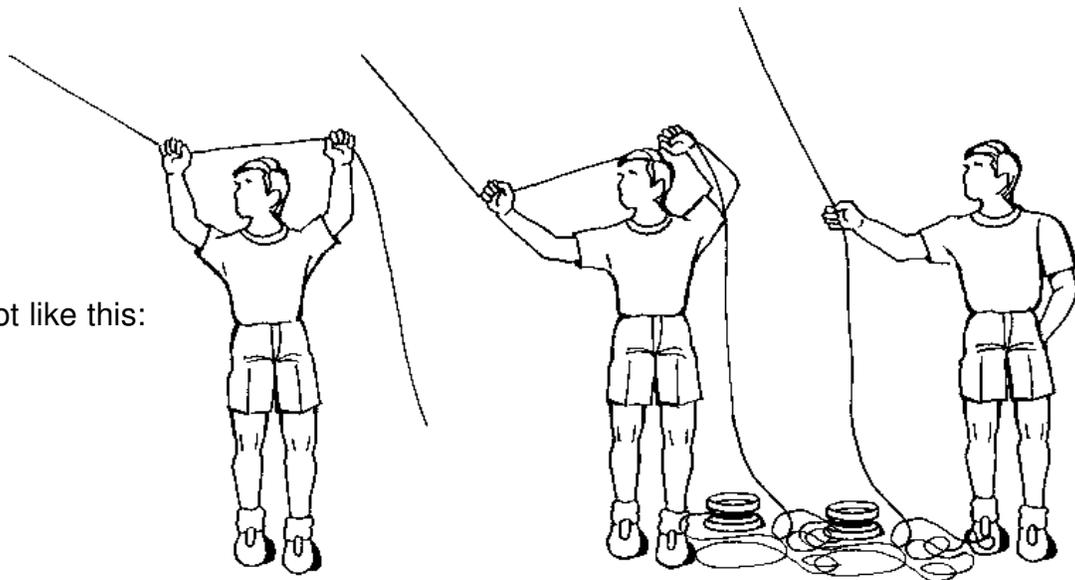
The proper stance for controlling your kite is knees slightly bent, elbows close to your sides, and hands in front of your chest. Flapping your arms doesn't help the kite fly and it makes you tired much more quickly.

Continue to use both hands on the kite line and make sure the line doesn't get all tangled up around your feet.

In other words ... stand like this:



Not like this:



Remember, if your kite dives toward the ground, pulling on the line won't make it go up again. It will make the kite zoom toward the ground even faster. Loosen the line. Let the kite become unstable. Then pull in when the kite points up and fly away from the crash. Your friends will be amazed!

*You can make your kite spin faster by attaching 1/4 to 1/2 ounce of gum or putty to the bottom of the center spine. I usually carry a supply of putty so I can fine tune the responsiveness of my fighters in different wind conditions.*

**Stan Swanson  
Boulder, Colorado**

Quick, intricate maneuvering is developed through good line tension and sharp signals.

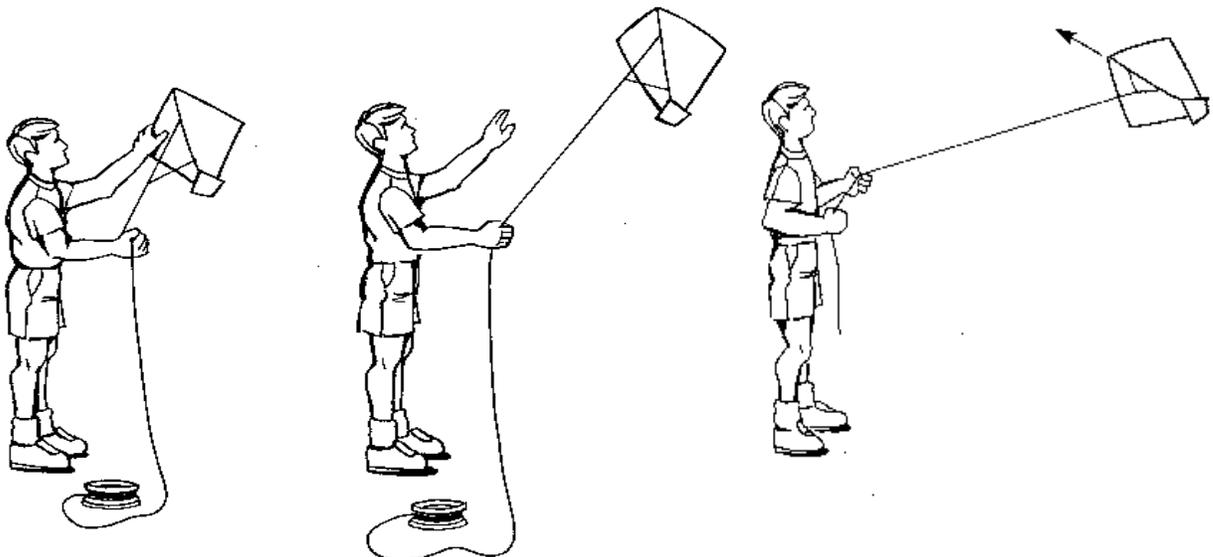
Beginners often find it easier to sharpen their skills with the help of a training tail. Attach about ten feet of tail to the base of the kite. Use plastic, light ribbon, or crepe paper cut to one-and-a-half inches in width. This new tail will slow down the action of the kite during your learning period.

Think of it almost like "training wheels" for your kite. As you gain experience, cut off a foot or two of tail at a time until it can be eliminated entirely.

## Solo Launching

With practice, you will soon be able to launch your fighter without a tail, without an assistant, and, eventually, with little or no wind.

To launch solo, grasp the nose of the kite with one hand and hold the line in the other. Release the kite, let the wind carry it for a short distance, then pull up on the line to gain height.



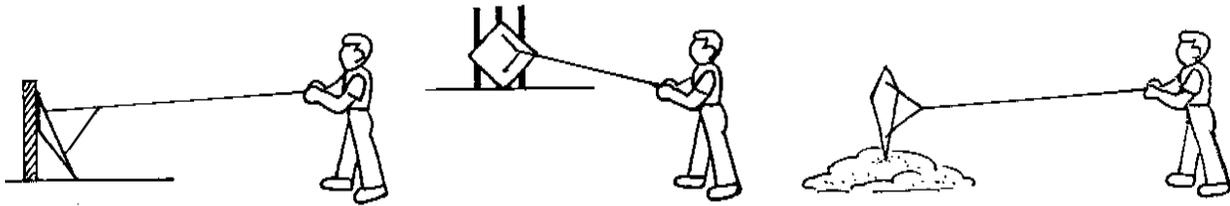
Repeat this several times to get your desired elevation.

*In Nagasaki, I saw fliers perform an interesting hand launch. Holding the kite by the bridle, they would flick it out into the wind. The kite would float on the wind for several meters, then the flier would pull the line taut. It was very efficient.*

**Pierre Fabre  
Paris, France**

Sometimes in light winds, hand launching can be difficult and you may prefer to begin with a bit more line in the air. At times like this, you may want to “create” a launching assistant.

A fairly cooperative assistant can be made from sand, sticks, or almost any kind of prop for the kite. Simply lean your fighter against the “assistant” and move back into the wind, playing out line as you go. When you are ready to launch, take in the slack line and lift the fighter into the air.



The nice thing about this kind of assistant is that they never demand equal flying time.

In time, you will learn to launch your fighter right off the ground. A curved center spine makes this much easier. If the kite is face-down and the nose is pointed up-wind, a quick tug on the line will lift it a few inches into the air. With quick reactions and good line handling, you should be able to maintain control and gain altitude.

Just remember not to make a habit of dragging your kite across rough ground while trying to get it back in the air.

*A self launch can take time to master. If you have trouble at first, stick with it. Be stubborn about learning and take time to practice. And remember, every time you hit the ground, you can effect the kite's tuning. Check it over. Maybe that's why you're having trouble.*

**Robert Loera  
Honolulu, Hawaii**

Launching alone will take practice until your reaction time develops. Then it will seem as easy as getting out of bed in the morning - which we admit is easier on some days than others...

## CHAPTER 3.

### SCIENTIFIC STUFF

Earlier, we suggested that scientific principles, expressed through kite designs and features, produce more stable and controlled fliers.

Let's try and say that another way.

A poorly designed kite is unstable. It doesn't fly or worse, it flops all over the sky. It causes accidents, upsets your neighbors, crashes, and generally makes you frustrated and unpopular.

A well designed kite does what you want. It's safe, goes where you send it, makes you look good and better yet, makes you feel good.

So science is the difference between being frustrated and feeling good.

*A number of kite enthusiasts obtain as much pleasure from designing and building their kites as they do from flying them, and a great deal of time and effort goes into highly imaginative and well-finished creations.*

*Unfortunately, imagination and craftsmanship alone don't produce lift and stability, so before proceeding with an original configuration it is well to have a grasp of the roots of aerodynamic theory as applied to kites. As in any other field of design, the measure of good design is directly proportional to the amount of information that one has on the problem.*

**David Pelham**  
**Penguin Book of Kites**

### Stability

We've been telling you that maneuvering fighter kites is based on recognizing, predicting, and controlling stability.

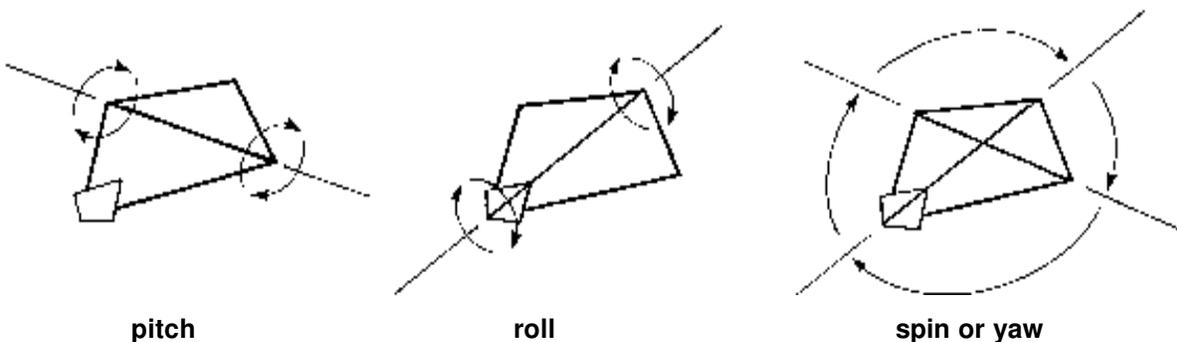
Actually, there are several different types of instability that effect your fighter. Some are helpful and can be used in maneuvering the kite. Some are not.

Let's take a look at the three basic forms of instability in kite flight.

**Pitch:** Think of a boat dipping alternatively at the bow and stern. That's called "pitch" or movement around the horizontal axis. Your fighter's horizontal axis runs roughly along the cross spar. Pitch shows up as wobbling at the top and bottom of the spine or the kite actually trying to flip end-over-end.

**Roll:** Now think about that ship turning over on its side. That's called "roll" or movement around the vertical axis. Your fighter's vertical axis is the center spine. When it rolls, the kite leans, wobbles or tries to rotate from side-to-side.

**Spin:** Finally, imagine a boat caught in a whirlpool and turning round-and-round its center of gravity. Fighters do the same thing. They turn around their bridle tow-point in a way which, if properly controlled, allow us to change direction. Aeronautical engineers call this a "yaw", but we'll just call it spin.



You're probably real confused now about boats, kites, pitches and yaws. The point is that unstable kites can move in a number of different uncontrolled directions. We need to look for design features which provide stability and control. Three that are particularly important are dihedral, balance, and the kite's angle of attack.

### **Dihedral — to convert spin into direction:**

Earlier, we talked about dihedral as a design feature that helps provide stability and control fighter kites.

We already know that fighters are traditionally constructed with a rigid spine and a flexible cross spar. When you put tension on the bridle line by pulling, increased air pressure on the sail bends the wing tips back.

If you think about it, what you've done by bending the kite in half is change a single flat surface, into two flat surfaces joined at an angle. That's basically the definition of a "dihedral".

Dihedral is one of the most fundamental principles of kite flight and stability.



A flat surface naturally gives way to any pressure from the wind. Two flat surfaces, joined by an angle, move into a position that creates the least resistance. It works like a weather vane.

A flat kite has no way of naturally moving into a position of least resistance so it spins around the tow-point. When we introduce dihedral into the kite, we create a position of least resistance. That stops the spin and helps the kite move.

So as we've been saying all along, by carefully choosing the point in the kite's spin to suddenly create that dihedral, we are able to control the direction the kite moves.

### **Balance - to avoid roll and maintain equilibrium:**

A fighter's dihedral will only work when the kite is properly balanced.

Balance is an important feature of almost all fighters. By balance, we mean that they have equal amounts of sail surface and frame weight on both sides of the center spine.

If the center spine of the kite doesn't divide the kite into two perfectly balanced halves, the wind will exert more pressure on one side of the sail and the kite will roll in the air. It won't actually flip over backwards because the bridle holds the front of the kite towards the flier. So instead, one side of the kite will lean back and it will either pull to one side or begin to fly in larger, uncontrolled circles.

This is something we'll talk more about in Chapter Five.

When a properly balanced fighter faces straight into the wind, the dihedral causes both halves of the kite to receive equal wind pressure. Then, if the kite leans to one side, that half of the kite exposes more sail surface to the wind and is quickly pushed back into equilibrium.



In other words, the greater surface area exposed receives greater wind pressure and tends to get pushed back into balance at the position of least resistance.

Let's take a moment now to rephrase our basic instructions for fighter flying. In a properly balanced kite, when you put tension on the line, you create a dihedral. This creases the kite along its center spine and creates a position of least resistance — at least from side to side — which establishes both stability and direction. If the bridle and tow-point have been set to the proper angle of attack, the kite will naturally move off in the direction it is pointed.

*Balance refers, not so much to the weight of the kite, as to the amount of sail area and how it is disbursed about the kite's frame. If the sail is even slightly larger on one side of the spine than on the other, the kite will favor or lean to that side. Even sail decorations such as applique can create wind resistance which effects this kind of "balance"*

*The traditional method of adjusting sail area on simple paper or plastic fighters is to cut or burn small holes in the sail. But I recommend you try something different.*

**Kevin Shannon  
Carlisle, Pennsylvania**

### **Angle of Attack - to control pitch and increase response:**

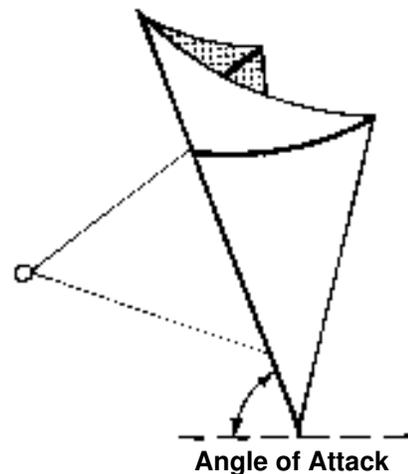
The “angle of attack” has nothing to do with diving on another fighter during a kite battle. Instead, generally speaking, it's the angle that the surface or spine of the kite faces into the wind.

The attack angle is formed by the bridle and flying line. Where these two lines come together at the tow point is probably the most critical part of your entire kite. An improper setting will cause instability that may prevent even the most perfectly constructed fighter from getting off the ground.

As we'll see in the Tuning Chapter, even minor shifts will effect speed and performance.

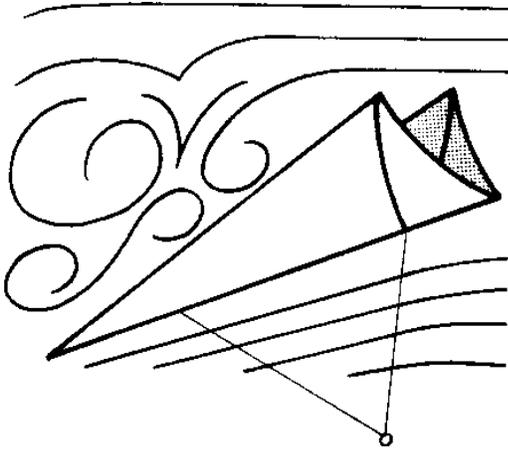
If the bridle is set too low, the kite may have a tendency to pitch or flip over so the back of the kite faces the wind. Usually, the bridle gets tangled or the flying line goes slack, and the kite dives uncontrolled and sometimes dangerously to the ground. If the bridle is set too high, you won't get any lift at all. You'll try to launch and the kite will keep settling lazily back down to the ground, tail first.

To test your bridle setting, hold the kite by the tow point. The spine of the fighter should be at an angle of between 20 and 30 degrees from the ground. Then test it in the air. Only small changes should be needed.



## So What Makes the Kite Fly?

The wind, the design of the kite, and you holding on to the line from the ground, together create the conditions needed to generate flight or lift. And if you think about it, all three of these factors come together through the angle of attack.

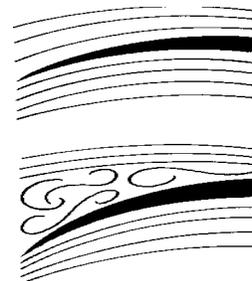


If the flyline and bridle hold the kite in the wind at an appropriate angle, then wind pressure is exerted against the sail. Lift results from this pressure being deflected across the face of the kite.

Wind moving over the top of the kite is traveling faster because it has a longer distance to cover. This creates a partial vacuum or low pressure area along the back of the kite which actually pulls or sucks the kite upward.

*An aerofoil at a low angle causes air to accelerate over its top surface, decreasing pressure and causing lift.*

*An aerofoil at an extreme angle causes the airflow over its top surface to break up into turbulence, and lift is decreased.*



**David Pelham**  
**Penguin Book of Kites**

What this all means is that, if the wind speed increases or if you tug on your flying line to simulate an increase, your fighter will move faster and pull harder. If winds decrease or you let line out, the kite will slow down, fall back, or become unstable.

In higher winds, the edges of the kite may actually be pushed back in a way that creates a dihedral even when you don't want one. This makes direction much more difficult to control - especially when the kite is already moving faster.

Let's take a more indepth look at wind and how it effects fighter flying.



## CHAPTER FOUR:

### ALL ABOUT WIND and TERRAIN

Most people don't spend a great deal of time thinking about the wind. Sailors, pilots, and other "professionals" may be exceptions, but for ordinary folks, average winds have little effect on their daily lives and go almost unnoticed.

Kite fliers are different.

A kite and the wind together form a system. The wind is the engine. No engine, no flying. For a fighter kite flier, learning about wind and how to "read" it will make the difference between success and frustration on the flying field.

Experienced fliers have a habit of watching the wind constantly, even when not flying. They watch flags, trees, smoke, ripples on water, and all the other signs of movement in the air. Being aware of the wind is second nature to a proficient flier. And when the wind is "right", they begin to get a wistful look in their eyes.

One admonishment before we start — **IT'S NEVER THE WIND'S FAULT!!**

Many fliers wish they could change the wind. If it doesn't blow hard enough - or smooth enough - or soon enough, they get upset.

Trust us — the wind doesn't care what you think! It does what it wants!

Think of all the energy those fliers wasted being aggravated. Resolve to use that same energy learning to cope with the wind the way it is, and you'll be a much better flier. You'll soon be able to fly and enjoy yourself in just about any conditions. You'll be flying while those others are complaining that the wind doesn't listen!

So ... start watching the wind. Get comfortable with it. Become one of those wistful observers who always notices the breeze.

*Wind is caused by uneven atmospheric temperatures.*

*Warmer air expands; cooler air contracts. Different temperatures thus create differences in air pressure. Since nature tends to seek equilibrium, these imbalances even themselves out by moving air from one place to another. Winds result.*

## Wind Characteristics

The wind has two characteristics that affect fighter kites — smoothness and strength. We'll talk about **SMOOTHNESS** first.

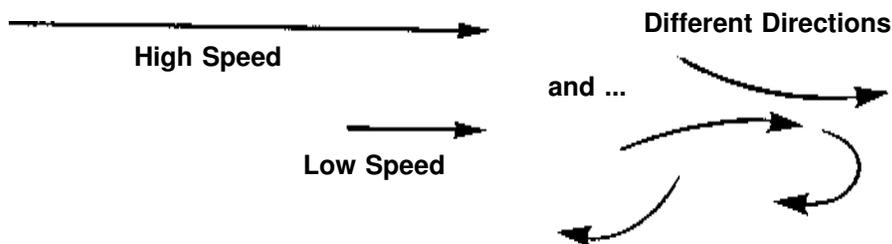
Finding a smooth, regular wind is, of course, preferable. Smooth winds are easier and more pleasant to fly in. Control is more predictable. Accidents are less likely.

Unfortunately, there is no such thing as a truly “steady breeze”. While it's tempting to think of the wind as a smooth, regular progression of air from one point to another, the facts are that it just doesn't happen that way.

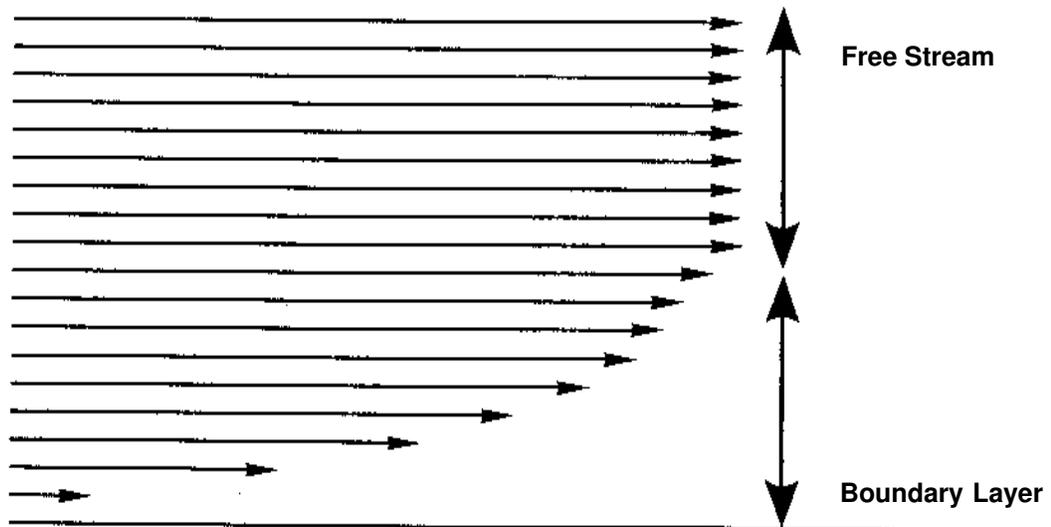
Friction with the ground slows wind down; obstacles like trees, buildings, and hills create turbulence; changes in temperature and even the heat of the ground surface affect wind patterns. And, in the face of all that, your job as a flier is to find the smoothest, most regular wind available.

Sound hard? It's not.

Let's look at the wind. We'll represent the wind with arrows. The direction of the arrow indicates the direction of the wind at that point, and the length of the arrow represents wind velocity:



If the earth were perfectly flat, the wind would look like this. Friction with the ground causes the air near the surface to move more slowly — even when the wind is quite strong.



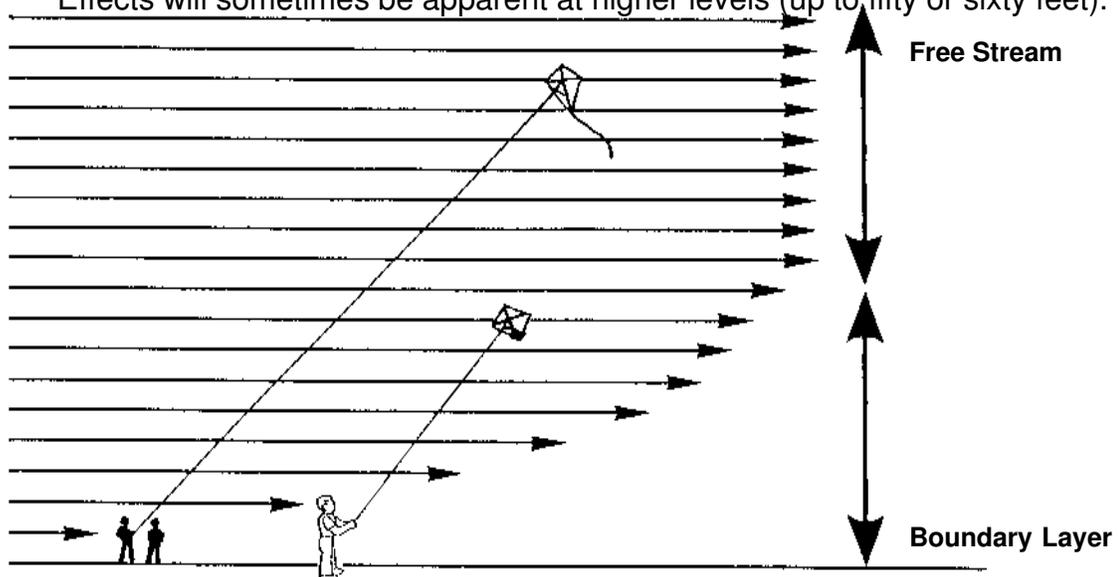
You can demonstrate this yourself on a windy day simply by lying down on the ground and feeling what it's like down there. Higher up, the wind moves faster, but is still affected by the slower air closer to the ground. This creates a region called the **BOUNDARY LAYER** — the region from the ground level up to the level at which the wind is no longer affected. Everything above the Boundary Layer is called the **FREE STREAM**.

The important things to know about the Boundary Layer are:

Its thickness varies.

Its effect on your kite will always be evident at low altitudes (under ten feet).

Effects will sometimes be apparent at higher levels (up to fifty or sixty feet).



So in some respects, those kids with their \$1.25 kite have it better than you do! Their kite will get up into the free stream and stay there, while you maneuver in and out of the slower Boundary Layer. Fortunately, your kite is designed for these conditions and will do just fine. Later on, we'll even talk about how to use the

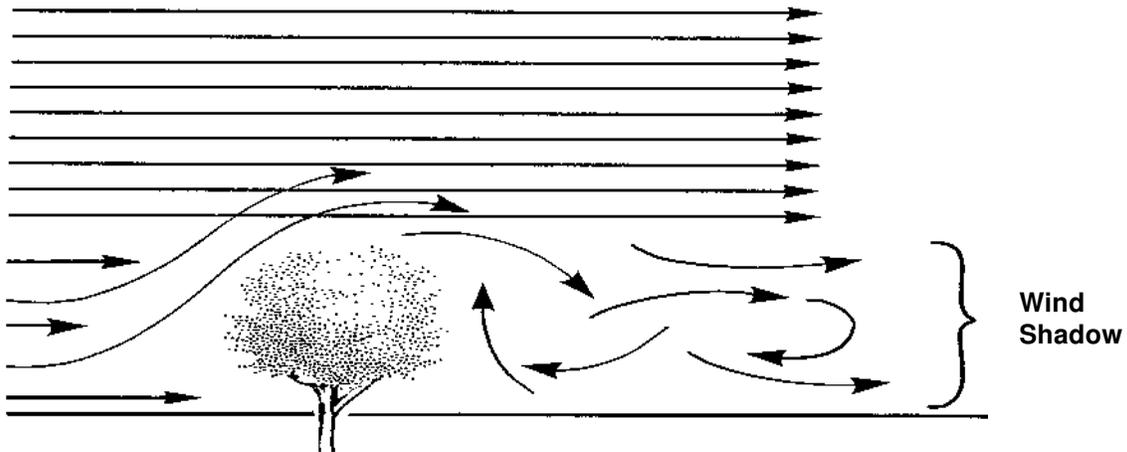
*The slower ground wind and faster high air have dramatic effects on your launching, control, and flying speed.*

*Ground wind and turbulence can make a self launch difficult and frustrating. But you can also use that slower wind to brake a fighter in a long dive and to perform delicate ground maneuvers. If you know what to expect you can also improve your control at higher altitudes*

*The point is to learn how the wind works and to use that knowledge to your advantage.*

boundary layer to produce some spectacular results. The Boundary Layer is something we can't change and which we can actually learn

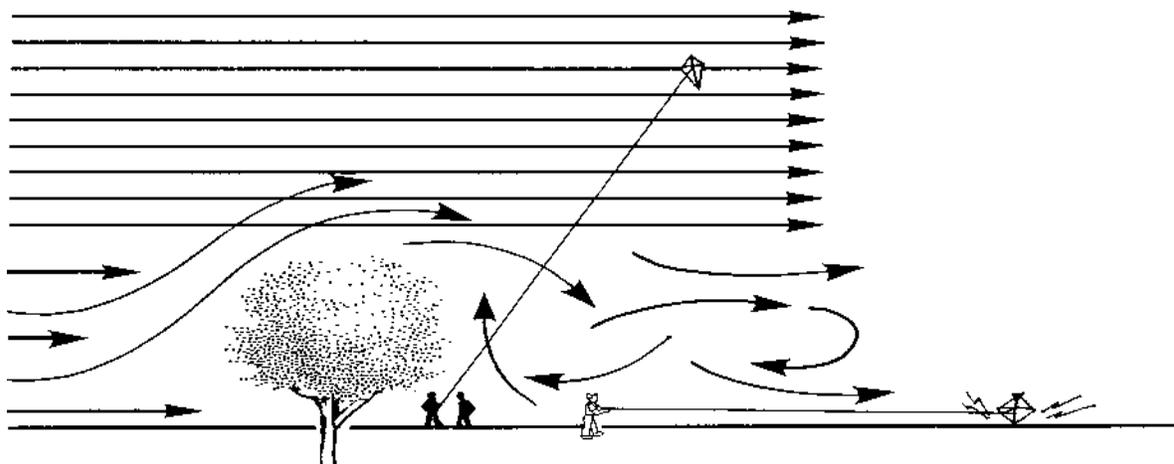
to work with. Turbulence is a different story. Turbulence is definitely bad news. **Turbulence** is generated by anything that gets in the wind's way. Even your kite generates some turbulence which may effect other kites flying nearby.



The turbulent area downwind of an obstacle is called its wind shadow. All wind shadows gradually disappear as you get further away from the obstacle. But not right away. The shadow from a typical tree extends several hundred yards, while a large building can make a shadow a mile long!

The air, flowing over trees, houses and fields, acts much like a river, flowing over rocks, around bends, and through level stretches. Turbulence, in both cases, takes some time to smooth out.

The difficulty with flying in turbulent conditions is that you will experience sudden, irregular, and unpredictable wind shifts. Depending upon the severity of the turbulence, coping with these shifts will range from exhilarating to impossible. So



the message is, in short — If you like crashing, go fly behind a tree.

**Strength** is the other important characteristic of wind.

Since wind is never perfectly smooth, any discussion of wind strength has to refer to its average strength. So when we talk about a “10 mile-per-hour wind”, understand that the actual wind strength at any instant will vary, but that the “average” will be about ten miles per hour.

Probably the best way to give you a brief overview of wind strength and how it will affect your kite is with the following table. The “Beaufort Scale” was devised by Admiral Sir Frances Beaufort of the British Navy in 1806 as a standard guide for describing the force of wind on sailing ships. (Note the “Beaufort Number” in the left hand column.)

The scale has been modified for land and for kite fliers in particular. We’ve even added a column of information to the scale which describes the effects of the wind

on fighter kite flying.

### ***The Beaufort Scale***

<i>Beaufort Number and Designation</i>	<i>Average M.P.H.</i>	<i>What to Look For</i>	<i>Effects on Fighter Kites</i>
0 Calm	less than 1	No wind; smoke rises vertically.	Stay home and read a good kite book.
1 Light Air	1-3	Wind direction just shown by smoke.	Challenging but possible. With a good kite and light line, you'll surprise the other fliers.
2 Light Breeze	4-7	Leaves rustle, wind felt on face, flags flap lazily.	Most fighters will perform fine, although you will need to work to stay airborne.
3 Gentle Breeze	8-12	Leaves and small twigs in constant motion; flags extended.	Perfect conditions! Everything flies well with little physical strain.
4 Moderate Breeze	13-18	Raises dust and loose paper; small branches move.	Control becomes difficult since you are unable to adjust line tension.
5 Fresh Breeze	19-24	Branches and small trees sway; wavelets form on inland waters.	Bordering on too much. The kind of day you can talk about next time there is no wind.
6 Strong Breeze	25-31	Large branches move; whistling in phone and electric wires.	Too forceful for most fighters. Stay home and read another good kite book.

Inexpensive, hand-held wind meters are also available at most kite stores and

*Large size in fighter kites is not a virtue. Larger fighters can become a strain on the fingers in strong winds (10 m.p.h. or higher). Even a one-foot fighter can relieve you of a lot of finger skin on a windy day. In addition, smaller fighters can usually be made a bit stiffer, a bit quicker to turn and generally more active, if that's what you like.*

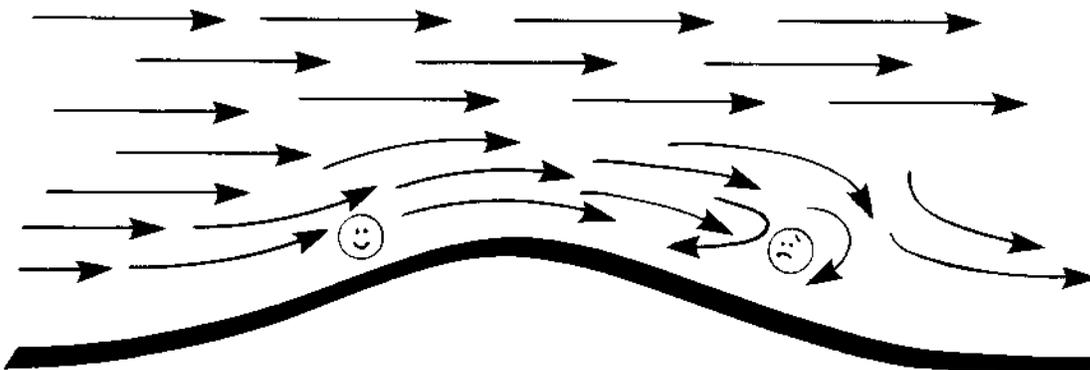
**Mel Govig**  
**Randallstown, Maryland**

supply outlets. But remember, they only tell you the wind speed at ground level.

## **PICKING A FLYING SITE**

There are two main things to consider when picking a place to fly: the terrain and site safety.

**TERRAIN** — We know from the previous section that it's difficult to fly well in turbulent wind. Turbulence is caused not only by obstacles, but also by the shape of the ground itself. Let's look at the way the wind flows over a hill.



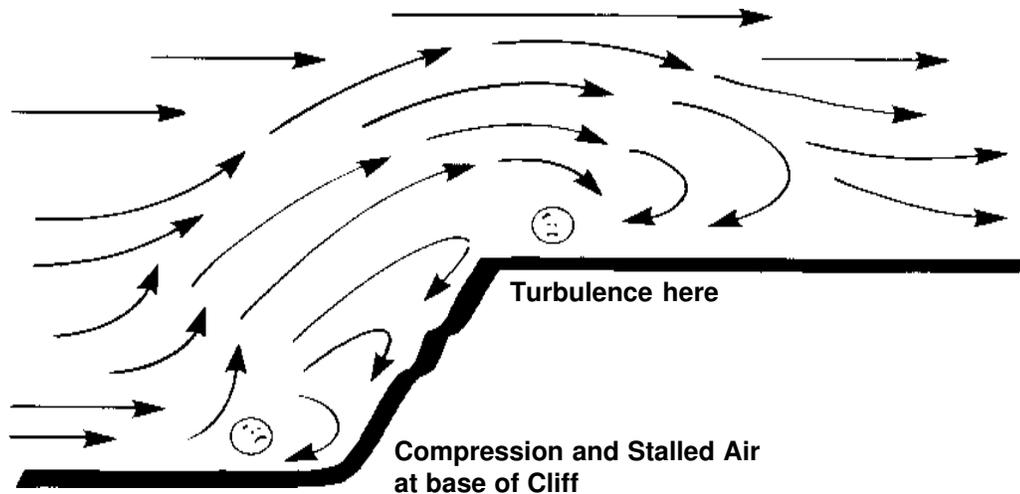
**The front face of a hill is great for flying ... but watch out for the back side!!**

On the windward, or “front” side of a hill, the air flow compresses and speeds up. These are good sites for flying. A hill that’s the right shape can even help smooth out some of the turbulence reaching it from farther upwind, cleaning up the flow and making for better flying.

The leeward, or “back” side, however, is different. Wind flowing over the crest of the hill separates and causes turbulence that can range from moderate to severe depending on the speed of the wind and the shape of the hill.

So if a little slope is good, a steep slope must be better, right? Well, not exactly.

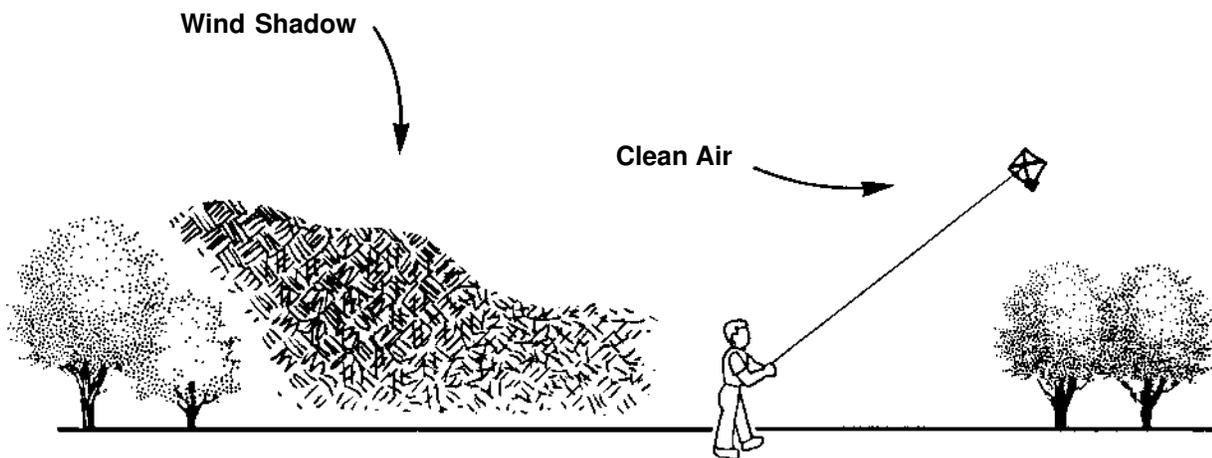
The sharp break at the foot of a steep rise causes the wind to form a pocket of stalled and turbulent air. The break at the top causes turbulence to form just like the back side of a hill.



So the general rule is: Stay away from cliffs.

The perfect flying site is absolutely flat and has no obstructions for miles in any direction. Those are the kinds of places we travel to for big kite festivals. Unfortunately, most of us have to settle for something a bit closer to home for “regular” flying.

Here’s how to make the best of one common situation:



On a field bounded both upwind and downwind by obstructions, you’re better off flying as close as you safely can to the downwind end of the field. Get as far away as

*The basic formula for turbulence is that unsteady winds will extend seven times further than the height of whatever object is causing the disruption. If a tree is 100 feet tall, you need to get 700 feet away to find clean or steady wind.*

*The best advice is to not fly downwind of trees, buildings, or geological formations. In fact, whenever possible, avoid flying downwind of any tall obstructions.*

possible from the source of turbulence so the wind will be as “clean” as possible.

## **SAFETY and COURTESY**

You’ll be hearing a lot about safety from us, from your flying friends, from your local shop owner, and from kiteflying organizations. There’s a good reason, so pay attention! A maneuverable kite is a PROJECTILE — capable of doing injury and property damage. You can injure others. You can do damage to your surroundings. You can hurt yourself.

Just to make sure we are absolutely clear, here are three essential safety rules:

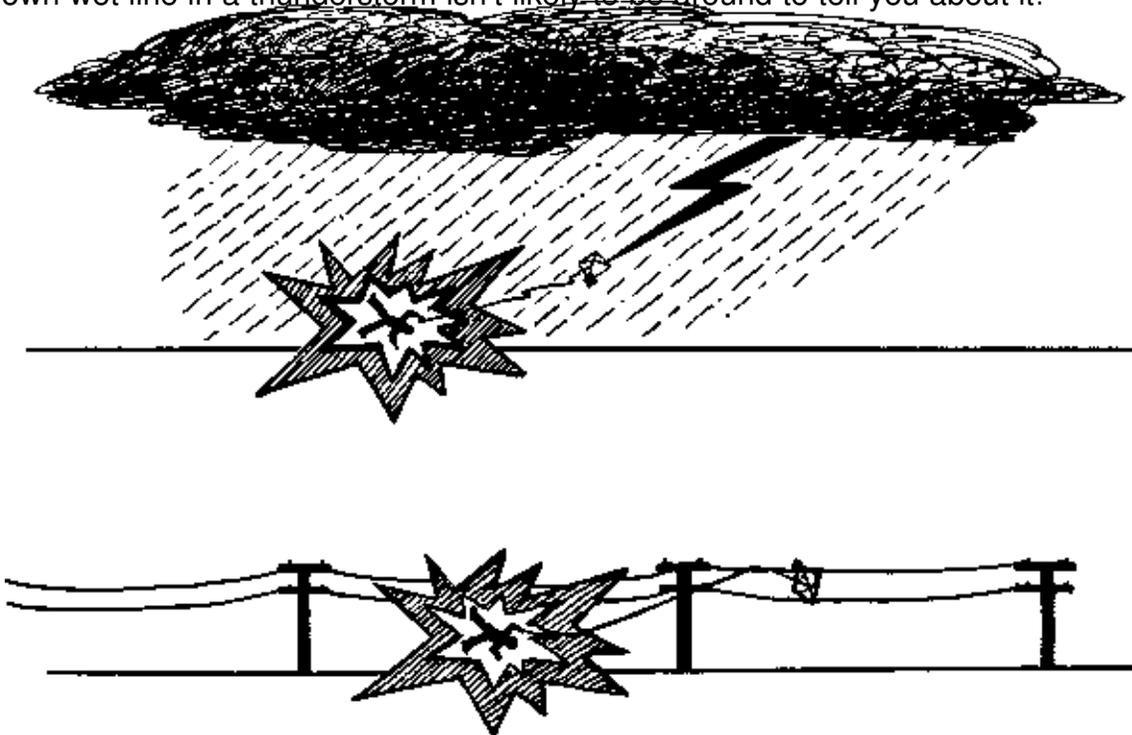
**Never fly glass or cutting line around people or unsuspecting kites.**

**Never dive a fighter over people’s heads.**

**Never fly in electrical storms or around power lines.**

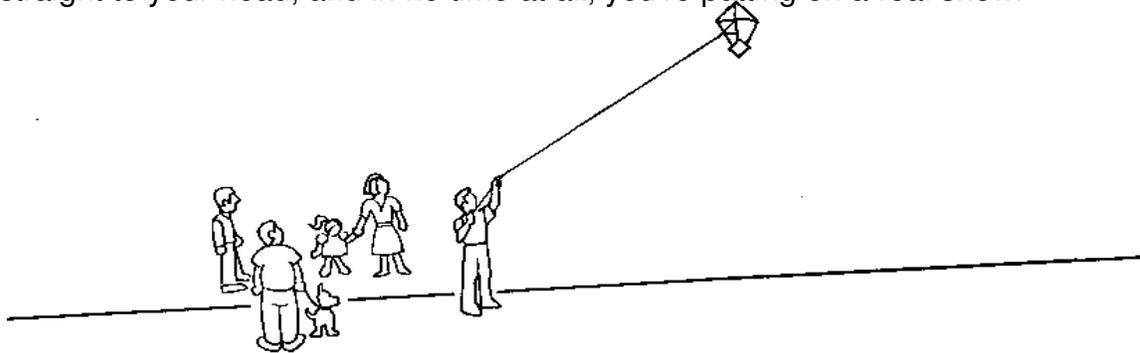
The dangers of glass coated line should be obvious. Whether it’s in the air or lying slack on the ground, **cutting line, by definition, is extremely hazardous**. Flying around other kites that aren’t equipt with cutting line or who aren’t prepared for a cutting contest is just asking for trouble. The easy and best answer is to not do it. There are plenty of good times to use glass line. Besides, it wears out quickly. Don’t waste your line by using it at the wrong time.

Here’s another obvious safety tip: **Stay away from electricity**. Anyone who tells you that wet flylines aren’t conductive hasn’t flown in a thunderstorm. Anyone who has flown wet line in a thunderstorm isn’t likely to be around to tell you about it!

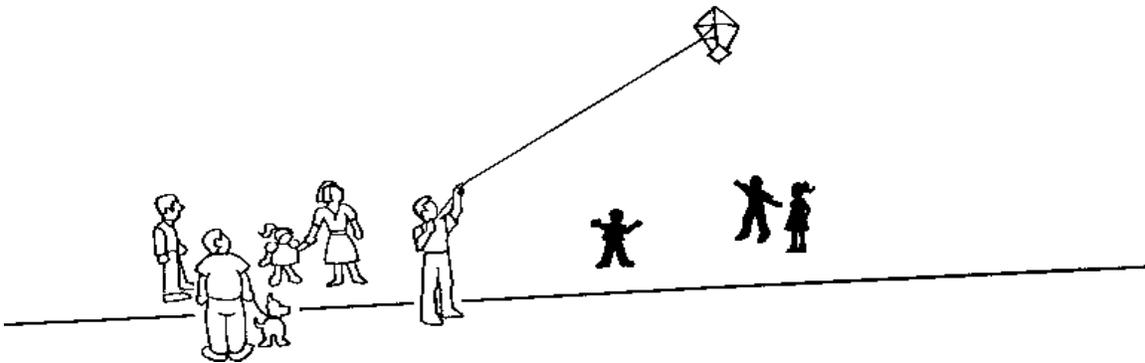


By the way, dry flylines also conduct electricity. No clouds, no rain ... same result. And even if you don’t get zapped, remember this: The power company carries 13,600 volts on lines less than two feet apart. In 1979, a kite dragged two of those lines together and burned down \$15,000,000 worth of Santa Barbara, California.

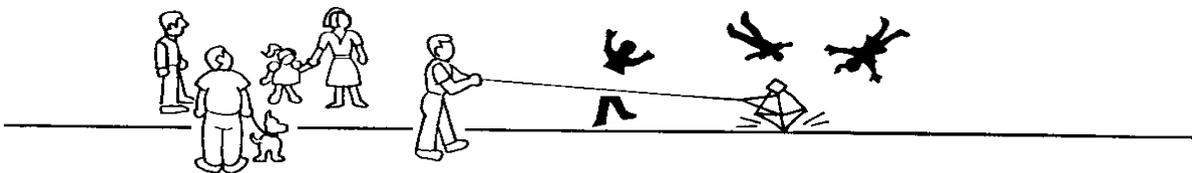
Most important of all, **watch out for people**. A typical situation that develops into a hazard looks like this: It's a beautiful day - just you, your kite, and a perfect wind. Soon your aerobatic prowess attracts spectators. Their "oohs" and "aahs" go straight to your head, and in no time at all, you're putting on a real show.



Some children, attracted by the motion and bright color, decide to chase your kite. Your ego tempts you to show off by chasing them back. You dive on them and make them fall down laughing while the crowd applauds. You think everyone is having great fun. The problem is, you may not know it or believe it, but you're in TROUBLE.



Because - no matter how good you are, no matter how good you think you are, you're not good enough...



You turn into an instant jerk...

It doesn't matter that you got away with it the last 100 times, or the last 1,000 times you tried it. It only takes once to hurt someone badly.

*Teasing bystanders with a maneuverable kite is one of the greatest temptations in the world. We've all done it - and we should all know better. Think about one of those spars hitting someone in the eye. Think about catching an earring with your flying line. Please, just think about it. And then don't do it.*

So when you get into a situation like this - and you will — LAND. Explain the danger to the children and their parents. People will understand. Tell them the best place to watch is up behind the flier.

Get the area under your kite clear, then resume flying. That way you can put on a dazzling show and be responsible at the same time. Your spectators will really be impressed.

Fighters are mobile, which means they can move around the flying field in order to avoid each other. That's not the case with many large show kites. Because you are flying vertically quite a bit, it is also easy to quickly come into contact with fast moving stunters before they even realize you are there.

If you are in an area where "stationary" kites are being flown, watch out for their lines -- especially the ones that are tied down and unattended. Stunt fliers should have their own area and you should have your's. Fighters are more fun when flown together anyway.

The point is that getting angry with other fliers isn't the answer. Communication and foresight is.

To sum it all up, share the flying space. Talk to people. Be alert. Be careful. Always remember the three "C's" of responsible kiting:

**Caution, Courtesy, and Common Sense.**

Unless you enjoy nasty letters from lawyers and insurance companies, pay close attention to what you're doing just as you would when driving a car, flying a plane, or operating any other potentially hazardous device.

*Some parks and beaches are now beginning to limit or even prohibit kite flying. This is a direct result of irresponsible fliers who monopolize space or needlessly frighten and injure people. Kites are not dangerous, but some kite flyers are.*

*For these reasons, liability insurance has become a major issue for kite clubs and groups sponsoring stunt kite events. These new expenses may actually force the cancellation of some contests.*

*The most important thing that kite enthusiasts can do to ensure the future of the sport is concentrate on safety and courtesy.*

## CHAPTER 5:

### FIGHTER KITE TUNING

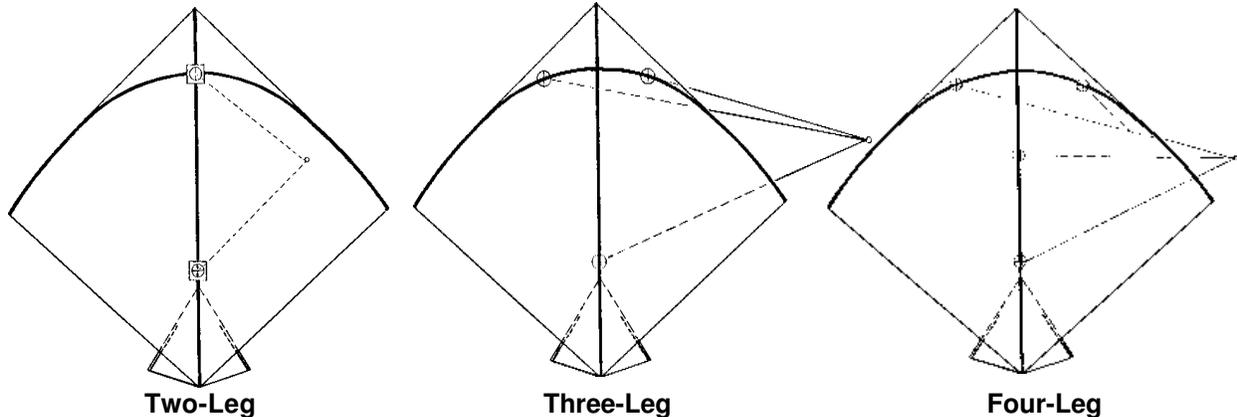
The best musician sounds terrible on an instrument that's out of tune. Just as a properly tuned musical instrument gives good sound and great pleasure, a properly tuned fighter will delight you with its ability.

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.

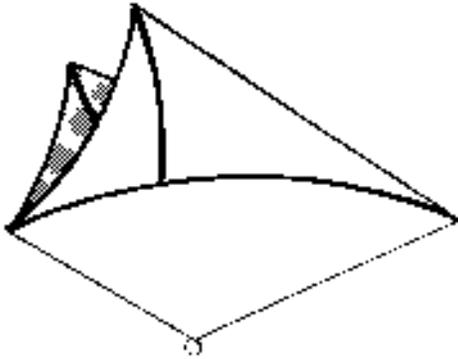
The lower line of both two and three-leg bridles is connected to the spine somewhere in the lower half of the kite. Very few fighters have the lower bridle connected at the bottom of the kite.

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

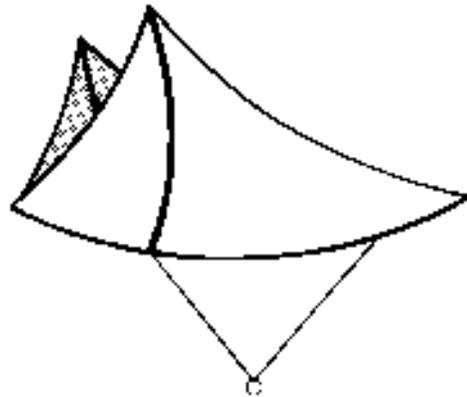
*The Bridle is the kite's "brain". This short piece of string attached to the kite adjusts the angle at which the kite heads into the wind. The more squarely a kite faces the wind, the faster it will go.*

**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**

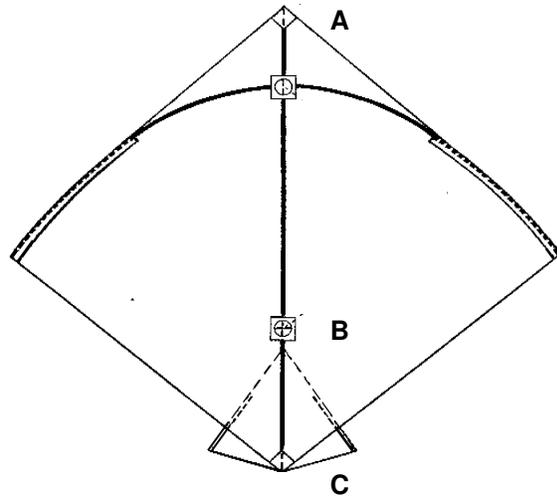
**Adjust the Angle of Attack:** As you know, when you adjust a fighter's bridle, you're changing the kite's angle of attack. This is something we talked about quite a bit in Chapter Three. The angle of attack is the angle at which the kite meets the wind. As winds change, the angle may need to be slightly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

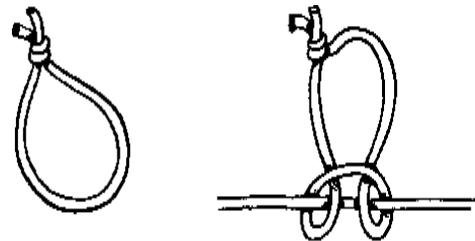


*Adjusting a kite to be more responsive in heavy winds can be dangerous. The kite will fly very fast and you will need very quick reactions to control it. The kite is more likely to crash, especially during launches, and if you hit someone while flying faster, you may hurt them more.*

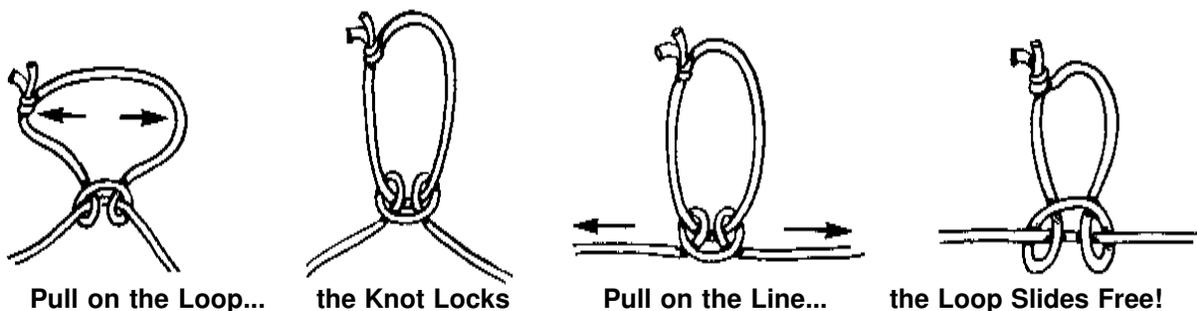
**Makoto Ohashi**  
**Tokyo, Japan**

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.



**Pull on the Loop...**

**the Knot Locks**

**Pull on the Line...**

**the Loop Slides Free!**

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.

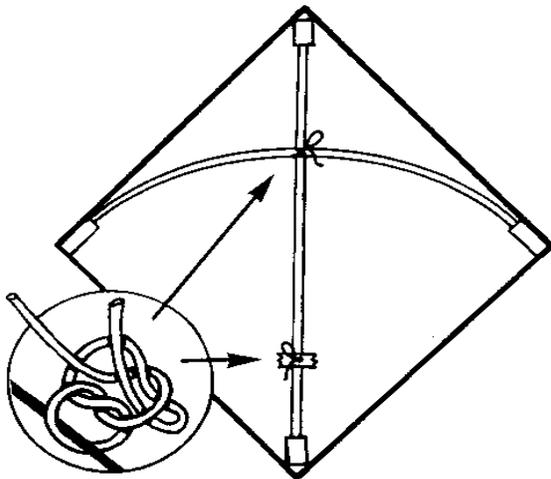
*Small adjustments of the tow-point position on the bridle can greatly change a fighter’s performance. This adjustment is made to suit the flier and the performance they want, rather than to suit the wind strength.*

*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.

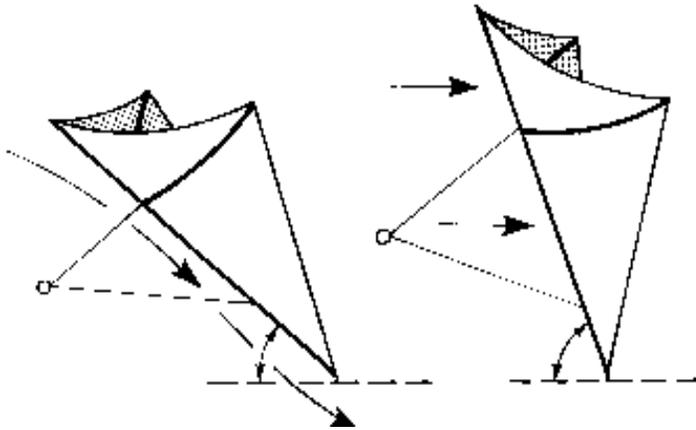
Making the top leg shorter has the same effect as moving the tow-point up. Making the bottom leg shorter is like moving the tow-point down.

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!

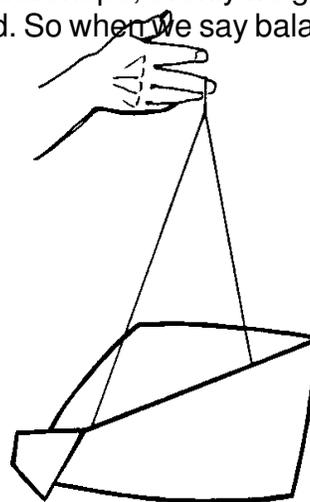
## Balancing the Kite

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.



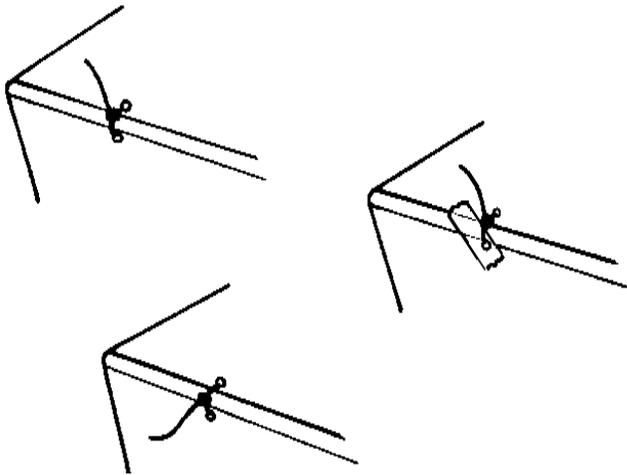
You can also check your balance during flight. A poorly balanced kite has a tendency to dive on the heavy side or loop in circles no matter how much tension you put on the line. The kite should not lean to either side and should fly free and straight with little slack on the line.

*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.

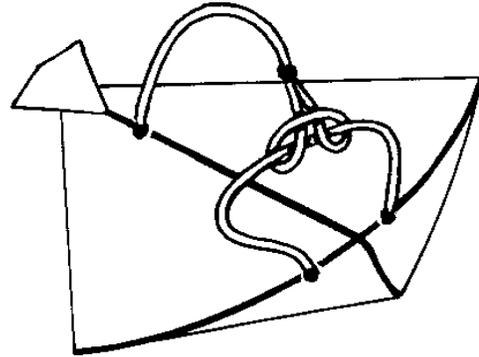
*A properly tuned kite will perform a figure eight overhead in a space of three or four feet. For fastest performance, move the bridle point up as high as you can while still maintaining direction and control. The ideal setting for wind conditions allows the kite to track instantly when you retrieve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

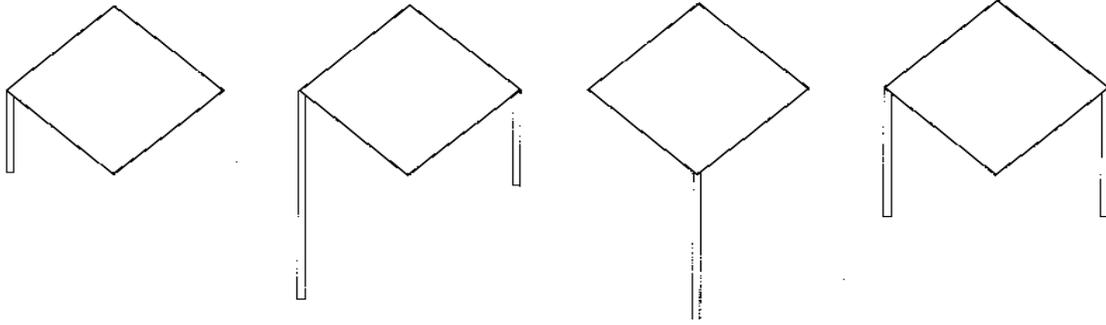
**Weight Shifts:** A final approach to correcting balance problems is to add adhesive tape or small pieces of fabric to the edges of the kite. Maybe you've already done this while making repairs and suddenly find the kite out of balance. Remember, exact balance is important, so if you make repairs to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

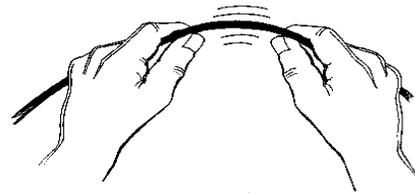
## Bowing the Kite

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.*

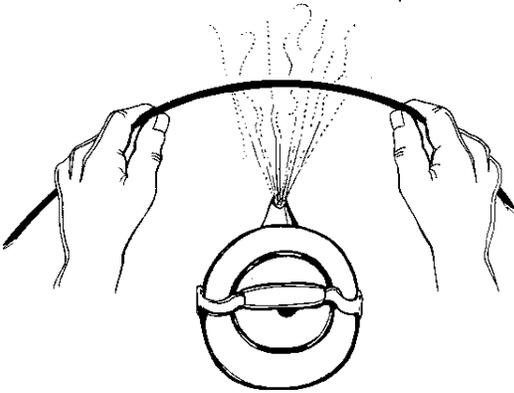
**Martyn Lawrence**  
Gwynedd, Wales, United Kingdom

*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.

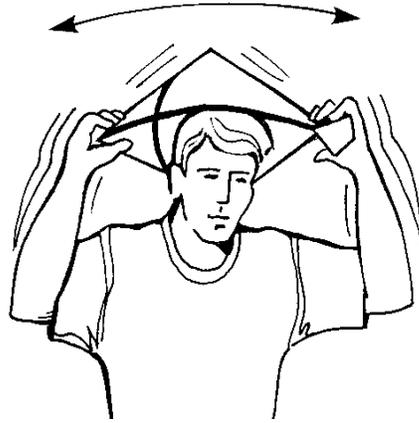
You think we're making this up, right?

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.

## CHAPTER 6:

### MAKING A FIGHTER

Local kite shops should be able to satisfy your fighter kite needs. But at some point you may wish to try your hand at making your own. There are hundreds of great designs out there. In Chapter Six, we're going to show you one of them.

*These instructions detail how to make a fabric fighter. It goes without saying that you can make the same kite from plastic or paper and use adhesive tape instead of sewing. Such simple kites are both cheaper and faster. And they fly great!*

*Something more important, however, is that paper and plastic kites provide you with the opportunity to experiment with designs. You can make changes, or if a design isn't successful, you can simply throw the sail away and start over.*

*Don't rule out paper or plastic kites. The great majority of fliers around the world fly them.*

#### Materials

- Sail: 18" square of crisp ripstop nylon, or  
18" square of soft cloth-like Tyvek paper
- Cross Spar: 3/32" diameter x 36" long flexible fiberglass rod
- Center Spine: 4 1/8" x 1/4" x 20" pine or cedar rod, or  
1/4" x 20" bamboo strip, or  
1/4" x 20" wood dowel
- Bridle: 4-5' of 20 pound test woven Dacron line
- Pockets & Casings: 1 1/4" x 18" of stiff nylon tape or fabric

#### Construction Steps

**Bend the Spine:** Earlier we talked about the importance of bending the center spine. A bow of around fifteen degrees is usually enough to provide the slight head-to-tail dihedral that you need for stability and control in light winds.

Place the arch or angle about four inches from the end of the spine. This will put it between the nose and the cross spar connection point.

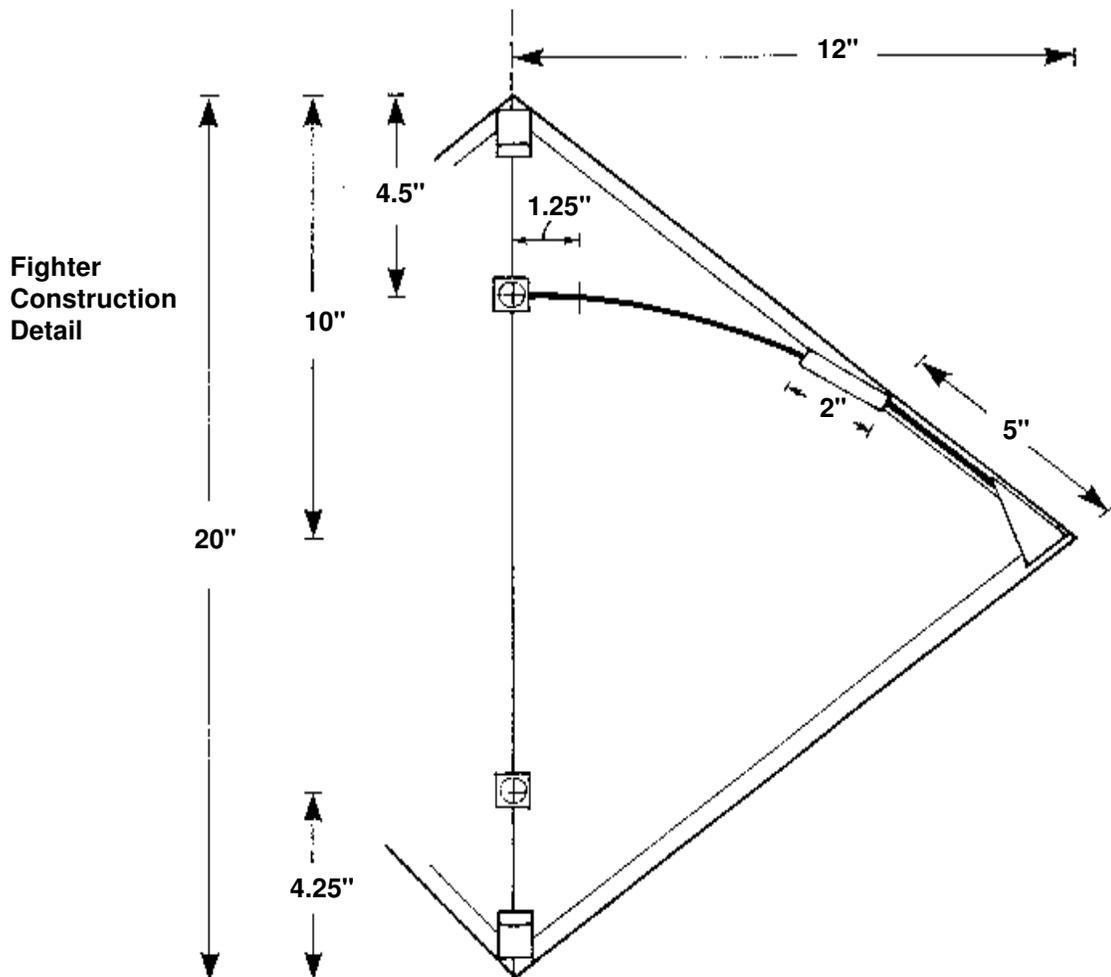
Hold the spine over a concentrated steam source and slowly begin to shape it. Remember to be careful. Steam is hot! We explained how to do this in the last chapter so you might want to go back for a quick review.

After the spine has cooled, check it again for shaping.

*The true hard core finatics continue to prefer a bamboo spine because of its natural, "built-in" energy and its ability to take punishment without breaking. Fiberglass just doesn't have enough "soul" for a good spine. Some fliers are starting to laminate woods together with bamboo for a stronger and more durable spine.*

**Ric Merry**  
**Seattle, Washington**

For a really first class spine, you may want to try laminating a piece of spruce or cedar to a strip of bamboo. Cut small slices across the wood so it will bend more easily. Then shape the spine and glue it to the bamboo. The result will be a good looking spine which is both stronger and stiffer.

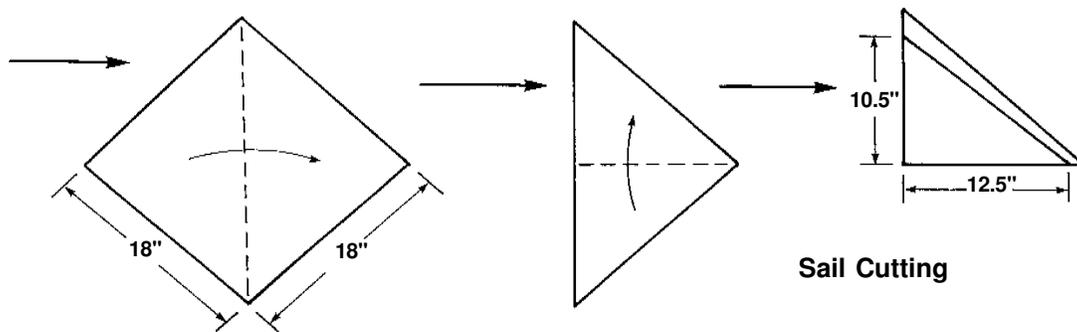


**Fold, Cut, and Hem Sail:** The finished sail is actually wider than it is tall. Since balance is extremely important, the easiest way to cut the sail is to fold it and then make all cuts at one time.

Fold your sail material in half diagonally. Then fold it again into quarters.

Mark one folded edge 10 1/2 inches from the center corner. Mark the other edge 12 1/2 inches from the corner.

Now, using a straight metal edge and a sharp knife or hot-cutter, slice through all four layers with a single cut.



Unfold the sail and sew a 1/4 inch hem around all four sides. While the center fold is still visible, mark the points for bridle attachments. The two-point bridle will be connected 4 1/2 inches from the nose, and 4 1/4 inches from the tail.

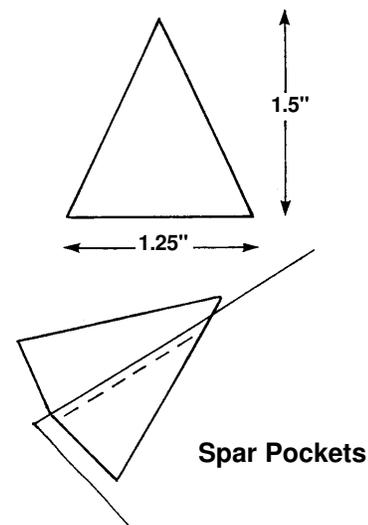
This is a good time to add any decoration or applique art to the sail.

**Attach Spar Pockets and Casings:** The cross spar is connected by pockets at the outside corners of the fighter, and by casings which help hold it in place and maintain a proper flex. Remember to put them on the back of the sail.

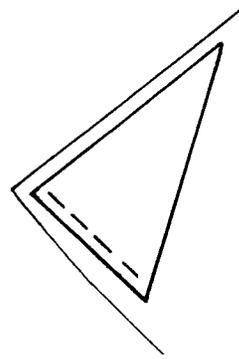
Since these fittings will absorb most of the stresses on the kite, it is important to make them of strong, tightly woven material, and to sew them securely in place. Use a hot knife to cut the fabric or carefully seal the edges near an open flame to prevent fraying later.

Cut two triangular spar tip pockets. These triangles should be 1 1/4 inches wide and 1 1/2 inches tall.

Stitch the center of each pocket triangle to the outside edges of the sail. Triangles should be "pointing" toward the nose of the kite. (Remember that the sail is wider than it is tall. Don't put the spar pockets on the nose and tail by mistake!)



Now fold the triangle in half and sew the two open edges together. This is an important stress point on the kite so you should use several layers of stitches.



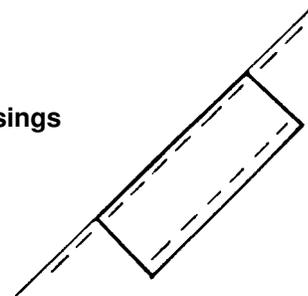
**Sew the Spar Pocket Closed**

Spar casings should be attached next.

Cut two casing rectangles of fabric, 2 inches long and 3/4 inch wide.

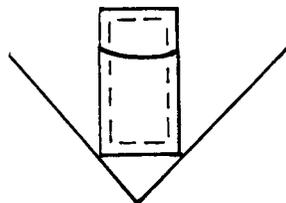
Attach these casings along the leading edge, 5 inches from the outside corners of the kite. Use two rows of stitches so that later, the spar can be inserted through the casing.

**Spar Casings**



**Placed between the Spar Pockets and the Nose**

**Attach Spine Pockets:** Spine pockets are quite similar to the spar pockets and casings.



**Open Ends Facing Center of Kite**

Cut two pocket rectangles of fabric, 2 inches long and 3/4 inch wide.

Fold the rectangle so that the top edge is 1/4 inch below the bottom edge. Place the fold in the nose or tail of the kite and stitch around the other three edges so that pockets are created with the open ends

facing toward each other.

**Insert Spar and Spine:** As we said before, the spar and spine are attached to the sail using the pockets and casings.

Insert the top of the spine into the pocket at the nose of the kite. (Remember that the top of the spine is the end that has been bowed.) Now insert the bottom of the spine into the pocket at the tail of the kite. To do this, you may need to carefully arch the spine. Place the nose on the ground and carefully put pressure on the spine to bend it out and away from the sail. You should now be able to slide the spine into the tail pocket.

Slide the end of the flexible cross spar under the spine and through both of the casings. Then insert the ends into the outside corner pockets. Note that the center of the spar is located at the upper bridle point. When we attach the

bridle line, this cross point will be secured with a knot.

With the spar and spine attached, the fighter's sail should be stretched smooth and

tau. If the spar is too long, some minor trimming may be required.

*To make your kite much more compact for storage or traveling, you can cut the long, flexible cross spar in half and connect a one inch ferrule to one end. Remember to cut the spar exactly in half to maintain overall balance.*

*Use brass tubing from a model shop. Glue the ferrule to one of the center-facing ends of the spar. The other half slips into place for assembly and is held captive by the tension of the kite.*

**Bud Koger**

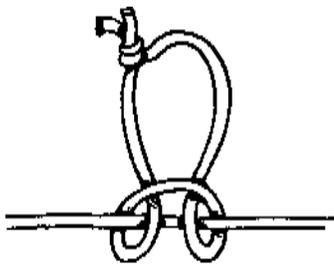
*Bellevue, Washington*

**Attach Two-Leg Bridle:** The ends of a two-leg bridle are passed through the front of the sail and tied directly to the center spine. You should have already marked the connection points, 4 1/2 inches from the nose, and 4 1/4 inches from the tail. An embroidery needle makes the job easier.

For a more durable kite, sew small pieces of reinforcing fabric to the sail at these bridle points. Adhesive ripstop tape also works well.

The total length of the bridle is 30 inches. The upper leg of the bridle will be tied around both the spine and cross spar.

You can improve the strength of your knots and prevent fraying by dabbing each of them with a drop of Super Glue. Just remember not to glue any movable knots that you may need to adjust later.



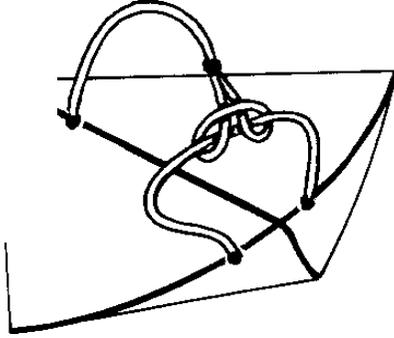
To finish off the bridle, take a separate piece of line about 4 inches long and tie it into a loop. Attach the loop to the bridle with a larkshead knot. We call this loop a movable tow-point. Back in Chapter Five, we explained how to make this tow-point loop and adjust it for maximum

performance.

**Optional Three-Leg Bridle:** A three point bridle will improve the stability of your fighter and allow you to adjust balance more effectively. The three-leg bridle is made from a 16 inch Main Line and a 12 inch "Yoke" Line.

Measure 1 1/4 inches out on each side of your top bridle point. That's the point, 4 1/2 inches from the nose, that we marked earlier. Pass the ends of the Yoke Line through the front of the sail at these two new bridle points and

tie them to the cross spar.



Tie a two inch loop in one end of the Main Line. Attach this end of the Main Line to the Yoke Line using a larkshead knot. We will call this sliding knot the “Yoke Point”.

Pass the other end of the Main Line through the front of the sail at the bottom bridle point and tie it to the center spine. You can now adjust the balance of your fighter by moving the Yoke Point.

*Heavy winds or regular flying may have a tendency to pull the ends of the Yoke Line closer together. This will throw the balance of the kite off and eventually will result in tears to your sail.*

*You can prevent this problem by adding “spreader bumps” to the cross spar where the Yoke Line attaches. Simply wrap several turns of thread or kite line around the spar, tie off the line, and then coat these “bumps” with glue.*

Congratulations! Your kite is now finished.

# CHAPTER 7:

## ALL ABOUT FLYING LINE

### Selecting the Right Line

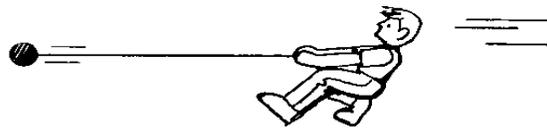
Some fighter kites come with line included. Most do not. Sooner or later, however, you'll probably end up buying more line, either because the original line broke, because you want more variety, or because you want to experiment with different types of line handling.

Fighter kites will fly on almost any old "kite string". As you might expect, proper handling takes something a bit more specialized. Here are a few things to think about when you go line shopping:

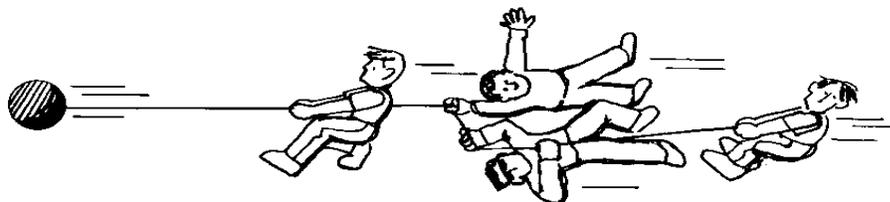
**Strength** - Fighters require lighter line than most kites and a line that's too heavy will weigh-down an otherwise active kite. On the other hand, bigger kites and stronger winds also require relatively stronger line.

**Stretch** - In order to control your kite, you need to be able to send it signals. But if you pull on the line and that signal is "absorbed" by line stretch, then you won't have much control. So the less your line stretches when you pull, the more precise your control will be.

**Diameter** - Diameter makes drag, and drag makes sag. Sag degrades control. And here's a sad fact of life, aerodynamically speaking:



If the line diameter doubles ... the drag increases four times!



Since round objects produce more drag for their thickness than streamlined ones, the line can actually produce more drag than the kite itself!

Increased line drag shows up generally in lower performance such as slower kite speeds or higher wind requirements

**Handling** - Thin or abrasive lines sliding through your fingers can be tough on your hands. Cutting line can be downright destructive.

Slippery lines are, by definition, hard to hang onto. Wax coated lines, on the other hand, are easy to grip quickly. When you go shopping for line, remember what you plan to be doing with it.

**Durability and Cost** - Some types of line last longer. Others will fray or wear faster depending on the conditions they're used in. Continued exposure to the sun can also reduce a line's strength.

You'll find a tremendous variation in the cost of lines available. Generally, if you're going to destroy line quickly in a cutting contest, use something inexpensive. Otherwise look for durable line which is easy to handle.

**Color** - Flying lines are now available in a variety of different colors. Color won't effect your flying but it may effect your satisfaction and state of mind. It may also help you sort out your own line in a crowded sky or messy tangle.

The ideal flying line would have zero stretch for responsiveness, be lightweight, be strong and durable to resist breakage, and cost next to nothing. And to make things even more difficult, it would be as thin as possible to minimize wind resistance, but also thick enough to be easily handled. What that means is that the "ideal" line isn't out there yet. But there are some alternatives that come close.

*If you keep your eyes open, you'll find a lot of good lines for fighter flying. I like surgical suture thread which is excellent for small kites and almost essential on light wind days. It's strong and can be waxed to reduce tangles and increase control. Carpet thread is another readily available alternative.*

**Ric Merry**  
**Seattle, Washington**

Here is an overview on some basic types of commercial flying lines and some observations about their suitability for fighter flying.

**Waxed Linen Line** - This may be the best option in terms of handling, cost, and safety. Stiff enough to avoid tangles, it is still thin enough to minimize drag. The wax coating is also a major plus for quickly pulling in line. Twisted carpet thread is another good and less expensive option, but it lacks the benefits of a wax coating.

**Cotton and Nylon** - Less expensive but not necessarily the best for fighter flying. Nylon will stretch like a rubber band and many cotton lines, when you can find them, aren't much better. Twists, tangles and burns on you fingers and palms are also a problem with thinner lines. Specially made glazed cotton line is often used in Asia and India because it is broad enough to not cause as many burns.

**Stunt Kite Line** - Special lines like Spectra™ and Kevlar™ which were developed for stunt kite flying might initially appear useful for fighters as well. They are strong and are engineered for minimal stretch. Of course, any stunt flier will also tell you that they are pretty darned expensive and seldom come in lengths over 300 feet. The biggest problem, however, is that most are so thin and slippery that they may cut your hands.

*My favorite line is waxed polyester/cotton thread Number 12 that has been flown and handled a fair bit.*

*Waxed line is very tacky when new and doesn't run out smoothly. But when excess wax has rubbed off, you are left with a line with no fuzzy bits, minimum drag for its size, and that you can grip easily with no string burns.*

**Martyn Lawrence**  
**Gwynedd, Wales, United Kingdom**

**Cutting Line** - Glass coated line is traditionally made by coating string in a paste made from powdered or ground bottle glass and wheat-flour glue. Egg whites and starch can be used instead of glue. According to Indian legend, wealthy fighters mixed diamond dust into their cutting paste.

Two kinds of cutting line are produced in India - single coat and double coat. The single-coated line cuts only from one direction, while the double-coated line will cut from either direction. This means you can pull to slice or let out line to cut by force. Designed to be sharp and abrasive, the line requires special precautions and special handling.

*Glass line isn't dangerous if you handle it right. Just remember to pull in or let out line hand-over-hand. Don't let it slide through your fingers. That's how you get cut.*

*I use glass which has been ground up and then strained through an old sock. That way, you get only glass powder and not larger pieces. The powder can then be attached to your line using glue or egg whites for a good, stiff finish.*

**Al Chang**  
**Honolulu, Hawaii**

Caution cannot be over emphasized when cutting line is in the air or on the ground. Be absolutely certain that spectators are off the field, and that non-combatant kites are not in the fighting area. Flying glass line among other kites - even among other fighters - is a quick and easy way to become quite unpopular. Make sure that everyone involved understands and agrees before you begin any "cutting combat".

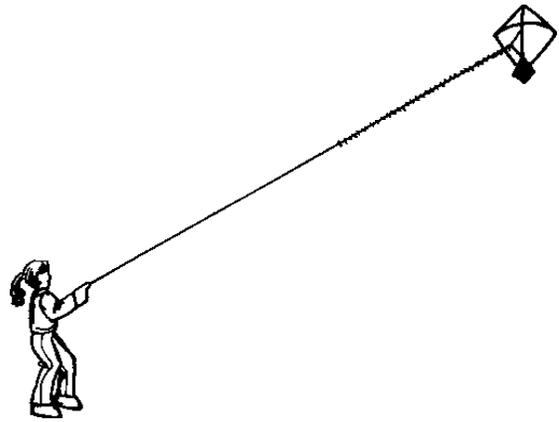
In addition to cutting down other kites, glass line can also quickly cut your hands if you aren't careful. Experienced fliers often coat their fingers with tape so that they can maintain tension and control without sustaining unnecessary injuries.

*You cannot effectively fly fighters wearing gloves, so if you use cutting line, be prepared to shed a little blood. In India, cut fingers are accepted as part of the game. Cuts heal "in a week or so", we are assured by master fliers.*

**Mel Govig**  
**Randallstown, Maryland**

To avoid cuts, an easy thing to do is simply limit the amount of cutting line to a small section up near the kite. You can then fly and control the fighter on “regular” line.

Not only is more skill needed to make contact on the shorter piece of coated line, but the hands are also spared the injuries caused by handling the cutting surface.



Besides, frequent contact with the line wears the glass coating off and makes it less effective. You’ll probably want to replace any “used” portions of your line after one or two good flights. Using smaller pieces means that you won’t wear out your entire line as quickly.

Another important thing to remember is to try and keep your line dry. The glue and glass mixture “melts” when wet and a large spool left in the rain will quickly become a sticky mess.

Don’t leave line unattended on the ground, and remember to pick up any stray or loose pieces you may have discarded. Leaving anything behind on the field is a bad idea, but cutting line can be particularly dangerous. Coated line is often hard to see and can easily cut the legs of people - especially children - and animals in the area.

Cutting line can be great and challenging fun. Improperly or carelessly used, it can also be extremely dangerous to you and to others. Be careful.

## Line Weight

Because of the effects of gravity and drag, choosing the right weight line is almost always the difference between success and failure. Line that’s too light will break and you may lose your kite. Line that’s too heavy will keep the kite from performing well and may actually keep it from getting into the air at all.

*When you shop for line, try the breaking strength on a short piece. The line should break before it hurts your hand. I am known in several shops in Paris for fiddling with the spools and breaking line. You will certainly get some remarks and be asked why you are doing this. Be prepared with your answers!*

**Philippe Gallot**  
**Paris, France**

The best weight of line for a given situation depends on the size and type of kite used, the wind, the number of knots in the line, and on the length you plan to use. Recommendations vary from 10 to 30 pound breaking strength. The best answer is to carry a number of lines for use with different kites and wind conditions. Use the lightest and thinnest possible line that will support your kite in different circumstances for maximum performance.

Line weight and length are usually printed on the packaging. Don't forget to write these figures on your spool or reel before you throw the packaging away. Some fliers even keep track of the age of their lines since regular use and even exposure to sunlight can wear them out. You can try and remember mentally, but with several sets of line in your collection, it can become a bit confusing. Better to use that brain power learning flying skills than memorizing fly line statistics...

## Spools and Reels

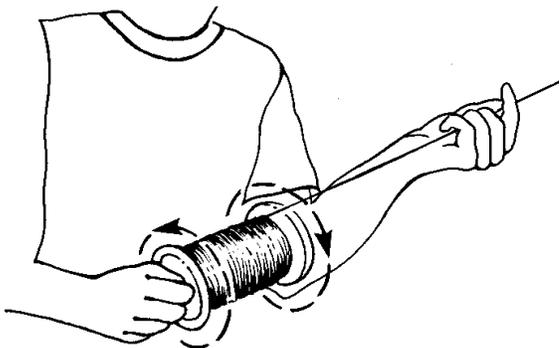
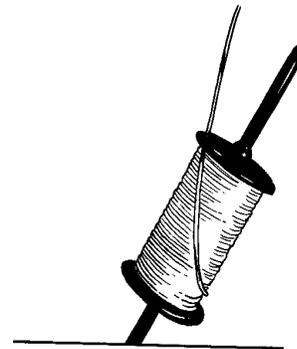
Proper line handling depends on a good, effective spool or reel. Different types of kite flying require different types of winders. Fighter flying is no exception.

To fly fighters well, you need a device which will hold a good amount of line and allow you to feed that line out quickly without drag or tension which will upset your control of the kite.

Since you will usually finish your flight with a fair amount of line loose on the ground, you also need a winder which will collect slack line quickly.

Fighter kite fliers have developed several devices which seem to work pretty well.

**Indian Spools:** The most common line devices for fighter flying are the traditional Indian spools made from a revolving barrel and two long handles. When you're flying, you place one handle vertically into the ground so that the line rolls off quickly and smoothly. This frees both hands to work the line.



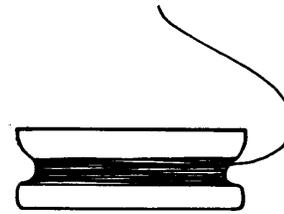
When you're ready to retrieve your line, you place one handle in the crook of your elbow and quickly rotate the opposite handle while guiding the line with your free hand. Thousands of feet of line can be collected in just a few minutes.

*The most important quality of a good (Indian) spool is to pay out the line as quickly as possible without any friction. A well balanced spool, heavy and easy to spin, is crucial in order to give speed and good recovery of the feeding line. From a technical point of view, the greater the mass, the better the rotation. Rotation is accelerated with the weight, like a type of fly wheel.*

**Philippe Gallot  
Paris, France**

**Halo Winders:** Halo winders are a more contemporary winding device. Those that are best suited for fighter flying have an extended lip on one side that allows the line to roll off smoothly.

To recover slack line, simply hold the halo in one hand and wind with the other.



**Halo Winder**

**Japanese and Korean Spools:** These winders look a bit like Indian Spools except that they only have one handle. Rather than place the spool on the ground and manipulate the line with both hands, spool handlers control the line with one hand and deftly spin the winder with the other. They grasp the handle in their palm and rotate the barrel with their thumb.

*Japanese spools are constructed with long handles. Usually the entire machine is finely crafted and decorated.*

*There are several different models of spools, each with different diameters. The larger the diameter you use, the more line you can maneuver. One turn of the spool will control a large length of line.*

**Makoto Ohashi**  
**Tokyo, Japan**

This type of flying is incredibly effective and amazing to watch. An expert using a Japanese or Korean spool is seldom beaten in competition.

**Baskets:** Some fliers carry large, open baskets suspended from a strap over their shoulders. The basket hangs at their waistline and collects line as it is pulled in. In this way, a flier can move about the field without leaving a lot of line trailing behind. Tangles are minimized and as soon as they bring the fighter down, they are packed up and ready to go.

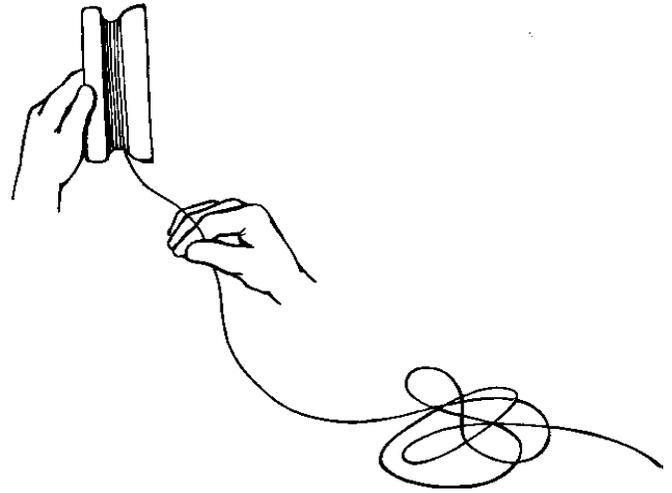


A flier with a fighting line basket looks a little odd, but you can't argue with success.

Whatever system you use, it's a good idea to practice unwinding and winding line to get the feeling of how it should work.

Generally, it's much easier to recover line which is laid out loose on the ground rather than try to collect taut line stretched out in the sky between you and your kite. Remember, winding in creates line tension which will effect kite performance. Some winders also have weaker cores which can collapse or be crushed by the cumulative pressure of many line wraps under tension.

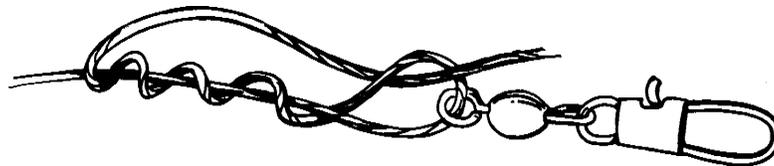
Another important thing to remember, is to disconnect the kite before retrieving your line. Use this as an opportunity to remove as many twists and tangles as possible. Fighter flying necessarily involves putting hundreds of twists in the line. At some point, you need to take those twists out in order to avoid tangles and minimize stretch.



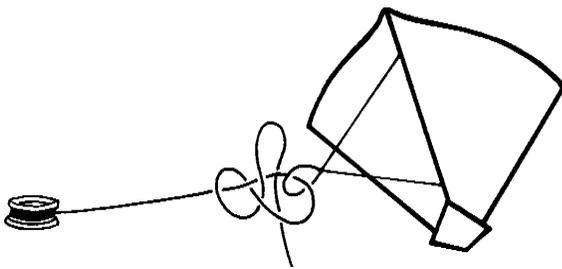
Simply hold the line between your fingers as you wind in and “push” the twists toward the end. By the time you finish collecting all your line, you will have “squeezed” out most of the twists.

## Attaching the Flying Line

Many fliers use snap swivels or locks to attach the flying line to their kite bridle. Snap swivels make attachment and removal easy, and extend the life of the line by reducing twists.



You can also attach your kite using a quick-release knot.



The kite is attached securely to the bridle by holding the loop and pulling tight on the flying end of the line. To untie the line, simply pull on the loose end.

Practice using this knot, not only for attaching flylines, but also for bridle line adjustments. It's a convenient and easy way to connect -- and disconnect lines.

## Flyline Troubleshooting

There are several things you can do to avoid flyline trouble. With proper care and attention, your fighting line will give you long and faithful service.

**Avoid Tangles:** The most common problem and by far the most aggravating, is getting your flyline all tangled up. A badly tangled line, covered with wax or worse yet, glass coating, can take hours to undo and can spoil your whole day. It's far better to use some caution and stay clear of tangles in the first place.

When retrieving line, lay it at your feet in big, random loops. You don't need to pile it in a nice tight little circle. In fact, if you have room, move around a little as you pull in large amounts of line.

If you do end up in a tangle, don't pull on the ends of the line. That only tightens the knots! Instead, pull on the loops to loosen a snarl.

When you begin to replace the line on your winder, it sometimes makes sense to “reverse” the line. Start with the end that was closest to the kite and make a new pile with the loose end at the bottom. That way, when you start using your winder, you'll be retrieving line from the top of the pile rather than the bottom.

**Keep “Twist” Out of the Line:** Twist in the line is bad for two reasons. First, it coils the line like a spring. That lets it stretch more, making control worse when you fly.

Secondly, it encourages tangles whenever the lines are slack. You can demonstrate this yourself — Stretch a piece of line between your hands and roll some twist in one end with your fingers. Now release the tension on the line by moving your hands closer together. Watch the lines tangle around themselves!

As we said earlier, twisting the line is a fundamental part of fighter kite flying. But once your line gets badly twisted, it will try to tangle at every opportunity. You may reach for slack line while flying and find it unusable. Winding up will be much more difficult. And when your lines become tangled, it will be much harder to undo.

The easiest way to minimize twist in your line is to use a good snap swivel while flying and to wind up carefully after each use. Squeeze the line between your fingers as you wind and push the twist out at the loose end.

**Watch for Fraying:** The more you drag your line across rocks or sharp objects, the more often you cross lines with other fliers, the more trees you eat, the quicker your line will fray. You can prolong the life of your flyline considerably just by being careful.

Be particularly careful about fraying close to the end of the line. This is one place that wear and tear tends to build up. Inspect your line occasionally, and if you see significant fraying, cut the ends off. You'll break fewer lines in the air that way.

**Minimize Knots:** Knots are weak points in your line. Some studies report that a knot will reduce the strength of your line by as much as 60%! And as if that weren't bad enough, think about what happens to your line during a kite fight. Lines slide against each other and a knot provides a good “stopper” for your opponent's line to make steady contact and cut through.

The same thing happens on the ground when you try to wind up slack line. Knots prevent the smooth winding of line and together with twist, help tangle your gear.

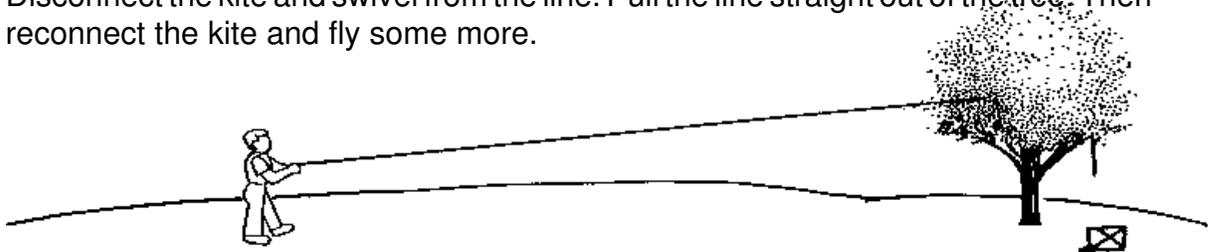
Now we're not saying that you should never tie a knot in your line. Knots are essential - especially if you want to place a short piece of cutting line into your main line. You also don't need to throw away a perfectly good flyline just because it got cut in the middle. But generally speaking, too many knots and too many twists are not good. Avoid using any overly twisted and knotted pieces. Damaged parts of the line should be removed.

**Look Out for Obstacles:** Finally, a word or two about kite obstacles.

We've seen fliers do some pretty amazing things to try and get their lines out of a tree. As with many other problems, the right way is simple if you think about it.



Disconnect the kite and swivel from the line. Pull the line straight out of the tree. Then reconnect the kite and fly some more.



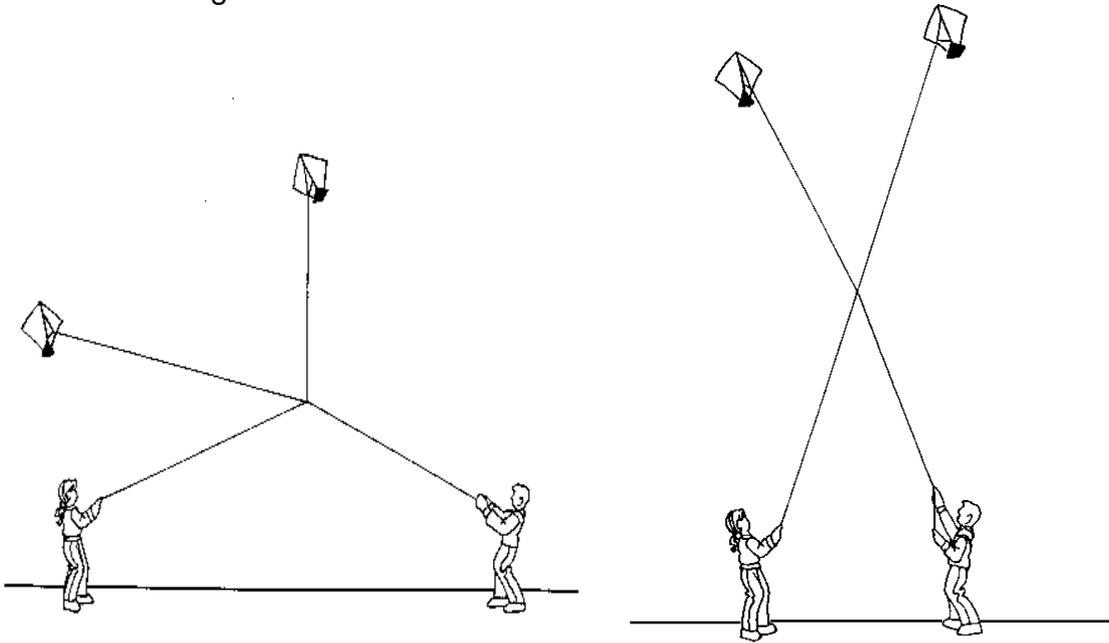
If the kite lands in the top of the tree, try pulling it out with the line. Even on lighter lines, your equipment will take a pretty hard pull before something breaks. And even if something does break, it's often better to lose a few yards of line than to have to climb a tree.

People are another kind of "obstacle" you should be careful of. Because fighters are maneuverable, they can take up quite a bit of air space and, eventually, will come in contact with other kites and their lines.

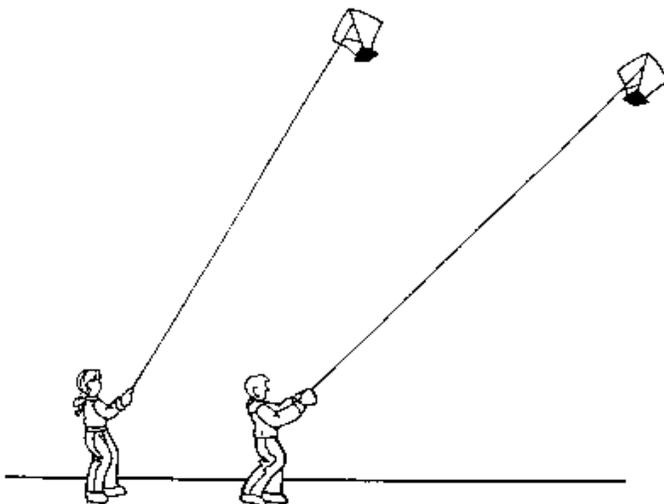
The simplest way to enjoy yourself safely is to stay away from other fliers. If you are using glass coated line, this is absolutely essential. Make sure you're far enough apart that your lines can't cross. Limit yourself to portions of the sky that aren't so congested. That way, you'll never have to worry about how to untangle your lines or explaining to someone that you really didn't mean to cut their kite down.

Of course, it takes a lot of space to fit very many fliers onto a field this way, and many fields are just too small. If you are flying with friends, you don't get to see much of each other. And besides, you may wander off so far that you won't be able to hear them call when lunch is ready.

For these and many other reasons, fighter fliers tend to cluster together. That's part of the fun. But if two fliers cross lines while standing some distance apart, they are almost always guaranteed to tangle and crash. The two lines "wind each other up" and both kites go out of control.



If your line crosses someone else's, the easiest way to fix things is to get right along side them and unwrap the lines. Cooperate! Communicate!! Flying with other people is always more fun anyway. Besides, before you know it, you'll be engaging in impromptu contests and battles that lead to more formal competitions and all the wonderful new ' ' 's of aerial excitement that they offer.



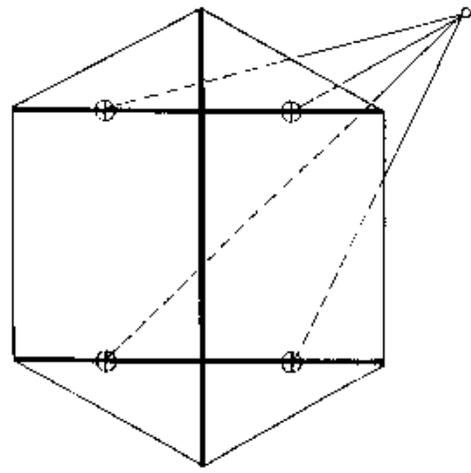
## CHAPTER 8:

# ROKKAKU FLYING AND FIGHTING

If you enjoy the skills and drama of fighter kite combat, you're going to love Rokkaku Battles.

### What is a Rokkaku?

The Rokkaku (pronounced roke-cock-coo) is a traditional Japanese bowed kite design. A basic hexagon in shape, it features six corners, a long center spine, and two cross spars. The bridle connects at four or more points, depending on the size of the kite or the engineering skills of the kite maker.



*Here is a basic Japanese language lesson. The word for six is "rok". The word for a traditional square, rectangular, or cornered kite is "kaku". Rokkaku, very simply then, means "six-sided kite".*

**Makoto Ohashi**  
Tokyo, Japan

Structurally, the Rokkaku is quite simple. The large uninterrupted kite sail is also an ideal "canvas" for kite artists to applique or paint wonderful designs. However, it is the maneuverability of this kite and the theatrics of Rokkaku contests which have encouraged its great popularity in recent years.

Rokkaku flying is, in many ways, similar to the handling of other fighter kites. "Roks" don't spin but they are clearly maneuverable. Maintain line tension and the kite will move in the direction it is pointed. Pull on the line, it will move faster. Slacken the line and the kite will become unstable enough to establish a new flying direction.

Based on these simple fighter principles, the Japanese have used the Rokkaku for centuries in small, large, and enormous scale kite battles. Individuals, teams, and even whole communities gather together to pit their kites, their flying skills and artistry, and their enthusiasm against other teams.

The object is to knock or cut other kites from the sky, but no clear winners are ever established among the traditionally costumed fliers. Supported by coaches, cheerleaders, and even marching bands, the point is to have fun. No one who has witnessed a traditional Japanese kite battle would doubt that they are entirely successful in that aim.

Not all Japanese kite contests utilize the six cornered Rokkaku. Most, in fact, fly four cornered kites made in a variety of square and rectangular shapes. But it is the Rokkaku that has captured the imagination of the West. Forms of the traditional Rokkaku Battle have spread far beyond the shores of Japan and are regularly held now in North America, Europe, and the South Pacific.

*If kiting is a bastion for the Renaissance person, then Rokkaku kite team fighting represents it best because it combines art, knowledge and athletics.*

*You need teamwork and athletic prowess to survive a long fight. You also need the knowledge to build, fly and fight these kites. And you want the kite to be beautiful. If any one of these things gets out of balance, you don't have a really successful and satisfied team.*

**Rick Kinnaird Jr.**  
**Bethesda, Maryland**

## Combat Fundamentals

Western style Rokkaku “battles” are usually organized for either individuals or teams. The size of the kites is specified within certain ranges, only certain types of flying line are allowed, and flying is limited to a designated area for safety.

On a given signal, all kites are launched. Then a second signal is given and the kites “engage”.

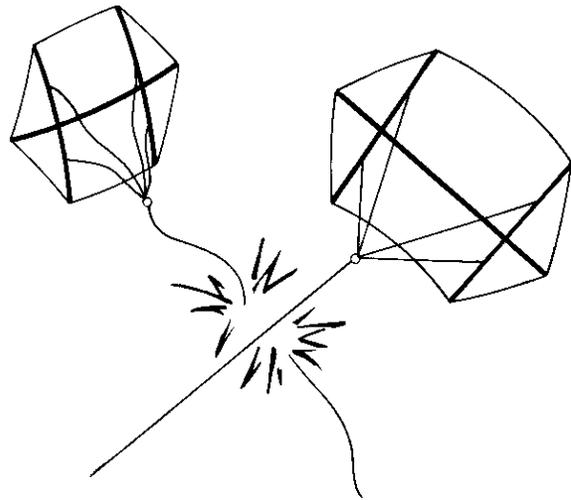
The object is to ground other kites using either your line, your kite, or the wind. Once your kite is cut or touches the ground for any reason, you are out.

An important difference between standard kite fighting and Rokkaku contests is that Rokkaku fighters move around the field. They move around the field a lot. Positioning is almost everything in a battle.

There are three basic techniques for grounding an opponent’s kite. The most effective strategy may combine all three tactics.

**Cutting:** Glass coated line is not allowed in Rokkaku battles. But that doesn’t mean that you can’t cut an opponent’s line. Any experienced kite flier knows that flying lines can easily slice through each other given the proper circumstances. In a Rok battle, it’s your job to create those circumstances.

When two lines come in contact, the one moving the fastest will cut, melt, or burn through the other. The object is to concentrate the friction in one particular point on an opposing line. Knots or bridle tow-points make convenient “stoppers” but with practice, you can attack the line at any point.

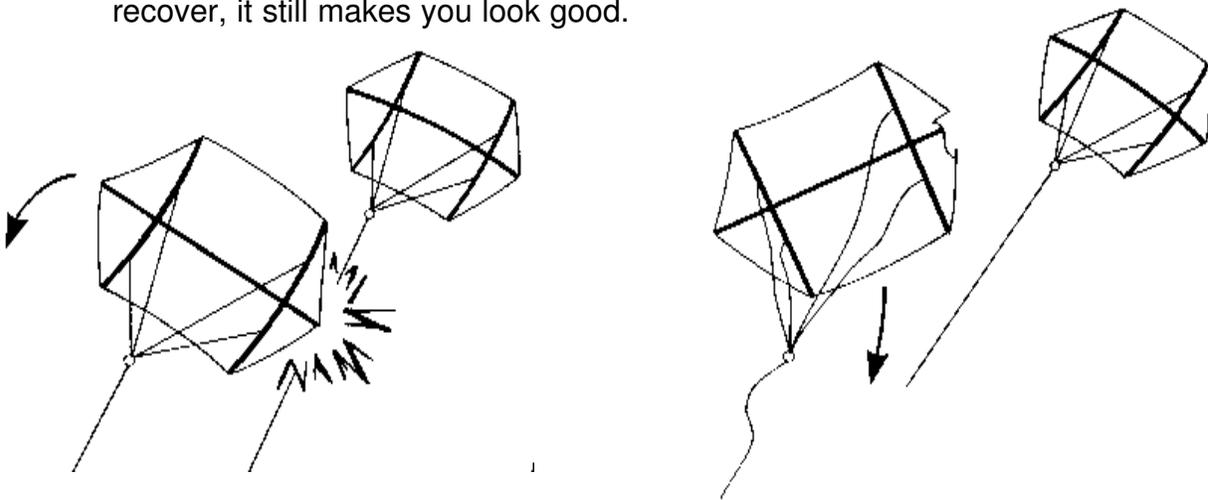


By maneuvering your kite, you can climb up from under an opponent or drop down from above. A more common tactic is to engage from the side and attempt to “slice”. Often you will see teams methodically pumping in an effort to saw through an opponent's line.

*Watch out for sugar-coated line. It's not as effective as glass line although it does taste better! We have seen several occurrences of sugar line being used in Britain with one team winning rather consistently. They soon stopped when they became aware of judges going round tasting flying lines.*

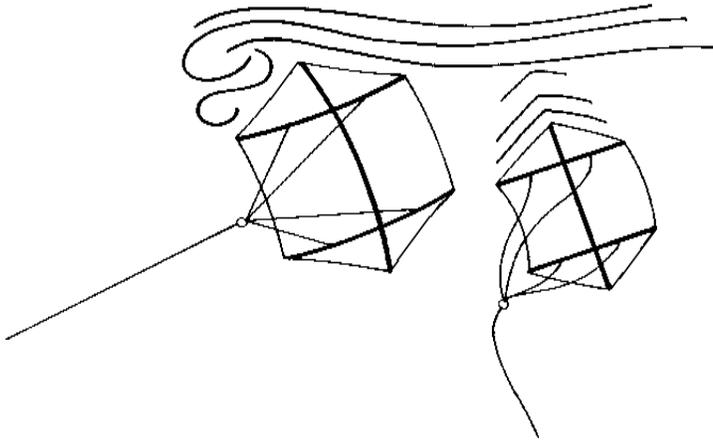
**Martin Lester**  
**Bristol, United Kingdom**

**Tippling:** Another effective battle technique involves actually contacting an opposing kite with your flying line. By catching one of the kite's six corners and then quickly moving position, you are often able to tip or up-end an opponent. If they are close to the ground, in poor field position, or just not particularly good at recovering, this may put them out of the fight. But even if they do recover, it still makes you look good.



When you tip a kite, be sure and follow it down so you can hit it again while its owners are recovering. This is the easiest way to ground someone. Tipping an opponent several times to ground them makes you look really good.

**Wind Blocking:** A more sophisticated technique involves using the wind -- or lack of it -- to ground an opponent.



Battles are not always fought under ideal circumstances. If the wind is light, simply staying airborne may be enough to win as everyone else backs up to the field boundaries in an effort generate lift. They will run out of space and come down. If you're smart, you won't.

In light wind contest, you can also use your kite sail to block the wind of an opponent.

Battles are usually fought through a series of heats and the last kites in the air from each heat earns points. In some contests, awards are also given for team spirit, costumes, or the beauty of the kite itself.

*The core rules of the Rokkaku Challenge as currently practiced in the United Kingdom and generally observed elsewhere include:*

- \* *Minimum kite height of 2 meters for teams*
- \* *Standard kite height of 1 meter for individuals*
- \* *No Kevlar<sup>™</sup>, glass, coated or wire line*
- \* *Minimum team size of 2 people*
- \* *3 rounds per festival*
- \* *15 minute time limit per round*
- \* *Kites are required to engage*
- \* *10 minutes of repair and recuperation between rounds*
- \* *The last 5 kites down receive points as follows:*
  - last kite up 6 points*
  - 2nd last kite up 4 points*
  - 3rd last kite up 3 points*
  - 4th last kite up 2 points*
  - 5th last kite up 1 points*

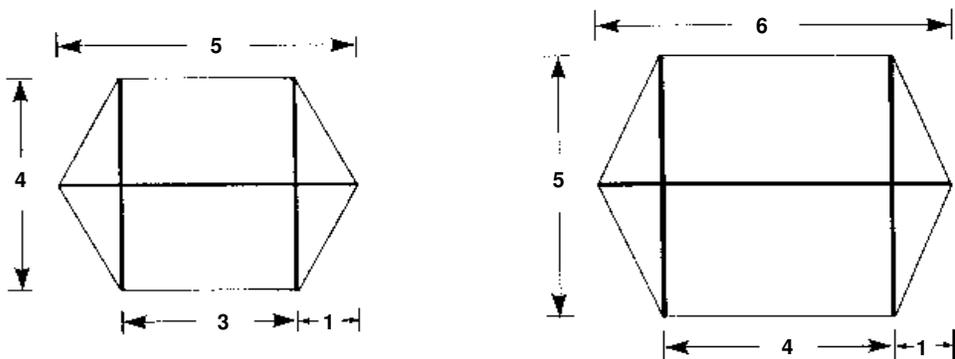
*Teams with kites still in the air when time has expired share remaining points. The team's best scores from any two festivals in a region are totaled to determine an overall trophy winner.*

**Martin Lester**  
**Bristol, United Kingdom**

## Construction

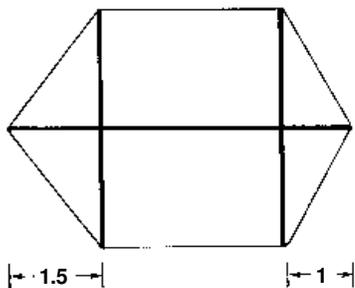
The Rokkaku is a fairly simple kite to make and a remarkably steady flier. You might actually want to put a few together in different sizes and weights of material for different wind and flying situations.

**Size:** Rokkakus are usually built to specific proportions. The two most common are the ratios of 3-4-5 and 4-5-6, where the first number is the distance between the two horizontal cross spars, the second is the width of the spars, and the third is length of the center spine or overall height of the kite. (Illustration)



By using these ratios, you can easily design a kite of any size. For example, if your base number is ten inches, and you use the 4-5-6 ratio, the kite will be 50 inches wide and 60 inches tall with 40 inches between the two horizontal spars.

Of the two shapes, the 3-4-5 is generally more popular because the squarer shape is well suited for most artwork.

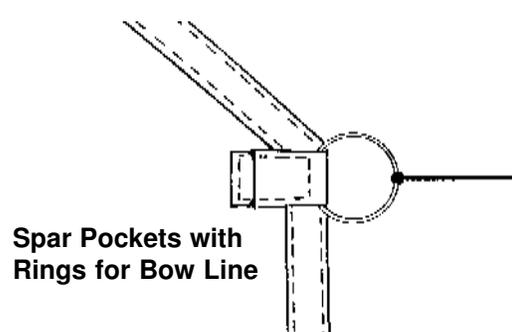
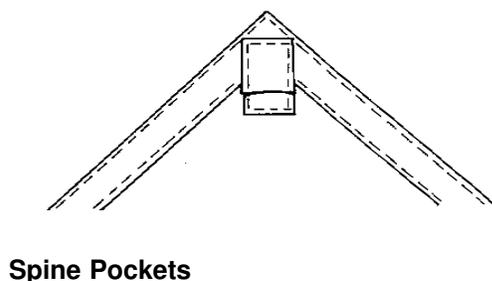


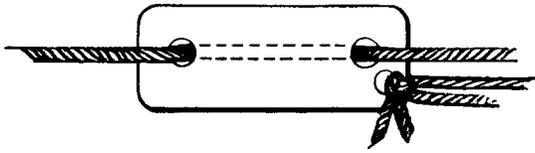
Both designs rely on top and bottom portions which are one unit long. Another option is to lengthen the bottom portion to one-and-a-half units for slightly increased stability. Of course, stability in a battle may not be what you want.

Remember to finish off your sail by hemming all the edges.

**Sticks:** Bamboo is the traditional material used for spars and the spine, but most kites are now being constructed of hollow fiberglass or carbon and graphite rods. As your kites get larger, remember to position joints or connectors in the rods so that the kite remains balanced.

Rods are attached to the kite corners with fabric “pockets” and should be reinforced at additional points in larger models. The spars will also be held in place by the bridle line connections. Pockets at the spar or horizontal corners are constructed with rings or loops to allow the attachment of two bow lines.





"Slider" maintains  
bow in Bridle

For the kite to handle properly, the spars should be bowed about one-half of one unit. Commercially or home made "sliders" and "tensioners" allow you to adjust the kites's bowing. Experiment with different degrees of arch in the upper and lower spars for a variety of flying conditions. Generally, you should find that a deeper bow in the lower spar will provide more stability.

**Bridles:** The easiest bridle for a average size Rokkaku is made from four lines. They are passed through the sail and attached to the cross spars on either side of the spine. For larger kites, you can add two more lines along the spine for a six-point bridle.

Bridle length may vary but six times the length of the kite is recommended. This may prove a bit long for a crowded battle environment so experiment. Combine changes in the angle of attack with adjustments in bowing for a finely tuned kite that will handle exactly the way you want.

## Battle Strategy

Earlier, we talked about combat fundamentals like cutting, tipping, and blocking the wind of your opponents. That's the easy part. The hard part is being in the right position to apply those tactics.

**Maneuvering:** Rokkaku's, especially the bigger ones, do not maneuver or respond as quickly as the smaller fighter kites.

Instead of spinning the kite, you need to pump the line, pulling and releasing, in order to make the kite rock or sway back and forth. The amount of line you give and retrieve will determine how much reaction you get. Then, like with smaller fighters, as soon as the Rokkaku is pointing in the direction you want, pull in on the line and the kite will move. Slackening the line will cause the kite to stop and reorient itself.

If you don't have time to maneuver the kite by "pumping and rocking", move your team across the field. As long as you keep tension on the line, the kite will follow you.

To move vertically, all you have to do is release line to lower the kite, or pull in to make it rise. It works the same way if you move your team downwind or upwind.

*Smaller kites always have the advantage of speed and maneuverability, so very few people fly anything larger than two meters. In fact, a Rokkaku the size of a fighter kite has proven to be quite unbeatable.*

**Martin Lester**  
**Bristol, United Kingdom**

*Watch out for the "Blood Lust Run". The minute that two kites come in contact, somebody invariably grabs the head of the line and takes off across the field for reasons that I don't completely understand. Avoid that temptation.*

*Use your knowledge and your skills and remember to have fun. **Always Claim Victory!** Never let the facts get in the way.*

**Rick Kinnaird Jr.  
Bethesda, Maryland**

**Field Position:** As we said before, positioning is everything in a battle. That includes positioning to take full advantage of strong or light winds, positioning to attack or retreat, and positioning to avoid major tangles.

Before you launch at the beginning of the battle, give some thought to the wind conditions.

If winds are light, you may want to stay as far downwind as possible so you have room to back-up and gain altitude. You may also want to use a long line to get as much height during the launch as possible and be able to reel-in later to maintain altitude.

If winds are heavy, you may want to position yourself upwind so you have room to move forward and drop into the fight. You may also want to use a shorter line so you can reel-out to make contact.

During the battle, it is helpful to maintain some field space around your team and your kite. Room in the sky gives your kite space to maneuver. Room on the ground gives you space to maneuver. Both can become very important.

Try to avoid multi-kite engagements that increase your risk of getting tangled or boxed in. Your chances of cutting or fighting your way out of that kind of a mess are rare. What's more likely is that someone will wrap a line around your bridles and you will all go down together.

Don't hang back in a corner waiting for someone else to clear the skies, either. You don't win battles or the respect of your opponents by running away. Look for opportunities and then attack! Besides, most contests will eventually disqualify contestants that continue to avoid direct combat.

Finally, don't let an opponent's line contact your kite. Maintain the initiative. The best position to be in is to be on the attack, not on the defensive.

*Don't be intimidated by bigger kites. They don't move as quickly, are easily upended, and recover slowly when tipped. In lighter winds, they are hard to keep in the air. In heavier breezes, pulling them around wears out a team more quickly. And heavy lines hardly ever cut through thinner ones.*

*So go for the big kites first! Think of them as large, slow moving targets.*

**Rokkaku Tuning:** A number of factors can be adjusted to affect your flying and maneuverability. The stiffness of your spars and spine, the proportions of the kite, the length of the bridle, position of the tow-point, and the amount of bow in either or both of your spars will help or hamper maneuverability in different winds.

Experiment!

The two quickest and easiest adjustments you can make in the field are to change the amount of bow in the kite, or to shift the tow-point.

## **Safety, Safety, Safety!**

A good Rokkaku battle involves a large number of people running around in an enclosed area. Everyone is watching the kites and not where they are going. Kites are being cut and falling. Line is all over the ground waiting to ensnare and trip the teams.

No wonder these fights are so much fun to watch! Everyone likes to see a really good accident...

Of course, no one likes to be in an accident so do everything you can to avoid them. Battles are great fun - but only if they are done carefully and everyone follows basic safety rules.

Here are a few good rules to remember.

1. Gloves are essential for all participants. These are big kites being flown on line intended to cut. Imagine what they can do to your hands.
2. The object is to make the kites fight - not the people. All intentional physical contact should be strictly prohibited including pushing, tripping, or purposely running line around people. Any "dirty tricks" should result in disqualification.
3. Cutting implements other than flying line should not be allowed. And flying line should not include Kevlar™, wire, or glass-coated line.
4. Don't get so caught up in the frenzy of combat that you forget to keep an eye open for falling kites, loose line, field boundaries or other obstacles.

A safety and rules meeting before the battle begins will help everyone enjoy a safer and more intense contest.

As much fun as Rokkaku battles are to watch, they are even more fun to participate in. So we'll warn you this one time: You only need to try it once to become addicted for life.

## CHAPTER 9:

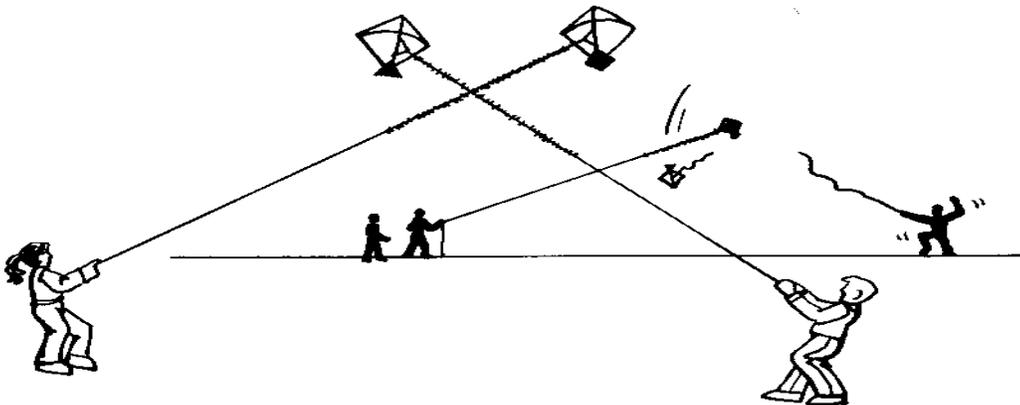
# FIGHTER CONTESTS

Ready to see how your flying skills shape up against the competition??

Depending on where you live or travel, fighter contests are either commonplace or fairly unusual. The good news is that more and more kite events are beginning to incorporate competitions specifically for fighters. And even if they aren't on the event schedule, some type of informal contest will often result whenever two or more fliers gather together.

After all, your kite was made and designed, in part, to “engage” others. We don't call them “fighters” for nothing...

In this chapter, we're going to talk about four different types of contests — Cutting Line Fights, Line Contact Contests, Non-Contact Precision, and Freestyle. We'll also share some hints that may help you improve your performance.



If you are ready for these types of contests, you're ready for anything. Your self-confidence, practice, and ability will prepare you for almost any kind of flying. Besides, contests are fun, and fun is what fighter flying should really be focusing on anyway.

*A standardized rule book for Fighter and Rokkaku contests is now available from the American Kitefliers Association. This rule book will also be used by the AKA at nationally ranked events.*

*For a copy of the rule book, send \$5 to the American Kitefliers Association at 1559 Rockville Pike, Rockville Maryland 20852, USA.*

## General Competition Suggestions

No matter what type of contest you enter, there are some basic tips that will help you do better and have more fun.

- Practice in as many different wind conditions as possible. Remember, it's never the winds fault.
- Check your equipment and tuning before you compete. Don't rely on new or unfamiliar kites and line.
- Watch the contestants ahead of you to see what the wind is doing or what new tricks they are using.
- Remember that kites perform differently in different winds. Practice with a variety of sizes and designs. Compete with the best one for the conditions.
- Make sure that whoever is controlling the contestant order knows who you are and where you are. Don't make them come looking for you.
- Be ready to go when it's your turn. Never keep the judges waiting.
- If relaunches are allowed, recruit a good relaunch crew. No one plans to crash. Remember to brief your crew so they know what you want done.
- Think positive! Don't be nervous. If you say, "I'm gonna crash!", you probably will. Fly to please yourself and you'll always do your best.
- Accept bad breaks graciously. Be a good sport. Congratulate the people that beat you and always thank the judges and field crew.
- Learn from everything - good and bad - that happens on the field.
- Enjoy yourself! Enjoy yourself! Enjoy yourself!

Competitive flying is an excellent way to test your skill and improve your ability. The best advice we can give you is to PRACTICE. Get to know your equipment, study the rules, and watch the other fliers for new ideas. Then PRACTICE MORE.

Finesse, precision, and delicacy of control are the hallmark of an expert fighter kite flier. Good luck!

*Before you can become a good fighter, you must become a good flier. Concentrated practice in launching and flying will give you a "feel" for your kite. When you know what your kite can do and you are able to make it perform as you want it to perform, then you are ready to try kite fighting.*

**Dinesh Bahadur  
Pacific Grove, California**

## Types of Competitions

The rules for fighter kite contests often vary from event to event. Sometimes, the rules are simply whatever the players agree on before the match. While that imposes a certain amount of uncertainty on the process, it also allows for a great deal of creativity. And that's good!

*Rules are stuffy! Too much structure is counter to what I think fighters are all about. The idea is to be flexible, creative and to have fun. Make up the "rules" when the fliers get to the field.*

**Mel Govig**  
**Randallstown, Maryland**

So now that we've told you that there are no "standard" kinds of contests, let's talk about four of the "most standard" events you may encounter.

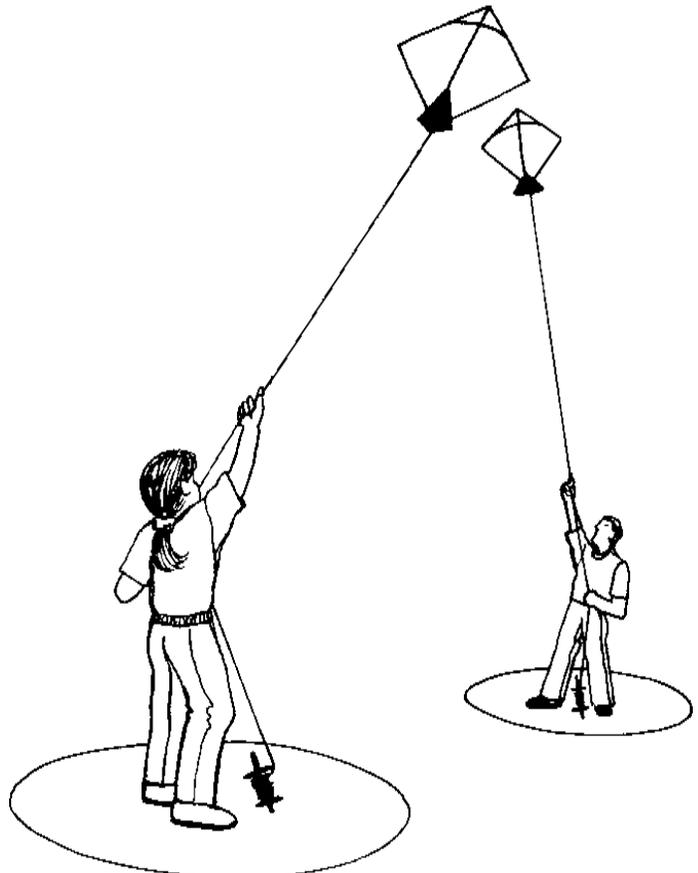
**Cutting Line Fights:** There are three types of contests you can enter with cutting line: one-on-one matches, group-against-group, or an open-air free-for-all. In all cases, the object is to cut down opponents. Contestants maneuver their fighters so the lines cross. Then they either let out line to cut by force, or pull in to try and slice the opposing line. Usually, the line moving fastest wins.

In a one-on-one match, contestants stand in separate circles which are spaced several feet apart. This prevents the fliers from moving around each other and focuses the contest on maneuvering the kites.

Contestants launch and fly from within their circles for the duration of the fight. The loser is the first person cut down or grounded.

Winners continue to advance into matches against other winners until an overall victor emerges.

Another alternative is to compete with a number of kites for a set amount of time. Contestants keep putting up kites until the allotted time runs out. Then the flier who has cut the most kites is declared the winner.



*In many traditional Asian contests, a kite which is cut loose becomes the property of the contest victor or the first person to catch it. Children will often gather downwind of the field waiting for prizes. Remember this tradition if you travel overseas. Don't enter your favorite kite in a contest unless you are prepared to lose it.*

**Makoto Ohashi**  
**Tokyo, Japan**

Remember that cutting line wears out or loses abrasiveness after contact with other lines. This means that you must either replace portions of your line after each match, or concentrate on attacking opponents with different sections of your line.

Remember also, that cutting line can cut you or anyone else it comes into contact with. Make sure that no one is in the flying area during a cutting line contest.

Sometimes, contests will limit the amount of cutting line to just a few feet up near the kite. Not only does this require more skill, it also has the added benefit of not making the contestants handle the glass line and cut themselves.

**Line Contact Contests:** Line contact games are very similar to one-on-one cutting contests except that glass line is not used. The object isn't to sever an opponent's line, but instead, to touch it in a certain way.

Sometimes, points will be awarded for a touch from underneath or below. Sometimes, the opposite will apply and the goal will be contact from above. The focus of these contests then becomes maneuvering for position rather than quickly making contact and working for a clean slice.

Contact games also last longer because the fighters stay in the air and time is not taken to retrieve the losers.

*I like to stay on the move. If you are on the offensive, your opponent will be on the defensive. They will be forced to think and respond to your movements. Of course, thinking takes time. When they hesitate, that's when you hit them.*

**Robert Loera**  
**Honolulu, Hawaii**

**Non-Contact Precision:** Precision fighter flying is much different than contact or cutting contests. The goal is controlled flight rather than "combat".

In most precision games, a paper cup or other target is placed on a pole in the middle of the flying field. Fliers stand behind a line upwind. The object is to knock the target down with your kite or flying line. Winners are either the flier to hit the target fastest, or the flier to make the most hits in a set amount of time.

For a real show, all the fliers compete at the same time with many poles set on the field. Each contestant has their own target and judge. They all launch together and compete in an entertaining frenzy of maneuvers, tangles, and hits.

*Speed and balance are critical in competition. Spend some time tuning before the match, and once you have the kite ready, put it down. Don't risk a knock before your heat which will "ruin your tune".*

**Joel Scholtz**  
**Austin, Texas**

**Freestyle:** Freestyle contests are more subjective than those events where hits, line contacts, or cuts can easily be counted. The object of a freestyle show is artistry and style. Contestants perform one at a time and panels of judges are asked to score performances for their entertainment value.

Types of performance might include flying trains of fighters or two independent kites at once. Some contestants perform specific patterns in the sky or interpret music in a choreographed "ballet". Balloon popping with kites is also real popular.

Just about anything is possible in a freestyle event. The kite, the line, and the flier all become part of an integrated program that has great crowd appeal. Some of these events have even been held indoors with the flier's movements and line handling skills generating the lift needed to keep the fighter airborne.

## **Fighting Techniques**

Earlier, we said that finesse, precision, and delicacy of control are the skills that will make you most successful in a fighter contest. Perhaps we should have added quick reactions and experience to the list. The experienced competitor will almost always have an advantage because they have honed their skills and know what to expect. But you can overcome that advantage if you practice.

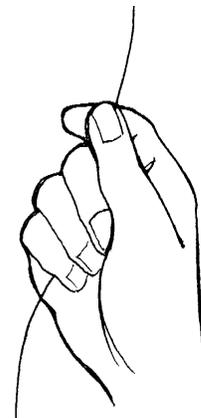
Holding and handling the flying line is probably the most important factor in improving competition performance.

*Always be careful about your line handling in a contest or match. The silliest way to lose points is to let your line get tangled or hung-up on your shoes and shirt buttons.*

**Robert Loera**  
**Honolulu, Hawaii**

The line should be held so that the thumb presses against the underside of the forefinger about three quarters of an inch from the tip. This part of the forefinger is very sensitive. With practice, you can feel the difference in pressure when another line contacts or crosses your own.

Practice line handling until you get really good at



moving the fighter where you want it to go. You want to be able to climb, dive, or move horizontally quite quickly to avoid an opponent's line. In extremes, you may need to let the line go entirely slack.

*Practicing for a match is important, but the biggest problem people have is practicing without a partner. Start out by just maneuvering your kite left and then right. Then try flying under the branch of a tree. Use any kind of stationary "target" available. Just make sure your target isn't too tall to climb if it catches you first.*

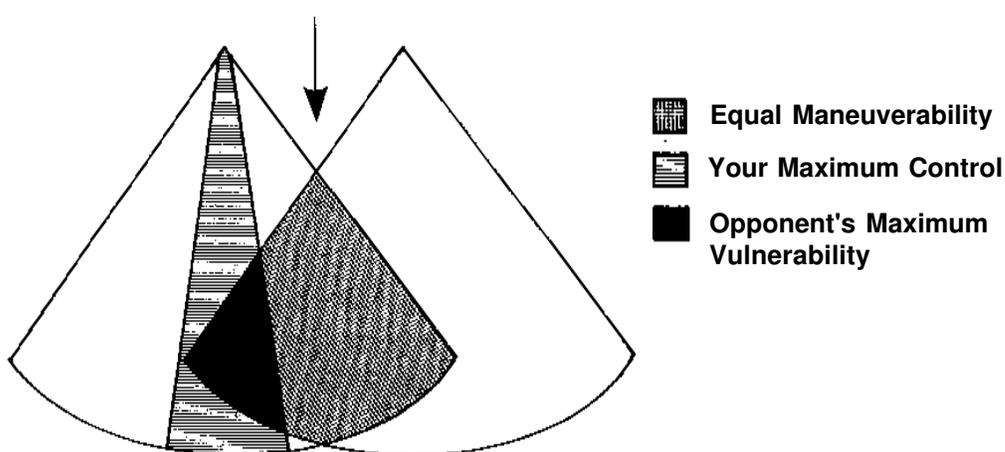
**Robert Loera**  
**Honolulu, Hawaii**

As many kites will be lost in a contest to ground touches as to actual contact or cutting. Remember what we learned earlier about how the wind changes as it nears the ground and about flying line stretch and drag.

- Long line means the kite will move slower.
- Short line allows the kite to move faster.
- Long line provides more maneuverability and height.
- Short line offers a smaller target to attack but are also more vulnerable to a ground touch.

Most maneuvering of fighters occurs at 5 to 10 degrees off center and above or below the natural angle of flight. At a natural angle, a fighter is usually very stable and it will take exceptional action on your part to put it in motion. Immobility is vulnerability in a kite fight.

The length of line used by both fliers determines the size of the "engagement zone". If your line is longer, your fighter will need to fly a further distance in order to bring your line into striking distance.



Another thing to remember is that most fighters perform at their best in a limited area directly downwind called the "power zone". Enticing an opponent out of their power zone and into your's gives you a decided advantage.

*Often in a fight, one contestant will "hang" in the far side of their maneuverable zone. Excited by the prospect of an opponent "just sitting around", the opposing flier will cross out of their optimal maneuverable zone to attack. Who's the "sitting duck"? The attacker who through impatience has swung out of the wind.*

*Don't follow the bear into their own den! Be patient. Make the bear come out to meet you in the middle ground.*

**Ric Merry  
Seattle, Washington**

Beware an opponent who is accelerating up as well as to the right or left. Each kite has a limited flying area which is based on the line length and the wind speed. At the end of every skyward dash of a fighter, there has to be a turn. Which direction it will take, and how soon, is the stuff of which great kite battles are made.

With practice and experience, you will learn about angles of opposition, wind effects, and anticipating an opponent's moves. After that, it's simply a matter of reaction time and split-second decisions.

## Conclusion

Susie and I have just returned from the beach. It was one of those glorious afternoons on the Oregon Coast - clear skies, light breezes, and waves crashing hard on the rocks. Just off shore, the first whales of the season were passing on their annual spring migration from California to Alaska.

Turbulence from the cliffs kept most kites on the ground, but my fighter flew like it was born in the sky. Sharp turns, fast ground passes, long straight dives to within inches of the ground. I was in heaven - or at least connected to it by my line.

Finally, a helpful spectator, one of those people whose kite couldn't seem to fly in the bumpy winds, came over to give me some advice. "Maybe if you put a tail on it," he said, "it would fly better".

I just smiled...

Back at the beginning of this book, I said that fighters can do things no other kite can. Perhaps I should have added that they can make you feel the way no other kite can. I hope that I have been able to communicate the sense of joy and wonder that these kites offer. Sometimes, it's hard to explain to people until until they see a grown man or woman out there on the flying field with that uniquely silly grin on their face.

If through this manual, you've learned to fly safer, or better, or skipped over a few of the problems that you might have otherwise encountered, then I've accomplished my goal.

All I ask in return is that you pass your experience along to the next flier you meet.

The sensation of flying kites is not the only reward that this pastime has brought Susie and I. We've also been privileged to meet new and warm friends all around the globe. Occasionally, we are flattered when the winner of an event turns to us and says, "I learned to fly by reading your book." Other times, the introduction is a bit more of a reality check - like when people come up to us and say, "You must be the Gombergs. We recognized the dog from the cover!"

Either way, please make a point of saying hello if our lines ever cross.

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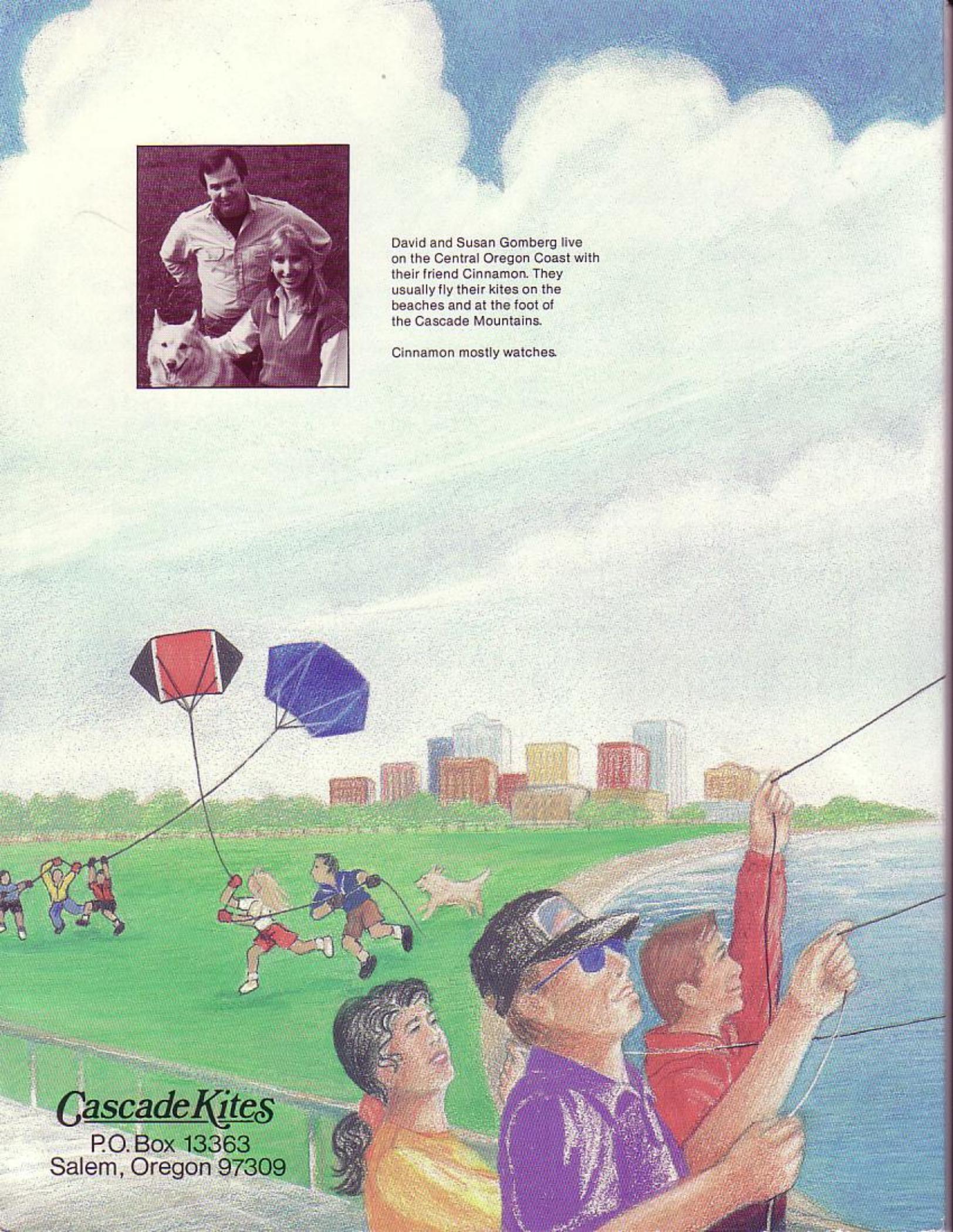
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David and Susan Gomberg live on the Central Oregon Coast with their friend Cinnamon. They usually fly their kites on the beaches and at the foot of the Cascade Mountains.

Cinnamon mostly watches.



***Cascade Kites***

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