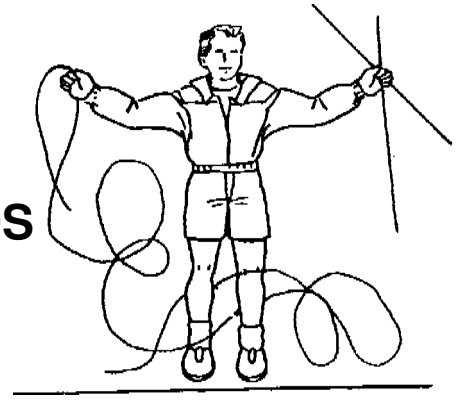
CHAPTER SEVEN:

ALL ABOUT FLYLINES and RODS



SELECTING THE "RIGHT LINE"

Many stunt kites come with line included. Others require you to purchase line separately.

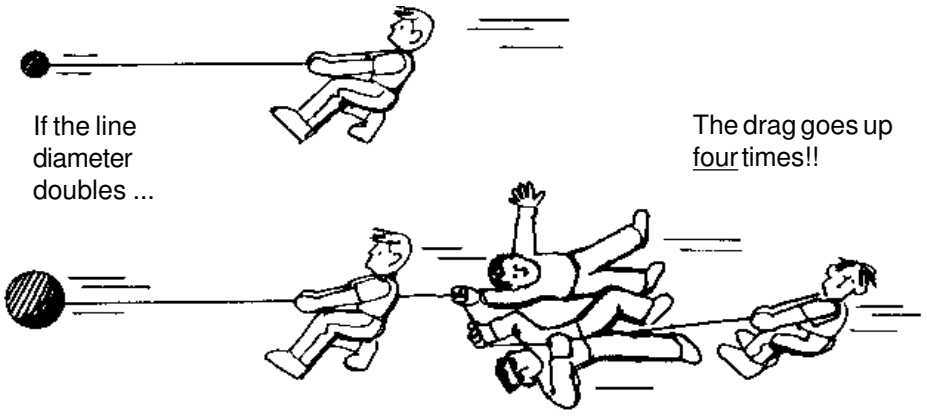
Sooner or later, you'll probably end up buying additional line, either because the original line broke, because you're looking for more performance, or because you want more variety for different flying conditions.

Here are five things to think about when picking flylines:

1. **STRENGTH** - Obviously line that's too weak won't work. The bigger the kite or the stronger the wind, the stronger your lines will have to be.

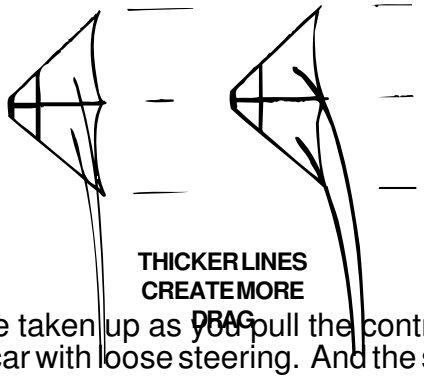
2. **STRETCH** - The less your lines stretch when you pull, the more precise your control will be.

3. **DIAMETER** - Diameter makes drag, and drag makes sag. Sag degrades control. And here's a sad fact of life, aerodynamically speaking:
You may feel safer with heavier lines.



No <u>one</u> line is best for all conditions. It is best to use the smallest diameter, but strongest line you can for any particular wind. But consider the value of your kite along with the wind strength. Don't risk a valuable kite on the wrong flying line.

But heavy line drags more than thinner, light line, and the lines can actually produce more drag than the kite! Increased line drag shows up generally in lower performance such as slower kite speeds or higher wind requirements. Its most apparent effect is sag.



Excess sag creates slack that needs to be taken up as you pull the controls before the kite responds. It's like driving a car with loose steering. And the sag tends to pull the kite's nose in, making control of its angle of attack less precise.

4. **DURABILITY** - Some types of line last longer. Others fray or wear faster depending on how they're used. Exposure to sunlight will even weaken some types of line. We'll discuss durability when we talk about specific line types.

5. **COST** - Don't be surprised by the expense of good quality flying line. You will find tremendous variation among the types available.

The one item in this list about which there's no compromise is strength. If you disregard line strength, you'll end up with broken lines. UNDERSTRENGTH LINES ARE DANGEROUS.

Remember to burn or melt the ends of your line. Not only does this prevent fraying, it also creates a "stopper" which keeps the end of the line from slipping through a knot.

The ideal flying line would have zero stretch for responsiveness, be as thin as possible to minimize wind resistance, be lightweight, be strong and durable to resist breakage, and cost next to nothing. Well, they say life is full of compromises. So is kite flying. Here is a rundown on the major types of stunt flying line.

Remember that braided lines are thinner and stronger than twisted ones, but also a bit more expensive.

SPECTRA - Smooth, lightweight, thin, and slippery, Spectra has become the preferred line for most stunt flying. It is excellent for team flying or performing numerous spins. It's also so light that it floats and is available in several colors besides the standard white. Spectra's main weakness is a low melting point which means that contact with other types of line or other kites will burn or cut through it. That means you must be careful if other flyers are using something else. Spectra may also require special sleeving for knots.

KEVLAR - This is a synthetic material characterized by its ultra-fine, yellow fibers. Kevlar is very thin, has low strength, and is reasonably durable. It has a high melting point, which means that Kevlar won't be cut by other lines or kites. It's main drawbacks are higher cost, abrasiveness - it can cut other lines and people - and the fact that knots in Kevlar require special attention. (More on knots later.) Kevlar also breaks down after prolonged exposure to sunlight.

NYLON and DACRON - Nylon is one of the least expensive but worst materials to use because of its stretch. Nylon expands like a rubber band. Although many inexpensive kites come supplied with nylon, do yourself a favor and replace it. Dacron is reasonably priced, durable, and tolerable in the stretch department but is seldom used because of thiner, less elastic alternatives.

Team flyers often splice together different types of line. They will use Kevlar for the fifteen feet closest to the kite, and Spectra for the rest. That way, wraps will occur in the more slippery Spectra, but if a kite hits another line in mid-air, it will contact the more durable Kevlar and not be cut.

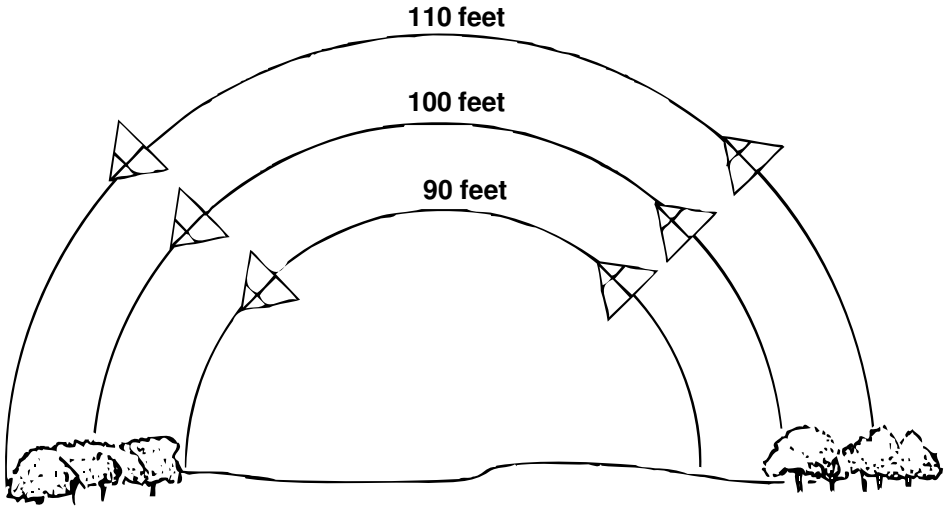
HOW MUCH LINE?

Stunt kites will fly on anywhere between 50 and 400 feet of line. Most commercially packaged flying line comes in 150 foot lengths. The amount you should actually use depends on several factors.

THE LONGER THE LINE IS, THE MORE IT WILL STRETCH. More stretch means less control or responsiveness. A 150 foot line will have 50 per cent more stretch than a 100 foot line.

Short lines take less time to wind up; longer lines require a larger flying field.

The important thing to remember is that kites flown on shorter lines will appear to be faster and more responsive. They don't actually move faster, but because the kite requires shorter distances to complete a maneuver, that maneuver will seem to occur more quickly and take faster reactions to control.



WHAT WEIGHT?

The best weight of line for a given situation will depend not only on the kite used, but also on the wind, the number of knots, and the length used. Many experienced flyers will carry a variety of lines for use with different kites and wind conditions. They will attempt to use the lightest and thinnest possible line in different circumstances for maximum performance.

Line weight and length is usually printed on the packaging. Don't forget to write these figures down before you throw the packaging away.

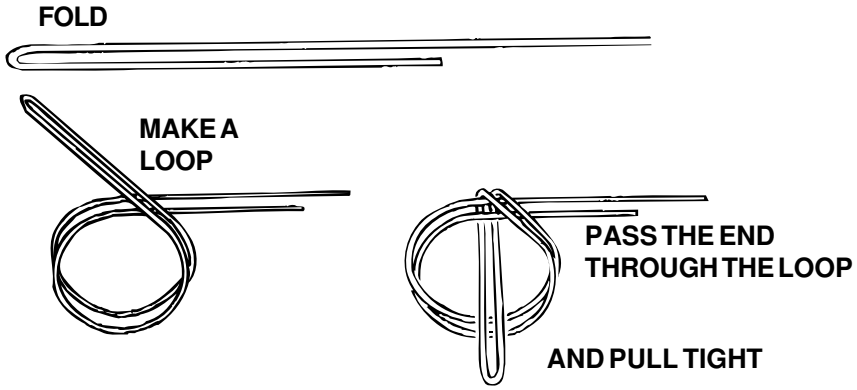
New flylines usually have to be set up. This includes tying loops at the ends, stretching, and making both equal lengths. Start by tying the loops in one end of each line. Then attach those loops to the same point on a stationary object.

Stretch the lines out before finishing the other ends. Pull as hard as you think your kite will without exceeding the line breaking strength, and apply this pressure for several minutes. If the line breaks at this point, you probably have defective line.

Once the lines are stretched, pull them tight again and adjust one or the other until both are the same length. Then give a little slack and see whether both lines droop to the same position. Once the lines are stretched equally, just mark the ends, trim any extra, and finish them off with loops .

KNOTS and SLEEVING

Any knot is a weak spot in the line. Most knots will reduce the strength of flying line by up to 40 percent. If you use knots, we recommend a simple OVERHAND KNOT for end loops. This knot has about 80 percent of the strength of the line. In other words, on a 90 pound line, the knot will hold roughly 72 pounds.



You can use a knot with more strength, but you risk overstressing the line. Then, it could break anywhere. This way, if you break a line, it will break at the knot. You'll be able to tie a new loop and go on flying, rather than losing an entire set of lines.

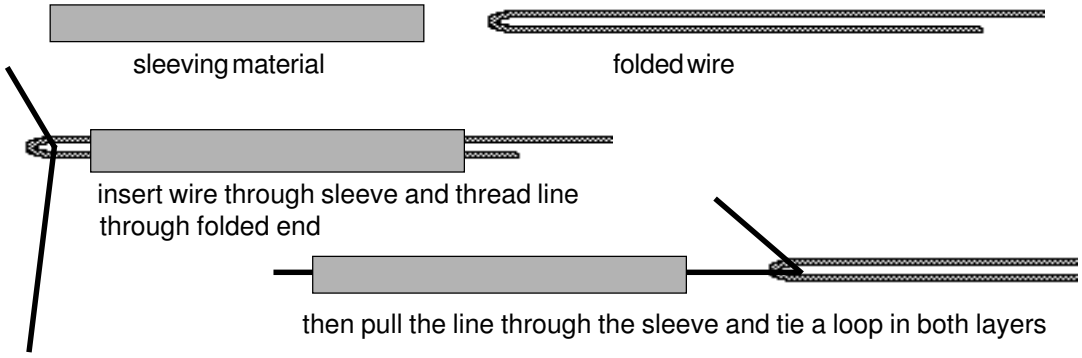
Some types of "high tech" lines can't handle knots at all. Spectra, because of its low melting point, and Kevlar, because of its abrasiveness, will actually wear through at points where knots are tied. You'll need to sleeve the line to prevent breakage.

Sleeving or "padding" involves inserting the line through a seven or eight inch long protective cover or sleeve.

The easiest way to sleeve lines is by using a thin piece of solid wire folded in half. Slip the folded end of the wire through the sleeve, insert the line through the top loop (like threading a needle), and pull your line through the sleeve. Then tie a knot in the protected portion of the line.

Remember to melt the ends of the sleeve and line to prevent fraying.

Sleeving material and wire is often included with commercially produced line. Generally speaking, if you aren't using special products like Spectra or Kevlar, sleeving isn't necessary unless you plan to exceed 60 per cent of the line's rated strength.



RODS FOR YOUR FRAME

Under normal wind conditions, your flying performance is based 75% on skill and 25% on your equipment. In heavier winds, and particularly in light winds, that ratio changes to 50% for equipment. Lighter winds need lighter equipment; heavier winds need stronger kites. This means that the frame of your kite, which provides much of its strength and most of its weight, is very important.

The rods used in kite frames can be very confusing. There are different types of materials, different sizes, different manufacturers and lots of funny names and codes. But if you lose or break your original rods, you need to replace them with the same type in order to maintain the balance and flexibility of the kite.

Kite rods can be evaluated according to their stiffness, strength,weight, and cost. As with flying line, there are compromises. Stronger rods are better in a crash, but heavier. Stiff and lightweight rods fly better but are more expensive.

The materials currently available and used in kites are made from fiberglass, graphite, and aluminum/carbon composits. Here's a brief explanation of each:

FIBERGLASS - has the advantage of being strong and relatively low in cost but is also heavier. Usually, fiberglass rods are manufactured as arrow shafts and marked according to the weight of the bow that the arrows match. A very popular rod is the "K75" which was originally made for a 75 pound bow.

PULTRUDED GRAPHITE - is stiffer for its weight, or lighter for a given stiffness, than fiberglass. It is also more expensive and not as strong. "Pultruded" is a manufacturing term which is a combination of extruding and pulling. Each manufacturer has a different way of grading their products, often based on their outside diameter.

SPIRAL WOUND GRAPHITE - With pultruded rods, the fibers line up along the length of the shaft. Spiral wound rods have some fibers wrapped around the rod in a spiral fashion. This process makes them much stronger and stiffer, but also much more expensive. Spiral wound rods are usually graded by a pair of numbers indicating the diameter and the number of layers of graphite. For the same number of layers, a larger diameter is stiffer.

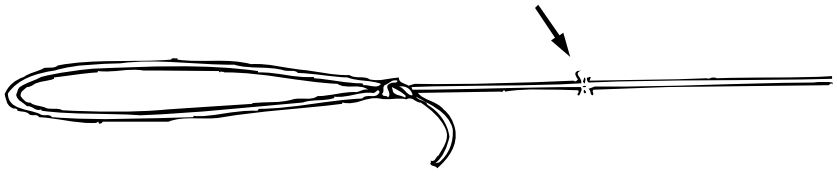
ALUMINUM/CARBON COMPOSITS — Here, graphite fibers are bonded to an aluminum tube to provide more support. These rods are comparable to graphite in stiffness. They are a bit stronger than pultruded graphite, but not as strong as spiral wound. Rods are sized according to the number of layers of graphite, and the diameter of the aluminum. A "3-30" has three layers of graphite on a .230 inch aluminum tube. The rods that are made specifically for kites are called "A/C/K" for Aluminum/Carbon/Kite.

FLYLINE TROUBLESHOOTING

There are some things you can do to avoid flyline trouble. With proper care and attention, a set of flylines will give long and faithful service.

WATCH FOR FRAYING. The more often you drag your lines across rocks or sharp objects, the more often you cross lines with another flyer, the more trees you eat, the quicker your lines will fray. You can prolong the life of your flylines considerably just by being careful.

Be particularly concerned about fraying about two inches from the end knots. This is one place that wear and tear tends to build up. Inspect your lines occasionally, and if you see significant fraying at this spot, cut the ends off and tie new loops. You'll lose a few inches, but break fewer lines in the air that way.



AVOID TANGLES. The most common problem, and by far the most aggravating, is getting the flylines all tangled up. A badly tangled set of lines can take hours to undo, and can spoil your whole day. It's far better to know some techniques for handling line to stay clear of tangles in the first place.

The next few pages will describe a few procedures for avoiding tangles in some common flying situations.

Keep "twist" out of the lines. The twist we're talking about here isn't the two lines getting twisted over one another while you fly. It's twist in the individual lines. Look closely at your flylines. If they are of braided construction, they won't be perfectly round. You'll be able to see whether there's twist in the line, or whether it's straight.

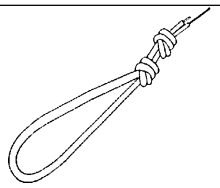
Twist is bad for two reasons. First, it coils the line like a spring. That lets it stretch more, making control response worse when you fly. Excess twist will actually shorten your lines or alter the length of matched lines.

Secondly, it encourages tangles whenever the lines are slack.If your lines are badly twisted, they'll try to tangle at every opportunity. Ground handling will be more difficult. So will winding up your lines. And if you get the lines tangled up, they'll be much harder to undo.

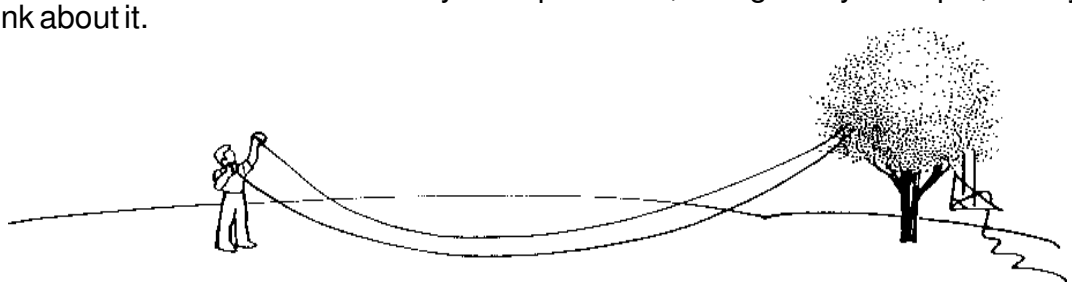
The simplest, best way to keep twist out of your lines is to use a good snap swivel at one end and follow a standard procedure for winding them up. Wind up in the same way you unwound when you laid your equipment out. Stand in one place while winding, and let the line drag towards you. That way, the line will untwist as you reel in. (See Packing Up in Chapter Three for more details.)

Develop good habits for winding up your line. If they are twisted now, fix them. Then if the twists come back, you'll know you're still winding up wrong.

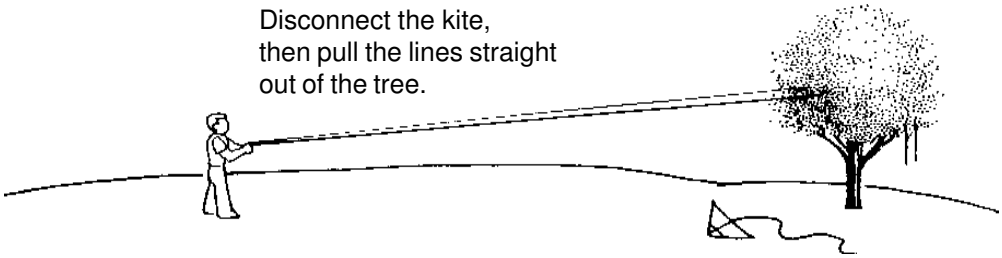
Spectra line is slippery and can slide or "creep" even through a knot in the sleeving. Creeping will effect the length of matched lines and also reduce the size of your end loop. What's the answer? Simple. Tie two knots in your sleeving.



Be Smart Around Obstacles. We've seen flyers do some amazing things to try to get their lines out of a tree. As with many other problems, the right way is simple, once you think about it.



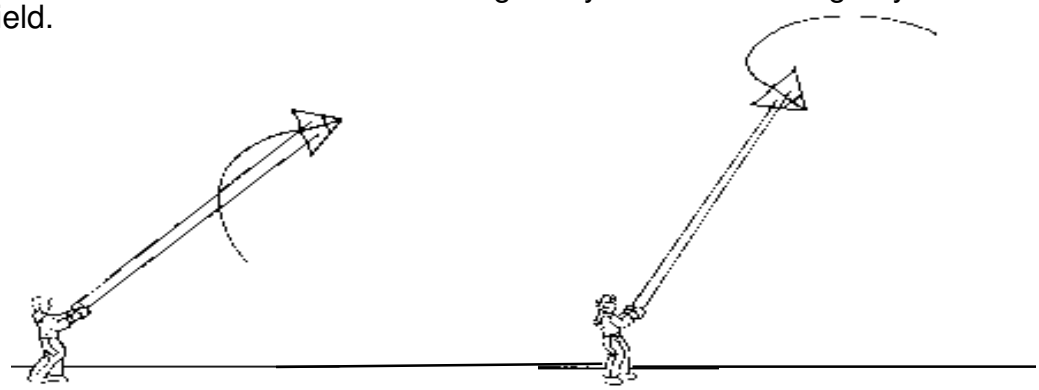
Disconnect the kite and clips from the lines. Pull the lines straight out of the tree. Then reconnect, and fly some more. If the kite lands in the top of the tree, try pulling it out with the lines. The kite will withstand a fairly hard pull before anything breaks. Even if something does break, it's often better to have to replace a strut or two rather than climb the tree.



Set up your kite twenty feet from the closest obstacle. Unwind your lines - attach your handles - set down the rest of your gear - and fly. Whenever you approach your gear, you'll know that you're twenty feet from the obstacle.

Corey Jensen
Monterey, California

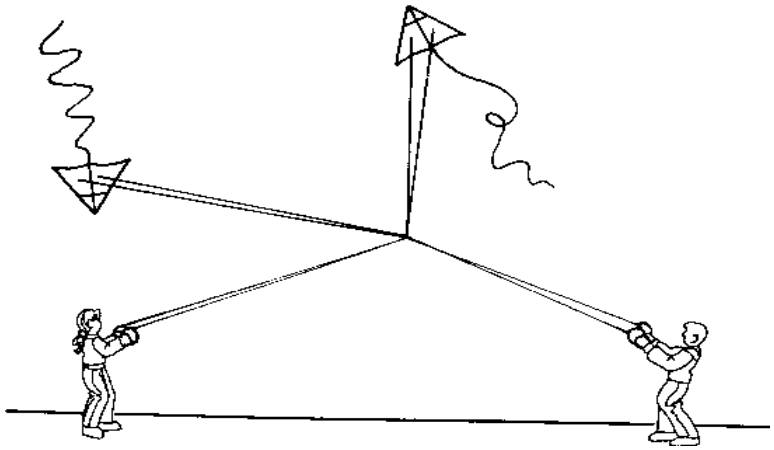
Learn How to Fly with Others. The most common problem is getting your lines crossed with someone else. There are two "right ways" and one "wrong way" to share a flying field.



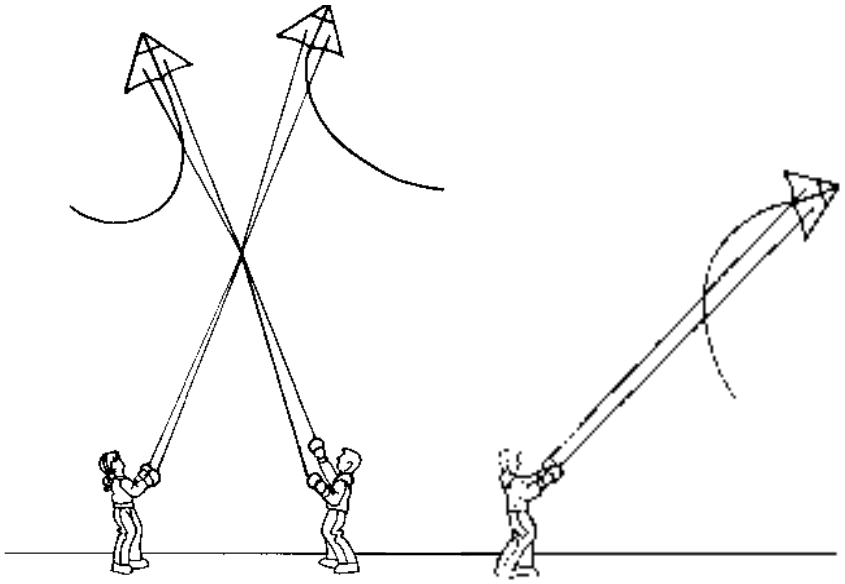
RIGHT WAY #1. The simplest way to enjoy yourself safely is to stay away from other flyers. Make sure you're far enough apart that your lines can't cross. This way, you'll have enough space to fly without worrying.

Of course, it takes a lot of space to fit very many flyers 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're likely to end up a long way from the picnic lunch.

These drawbacks will tempt you to fly closer to others, but be careful you don't end up doing it the wrong way.



WRONG WAY: Two flyers who cross lines while standing some distance apart are almost always guaranteed to tangle and crash. The two sets of lines "wind each other up", and both kites go out of control.



RIGHT WAY #2: If you like to fly together, stand nearly shoulder-to-shoulder. You'll find that, if you cross lines, your flylines will twist over each other just like they do when you do a loop. You'll both still have control, and will be able to fly out of the twist. Just be sure to remember how you got into the twist, so you can reverse it to get out!

Flying together like this requires concentration, because you'll need to pay attention to where the other kite is as well as your own. It also creates all the exciting possibilities for formation aerobatics. We'll talk about how to get started flying formations later. For now, just give it a try. If possible, fly with others regularly. Better still, find a regular partner to practice with. Talk about what you're doing. You'll soon discover that flying together opens the door to wonderful new levels of aerial excitement.

HANDS AND HANDLES

Handles are an important part of your flying equipment. The right handles can make your flying easier and more precise. The wrong handles can be dangerous.

The perfect flying handles are:
Strong, Safe, Comfortable, and, preferably -- Inexpensive!

They should also be light weight. Line under pressure stretches. If you let go of the handles while the lines are under heavy load, the lines will “slingshot” the handles forward for a considerable distance. Under those circumstances, lightweight handles are much less likely to cause injury to someone who happens to be in their path. Also, light handles won’t travel as far.

There are four predominant types of handles being used currently for stunting:

Padded Handles - generally recognized as offering the best feel and control for precision flying. Don't confuse them with the cheap wooden handles which are occasionally packaged with kites. Get rid of those uncomfortable wooden "sticks". Buy yourself a pair of good, sturdy, lightweight padded handles.

Halo Spools - look like small plastic tire rims. Halos are useful because you can easily adjust the amount of line you use or even let out more line after a launch. Halos are also convenient line winders. In heavier winds, you have to grip them hard unless all the line is all out or they will slide in your hands.

Molded Plastic Handles - available in a variety of styles. Some allow you to trim extra line by wrapping the excess around the handle. Plastic handles tend to be hard on the hands with a strong pulling kite because there is no padding. You’ll also sacrifice a little sensitivity of control because you won’t be able to “feel” the line quite as well, but for most flying that won’t be a problem.

Straps and Harnesses - work well with strong pulling kites but sacrifice some feel or control. The strap transfers the pull that normally would be supported by the fingers to the wrist, lessening fatigue and allowing longer flights with bigger kites. A harness transfers the load to your waist. For really big kites or stacks, consider padded straps. And with any harness, look for a safety release that lets you get loose FAST.

Think about the size of your hands when you go shopping for handles. My hands are small so larger spools and handles are harder to hang onto. You might consider wearing gloves. One nice thing about Halos is that they come in different sizes.

Halos are also useful because you don't have to use all your line. You can launch on short lines and even adjust your line length while the kite is in the air. Just slacken your grip on the spool and let the line "spin" out. Remember to make sure you let both lines out evenly so they remain the same length. And be careful you don't let them spin so fast you burn your hands or let out so much line that you might hit obstacles or other flyers.

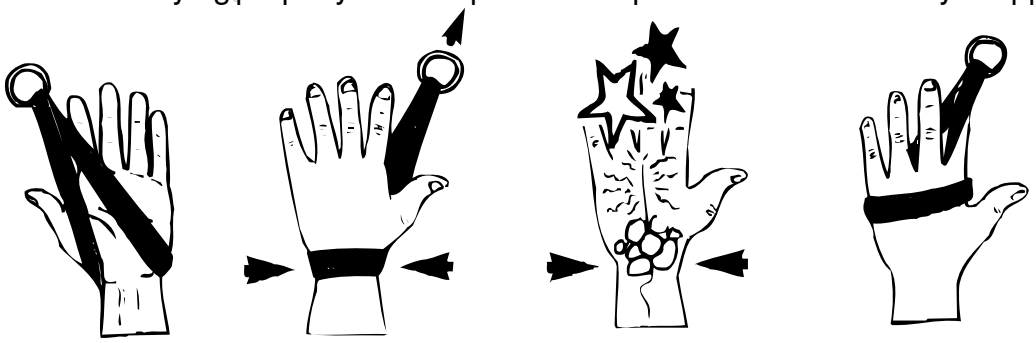
Susan Gomberg
Neotsu, Oregon

Wrist straps first appeared in about 1983, and were hailed as a major advance in kite flying. Then flyers who regularly used wrist straps began complaining of numb fingers and pain in their hands.....when they weren't flying. Several eventually sought medical attention, and found that they had acquired Carpal Tunnel Syndrome.

What's **CARPAL TUNNEL SYNDROME**??

Funny you should ask... The human wrist is a marvel of engineering. Its structure of 9 or 10 small bones with tongue-twisting names allows the wrist its amazing flexibility and its ability to support heavy loads -- like when you fly with handles.

The wrist does its job very well. But it was not designed to be squashed together, and that's exactly what a wrist strap does. Pushed out of alignment, the Carpal Bones of the wrist compress the Carpal "Tunnel" and mash the Median Nerve. Sounds messy and is. Even a mild case is very uncomfortable.
The answer to flying properly with straps is to take pressure off the wrist by wrapping it



WRONG WAY **WRONG WAY** **WRONG WAY** **RIGHT WAY!**

around the back of your hand and extending the strap between two fingers rather than between the finger and thumb. You can also hold the strap in your fist, like you would a handle. It's that simple.

For really hard pulling kites, padded straps work better. They don't cut into your hand or cut off circulation. Be sure your straps are loose enough that you can shake them off or slip your hands out quickly in an emergency.

No matter what you use for handles, after you've been flying for a while on any particular day, especially if you're flying a strong pulling kite or train, your hands will get tired. How long this takes depends on several things: your grip strength and the condition of your hands, the comfort of the handles, size of the kite, and wind strength.

Again, the answer is simple. Land and rest your hands. Take a break! This is supposed to be fun!

Finally, and perhaps most important is this central rule about kites and handles. Handles, harnesses, and straps are all designed to help you hold on to hard pulling kites. But at some point, the kite or kites are going to become just too big for you. Think about your safety and the safety of others.

If you can't hang on to it, you shouldn't be flying it !!