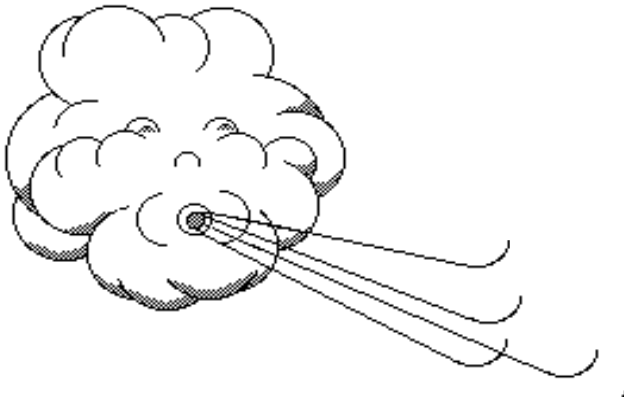
CHAPTER ONE:

ALL ABOUT WIND and TERRAIN



WIND CHARACTERISTICS

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.

Stunt kite flyers are different.

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

Experienced flyers 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 flyer. 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 flyers think that the wind should listen to them and do what they tell it to. If it doesn't blow hard enough - or even enough - or soon enough, they get upset with the wind. Be advised — the wind doesn't care what you think! It does what it wants!

Think of all the energy those flyers 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 flyer. You'll soon be able to fly and enjoy yourself in just about any condition. 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.

The wind has two characteristics that concern the stunt kite flyer — smoothness and strength. We'll talk about **SMOOTHNESS** first.

Finding a smooth, "regular" wind to fly in is important for the same reasons that finding a smooth road to drive on is important. Smooth roads are easier and more pleasant. They cause less wear on your car. Accidents are less likely.

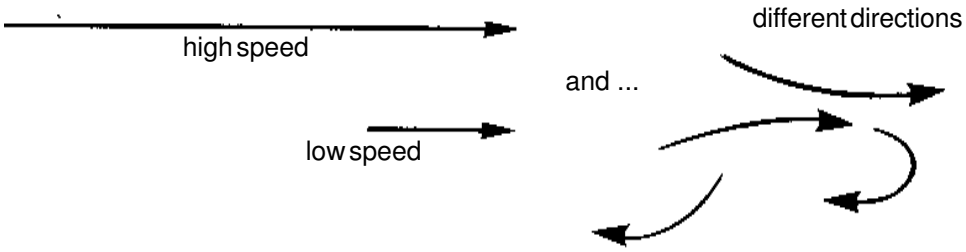
But it is a fact of life that if you want to get where you are going and the only way there is a bumpy road, you'll drive on the bumpy road. There are also people who enjoy going out in a four-wheeler and bouncing off rocks. Kite flying is no different.

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

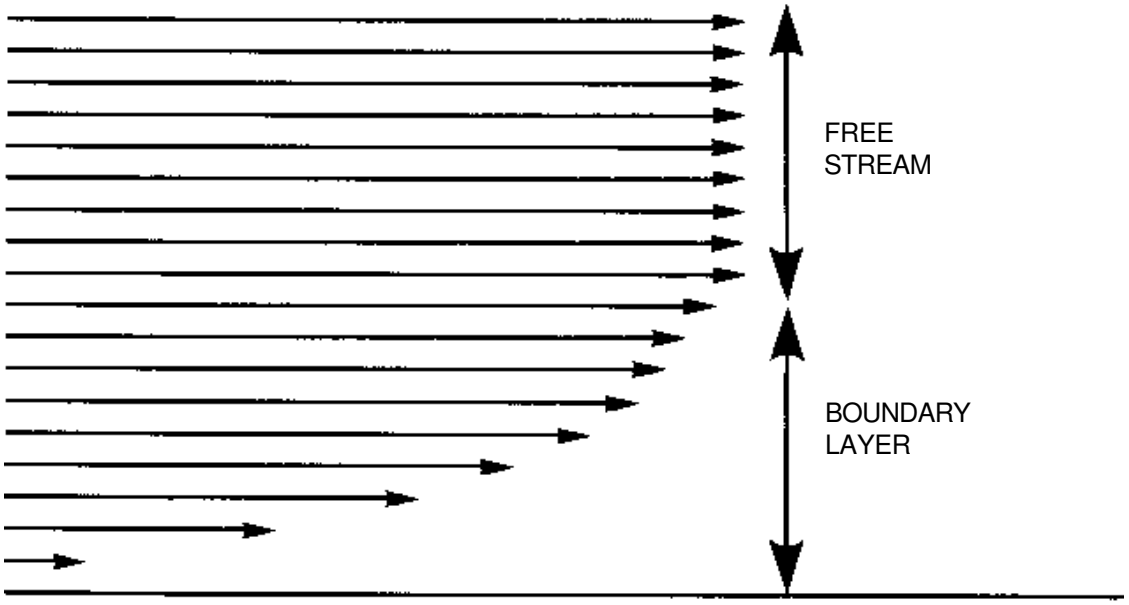
Wind suffers many interruptions and indignities. Friction with the ground slows it down; obstacles like trees, buildings, and hills create turbulance; changes in temperature and even the heat of the ground surface affect wind patterns. And, in the face of that, your job as a flyer is to find the smoothest, 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

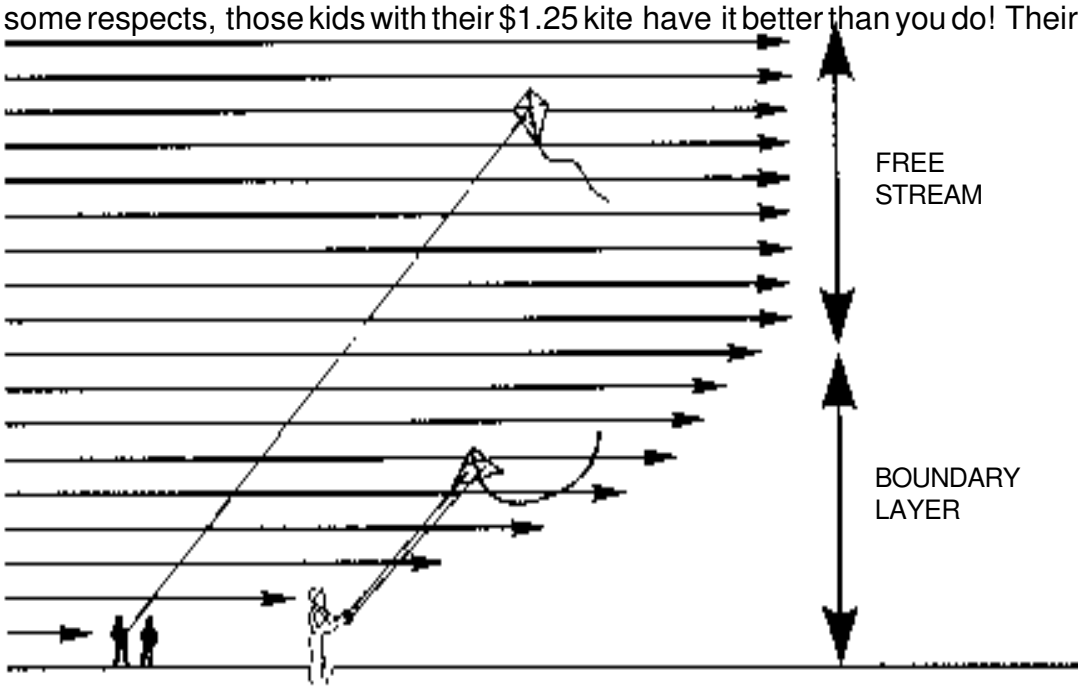


when the wind is quite strong. You can demonstrate this yourself on a windy day simply by lying down on the ground and feeling what it's like down there. Higher up, the wind moves faster, but is still affected by the slower air closer to the ground. This creates a region called the BOUNDARY LAYER — the 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, while you have to deal with 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 boundary layer to produce some spectacular results.

Wind is caused by uneven atmospheric temperatures. Different temperatures create differences in pressure and, as these imbalances even themselves out, winds result.

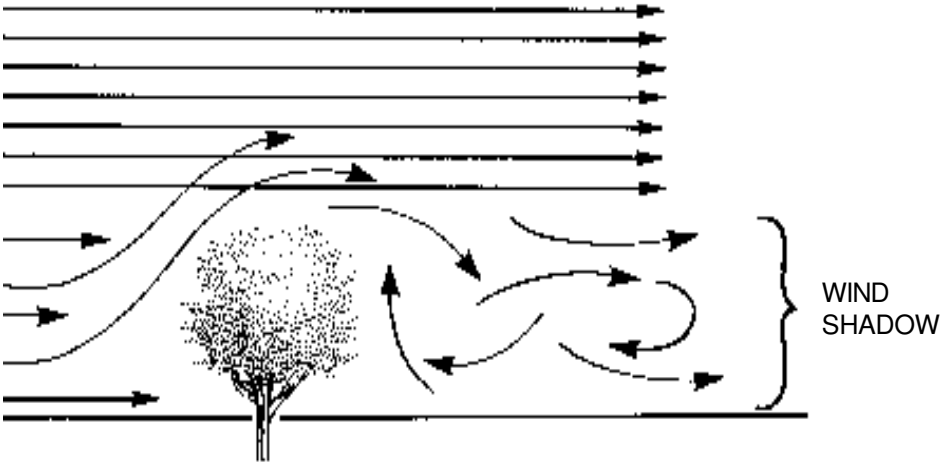
Because of differences in land and sea temperatures, an onshore wind can quickly turn into an offshore wind during the early evening. Coping with a relatively sudden turnaround of 90 or more degrees can be challenging to even the most experienced kite flyer.

David Pelham
The Penguin Book of Kites

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 stunt kite generates some turbulence, but we'll talk about that later.

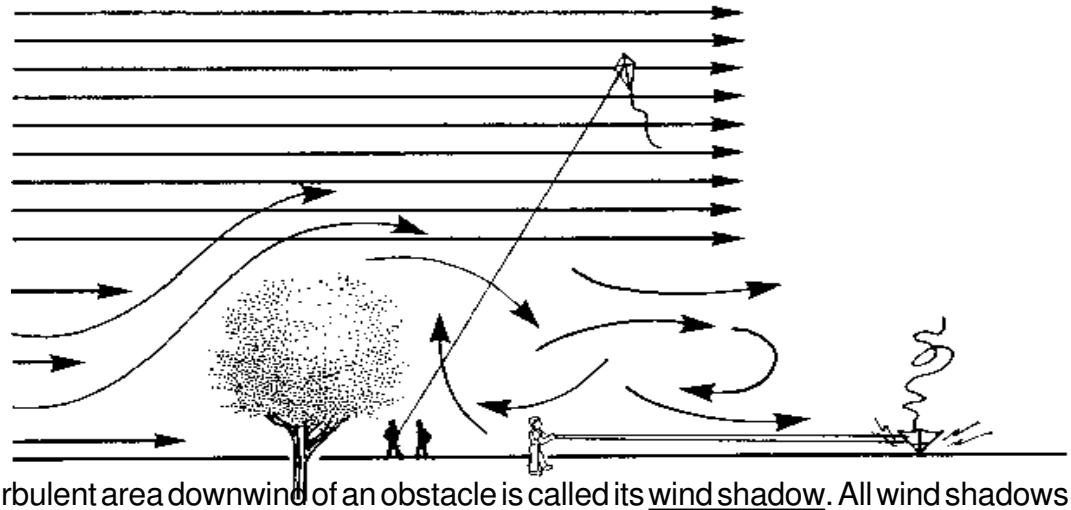


gradually disappear as you get further away from the obstacle. But not right away. The shadow from a typical tree extends several hundred yards, while a large building can make a shadow a mile long!

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.



The turbulent area downwind of an obstacle is called its wind shadow. All wind shadows

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 mph wind", please 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 flyers in particular. We've added a column of information to the scale which describes the effects of the wind on stunt kite flying.

The Beaufort Scale

Beaufort Number and Designation	*Average M.P.H.*	*What to Look For*	*Effects on Kite Flying*
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.*	*Visit your local kite store and tell stories about how great the wind was yesterday. **
2 Light Breeze	*4-7*	*Leaves rustle, wind felt on face, flags flap lazily.*	*Ultra-light kites will fly; use light wind techniques. **
3 Gentle Breeze	*8-12*	*Leaves and small twigs in constant motion; flags extended.*	*Excellent wind for beginners. Everything flies well with little physical strain.*
4 Moderate Breeze	*13-18*	*Raises dust and loose paper; small branches move.*	*Perfect conditions. The kind of day you can talk about next time there is no wind.*
5 Fresh Breeze	*19-24*	*Branches and small trees sway; wavelets form on inland waters.*	*Flying gets physical; equipment must be in good shape. Use high wind techniques. **
6 Strong Breeze	*25-31*	*Large branches move; whistling in phone and electric wires.*	*Upper limits for standard stunters. Heavy wind techniques mandatory and reinforced equipment recommended. **
7 Moderate Gale	*32-38*	*Whole trees in motion.*	*Banzai conditions! Go ski - or stay home and read another good kite book. **

** See special sections on High Wind and Low Wind Flying.*

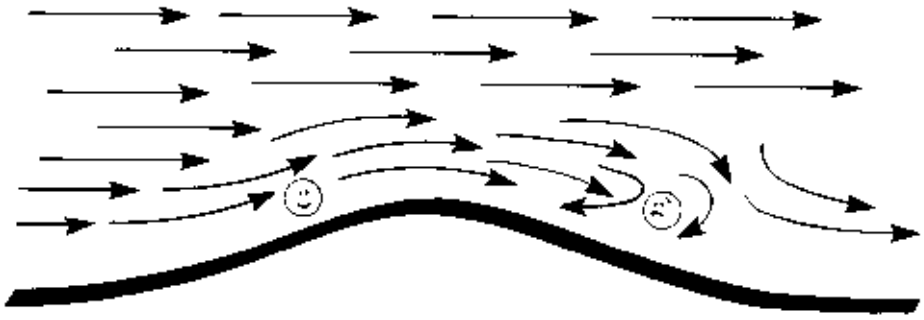
Inexpensive, hand-held wind meters are also available at most kite stores and supply outlets. But remember, they only tell you the wind speed at ground level.

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.

On the windward, or "front" side of a hill, the air flow compresses and speeds up.



These are good sites for stunt 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.

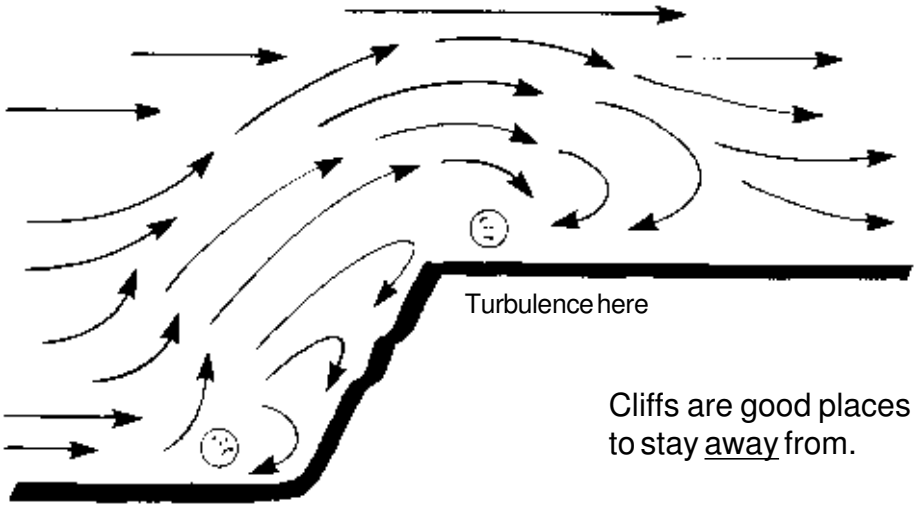
The leeward, or "back" side, however, is different. Wind flowing over the crest of the hill "separates" and causes turbulence that can range from moderate to severe depending on the speed of the wind and the shape of the hill.

So if a little slope is good, a steep slope must be better. And that means that a cliff

> *Chances are that you don't live in an area with perfect flying conditions. So when you do go flying, look for a place which will give you the smoothest, most consistent wind possible.*
>
> *When you fly into turbulent wind, you'll quickly notice an inconsistent pull or jerking on your line and the kite will actually feel like it is "bouncing" along. Hovering will become more difficult and you may suddenly lose control from time to time.*
>
> *If you don't have control, then you probably aren't having fun. Worse yet, you may actually be creating a dangerous situation. The key is to avoid turbulence.*

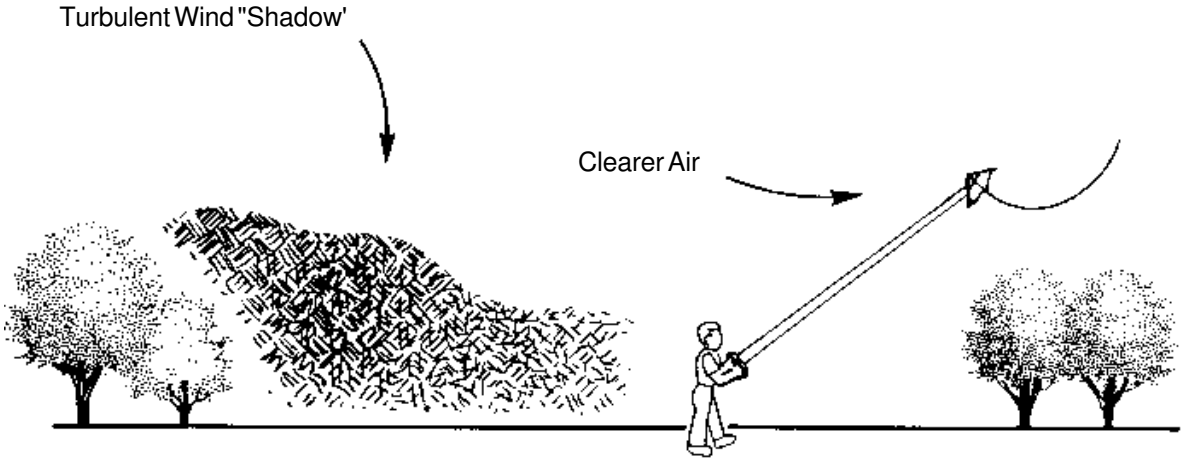
should be a wonderful place to fly, right? Well, not exactly.

The sharp break at the foot of the cliff 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 down 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 possible



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

SAFETY and COURTESY

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 tall trees, buildings, or geological formations. In fact, whenever possible, avoid flying downwind of any tall obstructions.

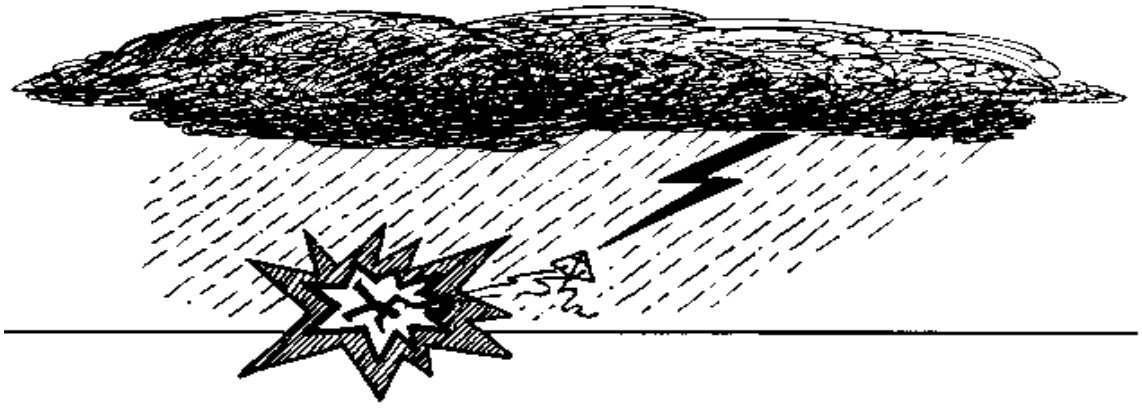
You'll be hearing a lot about safety from us, from your flying friends, from your local shop owner, and from kiteflying organizations. There's a good reason, so pay attention! Any stunt kite you fly is a PROJECTILE — capable of doing injury and property damage. You can injure others. You can do damage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

Even in a moderate wind, a typical stunt kite can be moving at over 60 miles per hour. **If someone gets hit by anything moving over 60 miles per hour, it's going to hurt!**

Remember, the same rigid fiberglass and graphite rods that allow your kite to handle strong winds and high performance turns are like arrow shafts that puncture people and things. Taut, thin flying lines moving through the air at high speeds are even more dangerous. A wire cheese-cutter uses the same principle.

So unless you enjoy nasty letters from lawyers and insurance companies, BE CAREFUL. 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.

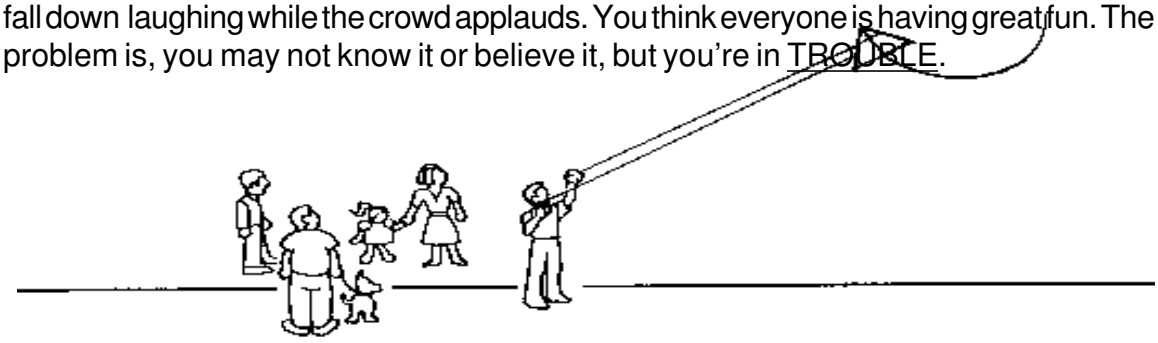
Here's another obvious safety tip: **Stay away from overhead lines.** Anyone who tells you that wet flylines won't conduct electricity hasn't flown in a thunderstorm. Anyone who has flown wet line in a thunderstorm isn't likely to be around to tell you about it!
By the way, dry flylines also conduct electricity. So watch out for power lines. 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



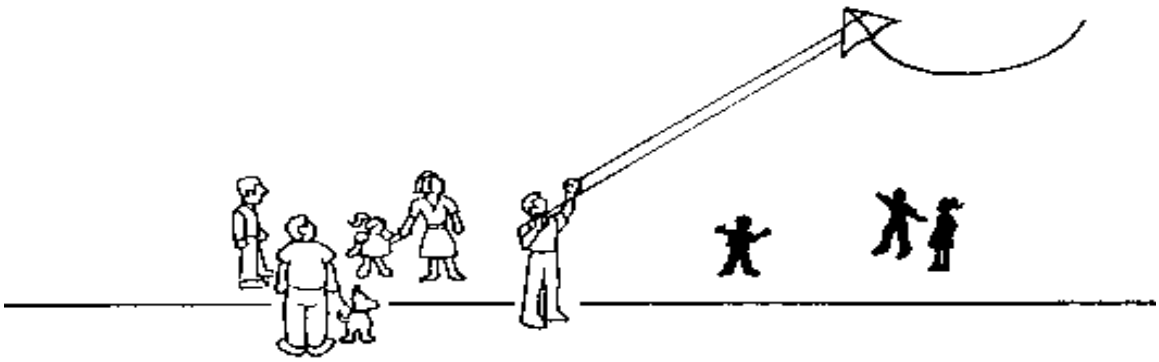
together and burned down $15,000,000 worth of Santa Barbara, California.

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 soon you're flying "all out".

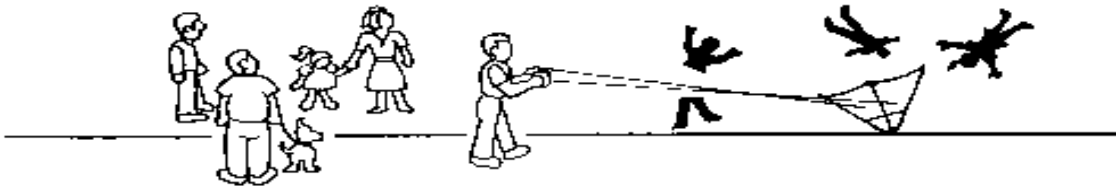
Some children, attracted by the motion and bright color, decide to chase your kite. Your ego tempts you to show off by chasing them back. You dive on them and make them fall down laughing while the crowd applauds. You think everyone is having great fun. The problem is, you may not know it or believe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



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 pilot.

Hitting people isn't the only thing to worry about. For the uninformed, a stunt kite can be a scary thing.

The noise your kite makes can frighten people so don't "sneak" up on or "buzz" them. And because flight is more horizontal than verticle, many spectators don't realize how close the kite will be coming. The point here is -- don't just be a safe flyer. Be a considerate and mature flyer as well.

Corey Jensen
Monterey, California

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

In Chapter Seven, we talk about how to avoid tangles with other stunt kite flyers. Stunters are mobile, which means they can move around the flying field in order to avoid each other. That's not the case with single line kites.

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 flylines can easily slice through the line used for other kites. Start cutting them down and their owners will come looking for you!

To sum it all up, share the flying space. Be alert. Be careful. Always remember the three “C’s” of responsible kiting:

Caution, Courtesy, and Common Sense.

Some parks and beaches are now beginning to limit or even prohibit stunt kite flying. This is a direct result of irresponsible flyers who monopolize space or needlessly frighten and injure people. Stunt kites are not dangerous, but some stunt 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 stunt kite enthusiasts can do to ensure the future of the sport is concentrate on safety and courtesy.