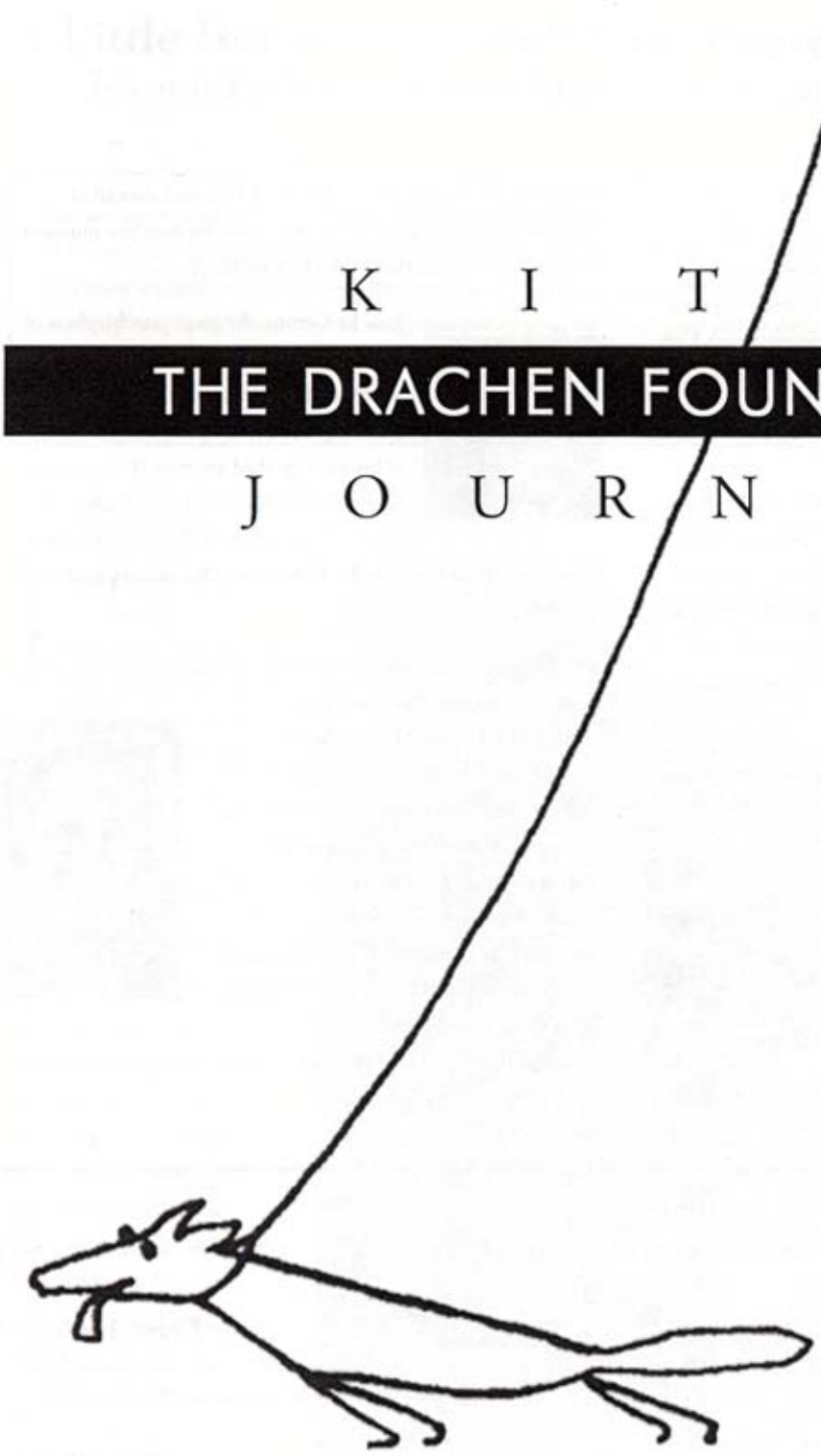


KITE JOURNAL

THE DRACHEN FOUNDATION

No. 5, Summer 2000

A Little-Heralded French Kite Pioneer

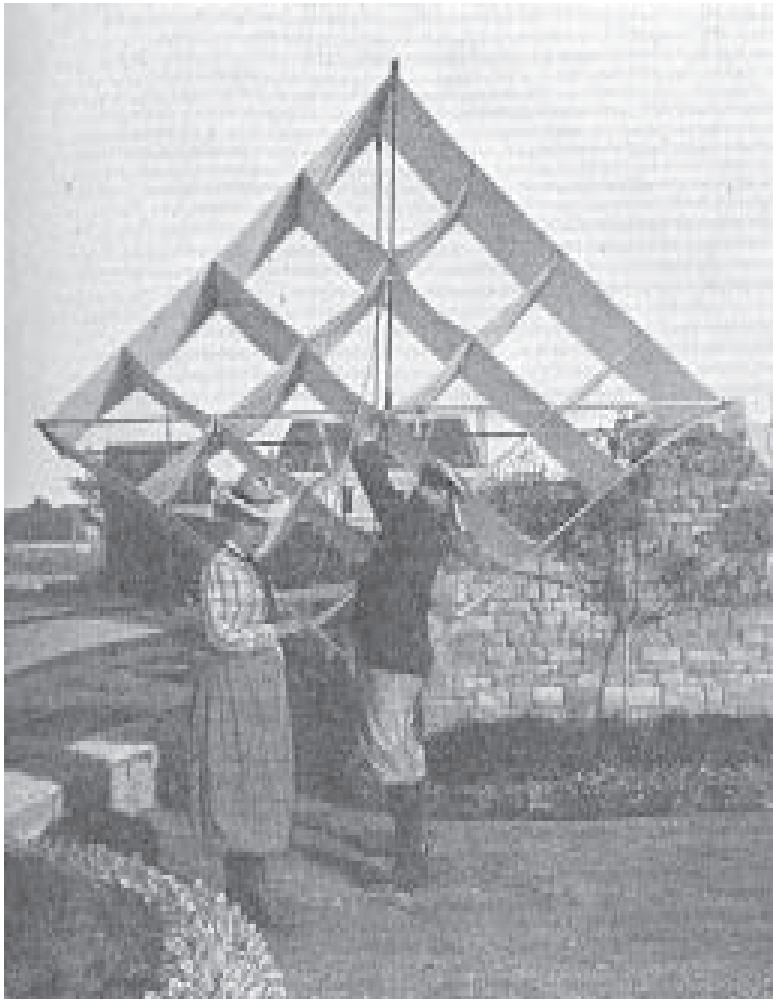
Joseph LeCornu Wrote Important Flight Manual in 1902

Editor's note: Joseph LeCornu was among the leading pioneers of flight in France at the turn of the 19th century. Following is a brief biography of him by a great-grandnephew, who used the memoirs of three members of his family as well as his own extensive research to put together this study. Note that while the family spelled its name Le Cornu (with space between the words) from the 17th century on, a registration error at his birth gave Joseph LeCornu a one-word name. A great-nephew changed the family name back to the traditional two-word Le Cornu in 1910, but since this was at the close of Joseph LeCornu's kiting career it seems appropriate here to use the spelling LeCornu himself used in his lifetime.

By Jean Le Cornu

Joseph Louis LeCornu was born in Caen, Normandy, on March 13, 1864, the seventh of eight children. His father was a lacemaker by trade. Following the father's death in 1878 when LeCornu was 14, he and his seven siblings were raised by their mother.

An early achiever, LeCornu received a prize in philosophy from his lycee in Caen at age 9 and four years later was included in a delegation from his school sent to Paris to attend the burial of writer Victor Hugo. The following year he was admitted to L'Ecole Centrales des Arts and Manufactures.

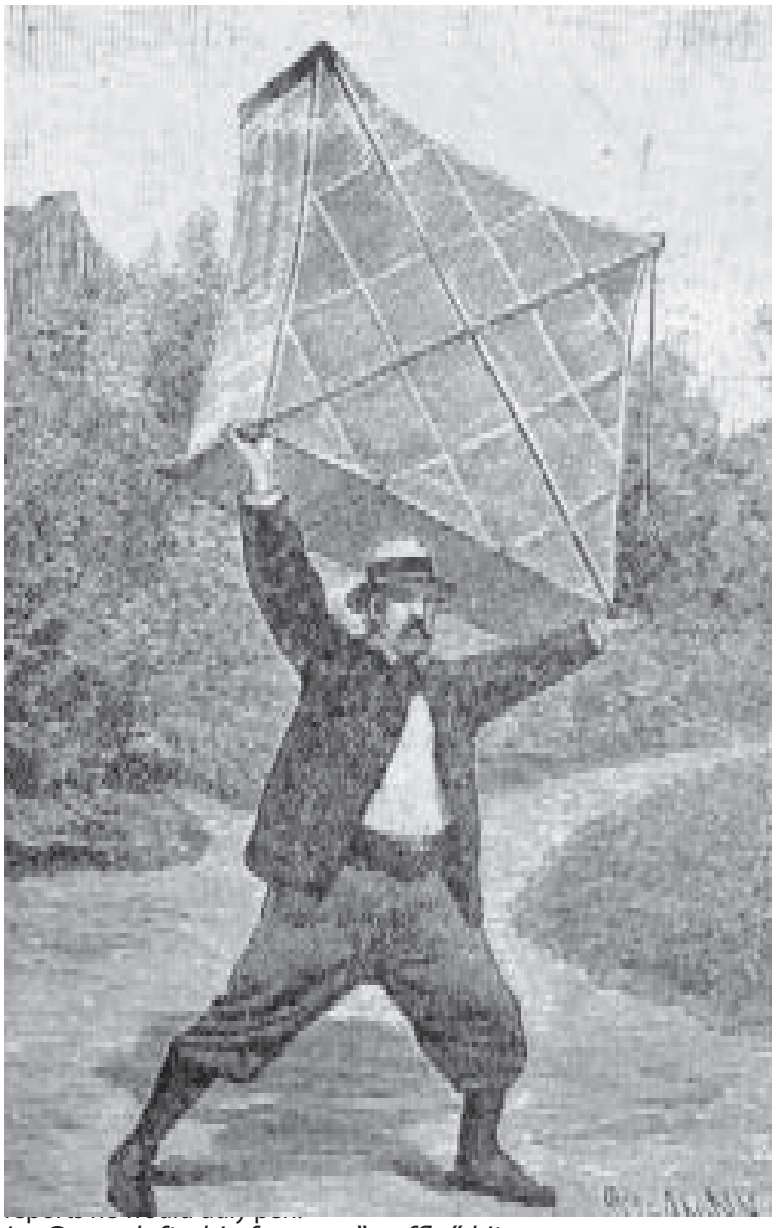


Joseph Lecornu and wife flying some in years ago.

A good student if a bit unruly, LeCornu was disciplined once for causing a disturbance in the dining hall, a second time "for having taken part in a noisy demonstration against freshmen."

During a seaside holiday at St. Aubin sur Mer, he helped organize torchlight tatoos and, aided by a brother, rescued a drowning swimmer. The brothers were awarded a medal by the French navy.

Le Cornu did a great deal of writing as a student, good preparation for the long, excellent aeronautical research



Le Cornu lofts his famous "waffle" kite.

Graduating from university in 1888 at age 24 with a degee in civil engineering, LeCornu did mandatory military service in Paris and then joined the National Electricity Company, of which he eventually became a significant official.

He married Marie Therese Hattersley in 1891 after she converted from Protestantism to his Catholicism. They were never to have children.

After a training period, LeCornu was assigned by the electrical monopoly to his home town, Caen, where he organized a regional electric firm, the soon to be powerful Electricity Company of Caen. Creating the firm and then building its first factory overlooking the city's fort, LeCornu became known as city's "father of electricity." Because of endemic French conservatism, the work was initially difficult. Citizens were unhappy with the new and revolutionary source of power. They objected to overhead wiring and to unsightly electric poles, clinging to tried and true gas for their power needs

Little by little, though, electricity made headway in Caen and by 1895 there were 5,000 lights in the city; four years later there were 13,000.

After a good period of development, the electric firm eventually ran into trouble when construction debts and operating costs combined to preclude payment of dividends to bond holders. A revolt followed, with complicated political overtones, and LeCornu was fired in 1904 from the firm he had organized and overseen with such apparent success. His investment in a brother's hotel was wiped out at the same time and LeCornu for the moment faced a bleak financial future.

Having become deeply involved in city politics during his battles on behalf of the power firm, Le Cornu took the job of secretary-general of the Caen town council and applied his organizing skills and intelligence to this administrative post. Le Cornu held the job for four years until ousted by rival politicians. He lost not only the post but also his lovely government lodging within the town hall, having then to settle in a single room in Caen. His work did not go unheralded, however, since he was awarded a medal for his services to the city.

That same year LeCornu assumed the mayorship of the nearby town of Cambes, a largely ceremonial post, and

held it until his death. Le Cornu maintained a country home near Cambes. Using political connections, he soon obtained an excellent job in the coal industry.

The extensive travel required by the work did not faze LeCornu because, starting around 1900, he had begun driving his own car. His first was a Bollee, which broke down often. LeCornu found his engineering skills invaluable in keeping him mobile. LeCornu's autos over the years ran to a Dion, Zebra, Amilcar, Peugeot and finally a Rosengaert. He and his wife were also pioneers with the new two-wheeled bicycles, going out for long rides together.

Jean Le Cornu, wife and friends pose with his replica of a classic LeCornu.

LeCornu had a pioneering spirit from the beginning. In 1887 while still at school, he attended a balloon launch in Caen. When a prospective passenger fainted at the last minute, LeCornu replaced him and sailed away on Captain Mangin's Siege de Paris , beaming with joy and shouting to one of his brothers: "Tell Mum I'm leaving." He subsequently published a magazine account on this joyful trip.

That same year, LeCornu joined the French Aerial Navigation Society and attended meetings of the group for many years, eventually becoming president of the organization that grew out of this society, the French League of Kites, a federal association that supported experimental studies.

In 1907, LeCornu had another opportunity to fly in a balloon in Caen. His wife permitted him to make the trip only if she were taken along. She was.

Having been intrigued by aeronautics, and particularly kites, since childhood, LeCornu by 1897 had invented a "shelf" or "ladder" kite, composed of three rectangular cells placed one above the other. His materials were basic: light wood for the frames, light cotton or silk cloth for the sails, glue, ties made of waxed string. But his construction technique was ingenious.

In 1900, LeCornu won a first prize at the World's Fair in Paris with an multicellulaire oblique kite, the famous Gauffre de LeCornu (The Le Cornu Waffle). He used the kite to tow himself in a boat and marketed it widely. Public recognition of the device's efficiency provoked led LeCornu to advertise the kite in specialized journals and it was subsequently used for weather soundings in many countries–England, Belgium, Russia, the U.S. Always abreast of the times, LeCornu marketed a suspension rig for cameras so his kite could be used to make aerial photographs, a new craze begun by the Frenchman Batut.

Using his writing skills to advantage, LeCornu published the important, widely used reference book Les Cerfs

Volants (Kites) in 1902. Although it contained inaccuracies, this book was the first comprehensive effort anywhere in the world to document the contemporary state of the art of kites. A volume on aerial navigation soon followed. From 1904 on, he contributed to the journal Les Cerfs Volants and served as one of its editors. Among the other writers were men whose names were to become hallowed in the field of flight–Saconney, Hargrave, Houard, Puyo, Roch-Donzella. In 1912 he issued Manual du Cerf-voliste (Handbook for Kitefliers). During World War I he published brochures on sea surveillance and on the use of manned kites from the decks of submarines to increase range of vision. (Disregarded by the French military, this idea of using kites from the decks of subs was taken up much later by the rival Germans who flew spotter Focke-Achgelis gyroplane kites from submarines during World War II.)

The fertile LeCornu not only wrote about kites, but also about many other subjects that interested him–electricity, aviation, mathematics. He wrote short novels with a scientific turn to them and most of these were published. He also wrote satirical songs and monologues, as well as articles on freemasonry.

Joseph LeCornu was not the only theoritician in his family. His eldest brother, Leon (Jean Le Cornu's great-grandfather) did much scientific research and wrote many books. He became a member of the prestigious French Academy of Science and in 1910 was elected its chairman.

Although a reserve officer, Joseph LeCornu was declared too old at age 50 for active duty when World War I broke out in 1914. With his usual energy, however, he took to writing letters to soldiers to dispense news and to express his unshakeable optimism in the French cause. He wrote many hundreds, perhaps thousands, of these missives.

Having used his political connections to get a good job in the coal industry after losing his Caen council post in 1908, Le Cornu by World War I found himself idle as the war brought his business to a standstill. LeCornu then involved himself in something quite new to him–cider-making and the distillation of cider into the high proof brandy marc.

By 1923 he retired with his wife to their country home at Le Bijude, near Caen and Cambes, where he busied himself with a big garden and raising bees. A gracious host to his many friends, he became something of a legend to his visiting nieces and nephews for the ingenious toys he built for them.

The still energetic LeCornu continued as mayor to run the nearby village of Cambes with wisdom and rectitude. He maintained roads, had water service installed, saw to road mending, supported the church, advised former school friends, served on a variety of local and national boards. Not surprisingly, he saw to the electrification of the town of Cambes and surrounding countryside. It was one of his major achievements.

In the summer of 1931, LeCornu drove to the town hall in Cambes for a meeting, where he appeared in obvious ill health to friends. He asked his secretary for papers which he ordinarly signed at the end of the meeting. He explained this request: "No, immediately, while I can do it." Returning home, LeCornu died in his bed on the morning of August 9, apparently from a heart ailment. The death was mourned in the church at Cambes, which proved to be too small for the number of people attending. LeCornu was buried in the churchyard in the city of his birth, Caen. He was 67.

A Personal Summing Up

As his biographer and admiring great-grandnephew, I am prepared to sum up Joseph LeCornu this way: A good and faithful man. Active, passionate, kind-hearted and very sensitive. He stayed young and joyful, was open-minded, honest, deeply religious. He had wonderful gifts for music, drawing, photography, poetry, writing. He was an expert craftsman–blacksmith, mason, house painter, modeler, electrician, cook, tailor, gardener. He was noted for his ability to tame birds. His dogs Taupette and Zezette remain legendary in my family's collective memory. Altogether, a renaissance man.

–Jean Le Cornu

Flying Leaf Kites in Sumatra

Question Posed: Did Kites Originate in Southeast Asia?

Editor's note. The following article on kite fishing is excerpted from a book in progress on kite flying in Indonesia. Here the author journeys with other Western kite fanciers to a fishing village on the island of Sumatra to observe kites being flown in a traditional, utilitarian way. From his experience, he comes up with a revolutionary theory on the origin of the kite.

By Tal Streeter

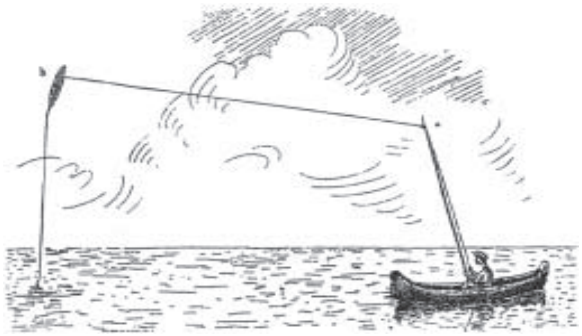
Sumatra's jungle foliage stayed with us right up to the village of Mutun's narrow, white sand beach.

Though I could not identify it conclusively, standing on the beach looking out over the bay, I felt the presence of one of the most spectral births of a land mass on planet earth, the island of Krakatoa: The massive volcanic eruption of Krakatoa in August 1863 sent tidal waves killing more than 36,000 people in the island inlets off the coasts of Sumatra and Java. In the days that followed this cataclysmic upheaval, Krakatoa generated waves traveling and recorded at points as far distant as the English Channel.

Today, the bay waters were crystal clear, its surface as smooth as a mirror–a picture right out of the travel folders, and, as always, at the moment absorbed in the prospect of new (or old) kite lore, there wasn't another place on earth I needed or wanted to be.

As we drove up, a friendly, amiable young man named Anshory Djausal hailed us.

Djausal stayed with me, the two of us clamoring over a pile of large rocks to find a comfortable place from which to watch the kite fishermen cast off with their passenger, a Frenchman I had accompanied to Mutun, both of us on our second visit to this small village. Mutun is located on a bay opening on the Sunda Strait which separates Sumatra on its southernmost tip from the northernmost coast of Java. The village is known to Indonesia's kite-flying community as a place where the ancient skills of kite fishing are practiced.



Kite fishing in the Banda Islands of Indonesia.

Anshory Djausal, the man who greeted us, is credited with reviving the popularity of kite fishing in this village. I listened attentively as Djausal expounded on kite fishing, obviously an all-consuming love. The fishermen's French passenger determined to catch a fish, was a friend, whom some have identified as my French counterpart, the kite journeyman and enthusiast, Pierre Fabre.

"The village's full name is Dusun Mutun Suka Jaya," Djausal told me, as both of us settling down to enjoy our perch on a large rock warmed by the afternoon sun. "Mutun is a misspelling of the name of a tribe of fishermen, the Butun, who came from the Celebes. The Butuns are believed to be the ancestors of the present-day villagers. This was from a time far beyond anyone's memory.

"The bay where kite fishing is practiced is known as Hurun Bay. The name is derived from a fish common to this body of water.

"There are 300 to 350 families living In Mutun. All are engaged in fishing. Normally it is necessary to fish all day long with nets for a variety of fish in order for a family to make an adequate living. In contrast, the kite fishermen go out to fish exclusively for garfish. Because the gar is more expensive in the marketplace, gar fishermen generally are able to earn a respectable income by fishing for three hours, then are back to spend the rest of the day with their families."

Djausal continued: "The gar has a long mouth like a

crocodile, with a row of nasty looking, sharp 'v' shaped teeth lining the top and bottom of its mouth. Not a particularly pretty fish, it is nevertheless considered a delicacy on the dinner table–and good for one's health.

"The lagoon alongside one end of the village is 30 meters deep; further out in the bay the waters are 40 meters deep. Gar in 30 meters of water tend to be about 30 to 35 centimeters long, half the diameter of an average man's forearm. In 40 meters of water the gar is much bigger, the size of my leg.

"Otherwise very shy and not easily hooked or caught in nets in the conventional manner, the gar is best caught by kite fishing. It travels in schools; though if one is caught by a kite fishermen, the others still come to the bait."

Djausal's hobbies were fishing and kites. In kite fishing he had managed to combine both his enthusiasms. He also appreciated the value of not letting traditional skills and ways of life slip irretrievably from view. I wondered if kite fishing was an old tradition.

"It is not an old tradition," he said answering my question with a very thoughtful observation: "This is a misleading phrase. Tradition is not something old as distinguished from something new, but the continuous, unbroken thread of life."

Djausal remembered the kite fishing from his childhood in this region and re-introduced it to a local fisherman. "This fisherman, whose name was Arifln, passed the techniques on to other villagers. There are presently five to ten people in Mutun practicing kite gar fishing, all members of an extended family."

Initial Visit

On our first visit with a larger group, several days earlier, three dugout tree trunk canoes with bamboo outriggers attached to either side awaited our arrival, moored alongside the village's modest dock, somewhat jerrybuilt, but for the industry of fishing, not just pleasure. Roofed over, the wall-less enclosure served as a multi-purpose work area–boat repair, seperating the day's catch, related activities, which could continue uninterrupted by inclement weather.

Two young men, one riding fore and the other aft, manned each boat. I took a seat at the back, my legs and feet hanging down in a small storage area well, water sloshing around at the bottom, in which our catches would be stored. The crew of the dugout into which I had jumped consisted of two brothers: Parwit, 19, and Sahroni, 9. Kite fishing for garfish was a daily activity for them. Sahroni joined his brother each day right after school. The two boys paddled our boat around the lagoon, staying close to the shore. Around 50 meters out, Sahroni dropped a small anchor to keep the boat from drifting into shore while his brother prepared the fishing line.

Hooks were not used; instead, the end of the fishing line was passed through the length of a small bait fish, then tied with a slip knot in a loop six or seven inches in diameter–the fish at the bottom of the loop. The idea was to pull the noose tight on the gar's upper jaw when he opened his long mouth to take the bait. Djuasal had told me that the Mutun fishermen often caught barracuda with their nooses and kites, but the fishing line strength, perfect for gar, was inadequate to hold the larger (and imminently stronger) barracudas

What's in a Title?

In a quip about the tropics, playwright Noel Coward famously said,"(Only) mad dogs and Englishmen go out in the noonday sun." This quote has a latter-day echo in the title Tal Streeter has chosen for his book-in-progress on Indonesian kites. He is calling it "In the Shade of Indonesian Kites."

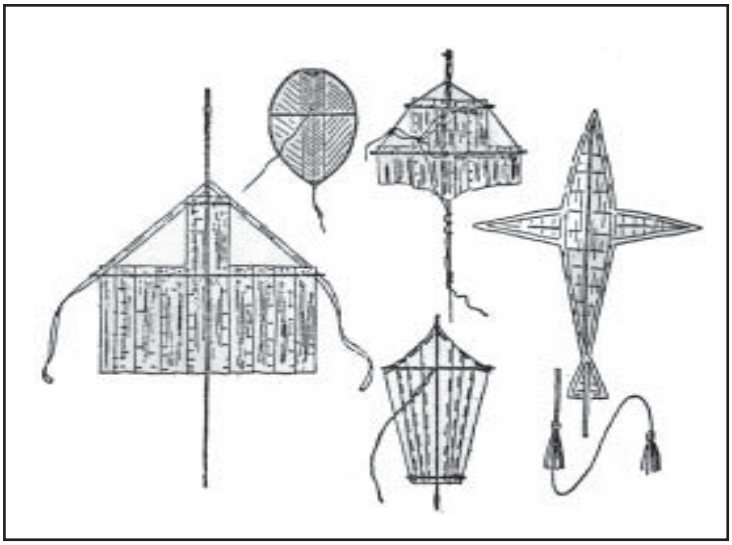
Streeter explains he saw Balinese fliers carrying their own shade–literally. Taking every opportunity to retreat from the sun's stunning rays, the native kiters set their big 12-by-30 bebeans over an open structure made of bamboo on the perimeters of the festival flying fields. The kiters and their familes, friends and strangers alike then sat in the shady space underneath the kites while waiting their turn to fly. The flight teams whiled away the time by eating, gossiping, singing, playing gongs and cymbals, relishing the occasional breeze.

As Streeter observed, "Though they are one group or several, they separate themselves in nearly perfect proportion to whatever shade presents itself."

who generally took off with bait, line and kite, probably unaware of the kite flying overhead. This was a rather humorous sight, the boys said, that of a fish flying a fishing kite. The kite, of course, soon disappeared from sight, finally pulled down into the water by the barracuda headed into deeper waters.

The reasoning behind fishing from a kite is not so dissimilar from that of fly-fishing. A fly fisherman casts his lure as far out into the water as his skill allows. The idea is to get the line as far as possible from the fisherman and his boat–which scares the fish away. The fishing kite, which maintains the bait far from the fisherman and boat, is ideal for this purpose. It is particularly suited to catching the shy gar, so desirable as a delicacy on the dinner table.

The fishing kite's flying line runs up along the length of a bamboo pole set upright at the rear of the dugout. The line is played out by hand from the bottom of the pole through an eye at the top as the wind takes the kite out, over the water. The flying line is attached to the bridle of a small kite, about 25 by 30 centimeters (10 by 12 inches). This line then continues back to the bridle point on the kite itself, where it is attached at the spars' crossing point, is slack to the bottom of the spine, attached at the spine's lowest point, and next drops approximately eight to ten meters down to a point where the lasso and its fish lure skims the water's surface. The kite fisherman, manipulating the kite flying line, jerking back and forth lightly on the line, making the bait dance just at the water's surface. (There was some confusion in the notes I kept at the time: I had written that the fishing line dropped down from the actual bridal point, but several sources including Pierre seemed to concur with the fishing line position as coming off the kite's spine–and Pierre added an additional thought in support of this position, pointing out that the kite leaf, in fact, was never absolutely symmetrical, but, "thanks to the weight of the fishing line and lure coming off the base of the kite, acting as a tail, which added stability, it flew just perfectly." Could it have been bridled differently by my crew? I'll hold out for a little lab work here, or going back to check this out. Anybody up for a visit to Mutun?)



Leaf kite designs from Southeast Asia.

Expectant Waiting

An occasional small motor launch breached the stillness of the lagoon; otherwise, the only sound was water lapping gently against the side of our dugout. Though it was wonderfully still and peaceful, it was quite exciting to wait with expectation as to which of the three boats would make the first catch.

Within a very short time, one after the other, occupants of all three boats were shouting out, excited that their crew had ensnared a gar. Line, kite and gar were quickly pulled in and the fish held up for display to the other boats. The gar caught by my boat's crew flopped back and forth several times, then was still, giving up the fight. The fish's upper jaw was still snared in the noose which, wedged between its teeth, held it from slipping off.

All the visitors were allowed to try their luck at gar fishing. It wasn't as easy as it looked. None of us were successful in repeated attempts. I for one was glad I hadn't enjoyed the dubious honor of "beginner's luck"–it would have been the first fish I ever caught!

Stepping out of the dugout which had taken him on as a passenger, Pierre Fabre, glowing with pleasure, made a heartfelt comment which caught the feeling of this experience for me: "Some travel is worthwhile only for a few minutes in which something truly wonderful occurs. This opportunity to see and take an active part in kite fishing was such a moment."

Back on shore, a small fire was set, and the fish quickly grilled to perfection. The gar was pronounced mild but delicately flavored. In the future, something to be on the lookout for, on a fine restaurant's menu.

Trumpeting a Catch

On this second visit to Mutun, Pierre's kite fishing experts took him into deeper waters. Pierre stood up in the prow of the dugout as the boat was pulled up on the sand beach nearby our rock perch. Shouting his enthusiasm, he proudly held up the gar he had successfully snared in the fishing kite's lasso noose for Djuasal's and my inspection.

The Moon Orchid Kite

Although the kites used in kite fishing on the several occasions when I visited Mutun were made of bamboo sticks with a black plastic covering, the original leaf kite was still very much in evidence in Mutun and the surrounding jungle. The plant whose leaf was once used to make the fishing kite grows in the tree limbs and on tree roots running everywhere, exposed on the ground in the village environs. And everyone, it seemed, knew of its existence and how to make a kite from this leaf called loco-loco by the villagers. The plant is a member of the orchid family. It was first identified for me as anggrek bulan or "moon orchid." A botanist later informed me this particular orchid was not anggrek bulan but anggrek tanduk rusa or "deer's crown," the name derived from the antler-like appearance of the blossoms. Later, yet another botanist offered yet another Latin name for our orchid leaf turned kite. And, adding further to the contention, Pierre's research back in France turned up yet another opinion: "an epiphytic fern, Polypodium quercifolium." The original image of a moon orchid kite was charming to me and already firmly rooted in my mind. Pierre suggested Moonus Orchidus might be acceptable as an author's prerogative. With this encouragement, given the degree of uncertainty at this point, I'm taking the liberty of sticking to the first name I heard, which had planted such an attractive, romantic notion in my head, calling the little fishing kite, the Moon Orchid Kite. Pierre concluded his communique to me with this message: "Whatever its name may turn out to be, it is indeed like a perfect ready-made bowed kite. A kite that existed long before man appeared on this planet, and patiently waited for some fisherman's line."

A local fisherman works the line as he uses a kite to fish for gar.

Leaves used for these leaf kites varied in size from 20 by 30 centimeters (8 by 12 inches) or 30 by 40 centimeters (12 by 16 inches). The leaves, dry rather than green, the dry leaf being considerably lighter than a green one, were very much similar in size and proportion to the black plastic-fishing kites, which we observed being used. Although the dry leaves seemed fragile, they were apparently sturdy enough to work well as fishing kites. The leaf had a very pronounced curve, curling back evenly on either side from the center stem–very much the same attitude, nearly exactly I should say, of a kite bowed for stability and/or a relatively strong wind.

A small stick was poked through on the horizontal making a small "t" with the leaf stem (and sometimes, but not always, a vertical stick was threaded in and out several times to reinforce the rigidity of the stem). Two bridle lines were tied to this horizontal cross stick and a third was tied lower down to form a three-legged bridle. The small portion of the upper section of the leaf was cut in a straight line across the top, paralleling the horizontal cross stick. This was not a fancy or elaborate kite in any sense of the word, but it was the bare

bones epitome of what we would consider today to be rudimentary perhaps, but nevertheless, a full-fledged kite.

Why was this orchid leaf chosen over the countless other leaves, which abound in the jungle? I picked a number of leaves off the ground, charmed by the beauty of their form and color. As they dried, like most leaves they curled and rippled into very irregular forms. A leaf might be pressed in a form while drying to give it a favorable contour, but the orchid leaf naturally takes and holds this evenly rounded contour, one very nearly ideal for a kite (although a kite with sharper dihedral would fly with greater stability).

Kite histories generally assert that the first kites were "flat." The "bowed kite" is widely believed to be a relatively new Western invention. It seems more likely to me that flat kites were the West's first kites, not the East's. Early Western kites, the so-called two-stick arched kites, were flat and quite rigid relative to lighter, Eastern kites which would have taken on a "bowed" dihedral once they were windborne, in a brisk breeze or the flying line pulled sharply.

These generally sturdier Western flat kites were finally given a curved surface by the addition of a bowstring fixed on the kite's backside. This development by William A. Eddy, the Bayonne, New Jersey journalist, was the result of his seeking greater stability for his experiments with kite payloads of photographic and meteorological equipment– Western kites up until this time were commonly flown with tails, a flat kite being inherently unstable. Though it would not have been common knowledge in the West, Eastern kites, of course, had long flown stably without tails. What was their secret? A more flexible frame and in some instances a looser cover (paper or cloth) which, pocketed on either side of the vertical spar. creates a dihedral effect as well as responding to the vagaries of wind currents. Not unlike a bird's optimizing its flying and sailing abilities in responding to the subtleties of wind currents, varying it's wing attitudes, and wingtip feathers. (It wasn't until the 1950s that Francis Rogallo, one of the contemporary West's most highly esteemed kite inventors, an aeronautical engineer with special expertise in wind tunnel testing, drew attention to the virtues of looser kite covers.) To what in Eddy's time was the sturdier, relatively non-flexible Western flat kite (the so-called pear-top, two-stick diamond kites), Eddy added a bowstring on the two-stick kite's backside. Attached on one side, tensioned and tied on the opposite, the bow string set the horizontal stick and kite cover into a curved surface,

An Appreciation of Tal Streeter

He has a quiet and understated sense of adventure. For him, adventure is a methodical search. He follows the thread of it, not knowing where it might lead him.

He's human, humane; he very much enjoys people and their emotions. He has a lot of insight into people's character. He seems to have a sense of nostalgia, but he's not burdened by it. He loves to give people an appreciation of other, former times.

I'm inspired by his talents. He has two distinct phyches–sculptor and writer. His writing makes the same statement his sculptures do. It says: we all relate to one another, and the environment.

He enlightens us to a new perspective. The perspective is optimistic. It's a striking one, of enjoyment. His description of himself as walking around India with "a plastered smile on my face" is the feeling he gives others: joy, love for what he's experiencing.

His stature in the political commercial kite world is one of being above and beyond it. As a writer, we kite fanciers need to draw him into it somewhat since his style of writing can so popularize the subject of kites. He keeps well away, but in a subtle way in touch, too.

His library is not kite-specific; kites have led him to marry many other areas to the subject–folklore, history, culture. His kite collection is significant, representing more than 25 years of work and put together with an impeccable esthetic sense. Its concentration on the Far East is one few Westerners, let alone Americans, have made. His Korean material is of particular value because so relatively unknown.

–Scott Skinner

right and left. In flight, this had the effect of increasing the vertical center stick's keel-like characteristic. This generated the stabilizing characteristic of the lateral dihedral–and allowed Eddy to do away with the tail which until then, at least in the West, had worked at the expense of adding weight to kite.

Voila: Eddy, in the unlikely locale of Bayonne, New Jersey, created a kite incorporating very nearly the best characteristics of ancient traditional Eastern kites: stability built into the flying characteristics of the kite itself, making the additional tail unnecessary (and paring down the kite's weight which diminished its flying abilities–a keeled boat cutting through water vs. a flat-bottomed boat bumping, jumping around in the water with less control is the standard illustration of the kite's keel effect, the kite traveling in its ocean of sky). This "Eddy/Malay," as it eventually came to be known, marked the transition of the first Western kite's evolution from the "flat" kites then common throughout the West to the "bowed" kite.

The quarry in kite fishing: the gar, or needlefish.

Then, so the story goes, Eddy saw his invention (which he patented in 1900) confirmed, viewing Malay kites on display in the Java Pavilion of the 1893 Chicago Columbian Exposition, the World's Fair best known for its pylon and sphere architectural symbol (the 1913, 13th Encyclopaedia Britannica "Kite-flying" entry notes that a collection of "fifteen different kinds" of Malay kites were sent to the pavilion by the sultan of Johor).

There is no question that Eddy's contribution to Western kite evolution was significant, but it does tend to play down the simple fact that in fact the bowed, tail-less, flexible kite had been around Southeast Asia longer than anyone could remember. We might also put this important facet of early Malay/Indonesia kite history up against the commonly accepted notion that kites were invented in China.

Wandering around the environs of Mutun, looking down at little "moon orchid kites" growing here and there throughout the jungle, I wondered: doesn't the moon orchid/deer's crown kite merit serious consideration as the "first" kite, and as well, quite plausibly to me, consideration as the first flexible (bowed) kite upon which early Eastern kites may have found their inspiration? I was to find leaf kites of all kinds, big and small, in countless forms, shapes and sizes, from the small, a single leaf, to quite large, made up of leaves woven together, time after time throughout the length and breadth of Indonesia.

The First Kites

Given the evidence emerging in Indonesia, coupled with what we have long known about leaf fishing kites, documented in the islands of the South Pacific, doesn't it seem a promising proposition that the first kites, were "natural kites," utilitarian products of the tropics, kites made out of leaves? I'm casting my vote in this direction, and hoping my legs (or someone's younger legs) will hold out long enough to carry me further in pursuit of this thesis. The moon orchid leaf kite has been too long overlooked: To my eye it is a strong contender for our "first kite." Bringing it into the foreground promises to stir up a fair amount of controversy in the kite community, challenging several long held assumptions of early kite history. It is surely, a worthy contender. Let's set a course for Indonesia, Malaysia, the South Pacific, the sweep of what used to be known as Oceania, keeping a sharp lookout for kites.

Maybe, just maybe, we will uncover further evidence supporting the growing likelihood of the thesis that this region may very well be the place where earth and sky were home to the first kites!

Alexander Graham Bell's Kite Tutorial

Smithsonian Curator Recalls a Lifetime in Aeronautics

Editor's note: Paul Garber, late curator of aeronautics at the Smithsonian's National Air and Space Museum, was a kite enthusiast from his boyhood to his death at age 93. In a wide-ranging interview in 1974, this grand patriarch of flight tells of his career which included, from the kite standpoint, curating the Smithsonian's kite collection, invention of the famed U.S. Navy target kite in World War II, authorship of a book on kites, and organization of the prestigious annual Smithsonian Kite Festival. Garber designed, made, flew, collected, wrote about, and lectured on kites for some eight decades. His memory was precise and his zest for story-telling strong, as the following excerpts from this oral history with a Smithsonian archivist reveal. Recently opened to the public by his family, the reminiscences are here being published for the first time.

Marian Frelicher: "Would you tell us something of your early years?"

Paul Garber: "In my early boyhood, my family lived here in Washington, D.C., on Connecticut Avenue just south of Dupont Circle, across from the British Embassy. I recall that in, I guess it was 1910, I was flying a kite and along came a distinguished gentleman whom I'd often seen going by and that was Alexander Graham Bell. He lived nearby. He looked up at my kite and told me the kite was not bridled correctly. And reaching up, all six feet of him, he pulled down my kite and while I held it he changed the bridling of it. The bridle is that cord that extends from the flying line to the surface of the kite, what we used to call the bellyband. So he rebridled it and then held the kite while I again put some tension on the line and the kite flew much better. So my interest in kites dates from being patted on the head by one of the greatest kite fliers of all time, Alexander Graham Bell. [Laughter.]

Paul Garber at age 92.

"As a child I enjoyed coming to the Smithsonian. I never had much of an allowance–my father was a well-off art dealer but never gave me much of an allowance–so weekends I would rather come here to the Smithsonian than go to a movie as my friends did. In those days, the Smithsonian did not have the wide publicity that today it receives. It was another pleasant Washington opportunity–I think more of an opportunity than an activity.

"In those days, the Arts and Industries Building at the Smithsonian interested me. There was the Wright military airplane there and the Langley aircraft and Stringfellow and Liliental gliders up on the gallery, and I was fascinated to look at them. Yes and I remember a model of a glider by Octave Chanute.

In 1913, amongst my friends in the Force School, I organized a club devoted to model

airplanes. And I remember there was a flight by Claude Graham White from Bennings field, a local airfield, and he landed in the street beside the White House and then took off and flew back to Bennings. Sometimes I would pedal on my bicycle out to College Park, Maryland, there were flights by the Army and by civilian experimenters. So there were these experiences of those early days that interested me because of my basic interest in aeronautics.

Q. Going back, when you became interested in kite flying, did you read books or just experiment on how to make a good kite?

A. My uncle Edward Sithens made my first kite for me in 1904. It was probably a birthday present. It had a deltoid shape and across the top, in rather small letters, was my first name, Paul, but then Edward, my uncle's name and my middle name, stretched all the way from bow to starboard all the away across this kite (laughter) and then a great big five on the bottom of it. Someday I'm gonna make a copy of that kite and fly it just for the pleasure of reliving that moment back in 1904 when I was flying the kite on the beach, probably up at Ocean City, New Jersey, where my family vacationed. My uncle flew the kite and then handed me the line. But I wasn't strong enough to hold it and yet I wasn't gonna let go–so somehow I wrapped that line around my fist and toddled off across the sand hanging on to this kite, taking seven league steps and heading for Europe. And as I was splashing into the surf, my uncle grabbed me and the kite and brought the two of us back. And everyone at this family party was laughing at me, my determination to not let go of that kite. [Laughter.] So that's my first recollection of a flight.

From then on, I made my own kites. My uncle may have helped me a bit. I don't recall any book on kites except one that my father gave me. I must have been very young then. The book was called The Boys' Modern Playmate, I remember the title. In there was a page or two about kites, so I tried to make some of those kites.

In 1909 I read in the paper where Orville Wright was flying at Fort Meyer, in nearby Virginia, so I asked my father for carfare, and I took the streetcar there. As I got off the streetcar, I could hear this airplane and as I looked toward the sound I could see the airplane in the sky. This fascinated me because I'd flown kites, so I'd seen something I'd made up there but to see this enormous kite with an engine in it, propellers turning around and two men sitting in it and then it came and passed right overhead and then went on down the field toward the far end and went around and around and around, and I just stood there sort of transfixed and fascinated by this marvelous sight of this airplane. So that really got me off the ground mentally far more than flying a kite as a youngster. I remember going home and trying to make a scale model of this airplane. Our house was elevated because it was on a hill. So, standing on the front porch, I was already one floor above the street, and I launched this airplane from that elevation. I was once asked if it flew and I said, "No it didn't fly but it lost altitude slowly." (Laughter.)

When I was 15–I'm able to date this to August of 1915–I made a man-sized glider based on the Chanute glider of 1896 on view at the Arts and Industries Building. When I had the parts of this glider completed, I took them out in the backyard and assembled them. And then I got some friends of mine to hoist this thing over the fence, and I got all of the string, all of the rope, that I could find in the neighborhood. So with all my friends and all this clothesline and this glider, we went to a field where California Street comes into Massachusetts Avenue. In those days it was a big open field. I backed up to the three oaks at the far end of the field. I had made the glider with shoulderpads for myself where the longitudinals extended aft to the quatriform tail. Quatriform is like you take your right hand and put it into your left hand to form four surfaces, each one at right angles to the other. So this glider had a quatriform tail and it had a biplane wing, but the booms to the tail extended both sides of where I stood. The center section of the glider's lower wing was open, so I stood there and put my arms across these two longitudinals and then I held on to the bottoms of the front struts. Thus I could push myself backward or pull myself forward and I could swing my legs from one side to another, because that was the way the experimenters in those days would balance their gliders. It's the way Lilienthal balanced his.

So standing there in my glider and with the clothesline attached to it at the same points as I had attached the bridleline for the kite–see, that's where kite-flying helped–I stood there and then all my friends began to run and I began to run as best I could carrying this

thing which weighed maybe 35 or 40 pounds. And to my delight and my friends' surprise, the thing rose–it rose as a kite with me in it. There was a good wind that day. We were running against the wind. So, up rose the glider with me in it, but my friends were so astounded to see the thing rise that they just stood there looking at me and I, with nothing to pull against, just descended backwards and the tail hit first, and why in the world I wasn't just skewered by those longitudinals I don't know because they broke and came sizzingly past my ear. But anyway, that was the crackup of the glider. So we went on home with it and I repaired it.

And the next week we again had a good wind and again I had all my friends hitched up to this clothesline, and they pulled and I ran and I took off, and I said, "For heaven's sake keep running!" which they did until they got to the far end of the field where there was quite a steep bank, and they sort of tumbled down that bank, which gave me enough extra pull to give me some more altitude and I glided above them and above the trees

The Font of Eternal Youth: A Personal Reminiscence

By Ben Ruhe

Because Paul Garber was interested in anything that flew, he took to boomerangs (my particular passion in my Smithsonian days) in a big way, quickly grasping the complicated aerodynamics and learning to throw and catch them. He thereafter carried my gift 'rangs in the back of his old van for those spells when it was too calm to fly kites.

Paul and I gave numerous joint lectures–he on kites, me on boomerangs. Afterward, if it was windy, we flew kites, if calm we tossed curved sticks.

My favorite memory of this great Smithsonian curator occurred in the fall of 1988 when Joe Hadzicki came to show me his hush-hush new kite. I had heard about the four-line wonder via the grapevine and wanted to write about it for a stunt kite book Ali Fujino and I were writing. I phoned Joe in San Diego. He said he wouldn't just send an example for me to test, he'd hand deliver it. A man of action, Joe arrived in Washington, D.C., the next afternoon.

After seeing the astounding Revolution in flight, with its ability to fly backward and to stop cold a foot off the ground after a screaming power dive, I took Joe to the National Air and Space Museum and rang Garber and told him I had somebody he needed to meet. "Busy," he mumbled. "Too busy." When I described the kite's performance, he said: "Be right down!"

Back out on the Mall, Joe Hadzicki put his Rev through its paces. We soon had a thousand tourists watching and gaping. I looked over to see how Paul was reacting and saw–a wide-eyed little boy.

Garber, at age 89, was reacting exactly as he must have responded when, at age 9, he saw Orville Wright fly an airplane at Ft. Meyer, Virginia, in 1909. Tubby Paul, leaning into the wind, huge smile on his face, absolutely glowing with pleasure–it's an image to be treasured. Kites as the fountain of eternal youth.

Having been briefed by me beforehand that it would be an enormous honor for him and his invention if Garber accepted the new kite as a gift to the Smithsonian, Hadzicki duly made the offer. Garber accepted immediately. "It's a great honor for me," he said in his courtly way. "Seeing this wonderful invention has made this day one of the happiest of my life." He was perfectly serious.

Paul started flying the Revolution himself. A wind had come up and there was a fair bit of pull on the lines. As Joe and I both expected, Garber started tipping over. The two of us with one accord reached out and saved him from falling on his nose. Garber just beamed.

and across the street and landed in a field on the far side. So that was the first time I was ever "unstuck."

From then on I progressed. I continued to go out to Bennings and College Park airfields on my bicycle and watch the flying. That continued my aeronautical education.

I continued to make gliders and made a credible one, and then a better one. I built these at home in Mount Rainier, northeast of Washington, where we then lived, where I had a shop. I've always had a shop since I was a child. I told my mother when I was, oh, just a toddler, "Momma, I want a shop" and she gave me her grandfather's soldering irons and that was the beginning. My grandfather was a leather worker and in the Civil War he was a saddlery sergeant–the man who went with the cavalry to maintain the harness. I still have the soldering irons. (Laughter.)

(After enrolling at the University of Maryland, Garber joined the regular Army in 1918 and applied for flight training. The war ended but Garber continued his aeronautical studies and soon learned to fly an airplane at the nearby College Park airport. After joining the fledgling air mail service that was then operating out of College Park and facing quick transfer to Chicago, Garber sought work close to hand because his father was now ill. He naturally applied to the Smithsonian.)

Carl Mitman was the curator of aeronautics and I applied to him for a position, and he said that I should apply in writing, which I did, and somewhere around here somebody once found that letter which I'd written in longhand in 1919 and it said that I was so much interested in the museum that I would even work for nothing. (Laughter.) Well I worked almost for nothing because I was hired as a so-called preparator, one who prepares specimens, at $700 a year.

First of two articles.

Murphy's Rules

The wind stops blowing the minute you get your line untangled.

The wind blows directly from the direction of the sun, so your kite is invisible in the sky.

The string on the end of the child's kite is never securely tied and after the kite escapes the child always cries.

Two kites built the same will not fly the same.

My friend's kite flies better than mine, unless I fly his.

When my kite crashes, it hits the only rock on the field and breaks.

Stepping backward to maneuver, you always bump into a spectator who sneaked up from behind.

When crowded by another kite you want to avoid, no matter what you do your kite veers right at the other kite.

When a kite gets away from you, it always lands in the most inaccessible branch of the most densely foliated nearby tree.

This is a tree next to a tree that can be easily climbed.

All these factors ensure that your kiteflying will not be a serene experience.

Kites at the Smithsonian

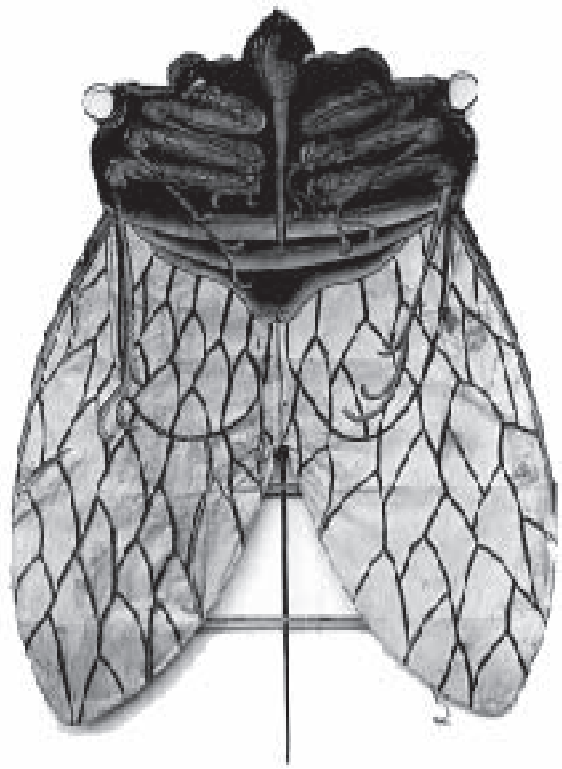
As the premier aeronautics and astronautics repository in the world, the Smithsonian's National Air and Space Museum on the National Mall in Washington, D.C., predictably has a wonderful kite collection.

Tom Crouch, chairman of the Department of Aeronautics, surveyed and reported on the holding after assuming his new job a few years ago.

Western kites of technical and historical significance at the Air and Space Museum include a Sir George Cayley reproduction, a refurbished Charles Duryea original from the 1870s, a reproduction of the Benjamin Franklin "electric" kite, a William Eddy tailless Malay-style reproduction, a reproduction of the Wright brothers' 1899 kite, and an original Perkins man-lifter.

Several kites, cells or parts of kites developed by Samuel Langley, inventor of the Langley Aerodrome, are included in the holding. Langley was the third secretary of the Smithsonian. Alexander Graham Bell, inventor of the telephone who went on to build the first flyable airplane in the British Commonwealth, is represented by a tetrahedral kite constructed from 16 original tetra cells by the late aeronautics curator Paul Garber.

The museum holds one unique object of importance to the history of flight technology, a Gallaudet kite. Now on display in the museum's early flight gallery, this kite represents the earliest serious attempt to demonstrate a simple version of the wing-warping



Elegant old Chinese kites at the Smithsonian Institution.

system later successfully employed by the Wright brothers. Gallaudet, who was working at Yale University in the 1890s, abandoned his work after conducting preliminary tests. Ironically, after the invention of the airplane, he entered the aviation industry and became an important manufacturer.

Special purpose kites owned by the museum include an early 20th century C.F. Marvin meteorological kite, a kite used in deep sea fishing, and examples of Garber World War II target kites manufactured in the tens of thousands and used to train gunners in the U.S. armed forces. One of these kites has a Japanese Zero aircraft painted on the skin, another a German FW-190 fighter. A sample harness and reel used to fly the kite are also in the holding.

Forty-two Cantonese show kites given to the Smithnsonian by China following the 1876 Centennial Exhibition in Philadelphia were the first flying objects accepted into the collections of the Smithsonian. Twenty-two of them are held by the Air and Space Museum, the other 20 by the Smithsonian's National Museum of Natural History. Because of storage problems in the past, their condition, unfortunately, ranges from fair to poor. Restoration of the paper-covered kites is a project for the future. The two holdings will be considered as one for this work.

Where these old Chinese kites are devoid of their sails, their frames and bindings will be conserved for what technical and anthropological value they may contain. One of the kites in the Air and Space Museum collection, a traditional centipede, was restored by the late aeronautics curator Paul Garber.

The Air and Space Museum's collection contains a wide variety of other traditional Asian kites of more recent vintage, ranging from a Korean fighter kite with reel to an 11-foot-square Japanese Hamamatsu. Other items include Chinese, Vietnamese, Philippine and Japanese kites collected by Garber, as well as traditional Asian models constructed by him.

Crouch would like to see appropriate kites from Southeast Asia and the Pacific islands added to the holding.

The collection houses several important examples of early Francis Rogallo technology, including his Jet, Flexikite Comet, and Flexikite Rocket. The Air and Space Museum's space history collection contains a Gemini boiler plate spacecraft fitted with a Rogallo wing recovery system, while the aero collection includes hang gliders based on the Rogallo wing system. An important soft kite in the collection is the original Domina Jalbert parafoil, given by the inventor in 1982. Pinpoint parachuting and other important aeronautical innovations have grown directly from the parafoil.

Recreational kites in the museum holding include one of the first four-line Revolution stunt kites by Joe Hadzicki and brothers. In addition, Paul Garber collected a handful of winning kites, or other recreational and sport kites that appealed to him, from the Smithsonian kite festival he ran for many years.

Tom Crouch of the Smithsonian sees a need for the institution to add more sport and recreational kites to its holding, paying attention to collecting soft-sculpted as well as controllable kites, with decisions being partly based on the possibility of an eventual exhibition that will require colorful and intriguing objects.

The Moon Kites

O solitude when come the stones
of which, in the Apocolypse, the city
of the great king is built.

Are you conscious...of the stages
of your growth? Can you fix the
time when you became a babe, a boy
a youth, an adult, an old man?
Every day we are changing, every
day we are dying...

—St. Jerome

The Power of Reverse Engineering

Building a 5-Foot Steiff Roloplan Kite

By Scott Skinner

One of the prizes of my kite collection is an original Steiff Roloplan that came to me because of the great people at the Into the Wind kite store in Boulder, Colorado. They were called a few years ago by a man in Nebraska, who asked if they'd be interested in buying two old box kites, rescued from his attic. Whatever they thought of the offer, they politely referred the man to me. We talked for several minutes on the phone and nothing quite made sense to me: the two kites he had were made of cloth, not paper, he knew their approximate age because of family history, but he admitted that they might not be box kites at all. I expressed intense interest in the kites–sight unseen–and proceeded to tell the owner all I knew about kites similar to his: Garber Target Kites, Gibson Girls, and any others that I had first-hand knowledge of. Obviously, what he had was something else, entirely.

An original Steiff Roloplan in the workshop of German Achim Kinter.

We agreed that he should send the kites to me for my inspection and then I would offer what I felt to be a fair price. The waiting was intense, as I had no idea what might show up at my door. I was not disappointed; when I opened the mailing tube, here were two yellow-cotton bags with Steiff Roloplan instructions printed on the sides! Carefully opening both tubes, I found classic two-wing, yellow-and-red Roloplan kites, one 150cm (4 feet 8 inches) tall, the other 180cm (5 feet 3 inches).

These were unique in that they both had the word "Atlantic" printed on the yellow top sail; this validated the owner's story that they were purchased by his family when the Atlantic City pier was opened–most likely in the early 1920s. Both kites included the six original bamboo spars and two extras, in case of breakage. Just to show the quality of Steiff products; each spar is labeled with its exact length and weight in grams.

Now, on to the power of reverse engineering. Knowing that the Roloplan was to be featured at millennial International Kitefliers' Meeting in Fano, Denmark, I decided it was time for me to make one for myself.

For the last three years, I've had plans for the Roloplan–

Werner Ahlgrim of Germany shared sets for several Roloplan models–but I found that I was reluctant to start on this completely new-for-me project. Cotton sails, bamboo spars, and hemp line were all foreign objects to a kitebuilder versed in ripstop and carbon. With "Atlantic" Roloplan in hand, I decided to use it as a model for an "almost original" replica. Achim Kinter, another German friend, has been most helpful in revealing sewing techniques, fabric sources, and creative solutions in projects like this, so I was confident that I could build something pleasing and functional.

The two-sail Roloplan is a simple-looking project, but there were some subtle details that just couldn't be explained (at least not to me) easily in diagrams. Having the kite in hand told me almost all I needed to know about sewing sequences, re-enforcement details, and types of fabrics used in the original. Achim taught me the technique of blowing through the cotton fabric to judge its porosity–something I know to be an important factor in the Roloplan's performance–so I was able to choose two cotton fabrics with similar horizontal and vertical thread-counts. Sewing the cotton sails was the easiest part of the project; re-enforcements at the corners and stabilizing lines were sewn to the cotton sails, then both sails were sewn to a pre-assembled center-pocket. It was the sewing sequences on the center pocket that were most revealed by the "Atlantic" kite. Bridle loops, re-enforcements, and stabilizing lines are all attached to the center pocket and the sails are simply sewn onto the pocket's seam.

The last steps in the building process were to find appropriate spars for the kite, then bridling the whole thing so it flies the way a Roloplan should. I was able to use the original spars in my kite, but didn't want to risk their well-being, so I had to find similar bamboo to spar it with. For test flying and bridling, I also made a fiberglass frame that I behaved similarly to the original bamboo.

The final word is that the kite flew nicely and I was extremely pleased with the whole project.

Scott Skinner will teach a 3 day Roloplan workshop at the Drachen Foundation in conjunction with the Fort Worden Kite Retreat organization on November 11th and 12th, 2000.

More About the Versatile Steiff Flier

As with any hobbyist group, kite-fliers often come into contact with zealots from other disciplines. It is not uncommon to be on the field with balloonists, glider pilots, model airplane makers and a variety of other flight enthusiasts. People new to kites are surprised, however, when the famous toy company, Steiff, is mentioned in kite circles. Most famous for teddy bears, the Steiff company has been making toys for more than 110 years. The founder, Margarete Steiff, once remarked: "Only the best is good enough for children," and this has remained the motto of the company since its founding in 1879. Certainly this motto holds true when we consider the famous Steiff kite, the Roloplan.

Invented by Richard Steiff and patented the following year, the Roloplan was a cloth, tail-less kite which caused an immediate sensation by winning toy show prizes at home and abroad. Offered in the Steiff catalogue "for sport and play," the Roloplan actually was intended as a serious tool for flight enthusiasts. Richard Steiff designed the "Steiff tripod" for use with all types of shutter cameras in kite aerial photography. The strong pull of the relatively small, highly portable kites made them an ideal, low cost alternative to balloon-based systems.

With the advent of World War I, the Steiff company made a particularly sturdy model of its kite for the German army. It was a 3.8 meter (11.8 foot) kite with a weight capacity of 30 kilograms (66 pounds). Although used primarily by the artillery as a target, the kite was featured in the Steiff catalogue as a man-lifting device. There is little doubt that this advertising was used specifically to gently remind military officials of the many uses of the Roloplan. According to Steiff records, more than 34,000 Roloplans were sold between 1910 and 1915.

Millennium Fly

The author's contemporary Roloplan.

After dismissing grand plans of travel, warm weather, and raucous New Year's Eve celebrations, I chose to celebrate the first day of 2000 the same way many other kite enthusiasts probably did: by flying kites. We'd had a very mild winter in Colorado, so I decided to drive up to Boulder and fly kites on the top of nearby Bald Mountain. For years, George Peters has invited friends to this scenic spot west of Boulder, to picnic, fly kites, and enjoy nature. He has had all the Colorado winter weather extremes in the last few years: from whiteout snowstorms to bright, sunny, 60-degree days.

Last New Year's Day dawned clear and warm, and as I drove to Boulder the beginnings of a weather front appeared to be moving toward the Front Range. Arriving at the Bald Mountain parking lot, I found bright sun, strong wind, and a hilltop decorated with banners, flags and kites (almost all by George Peters and Melanie Walker). I carried only one kite to the top of the hill; the same kite I had flown on the last day of 1999 (the day before), my 150cm (5 foot) Roloplan.

In the strong, updraft-interrupted wind, the cotton Roloplan proved to be a good choice. It flew high overhead in the updrafts and handled the strong gusty winds without a problem. After spending so many years as a "ripstop snob," making kites only with ripstop, this Roloplan, my first cotton kite, made me appreciate the building and design skills of kitemakers past. Not a soaring kite, the Roloplan flies "against the wind." much like a Japanese Edo or a flat barndoor. It has remarkable power in higher winds, a result of a comparatively low tow point on the bridle, but the porosity of the sail and the support of the bridles allow the kite to remain stable.

–Scott Skinner

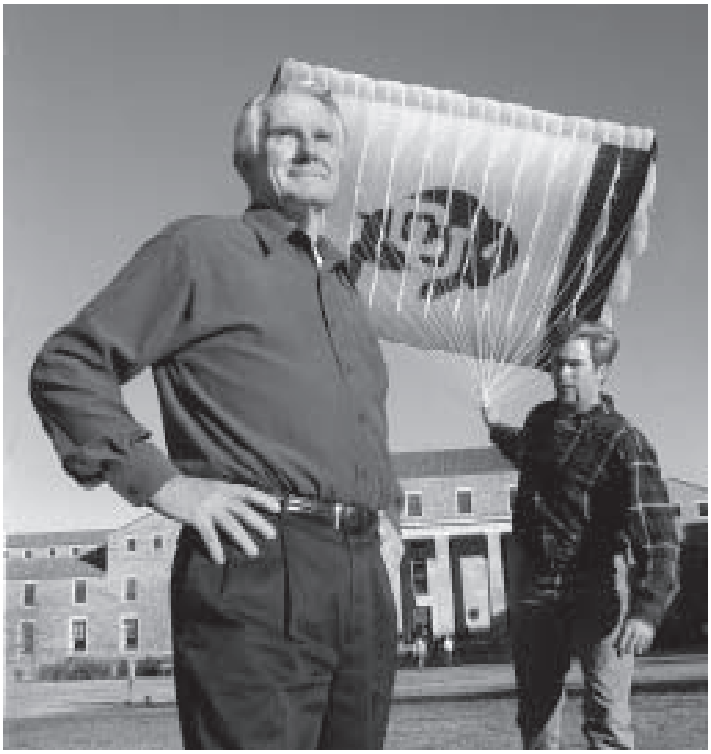
A 'Skyhook' for Studying the Atmosphere

Exploring High Altitudes With a Low-Tech Tool–the Kite

By Terry Devitt

Nearly 250 years after Benjamin Franklin flew a kite to sample the electric fields in a Pennsylvania thunderstorm, meteorological kites are again flying high as platforms for scientific research.

Used for fun for thousands of years, kites were first launched in the interest of science in Scotland in 1749 when Professor Alexander Wilson and his student Thomas Melville deployed a string of paper kites, each carrying a thermometer, on a single tether. The thermometers were released at set altitudes by a high-tech trigger–a smoldering fuse. Cushioned with paper, the thermometers crashed to earth where the scientists–if they were nimble enough to recover the thermometers in time–obtained a rough atmospheric temperature profile.



Ben Balsley (left) and Mike Jensen demonstrate one of their research kites. The kite is adorned with University of Colorado school colors and buffalo mascot.

Our money says it was really grad students who went chasing, not the august Professor Wilson, but let's get on with the story.

After Franklin, kites were used only sparingly for scientific purposes until the twilight of the 19th century, when they became a meteorological mainstay in the United States and Europe. In the United States between 1900 and the 1930s, 17 meteorological stations east of the Rockies used kites to probe the atmosphere and routinely measure temperature, pressure and relative humidity.

But in the 1920s the advent of high-flying weather balloons and aircraft equipped with a passel of meteorological instruments put a deadly damper on the use of meteorological kites, according to Ben Balsley, a University of Colorado scientist. Moreover, the deployment over the last few decades of a constellation of weather satellites, capable of instantly reading large swaths of the atmosphere, seemed to obviate the need for such low-tech platforms.

But when it gets right down to it, kites are more fun than satellites, and over the last decade, 60 years after meteokites were stashed in the basement, Balsley and a handful of other atmosphere scientist have dusted off kite technology. Once again, kites are contributing to studies of everything from electric fields to trace gases like ozone. "It's a proven technology," says Balsley. "It's just been forgotten."

But why, we ask, revert to an age-old toy when most meteorological scientists are lining up to use satellites and aircraft that can skip to the top of the atmosphere?

Because kites can do things that satellites, aircraft and

Balsley and Jensen rig on an atmospheric measuring device.

ballons can't, according to Balsley.

"At high altitudes, ballooons get blown around and satellite resolution isn't good enough," says Balsley. In addition, putting pricey scientific instruments aboard instrument packages called radiosondes, which are not tethered and rarely recovered, can put a serious dent in your research grant. Meteorological kites have other advantages, too:

* They're cheap.

* They provide a stable platform.

* They can provide a continuous read of a cross section of the atmosphere since kites can sometimes be kept aloft for days at a time.

* They can be used over land, water or ice.

* Modern kites can reach dizzying heights, hoisting scientific payloads as high as several kilometers.

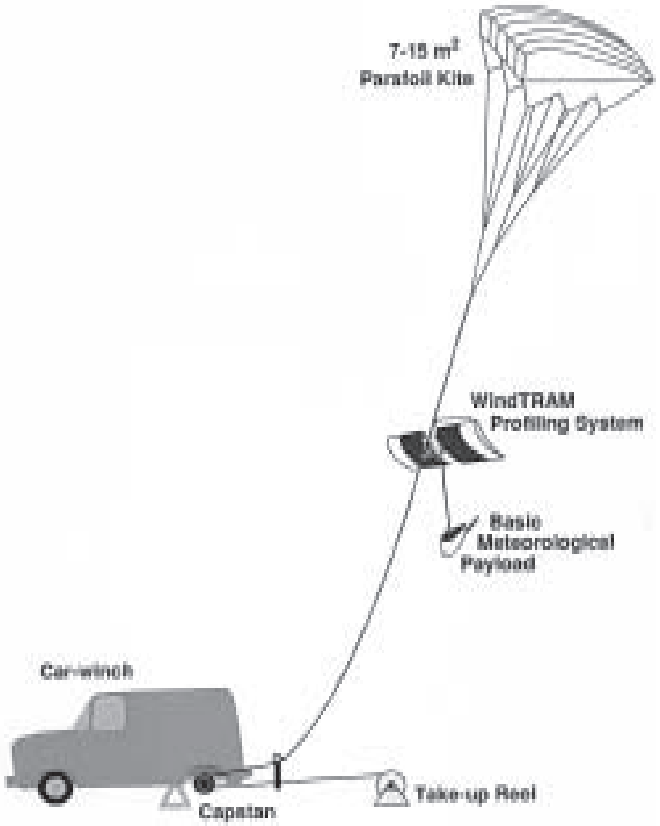
* They're low-tech, perfect for work in remote regions.

The new generation of kite-flying weatherfolk have added their own technological twists to scientific kite flying. Some kites are huge, parafoils capable of carrying payloads as heavy as 23 pounds. Tiny sensors can be attached to kite tethers to profile things like electric fields. Remote-controlled trams–aerodynamic, payload-carrying devices that scurry up or down a kite's tether on command–have enhanced scientists' ability to sample the atmosphere. Data can be radioed to the ground or recorded on board.

Beyond gathering weather data, some scientists are using kites to hoist insect traps high into the atmosphere to study insect migration. Others have lofted ultrasonic microphones to eavesdrop on feeding bats.

The scientific kite, argues Balsley, is back as a bona fide scientific tool. And in some circumstances, where high-resolution measurements of atmospheric conditions or chemistry is needed, there's no better way to get those data than to go fly a kite. Sounds like our kind of work!

* * * * * * *



Kite Altitude Record Is Targeted

Now that they've proved the worth of kites in atmospheric research, Drs. Ben Balsley and Mike Jensen of the University of Colorado have set themselves a new challenge: they want to fly higher than ever before. Much higher, in fact, in order to open new vistas for their work. It's a logical next step for them and they feel they have the technology to do it.

A significant scientific reward awaits them, perhaps a rich one, they feel. As a bonus, flying a kite really high in the sky might have a useful secondary aspect. It might yield useful publicity, and thus aid fund-raising, a perennial bugaboo for small, offbeat scientific projects such as theirs. Balsley emphasizes this high altitude flying would be done only in connection with an ongoing scientific project.

If the team goes way up with a single kite–say well over two miles–and can accurately document the altitude achieved, which it should be able to do with existing instrumentation, it will be able to lay claim to a long enduring record, or at least one that held up over the decades until a recent challenge to its authenticity.

The single kite mark of 12,471 feet was reportedly set at the Blue Hill Observatory, near Boston, just before the turn of last century. Recent research by Balsley and a top former Blue Hill official have now pretty well invalidated the 1898 claim, revealing it to be a simple misunderstanding. Because weather studies with kites were so routine at Blue Hill, a kind of reporting shorthand developed, and what was undoubtedly a kite train flight was interpreted as a single kite achievement. Thus the apparently mistaken record. John Conover, a former director of Blue Hill and author of the definitive book on the observatory, concurs with this view.

Duly enshrined by the Guinness Book of World Records, the mark however has developed a life of its own, being quoted as fact in books and articles.

In the absence of any other well documented flight, Balsley now says his team's solo kite mark at Ferryland, Newfoundland, in 1995 could constitute the single kite high altitude record, subject to challenge. The altitude of 10,193 feet or 3,107 meters was measured using accurate instrumentation. As Jensen explains, times changed after the beginning of last century. "A kite flier had no problem with airplanes then," he says. "Now, for any flying over 500 feet, the Federal Aviation Administration comes into the picture by requiring a flight waiver. To fly very high now, you either have to fly in restricted air space at a U.S. military installation, at a site where the FAA clears a 'temporary cylinder' of air space, or go somewhere else in the world."

Why the almost hundred year period of inactivity in high altitude flying? The answer is that kites as atmospheric research instruments faded from use as airplanes took over their work at the beginning of last century. It is only in recent years, primarily through the efforts of Balsley and Jensen, that interest has reawakened in the use of kites as a low cost, environmental friendly, efficient research tool.

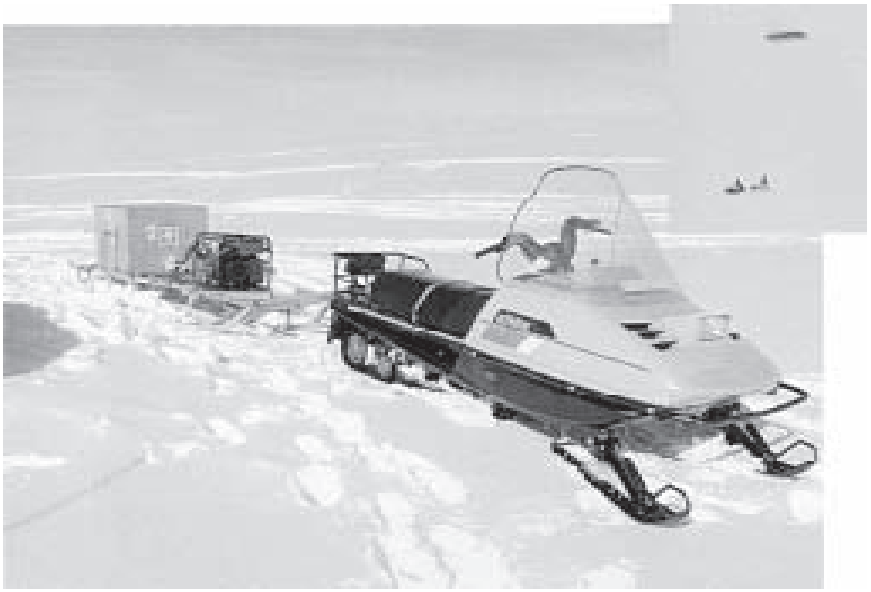
So where to conduct this really high altitude kite research? If in America, defense installations with restricted air space include Vandenberg in California, Dugway in Utah and the Smoky Hill Air National Guard base in Kansas. But a breakaway kite with miles of tough line attached might pose a safety hazard even at these sites.

"The best single place in the world would be the Antarctic or Arctic, in winter," says Jensen. "In the Antarctic, flying at 65 degrees latitude would benefit from a pattern in which the wind increases with height. This is important because the rule of thumb is: the less density of the air, the more wind needed. Also at that spot, there are no major mountains to create bad wind patterns. The circumpolar winds are very smooth.

"It's hardly bliss there, however. There would be total darkness in June and July–winter south of the equator–with horrible minus-40 degrees fahrenheit temperatures to cope with. Not fun. And not cheap."

At the other end of the temperature spectrum would

be Christmas Island, due south of Hawaii, where Balsley has already test flown, fairly successfully. There is just one inter-island flight a week to deal with and an already existing radar facility on the island that could help with the science. The winds and weather there are excellent. Again, there is a problem with the cost of mounting an expedition to a place so remote.



Balsley feels that under optimum conditions, his team could fly a single kite quite a few miles high. If it went higher than six miles, it would challenge the train record of 31,955 feet or 9,740 meters set at Lindenberg, Germany, after World War I. Eight Grund boxkites flying in tandem made this flight outside Berlin in 1919. It's worth noting that this record, like the single kite one, is now being challenged for accuracy by researchers.

What about the technology in current use? Balsley and Jensen fly highly stable soft parafoils measuring some 12 by 15 feet, with a wing area of some 20 square yards. Sails are made of nylon or Kevlar-strengthened Mylar sheeting. Kevlar is the material used to make bullet-proof vests. The line is Kevlar or Vectran, a coated Kevlar to make the line smoother. The whole rig costs some $8,000, a bargain, and with luck it could last several years. Another bonus: it is easily portable.

For flying in a temperate climate, a car winch is employed. The winch uses a capstan attached to the raised drive wheel of the vehicle to control the kite tether and to let out and pull in the kite under high tensions. Put the car in reverse and the line reels out, put it in park and the line stays still, put the car in forward and the line reels in. In a frigid climate, the team uses an electric winch powered by a small gasoline generator. It also flew from an electric winch mounted on a snowmobile in Antarctica last summer, a good technique when the winds are low.

By adjusting the angle of its wings, under automatic control, a WindTRAM (tether rover for atmospheric measurements) invented by Mike Jensen scurries up and down the kite line, carrying the scientific payload.

Flying can be done in winds from 10 to 40 mph. To get best results, the team would have to study the prevailing wind conditions (wind may blow in one direction at one altitude, in the opposite direction at another level), analyze line tension and drag, study the equations produced, and come up with test formulas to choose the proper kite, proper tether, etc.

As to the all important instrumentation for recording altitude, a pressure altimeter gives an accurate reading. A good second technique would be global posititioning using a space satellite. If differential GPS receivers were placed on both the kite and on the ground, it would be possible to measure altitude within inches. "It's easy," says Balsley. "People do it all the time."

–Ben Ruhe

The efforts are great but the reward will crown your efforts. Theory is knowledge that is debatable. Science is to do–a fact that must be accepted. Do not be afraid of opposition. Remember: A parafoil rises against, not with the wind.

–Domina Jalbert, inventor of the parafoil

This is Maple Grove
and no one comes here much–
a few kids now and then
or from the new
neighboring apartments
some retired fireman perhaps
to exercise his dogs.
No one seems to mind.
They bury now across the road.

Well, this spring, after months
of pacing in your room
or staring absently
at books of letters saved
or simply never sent
or looking simply
at whatever monuments
of absence or decay
the day might balance nicely
on the back of a hand,
you've come once more
to Maple Grove, reading out
as absently as the names
you'd memorized last fall
and are vaguely pleased
that things look much the same
that the same few graves,
the smaller headstones
near the fence, remain
decked sadly out
in last year's green
and plastic evergreens
and that the mausoleums
still manage somehow to suggest
a small grimy compromise
between an old unhappy school
and its adjacent church.

Somewhere beyond the masikeyns
fluttering somewhere
over the used up place
where the monuments
have settled, tilting
oddly in the weeds,
two kites are rising
are floating like the moons
you might imagine
keep rising still
over childhood's leveled
and desremembered town
the silly moons of love
moons of that moonlit
and leafy entrophy
of random stones
towards which the blank
white and real moon
or even love itself
so irretrievably depend.
Still, how colorfully they speak
our need for flags
bright signs and metaphor–
for such simple
celebrations of the weather
as the forever hovering
and impossible angle
might afford those saints
like bald Jerome
who, though sick
and altogether weary,
nonetheless sat quiet
in his wilderness,
neither wary of the lion
nor bruised enough
with the wisdom of stones.

–Michael Van Wallegan,

The Wichita Poems

Kite-Making as a Cottage Industry

It may not look like much, but the shop complex displaying kites in the Jodphur bazaar (above) constitutes one of the largest hand-made kite manufacturing operations in the world. Jodphur is in India's desert state of Rajasthan. Working in a warren of dark, cramped spaces, the Baylim family and some 20 employees produce upwards of four million Indian fighter kites yearly. Using colored paper, bamboo and glue, the workers turn out the kites assembly line-style, with each doing just a designated portion of the cutting, bending, and pasting. All told, a simple, undecorated kite can be produced in about one minute of elapsed time. The speedy, concentrated hand assembly is so mechanical workers are able to watch television while their fingers fly. There is a ready market for these little fighters because kite-fighting, using ground-glass line to slice opponents out of the sky, is a highly popular national sport in India. The kites retail for between five and twenty five cents U.S. each and are routinely purchased a handful at a time. Even for the most skillful fliers, kite mortality in the aerial free-for-alls is quite high.

Knotty Kite Patent Problems
Protecting Inventions in Predatory Marketplace

Editor's note: Following is an instructive essay by Peter Lynn, of Ashburton, New Zealand, on protecting the rights to his various inventions. Lynn was the first to establish the commercial feasibility of traction kiting as an "extreme" sport in the early 1990s.

By Peter Lynn

Patents are a "damned if you do and damned if you don't" for kite designers. They take huge amounts of time (which I'd rather spend kitemaking), they are horrendously expensive, like more than US$50,000 for just a few core countries (plus at least the same again in a defence fund to establish credibility), and, even after considerable investment, won't necessarily be granted or be defensible because of legal vagaries. Sometimes major innovations prove not to be protectable, leaving their deserving inventors languishing forever unrewarded, while, conversely, patents can be granted for minor (and occasionally even for already well known) details that subsequently block off "best practice" for years–for example the French patent on the use of wingtip "stretchies" to tension the skins on stunt kites.

Patents also cause public relations problems for designers and manufacturers by generating understandable resentment in those who feel excluded from the free development of ideas. I understand this well because this is how I feel about patents that impinge on "my" territory. I wish there was a way to allow one-off, so-called "non-commercial" use of ideas by amateur enthusiasts, without it costing more to administer than having a patent is worth or opening the floodgates of unstoppable large scale commercial copying. Our sport needs the support of these enthusiasts both as customers and for the huge contributions they make by way of myriad suggestions for improvements.

On the other hand, it just isn't worth the considerable investment in time and money that is required to come up with breakthrough designs if copiers can step right in the moment new ideas become public. It's almost a no-win game and I understand completely why most kite manufacturers choose to stay with the safe but less than cutting edge stuff and put their discretionary spending into image advertising–and often do so by spinning a line about research and development!

Of course, continual small incremental changes are relatively risk free and can hugely improve performance in the long term–consider the example of motor cars. But the basic design has to exist and work at least marginally well before this evolutionary process can begin. Why go for the breakthroughs, then? Why do artists spend their lives in garrets, not recognised until after their deaths, or most often never? The reason is not selfless striving for the public good, that's for sure. On a personal level it's for a chance at immortality, fame and wealth, not to mention that it's fun to do. Of course on a deeper level we're programmed by our own evolution to behave this way, so maybe it is all for the good of humankind after all. Okay, okay, self-delusion is everywhere!

Kite patenting has an extra level of difficulty because kites are a trivial field in the world sense but of intense interest to those few hundred thousand people who make up the world kite community. There are no IPR attorneys who specialize in kite patents and copyright, nor would there be sufficient activity to justify such specialization. In the major patent fields there is considerable specialization so that inventors in these fields can expect detailed knowledge of prior art, current practice (that is, those things that are in common use but have never been patented), even industry gossip and knowledge about who is working on what.

A kite designer must start the patenting process by first convincing his chosen attorney not to just massage the naive inventor's ego while taking his money, like the vanity press dealing with some hopeful author. He must then educate his attorney about the kite world, prior art, etc.–paying for this by the hour, of course. Then he

must learn to become half a patent lawyer himself if the final specifications are to have any chance of holding up through the examination process.

My personal experiences of patenting have been less than satisfactory. The fundamental problem is that decisions have to be taken before it is possible to have any clear understanding of how things are going to work out–or maybe I'm just another hopelessly deluded inventor being suckered by lawyers.

Of course I have had a few false starts–provisional filings for things that seemed fantastic to me in the first flush of invention but that on subsequent reflection were less than likely to be commercially useful patents. Sometimes this is necessary because there can be commercial imperatives to publicly disclose a new idea (after which date patenting is not allowed in most jurisdictions) before it will be clear whether patenting is worthwhile. Provisional patents hold the gate for this and are not ruinously expensive.

For example, while still an engineering school student in the 1960s, I filed provisionally for a device that strapped on the feet and enabled rapid climbing of poles and small trees, but I couldn't get anyone to take it on as a product so allowed it to lapse.

Lesson number one: Know how an idea is going to be made and sold before getting too excited. In this case it wasn't a bad idea but the idea itself is the easy bit. Err, take two, it was a bad idea.

During the '70s I developed and patented a new type of portable sawmill, made a few and then licensed the idea to a large forestry equipment maker. The firm took for ever to get it into production, started selling a few and was then taken over by another company whose focus was elsewhere. Patent costs were piling up year by year (the initial costs only cover the first couple of years–after which there is a substantial upkeep fee that increases each year), and the royalty income was not covering these costs, so I abandoned the patent. Now in the year 2000, this idea has become the industry standard and manufacturers take delight in telling me how rich I would have been if I had persisted.

Lesson number two; Don't give up too soon. But the system I invented didn't really become established until after the 20-year patent period would have expired anyway.

Probably I should have taken back the sawmill license and started up my family's own manufacturing again, but by the late '70s I wasn't really interested in anything except kites.

In 1990 the buggy came along and I could have patented the salient features of layout and especially the direct steering foot pegs on the front forks, but didn't, mainly because I failed to anticipate that the buggy was going to be as successful as it has become. My estimate in 1990 was that we could hope eventually to sell up to 1,000 buggies total (others in our business thought this wildly optimistic). We now sell many more than this per year.

Lesson number three: Underestimating the value of a new idea is just as bad as overestimating–and is perhaps even less easy to live with in hindsight! But I am not at all unhappy with the outcome for my firm in buggy-making as not having legal protection has required us to stay with the trends and to manufacture and distribute efficiently. Ten years down the track we remain the dominant world manufacturer and I often wonder if this would be the situation if we had spent this time fighting off patent challenges and copiers in the courts. It is also true that not protecting our design has, advantageously for us, resulted in its becoming the world standard–which may not have been the case if we had provided an incentive for others to find alternatives. In truth, these aspects were also in our minds when deciding initially not to patent.

After a few more provisionals, my next major foray into patenting was for the C Quad. I think this is probably the first traction kite that is a hybrid between framed and frameless, but at least it is an original form of such a hybrid, and seems to me to be a significant breakthrough, well worth protecting. It has already (in three years), spawned a dynasty of copies and variants, and is the first significant alternative to challenge the dominance of parafoils for buggying.

The C Quad patent filing has been a frustrating process. So far, either I am not being very successful in communicating to my attorneys the essential difference

between the C Quad and the Flexifoil or delta-style stunt kites, or my attorneys are failing to adequately express this difference in patentese. Of course, heaven forbid, there may be no describable novel features in the C Quad from a patent point of view. But it seems to me that there is a fundamental difference between the C Quad and earlier traction kites. The challenge is to persaude a patent examiner of this difference and this is requiring expensive revisions, rewordings, re-examinations, and could possibly even get to re-filings and legal challenges.

Of course I blame my attorneys, for their failure to understand kites, and especially for insisting that their version of the original specification should be filed–over my worries that it did not correctly describe the significant novel feature of the C Quad. Of course they no doubt blame me for claiming I have invented something new when, in their view, maybe I haven't–but are too polite to say so. Lesson number four: Never trust experts (myself included, of course).

For our new kite, the Arc, I took lesson number four to heart and fairly much wrote the entire specification myself. At least this time if I have problems I can only blame myself. This kite really is a breakthrough–but then I always think that! It took me four days and 22 pages to complete the draft patent specification for the Arc but I still received a very substantial bill for "drafting."

Lesson number five: I'm in the wrong business! Actually, this patenting business is not all bad–at least while the process is under way there is significant protection against copying . Only a brave or foolish person would copy on any commercial scale knowing that all investment in development, production, and marketing could be lost from the date that any patent is eventually granted–and all that is necessary for this is that at least one significant novel feature is recognised out of the many that are usually claimed in the specification.

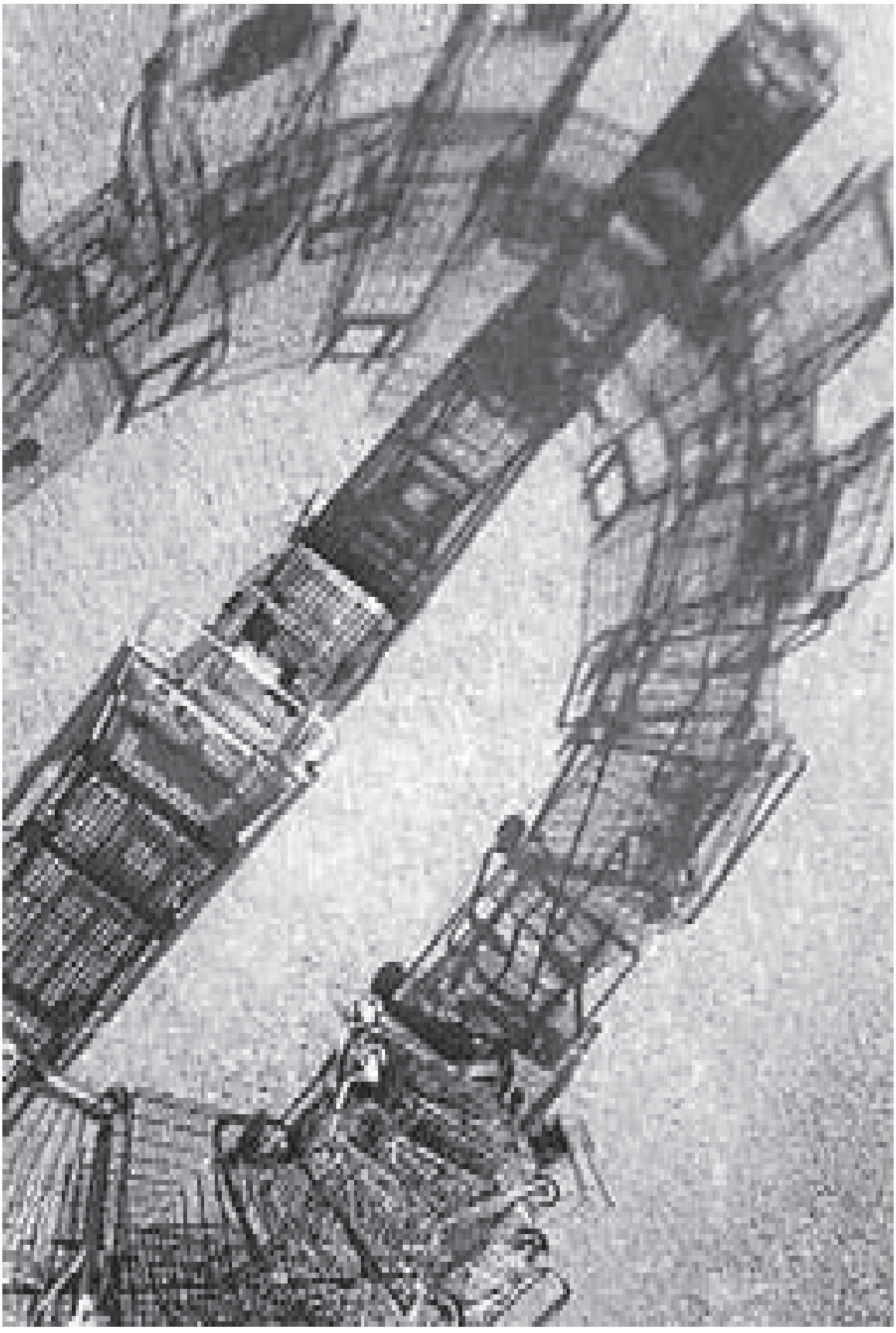
While the patenting process wends its slow and expensive way, there is time to complete the design, get into production and develop a market. By the time a patent is granted, or not granted, any manufacturer worth his salt should have such a grip on the market by price, quality, brand name and distribution as to leave no worthwhile share for rip-offs. So, by the time you get, or don't get the patent, you don't need it anyway.

And then of course there's copyright–but this is a whole 'nother story. And I don't know anything about copyright either!

Maori Kite Song

Climb up, climb up
To the highest surface of heaven
To all the sides of heaven

Climb then to thy ancestor
The sacred bird in the sky–
To thy ancestor Rehua,
In the heavens.



Shopping Cart Sculpture, Albany, California.

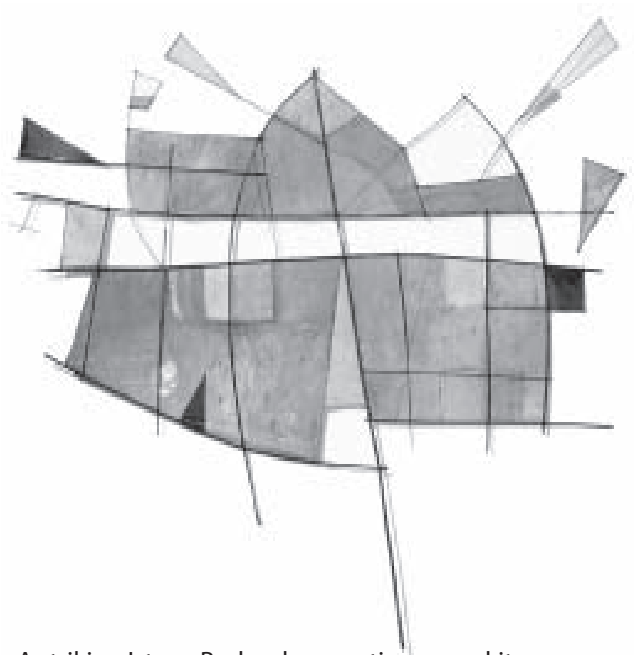
A Challenge to Creativity

Editor's note: In connection with a Drachen Foundation-sponsored exhibition of Istvan Bodocsky's kites at the Davis Art Center in Davis, California, the foundation republished a challenging piece of writing by the Hungarian artist. Here the president of Drachen gives a very personal appreciation of this volume.

By Scott Skinner

Reading Istvan Bodocsky's small, elegant volume titled Hidden Symmetry proves to me the value of individual expression in kite-making. Istvan explains in the preface that his recent works "have irregular asymmetric outlines" and that "I make line drawings first, and only later decide which lines will be 'real' (painted) and which ones will be 'only' part of the physical structure."

A glance through the pamphlet shows what an understatement he makes: his irregular asymmetric outlines contain interesting negative spaces that cry out to be flown in changing skies. Knowing that these forms might all fly like kites challenges the reader to imagine their orientation and characteristics in the air. This use of random shapes and negative space could not be further from my own kite-making approach, marrying as it does geometric surface patterns to regular, geometric kite shapes. But, in fact, it's surprising how similar our approaches become when you consider the role of the viewer.



A striking Istvan Bodoczky negative space kite.

Istvan states that "symmetry is linked with motionlessness, timelessness, whereas asymmetry is aligned with movement and with time." When his irregular structures become stable kites, they become, to the viewer, more symmetric. Yet even while displaying flight symmetry, the viewer senses an element of asymmetry since the kite is always moving, always reacting to a changing environment.

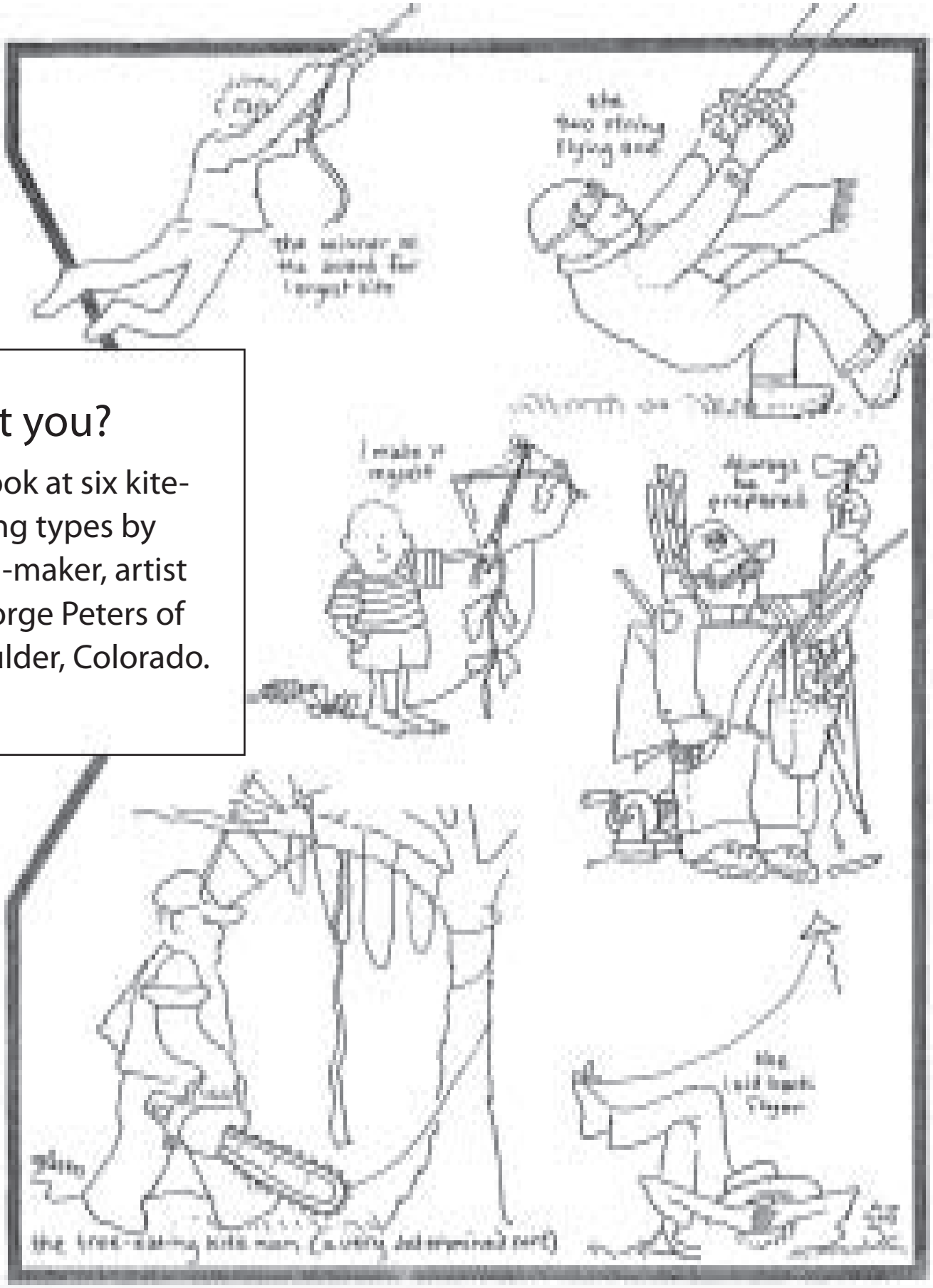
The traditional shapes that I tend to favor display their symmetry on the ground and in the air, but with surface graphics that are rarely "centered," I hope that the viewer creates symmetry by finishing my idea with his own. Additionally, I depend upon time and changing environments–especially light–to reveal and hide images. If the viewer looks at my kites only once, I have failed! Both of us depend upon negative space to really complete our flying art; Istvan with space inside and out of the kite body, me with space around the kite body.

He states that "repetition ...represents boredom" and "life is movement," so in an environment that constantly changes, our kites' symmetry and asymmetry are constantly blurring. Back light, blue sky, or indirect light can and do completely change the nature of the work. So both of us play upon this principle that symmetry is the seed of asymmetry and vice versa.

Istvan's innocent-looking little book challenges the kite maker to totally revise his or her way of thinking. While it has some construction tips and techniques the value of this book is its unstated challenge to our creativity.

Is it you?

A look at six kite-flying types by kite-maker, artist George Peters of Boulder, Colorado.



Two Kite Research Papers

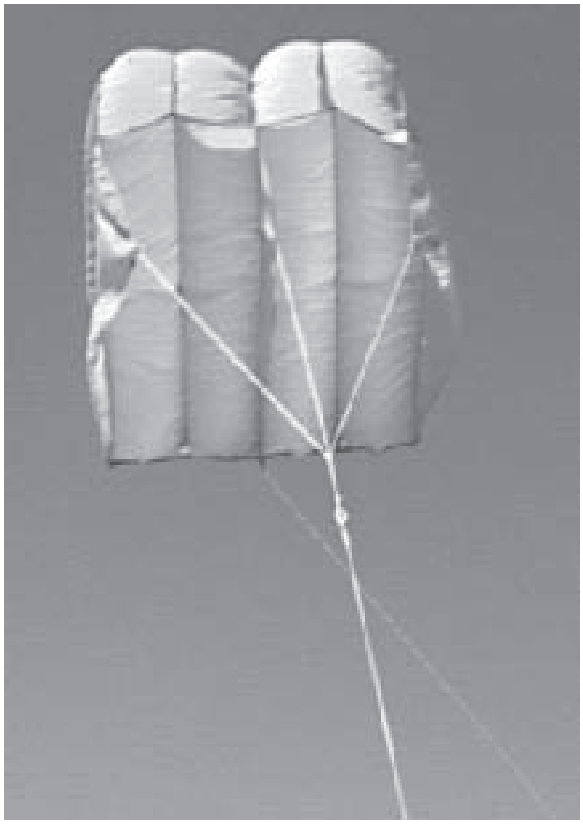
By Ed Grauel

Evaluating Kite Performance

When one acquires several kites, it is likely that one or two will be more favored and get the most flying time. While it is normal to have favorites, the reasons why this is so may not be easy to understand or express in words. The purpose of this article is to try to explain what makes some kites favored over others.

There are three basic ways to evaluate a kite: by objective means, by subjective means, or both. First, the objective, or non-judgmental–seven methods in all.

* An important test of any kite is its wind tolerance: what minimum amount of wind is necessary to lift the kite from the hand without moving backward? A related test concerns the maximum amount of wind the kite will take before power-looping, diving, or becoming erratic. If the maximum figure is divided by the minimum figure, the result is an M/M ratio. Any such ratio which comes under 3.0 would be considered a poor showing; a 3.0 to 4.0 ratio is passable; 4.0 to 5.0 is average. Anything above 5.0 would be excellent. For example, if a kite has a minimum wind requirement of 4 mph and a maximum tolerance of 20 mph, the resulting M/M is a satisfactory 5.0. These M/M ratios can be used to compare one type of kite with other completely different types.



A symmetrical kite has a 5% center of gravity.

* A second objective test is the normal angle of elevation a particular kite achieves. By "normal" is meant an average elevation without thermals, gusts or changes in wind direction. Several readings should be taken with a clinometer or quadrant and averaged to obtain a proper figure for the angle of elevation (AE). The average AE for various types of kites is 53 degrees.

* The lift-drag ratio of a kite is normally obtained by means of a glide test which measures the distance a kite will glide relative to a predetermined starting height. Rather a difficult procedure. However, by the use of trigonometric functions, a normal AE can be converted directly into a lift-drag ratio. The tangent of the angle of elevation, which can be obtained from tables in math books, gives a figure that tells whether a kite has more lift than drag, or visa versa. For example, the tangent of a 45 degree AE is 1.000, which means the amount of lift is exactly equal to the amount of drag on the kite; a 60 degree AE would give a lift-drag ratio of 1.732 translating into 73 percent more lift than drag. and a 30 degree AE into .5774–meaning 42 percent (1.000-.5774) more drag than lift. A minimum 1.000 lift-drag ratio is desirable, otherwise the kite will have a high sink rate and may not return to the hand when the wind slackens.

* Another evaluation test measures aspect-ratio, that is, the depth of a kite (chord) in relation to its width (span). Aspect-ratio is determined by dividing the chord into the span and the resulting number should not exceed 4.0 for a high-aspect ratio kite, or be less than 0.25 for a low-aspect ratio kite.

* The location of the center of gravity of the kite is important. Ideally the center of gravity is located 50 percent down on the center mast, but a range of 40 to 60 percent is usually acceptable.

* Another factor is the amount of porosity or permeability in the material used in making kites. Porosity should be less than 15 percent, particularly in nonrigid parafoil-type kites. Rigid kites can accept a small amount of porosity, but as a general rule zero porosity, as exemplified by plastic or coated fabrics, is desirable. A machine is required to accurately measure porosity, but an approximation can be made by holding the material tautly against the mouth and breathing in or out to determine if air passes through the material.

A kite 120 inches deep and 78 inches wide has an aspect ratio of 3.15.

* And finally, the weight of the kite in relation to the surface area used for lifting purposes needs to be considered. When the lifting surface, defined by the shadow area made by the kite, measured in square feet, is divided by the weight of the kite in ounces, the resulting ratio is the amount of sail-loading. A reading not exceeding 1.0 ounces per square foot of lifting surface is considered satisfactory.

We are now familiar with seven objective methods of evaluating the efficienty of a kite: 1. wind tolerance, 2. angle of elevation, 3. lift-drag ration, 4. aspect-ratio, 5. center of gravity, 6. porosity, and 7. sail-loading. So, on to subjective, or judgmental, observations–four of them.

* First, the kite in flight. Does it take off easily and steadily, or is it balky, erratic or difficult? Some kites fly well at an elevation, but behave poorly in takeoff. Others may take off well, but fly poorly a higher elevations, caused by changes in direction of the wind. Kiters have tried to offset this problem by installing several towing points on the kite for various wind speeds. The present trend, however, is to use one optimum towing point.

* If the takeoff is satisfactory, how does the kite fly at its normal angle of elevation? It should be fairly stable, without much yaw, oscillation or back-and-forth horizontal wander across the sky. Any wander above 25 degrees in normal winds is considered excessive by some purists.

* Next, does the kite return to the hand steadily, without power-looping, diving or excessive pull? And when the wind decreases, can the kite be pulled in fast enough to create sufficient air movement to bring the kite back to the hand of the flier?

If the answers to these questions are "yes," you have a winner so far as flyability is concerned. However, there is another consideration, which might be categorized as "esthetics."

* The way a kite is constructed, plus the shape, decoration, color combinations and general appearance of the kite certainly have a great deal to do in selecting favorites. And even though a kite may not meet any of the usual efficiency criteria, it can still turn out to be a favorite–if only because of its general appearance and workmanship.

So now, hopefully, you have a better idea what causes you to pick your favorite kite.

Determining Lift to Drag Ratios

The lift to drag ration (L/D) for a kite is determined by a glide test measuring the distance a kite, which has been converted into a glider, will travel in relationship to the height from which it has been launched.

If a kite started five feet above the floor travels five feet before landing, the L/D ratio is 1.0, meaning that the lift forces and the drag forces are exactly equal. If the kite travels four feet, the ratio is 0.8, indicating that the drag is 0.2 greater than the lift, or 20 percent greater. On the the other hand, if the kite travels six feet, the ratio is 1.2, or 20 percent more lift than drag.

This is a rather cumbersome and complicated method of measuring the lift to drag ratio of a kite. Fortunately, there is another way–by using an inclinometer to measure angles of elevation of a kite, plus some trigonometry to convert angles into tangent functions.

This is accomplished when horizontal surface winds are blowing with reasonable consistency, without excessive gusting and without an influence of thermals, updrafts or downdrafts. The kite to be measured should be flown on a taut monofilament line to minimize line drag, and at least 100 feet high to avoid ground turbulence. Several readings on the inclinometer should be taken when the kite is in a stabilized flying position, and the readings averaged.

This averaged figure is matched with the cosine of the trigonometric functions, which can be found in any book on trigonometry. Also, cosines can be obtained on a slide rule which has ST and T scales.

Examples: If the normal angle of elevation is 45 degrees, the cosine reading is 1.0–which means that the effects of drag on the kite are exactly equal to the effects of lift. Any normal angle of elevation below 45 degrees translates into a greater amount of drag on the kite than the amount of lift created. Conversely, any normal angle above 45 degrees means that more lift than drag is present. An angle of 63 degrees gives an L/D ratio of about 2.0; 71 degrees–3.0; 76 degrees–4.0; 78 degrees–5.0, and at 88 degrees an astronomical 30.0.

Letters to the Editor

A Mysterious Cody 'Save All'

Dear Drachen,

Wow! Contact at last! These computers have been giving me grief since 1965. I blame your Defense Department. Anyway, here's the e-mail I've been trying to send:

Hidden deep in the catalogue at Sotheby's sale of the Cody family's treasures was Lot 164 which was described as three small kites and a larger one. After buying this offering, I discovered the small kites were three (of the original four) devices Cody mounted at right angles to his War Kite's sails and inside the rear boxes. Presumably this was to counter the kite's habit of suddenly diving out of the sky if the wind blew too hard. The larger kite turned out to be the front box of a kite and was unlike any other; it was in a very distressed condition. The silk had become brittle over the years and had crumbled into extremely small pieces. Luckily, the kite had had a hemp line sewn around the sail edges to keep the leading and trailing edges in shape and to hold the bridle, spars, etc., and this gave some clue to its shape.

After carefully getting the bundle of string and split canes into some sort of order to be measured and photographed, I was sweeping up the pieces of silk on the floor and decided to clean the sacking in which the kite was wrapped. To my surprise, I realized that I was holding what could only be an original 'Save All.'

The 'Save All' was fixed behind the British Army's man-lifting kites and was nothing more than a rectangular drogue. Made of hessian, or jute sacking, it measured 23 by 46 inches. Around the four edges of the sacking was a hem about 1 inch deep and inside the hem was a drawcord of about a half-inch circumference. The drawcord had neat back splices in each end and was coming out of the hem in the center of one of the larger sides. At each corner of the sacking a small hole had been punched where the two hems met and this was for the cord holding it to the rear of the kite's four longerons. A 'Save All' is shown in an excellent Royal Navy photograph of the November 1908 Portsmouth anti-submarine trials.

Checking the stores list (Army Form G1033) issued to Petty Officer Bobbett when he took the equipment to Portsmouth, I was surprised to discover in the HMS Excellent files that the "Save All" was not listed. As there was a dispute between the Army and Navy over just what was issued and returned after the final anti-submarine (or magnesium flare) trials in 1908, the files are extremely large and contain a great deal of detail (varying from rought notes on scraps of paper to formal letters between the Admiralty and the War Office). Perhaps Cody took the 'Save All' to Portsmouth from his own equipment and it after all was nothing to do with the Army's kites.

David Hughes
m025xx00@cwcom.net

Hello, My Favorite Kite Journal!

Dear Drachen,

I must thank you so much for the nice writing (Journal No. 4) you did about my miserable life! Mainly, it's just a wonderful present you made to my dad, who is on his way to leave us, being in hospital at the end of his life. He did not know me as much as he could, for the last 20 years, and reading your article is just something he needed to leave in peace, and in some way, to be proud of his son. Thank you for that.

Beside, he's almost more English than French, and sometimes, he speaks to me in English, just like if he was still in Nigeria! The Drachen Journal in English was just perfect for him to read.

Nicolas Chorier
Montpellier, France

Update on U.S. Kite Patents

Dear Drachen,

Just to keep the record up to date:

A total of nine patents for kites and accessories were issued by the U.S. Patent Office during 1999. This compares with 10 issuances the previous year, but is still about half the average number of kite patents each year during the

past 25 years.

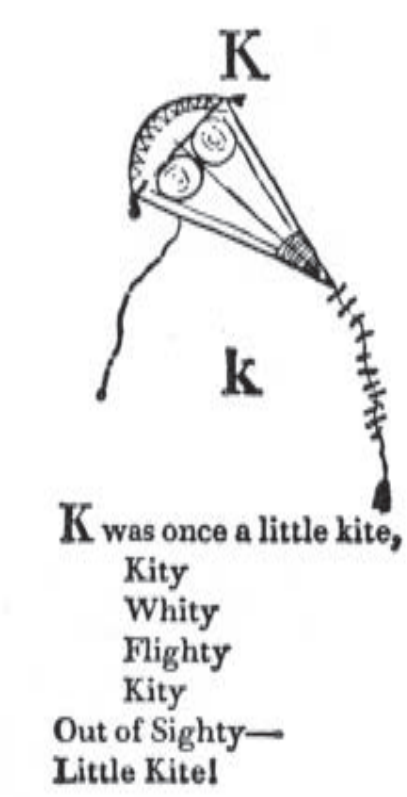
The 1999 patents include two rotary-type kites, two kites designed primarily for appearance, two kites with variable towing points, and one to permit easy folding.

I must correct the number of the patent in the Eddy piece ("He Put Diamonds in the Sky," Spring 2000 issue of this journal). It should be 646,375–not 6,446,375. Currently issued patents are in the 6,100,000s, so 6,446,375 has a long wait.

As to my age, I came in with the San Francisco earthquake, the eruption of Vesuvius, the Chilean earthquake, and just before a big stock market crash. In other words, 1906, September 30th to be exact. This adds up to 94. Can this be possible?

Up and away,
Ed Grauel
Rochester, New York

About Bell Tetras



Hi Ali Fujino,

That's a true observation by Leonard Opdycke (letter to editor, journal No. 4), putting a motor on one of Mr. Bell's tetras would still be a long way from a human bird. I don't have the numbers correct, but engineers point out that there are seven or eight things required for flight, absolutely critical: and the Wrights had perfected and incorporated five of them as basic elements in their aircraft, only two or three (requiring a bit more tuning?) to be added in the ensuing years after their first historic flight. But, wouldn't it have been something to have seen tetras flying around in the sky, and, thinking how long it took the automobile to cast off the appearance of a horseless carriage, tetra jets in that deep red fabric Alex favored for his tetras flying overhead [paraphrasing Mr. Ford, "Give them anything they want if it's deep red."].

Tal Streeter
Verbank, New York

Letter of Thanks

Dear Drachen Foundation,

The students and parents of Sacajawea Elementary School thank you so much for participating in our science and math fair. As you could probably tell from all the kites that went swirling through our gym, halls and cafeteria, your exhibit was a really big hit with the kids. I know my boys have done some experimenting with how the kite flies without a tail, and when the slight fold is increased. Thank you for taking the time and effort to help each eager child who came to your exhibit. Thank you for your preparation in setting up and organizing materials. The fair really got our kids excited about math and science, and illustrated for them how these fields of study are part of real life!

Rebecca Keith
Seattle, Washington

Praise for Drachen and Ed Graul

Dear Drachen Foundation,

Another excellent edition of the Drachen Journal. Great pieces by Ed Graul–the man's curiosity and perseverence continue to delight and amaze me. Keep it up Drachen–for all of us.

John Freeman
marzlie@aol.com

The Drachen Journal

This journal is produced by The Drachen Foundation and is issued two or more times a year. Single copies and subscriptions (including back issues) are free. Contact the Foundation's administrative office.

If you have questions or comments about the Kite Journal or kites in general, please submit them to the Foundation.

Now you can visit The Drachen Foundation online at www.drachen.org. Our new website is up and running, and we invite all our readers to visit us.

About the Journal Staff

Editor and major contributor to the Drachen Journal, well traveled Ben Ruhe regularly contributes articles to special interest publications on subjects as diverse as boomerangs, tribal art and flint-knapping.

Scott Skinner, president of the Drachen Foundation, is a former pilot instructor at the U.S. Air Force Academy. He has been a kite enthusiast for two decades–designing, making, flying, collecting and teaching about kites.

Ali Fujino is the administrator of Drachen. A museum specialist since age 19 when she began work at the Smithsonian Institution, she has long been fascinated with anything that can become airborne.

Elizabeth Snodgrass is the desktop publisher of the Drachen Journal. She is an anthropologist by training and through her association with the Drachen Foundation has come to love kites.

page 33 Charles C. Benton