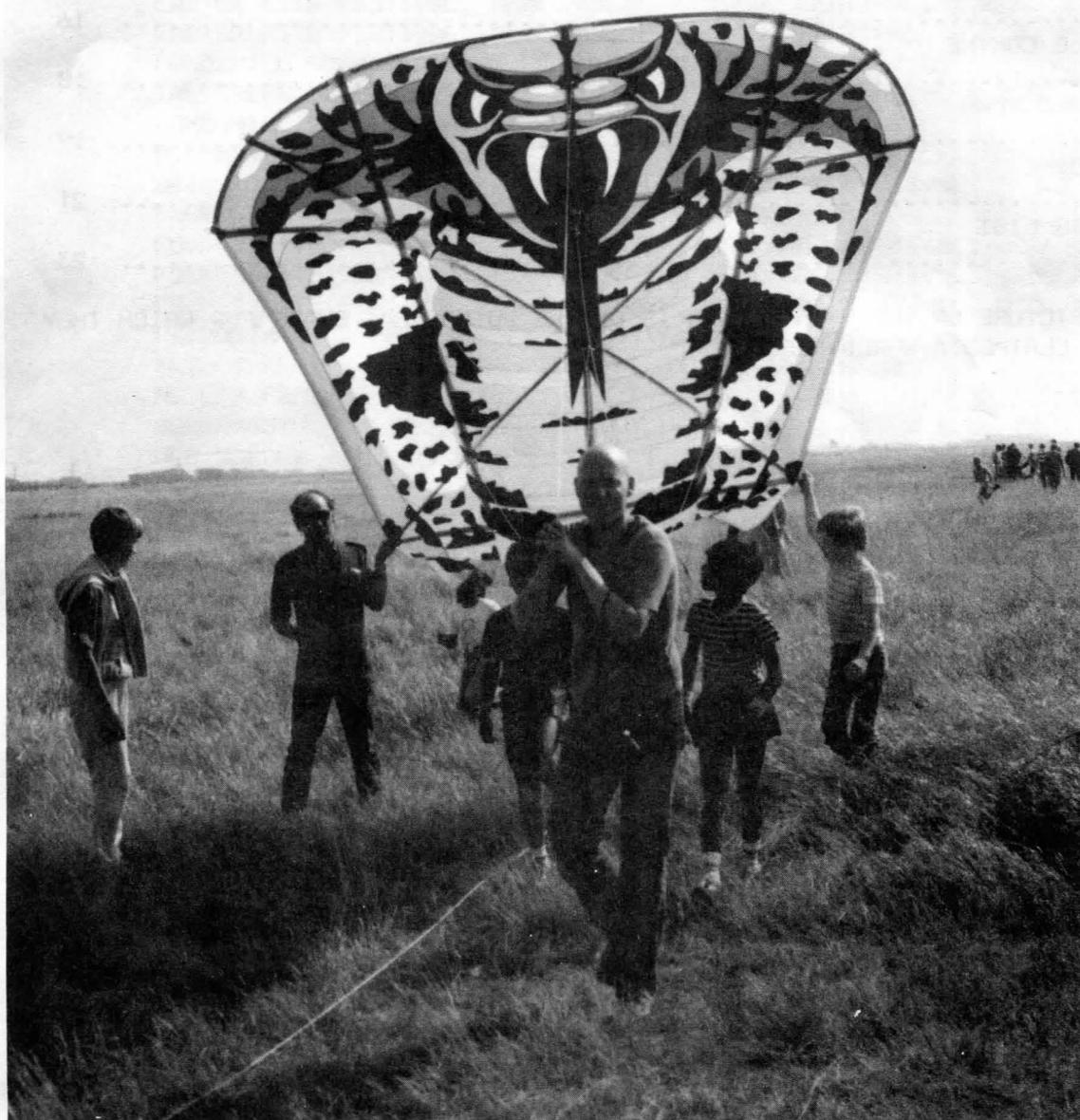


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# KITEFLIERS OCCASIONAL NEWSLETTER

WITH THE MIDLAND KITEFLIERS NEWS & BRIGHTON KITEFLIERS AERODYNE



**Published by The Kite Society**

**ISSUE 22      JANUARY      1985**

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THE PICTURE ON THE FRONT COVER IS OF THE DUTCH THAI SNAKE FOR WHICH THEY HAVE CLAIMED A WORLD RECORD.



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Dear Reader,

First of all we would like to wish all you a very happy New Year and let us hope that 1985 is a good year for kiting - steady winds and warm summer days. (Well we can hope can't we!).

We would like to thank everyone who rallied to the call - and to all those readers who thought about writing to us but never quite got around to it in 1984 - how about writing in 1985!. Any contributions are always welcome so keep them coming.

So far in 1985 the kite festivals seem few and far between with only the major festivals and dates being known at the moment including Scheveningen.

Once again we are organising a party to attend the event in Holland and the outline trip is as follows:-

Depart from Gatwick airport on Thursday 20th June and arrive in Scheveningen (via Schipol airport and a short train journey) in the early evening.

Stay in Scheveningen for the nights of the 20th, 21st, 22nd, and 23rd June and return to England on the 24th June arriving late afternoon.

The hotel will be on a bed and breakfast basis.

The cost for this will be £141.00 (a supplement of £4.00 a night is payable for a single room).

If you are interested in this trip or require any other details please get in touch with us at the address below.

For those people who definitely want to go we require a deposit of £25.00 per person plus £10.00 for holiday insurance. NOTE: the deposit must reach us by 23rd February and NO later.

Jon and Gill Bloom

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Membership to the Kite Society is £4.00 per year for the U.K. £6.00 for Europe. The rest of the world is £6.00 landmail and £8.00 air mail. PLEASE NOTE THAT ALL CHEQUES, POSTAL ORDERS OR MONEY ORDERS SHOULD BE MADE PAYABLE TO THE KITE SOCIETY.

For this members will receive four issues of Kitefliers Occasional Newsletter and a five percent discount at shops throughout the U.K. and Europe.

PLEASE SEND PAYMENT AND ALL CORRESPONDENCE TO:-

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From Richard Anderson, 36, North View, Winchester, Hants. (Richard was the author of the article about aerial photography which appeared in K.O.N.17).

I have returned from four months of archaeology abroad, including some very successful kite photo work: Five photo flights plus some flying just for fun (Alas too little). I built a whole new system except for my faithful J.45, in Cyprus which is a paradise for lines and equipment. 530m of 3.5mm diameter Italian solid braid Nylon cost about £10 and about a mile (!) of 1.6mm German Monofilament was about £25. I made "Anderson Mk 1" windlasses working in a carpenter's shop in the evening after digging, iron parts were forged while I waited by one of many blacksmiths. The flights were 2 on "our site", a crusader castle at Paphos and then for the Cyprus Dept. of Antiquities site near Coral Bay, mouth of Paphos. That was particularly unnerving because of the system was flown on an offshore breeze from one shore, across a bay to the site which was on a point...if anything had broken, which was a worry in the very strong wind, all of the gear would have been lost in the sea.

In July, I flew two photo flights in the mountains of the Peloponnese at Stymphalia (in Greece) where I was working for a Canadian project. There the problems was judging the wind which was erratic compared with the coastal winds at Paphos. My luck holds! Nothing was lost or broken and about 10 rolls of very useful photos were produced during the five flights. This was with two completely different novice crews so, needless to say I am pleased.

From Mark Hergan, 437 Sudbury Road, Linthicum, Maryland, U.S.A.

My father picked up an issue of your newsletter from the Kite Store in London while on a business trip. I read it from front to back and found it very interesting to see what kiteflyers in England are doing. I am a member of the Maryland Kite Society and thought that you might like to hear about what we Americans are up to.

I recently had the pleasure of attending

Sunfest'84 in Ocean City, Maryland, The "Kite Capital of the world" and the first site of American Kiteflyers Association National Convention.

It was held over the weekend of September 22-24 with well over 150 kite enthusiasts participating in this exciting event to set world records.

Saturday was .toasted with a delightful champagne brunch held on the beach and attended by formally attired ladies and tuxedoed gentlemen. Then the action began: the boardwalk was lined with spectators as kites of all sizes, shapes and colours filled the skies. Rick Bell, designer of Hyperkites came with his train of 150 hyperkites from San Deigo in an attempt to set a world record for most dual controlled kites in a train. Light winds, however prevented him from keeping his kites up for the required five minutes and perform a loop to each side. Unfortunately the winds coming off the Atlantic did not provide the right conditions for any other world record attempts on Saturday. That did not stop the fun-filled day. The day did not end there, another night fly was starting as the dinner was coming to a end. The night sky was filled with close to 100 lights dancing in the sky well into the evening.

Sunday, the winds were coming from the south and just perfect for two world record attempts. There were judges from the Guinness book of World Records on hand to recognize any record setting flights. As on the previous day, kites filled the sky and spectators filled the boardwalk to watch the record attempts. Rick Bell again set up his 150 hyperkites for the record. After a few attempts some fine tuning and removing of the last ten kites, Rick performed the necessary manoeuvres and flew for about eight minutes to establish a new world record of 140 dual controlled kites in a train. As the day went on Bill Tyrell of the Fabric Lady appeared on the beach with an 800 square foot parafoil to break his own strongest pulling record. With a huge United States flag flying off the line the gigantic parafoil held down by a huge beach tractor, crushed the old record of 420+ pounds and established a new record of 728+ pounds. In a short ceremony Bill

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Ochse, the king of the wind, awarded both Rick Bell and Bill Tyrell their World Record Gold medals.

From Brian Hill 15 Beauworth Avenue,  
Harefield, Southampton.

Some time back in my early years of the kite making I made a Triple Ram Delta. It flew quite well, but the rams on top would'nt inflate to my satisfaction and in strong gusts it bent and broke its leading edge spars. (Strange I've never seen 10x6mm break clean across the grain in that way). So I chucked it. As I was looking for inspiration recently I decided to dig it out and have another crack at it, and was it rough? All those furrows and twists, no wonder it didn't come up to spec. Yuk! I've learned a lot since then so my new one has heavier nylon pockets sewn on to the leading edges and the front of the rams have been stiffened with boning. All sewn together with invisible nylon thread. Smashing stuff this, ideal when working with lots of different coloured ripstop. She's a beaut now and lifts from the hand, bridled right on the nose.

I've made most of the kites from the plans in K.O.N., so I find them very good value. One of my favourites is Len Patten's mod on Tony Cartwright's Arrowhead (K.O.N. 18). I've used bright red on the streamer edged body with blue and white wings. It caused quite some comment at our W.K.G. festival. Some said it looked like it was on fire. I've also made up my own shark using a character from my kids comic for layout. Had a bit of a problem getting it stable though, but it flies quite well now. Near the ground he becomes a real clown, and seems to like to chase the girls around.

From Mr Goldman 274 Southbourne Grove  
Westcliff, Essex.

Back to the drawing board - With the increasing cost of fibreglass rods for kite spars and the problems of obtaining long lengths through the post I have returned to the original idea of wood for repairs and new constructions. The choice is between dowelling, bamboo canes and split cane. Dowel can be obtained easily in many thicknesses although some D.I.Y.

retailers will only sell it in 6ft lengths its smoothness and accuracy makes it an ideal material for complicated kites, but as much of my kiteflying is done with and for children dowel rods do not stand up to the frequent crash landings that result from this- "back to the drawing board" is the inevitable ending of an afternoons enjoyment.

Bamboo canes, again are easily available in a range of thicknesses and lengths but practically all of them have such a marked taper that one may have to buy an 8 ft length to get 4ft of even diameter. The swollen joints can also be a problem when spars have to be threaded through tunnels in the kite cover. Whatever you do, dont force them down- this produced a very weak spot and ruins the prime quality of elasticity in the spar.

Split cane is made from large bamboo poles, cut and split to size- easily available from garden centres (alas often stained with preservatives) it has many of the virtues of both the former materials. One is usually limited to about 3ft lengths. To ensure even diameter I usually put the split cane through a steel die (actually one of a number of nuts from 1/8,3/16,1/4,bolts) and use a stanley knife or glass paper to reduce any thick areas. For many of the simpler types of kites I think split cane is ideal. You will need to spend some time choosing the straightest and most even lengths, but small curves or bowing can be converted by steaming or bending the cane over a candle or spirit lamp. I have noticed that the supply of split cane tends to be seasonal, it disappears during winter months, so I would advise buying in a decent stock during the summer months. It is much the cheapest of the spars available and at around 1 or 1 1/2 p per foot you can carry a good supply without taking a mortgage on your house.

Some years ago, when I was involved in small boat building I found spruce a delightful wood to work with; light in weight, straight grained and very flexible it would be ideal for kite constructions of all types:- does anyone know of a convenient source of supply?

Denis says the following - I've only made one of this version of box, but it flies very buoyantly, achieving a high angle of flight. It prefers steady winds, in gusts it tends to wander around and drop like a stone in between them. The bridle is a bit of a pig to set, but once done, never needs altering.

After measuring it, I'm still wondering why the diagonal spars aren't twice the length of the diagonal cross in the middle, but I assure you they are not.

One thing to note, if the short spars are put in pockets, there's not much stretch in 13" of ripstop to insert the dowels. Where the diagonal spars pierce the cover a small leather patch with a punched hole is stuck and stitched on. The piercing point is as close to the seam as possible.

All spars are 1/4 " dowel and the cover ripstop. The joints I made simply from plastic pipe, cut and bent. They don't slip out or anything, nor protrude through the cover. It could conceivably be improved by adding another 13" dowel in a sleeve or pockets in the very centre of the cross, to keep the cover really taut.

If made bigger, twin braces would probably be necessary and the bracing lines on the back, which control distortion might be dispensed with.

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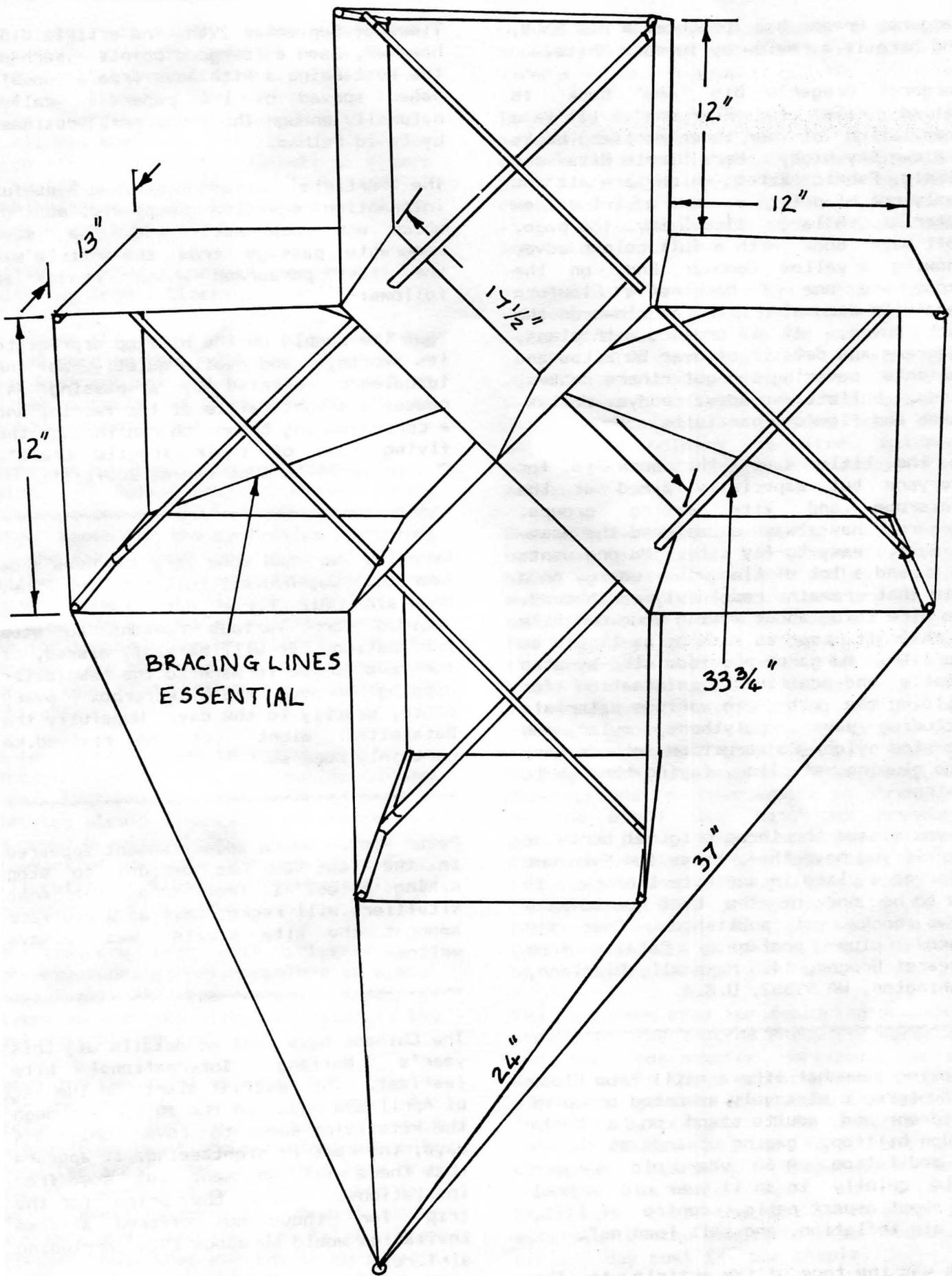
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Margaret Greger has produced a new book, and here is a review by Terence White.

Margaret Greger's big 'new' book is called "Kites for Everyone". It is a compilation of her three earlier books - Blown Sky high, More Simple Kites and Simple Fabric Kites which are all now sadly out of print - and a lot of new material. A large 11x8.5 in, 136 page, soft back book with a full colour cover showing a yellow Conover Eddy on the front and one of Margaret's Flowform parafoils decorated with a clown on the back cover. It is crammed with plans, diagrams and details of over 50 kites and variants covering amongst others snakes, sleds, bullets, squares, eddys, deltas, boxes and flowform parafoils.

As the title says the book is for everyone but especially aimed at the classroom and kite making groups. Margaret has always championed the easy-to-make, easy-to-fly kite. No one wants to expend a lot of time and energy on a kite that remains resolutely earthbound. The nice thing about making your own kite is that it cost as much or as little as you like. Margaret provides step-by-step details and additional information for building the kites in various materials including paper, polythene, mylar and rip-stop nylon. Construction methods vary from glueing, stapling, taping through to sewing.

If you missed the three original books or even if you have them, Kites for Everyone deserves a place in any kite library. It has to be one of the best how-to-make kites books yet published. Cost \$10 approx plus postage. Details from Margaret Greger, 1425 Marshall, Richland, Washington, WA 99352, U.S.A.

"Looking somewhat like a still from Close Encounters, a strangely assorted group of children and adults stand on a North London hilltop, gazing upwards as though in meditation. A 60 year old surgeon chats quietly to an 11 year old school boy about aspect ratio, centre of lift, ram air inflation, and sail loading".

Such was the tone of the article in The

Times of September 29th. The article did, however, have a few good points - perhaps the best being a kite made from a double page spread of the paper - called naturally enough The Thunderer, designed by David Pelham.

The Article also contained useful information regarding groups etc. most of which was incorrect! But the most memorable passage from the article was the last paragraph which reads as follows:-

"But the people on the hilltop appreciate its worth, and smile quietly as the turbulence created by a passing 747 causes a slight rattle of the fabric, and a corresponding tremor to run through the flying line of their fragile craft". Obviously 747's must fly at 200ft!!!!

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Recently we had some very sad news from America. Guy Aydlett Editor of The Piney Mountain Air Force Data Letter has decided for various reasons to stop publication. It will be sadly missed, I for one looked forward to the newsletter popping through the letterbox every month, exactly to the day. Hopefully the Dataletter might yet be revived, we certainly hope so.

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Peter Hopker whose advertisement appeared in the last KON has decided to stop making kites. I feel sure that most kitefliers will regret this as a new face amongst the kite stalls was always welcome.

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The Chinese have sent us details of this year's Weifang International kite festival. The festival starts on the 1st of April and ends on the 10th, although the kiteflying seems to cover only 3-4 days, the rest is sightseeing. It appears that there will be sent out some free invitations. However the price for the trip for those not offered a free invitation would be about £900 (excluding airfare).

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We have noticed, however, that the French Kite group is arranging a trip to the festival departing from Paris on the 30th March arriving back in Paris on the 9th April. The whole trip, including airfare is meant to cost 11500 Francs.

If interested in any of this please write to us and we will see what can be done.

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We had news of a new kite record from the Nederlands Vlieger Gezelschap. On 11th August Herman van den Broek and Jan Pieter Kuil flew a Thai snake with a length of 650 metres for 22 minutes and 50 seconds. We think they are claiming the world's longest kite.

~~~~~

News from Germany. Berlin now has a local Kite Association called "Windspiel-Berliner Drachengemeinschaft" translated Windgame - Berlin's Kite Society. Contact Address is Heniz Hattig, Landerallee 27, 1000 Berlin 27.

The local group was founded on November 9th and regards itself as the local Chapter of the Drachen Club Deutschlands (Kite Club of Germany) which was founded in Bremen on the 27th of October. Another group from Germany is the Fessel Drachen Gesellschaft, Roland Falk, E.V. Stuttgart.

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We had a small note from a Mr Gleave claiming that he was running the Keighley Balloon and Kite Company. He said that he was hopefully bringing kiting to the north of England. We know no more. Despite repeated letters he seems to have disappeared off the face of the earth, is it all that home brew of Ian Waltons we wonder?

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Talking of Ian Walton, it was sad to hear that the Northern Kite Group has lost David Holmes as editor of their magazine Kite. He certainly has done a sterling job. Fortunately not all is lost as the most famous letter writer in the kiting

world, John Spendlove, has agreed to take over. We wish John the best of luck, and wonder if John's new found position has gone to his head, it must be at least 2 months since we had a letter from him!

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Various kite related bits and pieces:-

A kite mobile made from dyed shells from Aquilla, 4 Gate Street WC2

Spotted in Fenwicks, cocktail glasses and tumblers with kite designs.

Tesco have a range of various kite design mugs from 90p to 1.70p.

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And if you ever get desperate for ripstop you could always raid the "Flying Start" restaurant at Gatwick Airport which has quite a nice display of ripstop kites including a whole train of Manana kites winding its ways across the ceiling, and also some lovely painted kite curtains.

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Rumour has it that Peter Powell will soon be making a stunter in Ripstop nylon. We look forward to seeing that.

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Jon Burkhardt made a flying visit to England just before Christmas bringing with him news of various kiting activities in the States. He has the most beautiful full panoramic picture taken at the A.K.A convention. It appears there were some rather nice kites at this including Jon's own Topless lady rokoko kite which won first prize for the best homemade kite.

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Jon brought with him two films, one on Tom Van Sants kites and a film produced by I.B.M. who had a recent promotion involving kites. Both films were good, mainly because they brought to life kites previously only seen in books or magazine.

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The following article is reproduced by the kind permission of Peter Lynn Ltd., N.Z.

Fibre Reinforced plastics in Kite Construction. A Qualitative Analysis. Peter Lynn, B.Eng.

Preamble:- Since the 1950's fibre reinforced plastics have become generally available in many countries. Especially, glass fibre reinforced polyester rods and tubes, now manufactured in a wide range of sizes, can be purchased ex-stock in most developed countries. This material and its higher technology cousins, epoxies and etc., resins reinforced with "Kevlar" (Dupont trade name) and graphite offer significant advantages to the kite maker when compared with the more traditional materials such as wood, bamboo, cane, aluminium and non-reinforced plastics. In most cases, kite makers have been slow to adopt these new materials and, even when they have used fibre reinforced plastics they have not necessarily used them in the most effective ways. However, because of their very high specific strength it appears likely that fibre reinforced plastics will have a major long term effect on kite design (structural and aesthetic). As in most established crafts when major materials specification changes occur (in this case fibre reinforced plastics especially glass fibre reinforced polyester associated with coated synthetic woven fabric skins ripstop nylon etc.) the first reaction is to replace existing components with virtual duplicates made of the newly available material. For example early Bronze age implements show a striking similarity to their Stone predecessors in size, form, means of attachments etc. Later Bronze age artifacts make much better use of the significant advantages that even soft metals had over stone (greater impact strength, ability to be formed, homogeneity etc.) The trend is that gradually the medium exerts a powerful influence on both functional and aesthetic design. This paper will examine the following aspects of fibre reinforced plastics used.

1. In the scheme of things where does the craft of kitemaking stand at present; 2. What are the characteristics of this new material, its various advantages and disadvantages, the opportunities it offers, the restrictions it imposes; 3. Types and forms of fibre reinforced plastic products and manufacturing systems as at 1984 (a) available to kitemakers (b) likely future trends 4; Specific techniques for using fibre reinforced plastics (a) rigidity versus strength (b) member terminations (c) joints (external internal etc) (d) glueing (no cross-fibre connections); 5. Prestressed fibre reinforced plastic structures.

1. It is plain from studying current kite literature and from the "State of the Art" kites displayed at major world kite festivals that kite makers are still very much at the stage of replacing existing wooden or etc components with similarly dimensioned fibre reinforced plastic components. As evidence of this consider the standard western kite design such as the sled and delta which generally fly very well when constructed with wooden dowel members.

In response to the reputed unbreakable nature of glass reinforced plastic their makers swap over to glass reinforced plastic members (generally rod not tube) and find that their good old reliable kite flies less well or not at all. Their reaction to this is to conclude that "fibreglass is no good for kites". Let us examine their situation in more detail, Firstly, glass reinforced plastic has a higher density than wood (heavier for a given volume), it is also not as rigid for a given section size but it is very much stronger (by weight and by section size) i.e. it is capable of withstanding much greater deflection before failing. The average kite maker confuses rigidity with strength. For their sled they will either choose glass reinforced plastic rods which are of a similar weight (i.e. smaller diameter) to the dowel they are accustomed to using or they will choose glass reinforced plastic rods which are of similar rigidity (i.e. much heavier than their dowel). In the first case the g.r.p. will be too flexible, the sled will exhibit classic collapsing at the front characteristics. In the second case the heavier members will adversely effect the kites light wind performance and by shifting the kites centre of gravity tailwards could adversely effect the kites stability in all

conditions. Deltas react in much the same way. The solution is obvious and is now well known. For these applications fibre glass tube is more rigid, weighs less and is much stronger than wooden dowel of similar size.

Similarly, member terminations and joining methods generally employed plainly show their wood or bamboo member ancestry.

There is a growing number of exceptions to this situation but we are not yet at the point where g.r.p. can be shown to have had major influence on kite design. If we are to advance our craft then it behoves us to examine more carefully the characteristics of our materials.

## 2. Characteristics of Glass Reinforced Plastics.

| MATERIAL                                          | SPECIFIC GRAVITY | MODULUS OF ELASTICITY (p.s.i.) (raised by 10 to the power of 6) | ULTIMATE TENSILE STRENGTH (p.s.i.) | SPECIFIC STRENGTH STRENGTH/WEIGHT RATIO |
|---------------------------------------------------|------------------|-----------------------------------------------------------------|------------------------------------|-----------------------------------------|
| A.B.S. thermo plastic co-polymer                  | 1.0              | 0.4                                                             | 7,000                              | 7                                       |
| NYLON 11 (non-reinforced thermoplastic)           | 1.0              | 0.2                                                             | 8,000                              | 8                                       |
| OREGON (pseudotsuga menziesii)                    | 0.5              | 1.4                                                             | 10,000                             | 20                                      |
| HICKORY (carya ovata)                             | 0.8              | 2.3                                                             | 20,000                             | 25                                      |
| ALUMINIUM (6351 alloy T6 temper)                  | 2.8              | 10                                                              | 69,000                             | 23                                      |
| G.R.P. (glass rovings reinforced polyester resin) | 1.9              | 4                                                               | 120,000                            | 63                                      |

"Kevlar" or graphite/epoxy composites have even higher strength and rigidity characteristics (modulus of elasticity 9 and 20 respectively).

The above table lists the major physical characteristics of commonly used kite making materials. The inherent potential of g.r.p. is obvious, our task is to determine how to realise this potential.

A note of caution should be sounded at this point. The comparison chart can be used directly only when comparing like sections. Tubular or hollow rectangular sections have inherently greater strength and rigidity in bending than similar weight solid sections. For example it is possible for a large diameter thin walled A.B.S. (the lowest listed specific strength tube) to have superior strength in bending and rigidity to a g.r.p. (the highest listed specific strength) rod of similar weight.

There are some other characteristics of g.r.p. members that are worth considering. G.r.p.'s are non-conducting - important when flying kites near overhead power lines - g.r.p.'s gain their great strength partly by alignment of their fibres (as does wood), resistance to splitting and shear along the axis of fibre orientation can be much lower. Aluminium and non reinforced plastics are homogenous (of equal strength in all directions). G.r.p. members lose almost all their strength (except in direct tension) at temperatures above about 75 degrees C. G.r.p. members cannot plastically deform. On impact

or major stress they will either break or deflect elastically (and later return to their original position). All the other listed materials (though timber to a lesser extent) will take a permanent bend or set which is likely to adversely effect the kite's flying characteristics.

G.r.p. members are not subject to fatigue failure (as is aluminium) and are relatively immune to weathering (particularly U.V. radiation that causes deterioration in timber and non-reinforced plastics).

G.r.p.'s (and aluminium, non-reinforced plastics) are manufactured materials and as such are of consistant and predictable dimensions and specifications, their great advantage over naturally occuring materials such as wood and bamboo.

The advantage of g.r.p.'s obviously derive from its great specific strength, the opportunities it offers kite makers are therefore towards lighter but stronger more crash resistant kites and/or larger kites. The major disadvantages of g.r.p. kite structures are firstly price and availability (improving all the time) and that the kite maker must develop new techniques of design and construction.

### 3. Types and forms of G.R.P. products and manufacturing processes.

(a) Currently available g.r.p. rod is manufactured by a process called pulltrusion in which glass rovings (parallel multi-filament bundles) are drawn slowly (typically 0.5 to 2 metres/min) through a resin bath and then through a heated die where the resin sets up or cures. Modern systems tend to be of the "cure in the die" type where the rod leaves the die in a fully cured state. This system produces continuous rod of good surface finish but not always fully wet out as by the older "gel in the die" system where some post curing is required. "Gel in the die" systems produce a much rougher surface finish which is often overcome by centreless grinding and subsequent polyurethane coating. Both processes can produce rod of a variety of cross sectional shapes but are limited to parallel sections. Tapered and other sections are created by additional grinding processes.

G.r.p tube is usually made by wrapping pre-impregnated glass cloth around polished steel mandrels (which can be of parallel or tapered section). After wrapping, plastic tape is spirally wound tightly over the cloth and the whole unit is placed in a curing oven which first liquifies the resin (ensuring proper bonding between layers) then cures the tube. After removal from the oven, the tape is unwound and the steel mandrel withdrawn to leave the finished g.r.p. tube. This is a batch production system which nevertheless produces tube of consistant high quality at reasonable expense. It is also a process which does not require large production runs. Tube of specific dimensions can be manufactured almost on a "one-off" basis. Length is limited by mandrel and oven dimensions but high specific strength is available especially with non-square cloths (more fibres in the longitudinal axis).

There are also proprietary continuous process tube making systems using various layering spiral winding and pulltrusion techniques in combination. Tube made from these processes is of good consistant quality but is only available in standard sizes and wall thicknesses not always suitable for kitemakers.

#### (b) Likely future trends.

Research and developement in aerospace fields is likely to have spinoffs to the manufacturing of g.r.p. components of non-straight non-parallel section. Costs of rod and tube are likely to continue to drop as better manufacturing systems are developed. Polyester resin sells to pulltrusion and etc. manufacturers at under U.S.\$3 per Kgm. Glass rovings at about the same price. Hence there is margin for major reductions in product price as labour costs are reduced by the advent of more automated systems.

Kite makers can expect to have more g.r.p. products made and available specifically for the kite industry, a contrast to the last 15 years of using fishing rod blanks!.

4. Specific techniques for g.r.p. use.

(a) Rigidity versus Strength.

When designing kites for g.r.p. members take into account that g.r.p. is stronger but not as rigid as traditional materials.

1. Relocate members to places where their general strength can be fully utilised but where lower rigidity will not adversely effect the overall structure e.g. consider making a tetrahedral kite internally braced (4 members per cell) rather than using the traditional 6 member system.

2. Take into account changes to the kites longitudinal balance caused by lighter or heavier or differently placed members.

3. Consider changing the overall proportions of the kite to suit g.r.p. construction.

4. Use tube rather than rod where more rigidity is required - but resist the temptation to use ultra thin walled tubing as this is very subject to accidental crushing damage while handling, storing or landing thus negating one of the major benefits of g.r.p.

5. Use extra rigging lines to assist rigidity. A cord is lighter than extra structural members.

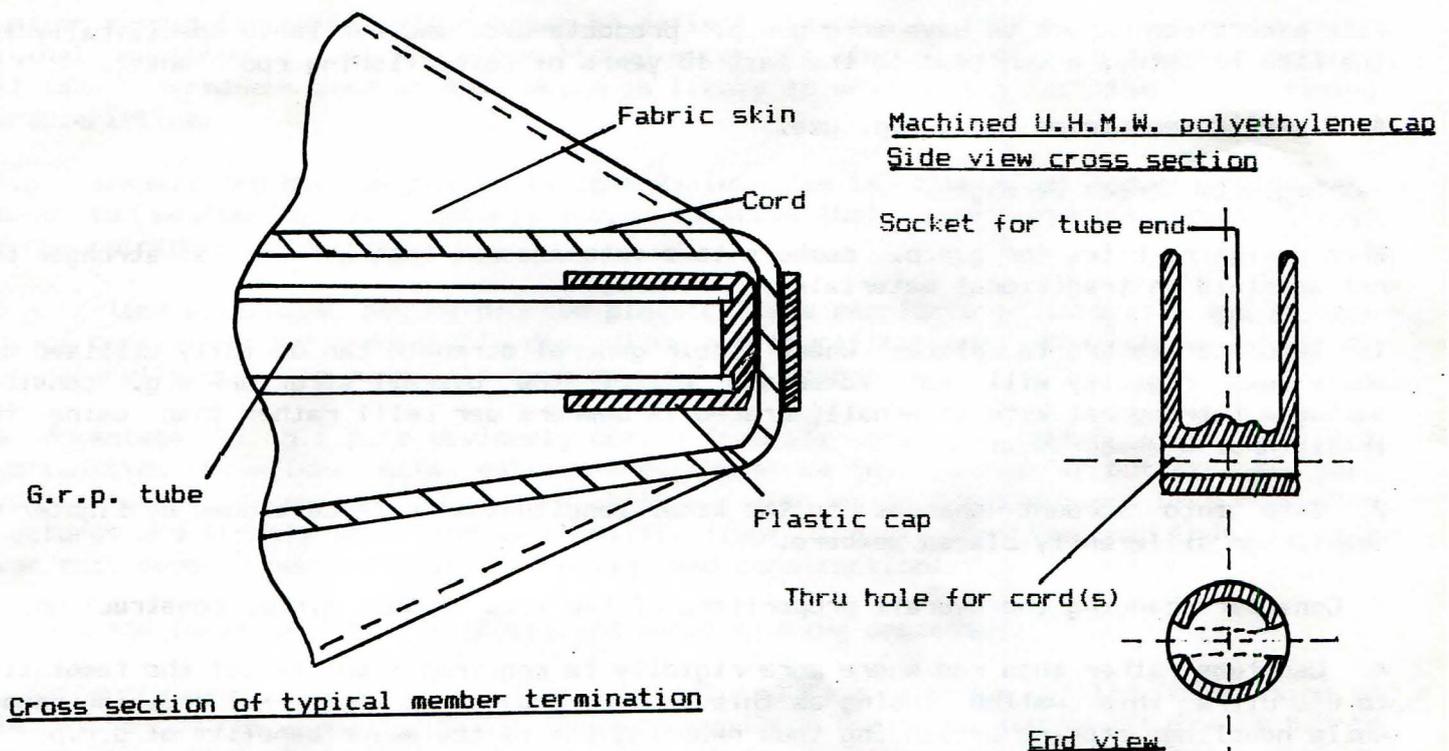
(b) Member termination

1. G.r.p. has a hard abrasive unyielding surface. Just sewing g.r.p. rods into fabric sleeves is almost totally useless (except on miniature kites) because a few contacts with a hard surface or merely the fretting movement of a few hours flying will see the member come out through the end. Nor are extra layers of fabric or even patches of synthetic leather of permanent value except on small kites. Soft plastic rods and caps are of some assistance but really only delay the problem. What is needed is a system that transfers stress from the soft fabric to the rod without creating a weak spot that can wear through or fail during a heavy landing or in heavy winds. Cutting a slot in the rod/tube end for a cord sewn to the fabric does not work satisfactorily because the cord will have a tendency to jump out of the slot with the flex of the g.r.p. The cord will wear through where it contacts the member (g.r.p. is very abrasive) and the cord will tend to split the rod/tube (one directional filaments have very little splitting resistance). Quite unequivocally, there is at this time only one system that is effective, especially for larger kites.

The cap can be machined from nylon or U.H.M.W. polythene. The cords pass through a hole (not a slot) in the cap and hence can't come out or wear through by contact with the ground or etc. The plastic cap is soft enough not to abrade the cords. The cap protects the end of the rod/tube (must be external, that is enclose the end of the tube as internally fitted shouldered plugs often split the tube during impacts). The tube can be pulled out of the cap for kite disassembly. The cords can be sewn to the kites skin in various arrangements so as to effectively spread the load and eliminate necking. Finally, the cap through-hole can be used for the attachment of various other rigging lines, bridles etc.

(c) Joints.

Longitudinal joints (sleeves). Resist the temptation to employ internal joiners when connecting lengths of g.r.p. tube as again these plugs will often split the tube during



Cross section of typical member termination

major stresses. Sleeves should be external tubes.

If g.r.p. tube is to be used for external sleeves ensure that the tube to be used has sufficient circumferential strength (i.e. resistance to longitudinal splitting) wrap ends with wet-out glass rovings if necessary to overcome this problem.

For connecting g.r.p. rods of small diameter either use quite long aluminium or steel sleeves (say 8 x diameter per side) or use unreinforced plastic sleeves. Especially when a lot of flexing is occurring. G.r.p. rods have a bad tendency to break off short at the joiner ends.

For very highly stressed joints in tube use external and internal sleeves. For T and X intersections the same sleeves used for longitudinal connections can be pinned or bolted together. Adjustable joints can be made this way by incorporating a series of holes.

#### 5. Glueing.

Glueing of g.r.p. is not generally successful except in areas of very low stress, low flex. The reason for this is that the strength of g.r.p. components is in the fibres (typically the fibres exhibit tensile strengths upwards of 200,000 p.s.i.). The plastic binding agent which has the function of surrounding these fibres and preventing their relative movement typically breaks at around 3000 p.s.i. Any glued connection that does not incorporate fibres passing along the joint will generally soon fail by brittle fracture because of the major change in elastic modulus that occurs at the g.r.p./glue interface. If possible, arrange to wrap the joint with wet out glass fibre rovings, (clean and roughen the surfaces of the members to be joined first). If straight glueing is unavoidable the best glue to use is the closest match available to the plastic component of the g.r.p. parent member (i.e. polyester resin for glass/polyester, epoxy for glass or graphite/epoxy). Polyester will not stick to wood or epoxy but epoxy will stick to wood and polyester. Nothing sticks to polythene, almost nothing to nylon. Flexible silicon rubber adhesives are very useful.

#### 6. Prestressed fibre reinforced structures.

It is very tempting to use curved (really prestressed) g.r.p. structures but there is a problem in doing so that should be made clear. Their advantage is greater rigidity (in the same way that a partly compressed spring requires much more applied force to create a given deflection than the same spring does in an uncompressed state). However, such structures frequently (and often inexplicably) break. The reason is that g.r.p. structures have quite poor capacities to withstand high temperatures. A glass/polyester component at rest (i.e. unstressed) will not fail until a temperature above 130 degree C is reached. At, say, 75 degree C the component will have strength much less than what its strength would be at 20 degrees C and this characteristic is time related. A g.r.p. rod stressed to a third breaking stress (20 degrees Centigrade U.T.S.) will fail after 6-7 minutes at 80 degrees C, 2-3 minutes at 90 degrees C and less than 30 seconds at 100 degrees C.

But are kites ever subject to this level of temperature? They are! Not when they are flying, temperatures during flying probably never reach ambient because of the cooling effects of airflow, but kites at rest or in storage, particularly behind glass in direct sunlight, get to a temperature of 120 degrees C and more. So, if you can guarantee that a kite will stay cool always, by all means experiment with curved structures. Note: the amount of curve is relevant: the bow in a Nagasaki Hata for example is quite safe as its probably only at an eighth to a sixth of its U.T.S. As a rule of thumb don't use a radius of curvature less than 5 X the minimum radius attainable without fracture occurring in cool conditions.

#### Conclusions.

Primarily because of their outstanding strength/weight ratio glass reinforced plastics are here to stay. They will have an increasing effect on kite designs and construction. As kite makers, we have not yet properly assimilated these new materials. We must first understand the characteristics of fibre reinforced plastic then we must cease to be blinkered by the techniques and skills we have acquired for dealing with traditional materials. It is a new dawn for kite making.

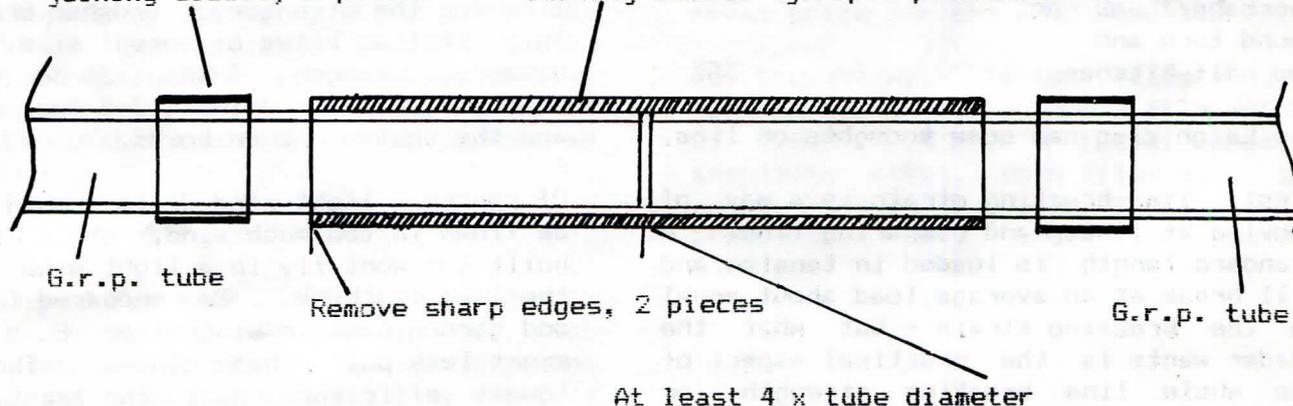
Glossary. G.R.P. - Glass reinforced plastic. F.R.P. - fibre reinforced plastic. A.B.S. - Acrylo nitrile butadiene styrene co-polymer. U.T.S. - Ultimate tensile strength.

Tubes taped to prevent

excessive movement of

joining sleeve, 2 pieces

Joining sleeve (g.r.p.) plastic or aluminium



Following the letter by George Webster about line (which appeared in the last issue) we had quite a reaction and this article is an attempt to give air to the different opinions we received.

The first letter came from K.Reedman.

Tests which I have carried out on several lines of differing stated breaking strains under static loading show that they all break at about 50% of the stated load. The break is always at a knot. If it was possible to obtain equipment which gripped the line without the use of knots then the stated breaking strength would probably be obtained. So if you can attach a line without a knot then that is the best way to do it. Otherwise use a Hunter's bend which is the best known knot. It will in some cases help to achieve up to 75% breaking strain and will usually give above 60%.

Following on about knots we had a letter from D.Wraight.

Clifford W. Ashley in 'The Ashley Book of Knots' states that his experiments provided proof that knots do weaken a rope, causing it to break just outside the entrance to a knot. He does not deal with the varying effects of different knots. However tests by others on a variety of lines and ropes tend to average out at the following figures:-

| KNOT                            | STRENGTH REDUCTION |
|---------------------------------|--------------------|
| Timber Hitch                    | 35%                |
| Bowline                         | 40%                |
| Reef Knot                       | 50%                |
| Sheet Bend                      | 50%                |
| Overhand/Thumb Knot             | 55%                |
| Round turn and two half hitches | 35%                |

Dan Leigh also had some thoughts on line.

First, line breaking strain is a way of looking at line, and comparing line. A standard length is loaded in tension and will break at an average load about equal to the breaking strain - but what the reader wants is the practical aspect of the whole line breaking strength (or Tensile strength) story.

Line is sold, sometimes, with a breaking strength shown on the coil. This is a guaranteed minimum, but no line should ever knowingly and deliberately be strained to anywhere near its breaking strength. Even if it were not to break, it would be weakened. Now, your SAFE working load should be one-sixth of your guaranteed minimum breaking strain. Age weakens the line, wear and tear, kinks, ultra-violet light, acids (in the case of nylon) all contribute to permanent weakening. Nylon is 7% weaker when wet. Knots, as a rule, may be considered to weaken a line by about one eighth, and it doesn't matter how many knots.

Nylon will, or can, stretch up to 40% before breaking. It is good at cushioning shock loads. Friction with other lines severs twisted line readily, braided line much less so. Always unwind crossed lines without pulling the lines against each other (do the kiteflyers shuffle). Bring the reels together and shake down the tangle.

Low drag is important to some people, but actually the main reason for using stouter line than you need is for trees. You're less likely to lose the kite with strong line. But for thermalling in light thermals, etc. light line is best. Rule of Thumb:- Use a breaking strain in pounds equal to 3 times the kite surface area in feet. For higher winds, the force of the wind increases with the cube of the velocity, so use much heavier line for strong winds. The heavy line will stabilize the kite with its inertia. A general rule of thumb is to use 35-50 pound line for light winds, 60-80 pound line for medium winds and 150-250 pounds line for the stronger, fresher breezes. This implies kites of normal size, for example, hexagons of about 34-36 inches diameter, 4 foot rollers; 7-9 foot deltas and the equivalent in boxes.

Of course a light wind delta should never be flown in too much wind, and a heavily built box wont fly in a light wind - but the idea is there. Be prepared for the odd strong gust in wintertime. Some kites exert less pull than others. Those of lowest efficiency pull the least. All this has to be vague because everyone's idea of a kite is different, and in my

own case, changing, as I've developed, recently, a whole range of small Deltas which pull like Bulldozers. I mean, I have to fly on 340 pounds line to do tests in ordinary light winds with kites of 7ft 9in span and 8ft 5in span; kites which I've flown with a variety of frames up to 1/2 inch in diameter. I've flown 34 inch hexagons on 250 pound line in 35 mph winds - until the sticks went !

Lastly on the subject of line we had the following from J.Clarke.

To answer the question on line referred, to as cord in the industry. This is a very wide subject and I can only touch on a few aspects of the suitability of various compositions.

There can be Hemp, Cotton, Sisal, Silk, Nylon, Polyester, Polyethylene, Polypropylene and Kevlar. There are many other names for the synthetics according to who makes them and they all have different properties according to their construction and finish. Nylon for instance has a great elasticity hence its use for towing ships or gliders. Sudden strains are absorbed but it deteriorates more than any other synthetic in sunlight.

Kevlar is the latest invention and is far stronger than all the others. It follows then that using Kevlar a 100 pound breaking strain line is no thicker than a 30 pound breaking line, but it has the drawback of having a very abrasive feel, will cut other lines down very easily and the price is ridiculous.

We are now left with polyester or polypropylene. As Polypropylene is almost unobtainable in the amounts used by flyers we are left with polyester as the most suitable choice.

There are two types of make up, twisted line or braided line. Strength for strength braided line is very much thinner than twist and therefore presents a smaller area to the wind thus less drag than the twisted line. The twisted line has a great tendency to untwist under tension and regain its twist when released thus, when reeling in on a tight line, there are great pressures put on

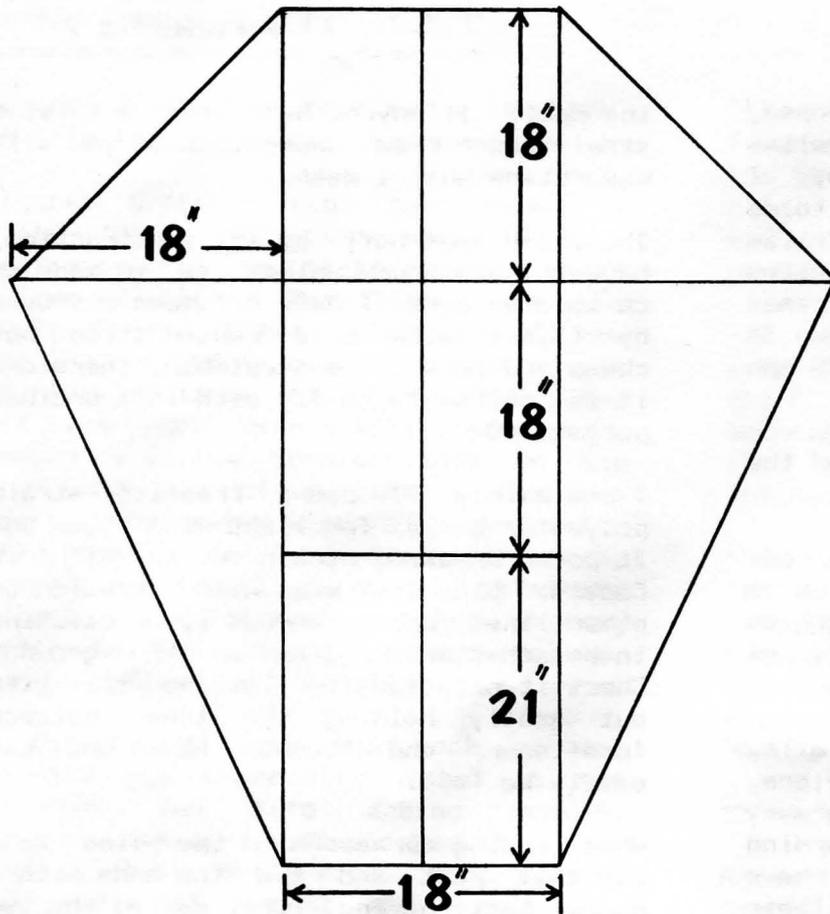
the reel. If anyone has seen a twisted steel hawser break under tension you will understand what I mean.

The braid does not, by its construction, have this tendency unless it is made up on twisted core. I have not seen any used by flyers with this construction but cheap job lots are susceptible, therefore it is advisable to fly with 100% braided polyester.

I use mainly 27 pound breaking strain polyester braid for light wind kites and 76 pound breaking strain for say 4ft 6 in Cody's. Line does wear with abrasion of other lines rubbing across it or catching in branches or dragging on the ground. Check it occasionally letting the kite out gently holding the line between forefinger and thumb. Abrasions can easily be felt.

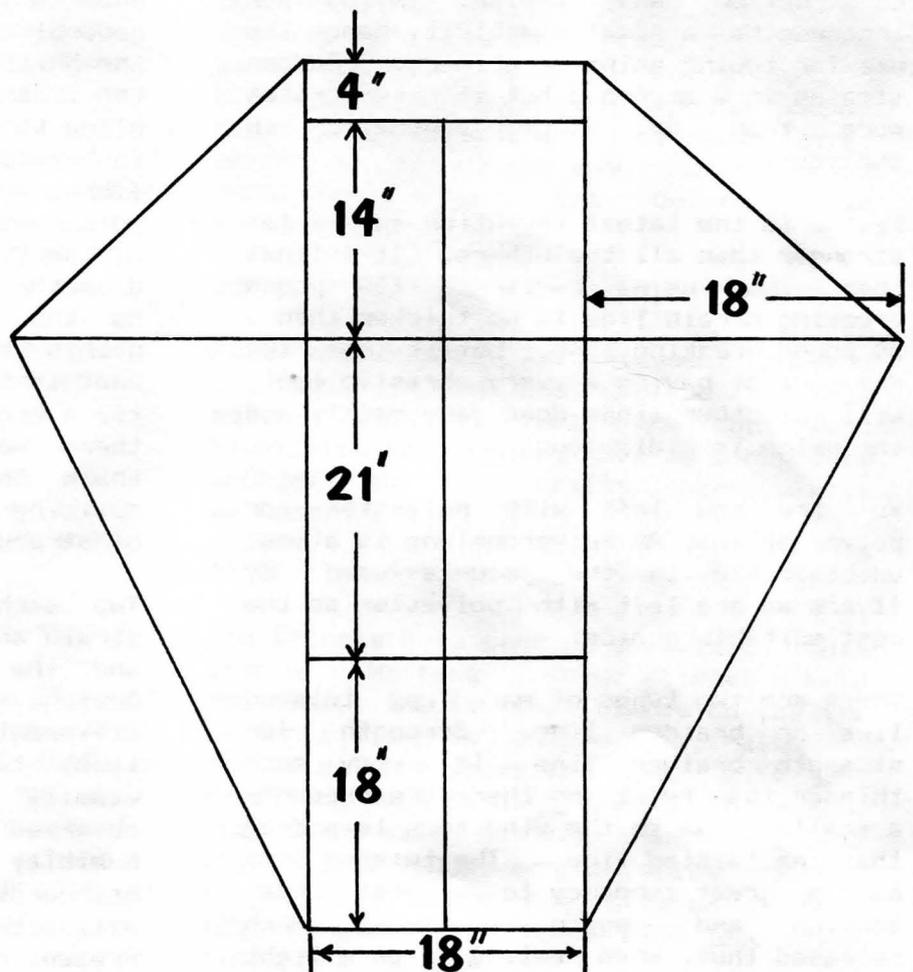
When finding abrasions on the line take out that part and tie the ends with a blood knot having first sealed the two ends to prevent fraying. Contrary to the general belief this knot does not halve the breaking strain. Some knots weaken the line more than others. So use the blood knot. The weakness caused by a knot is explained by the crushing action on fibres crossing each other under permanent pressure thus the round section of the fibre gets squeezed into a smaller diameter and is thus weaker in strength. As the blood knot has less pressure points it is the most suitable. A reef knot is next as not everyone knows how to tie a blood knot. When you see a coloured thread woven into a braided line it is there to assist the person who is splicing a join or an end loop. No loss of strength in a spliced line.

Two machines used for measuring breaking strain are the Instron Pneumatic Vertical and the Tensionmeter Horizontal screw Action. Both these machines have sets of different jaws to accommodate the various items to be tested. Test lengths are usually 50cms and lab conditions are observed regarding temperature and humidity as laid down in British Standards. While the test is in progress extension of the sample is also recorded. Present day cost £40 per sample.



Design by Dan Leigh. He says in the accompanying letter he wanted to send something different. The top design is a Conyne from a 1908 publication entitled "The Boy Mechanic". Cotton Broadcloth or cambric is the recommended cover. The wing spar is set in pockets at the wingtips, passes in front of the longerons, and should be tight enough so that the resulting slight bow causes the spar to be just tangential to the longerons. This takes careful fitting but the results are said to be worth the effort.

It was this kite which led Physicist Ray Biehler into his investigations of relative cell proportions. Both cells are actually too large and the better proportions and locations (Bottom kite) will reduce drag and improve stability and overall performances, all other things being equal. I reckon the best place for attaching the bridle is at the very front edge of each cell.



# MKEXTRA

MIDLANDS KITE FLIERS NEWS

76 OXHILL ROAD, HANDSWORTH, BIRMINGHAM, B21 9RH.



★  
★  
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★

HAPPY NEW YEAR  
AND  
GOOD FLYING IN '85

★  
★  
★  
★



## DATES FOR YOUR DIARY

SUNDAY 3rd FEBRUARY 1985.

FLY-IN, Foremark Reservoir, Derbyshire.

SUNDAY 3rd MARCH 1985.

FLY-IN, Walsall Arboretum.

SUNDAY 7th APRIL 1985.

FLY-IN, Sixth Birthday meeting at Walsall Arboretum.

SUNDAY 5th MAY 1985.

BRITISH KITE FLYING ASSOCIATION FESTIVAL, Old Warden Airfield.

SUNDAY 2nd JUNE 1985.

SHREWSBURY KITE FESTIVAL.

( The date of this festival may be altered in the near future. )

SUNDAY 18th AUGUST 1985.

FLY-IN, Rufford Country Park, near Ollerton, Notts.

(Arranged by Dennis England and members of the park staff.)

As yet no date has been arranged for the annual Kite Fliers Ball. Members will be circulated with full details in due course.

Unfortunately there will not be a repeat of the very successful Derby Festival this year. It is hoped to repeat the festival in 1986 as a regular bi-annual event.

## SEEN RECENTLY

On a recent visit to New York I came across a book that members may find of interest. 'Wind and Sand', the story of the Wright Brothers at Kitty Hawk, told through their own words and photographs. Although rather expensive at twenty dollars this book carefully reproduces many of the Wright Brothers original photographs together with details from their diaries. A real labour of love...

'Wind and Sand' by Lyanne Wescott and Paula Degen, published by Harry N. Abrams.

Whilst in the Big Apple we also visited 'Go fly a Kite' 1201 Lexington Ave, Very friendly people but we were disappointed with the quality and the prices of the kites on sale in this New York's major kite store.

## KITING GURU

I hope nobody missed the kite article by David Pelham, the guru of kites in the Times 29.9.84. The article contained a unique plan for a newspaper kite.

Copies of the plan are available from yours truly.



MIDLANDS KITE FLIERS

SCREEN PRINTED SHIRTS

The MKF are now able to offer screen printed logos for your own pre-washed shirts. (T-shirts or sweat shirts.) Printing in BLACK, the 230mm diameter logo will look great on coloured shirts. All profits go toward club funds.

Send £1.00 and .50p to cover cost of post and packaging together with your own shirt to Bill Souten at the M.K.F.

# AERODROME

*the magazine of the*

## **BRIGHTON**

## **KITE FLYERS**

### EDITORIAL

A Happy Christmas and prosperous New Year to all readers.

1984 has been a year of increasing activity by kiteflyers and this has been reflected in both media coverage and increased membership. 1985 should see a wider spread of activities, hopefully at reasonable costs and without major events clasing.

The club policy of only recognising events where dedicated/genuine kiteflyers are afforded free entry and car parking will continue along with the concept that a kiteflyer is not a solitary person-he/she will often be accompanied by a non-member (if only to keep the drivers awake on the return journey) and should be afforded the same freedom. Likewise only one subscription will be required per household-only one magazine will be sent for all to read!

On the membership side; 1985 dues will rise by 10p to £2.85 and will be due on May 1st, 1985 - individual remainders will not be sent. This increase is due entirely to postal and telephone costs.

Insurance wise the premium for new participants will be £ 2.60 ; to current holders, due to an events Insurance surplus will be able to renew their Insurance cover for 1985 for only £ 2.00 The policy passing on surplus will continue in 1986.

### Event Reports

#### Shoreham - Brighton Beaches November 10th

"Santa Claus sails in" - the gremlins struck - barely a breath of air despite Peter and Danny's attempts to get something airbourne. As a PR exercise with both Chamber of Trade and R.N.L.I. it was worth the soakings and one or two new ideas were tried out that will make the future events easier.

#### Red Hill - November 25th

Primarily a photographic do for local press but with the wind freshening and the sky blue it turned out to be a good day. Dave White had the triples airbourne while Dave Clements/Carol/John had bears dropping like confetti and Peter had the latest slodmod special on the end of a long string.

Churchill Square Shopping Centre - Brighton - December 11th

Bears galore - nineteen to be precise; of which seventeen made a mass drop from the top of the British Telecom Building as an attraction for the Chamber of Trade/Evening Argus Christmas Appeal, whose thanks go to Dave, John and Alice Clements; Peter King and Di Locke for getting it all together. 18 up is now a must for 1985 and with the sort of technology applied here 100 plus should be no problem!

Future Dates

Brighton Kite Festival - Sunday May 26th, 1985.

Same site (North Sheepcote Valley), but new date in the hope that weather/wind will be more favourable.

Fly-Ins: Sunday 6th January - The Red Hill (Dyke Site).

- " 20th January - Goring Gap (Worthing).
- " 3rd February - Telescombe Tye (Peacehaven)
- " 17th February - T.B.A. (Probably N.E. Sussex).
- " 3rd March - The Red Hill (Dyke Site).
- " 17th March - Beachy Head.
- " 31st March - T.B.A.

- All events will have CAA clearance-altitudes TBA-

Names and telephone numbers of the landowners of your favourite fly-in sites are still required-jot the information down and get it to either David White, Peter King or Greg Locke.

It is hoped to hold a mini festival in the West Sussex area during 1985- see Peter King with your ideas etc.

Twenty teddy bears parachuted from the top of the British Telecom building in Churchill Square, released by members of Brighton Kite Flyers.



TV's Lucy Morgan, Santa and Chamber president Mr Jeremy Buckwell watch the teddies

|               |                                                                  |
|---------------|------------------------------------------------------------------|
| 27th JANUARY  | HYLANDS PARK, CHELMSFORD, ESSEX. FLY-IN. E.K.G.                  |
| 3rd FEBRUARY  | TELESCOMBE TYE, PEACEHAVEN, SUSSEX. FLY-IN. B.K.F.               |
| 3rd FEBRUARY  | FOREMARK RESERVOIR, DERBYSHIRE. FLY-IN. M.K.F.                   |
| 10th FEBRUARY | LORDHILL SPORTS CENTRE, SOUTHAMPTON. FLY-IN. W.K.G.              |
| 17th FEBRUARY | THORNDON PARK, ESSEX. FLY-IN. E.K.G.                             |
| 3rd MARCH     | THE RED HILL (DYKE SITE). FLY-IN. B.K.F.                         |
| 3rd MARCH     | LORDSHILL SPORTS CENTRE, SOUTHAMPTON. FLY-IN. W.K.G.             |
| 10th MARCH    | SOUTH WEALD PARK, BRENTWOOD, ESSEX. FLY-IN. E.K.G.               |
| 17th MARCH    | BEACHY HEAD. FLY-IN. B.K.F.                                      |
| 31st MARCH    | THORNDON PARK, ESSEX. FLY-IN. E.K.G.                             |
| 31st MARCH    | LORDSHILL SPORTS CENTRE, SOUTHAMPTON. FLY-IN. W.K.G.             |
| 7th APRIL     | EASTER KITE FESTIVAL, BLACKHEATH, LONDON. FESTIVAL. B.K.A. **    |
| 8th APRIL     | EASTER KITE FESTIVAL, BLACKHEATH, LONDON. FESTIVAL. B.K.A. **    |
| 14th APRIL    | LORDSHILL SPORTS CENTRE, SOUTHAMPTON. FLY-IN. W.K.G.             |
| 21st APRIL    | THE GREEN, GREAT BENTLEY, COLCHESTER, ESSEX. FLY-IN. E.K.G.      |
| 28th APRIL    | LORDSHILL SPORTS CENTRE, SOUTHAMPTON. FLY-IN. W.K.G.             |
| 5th MAY       | OLD WARDEN AIR FIELD. FESTIVAL. B.K.F.A. **                      |
| 26th MAY      | BRIGHTON FESTIVAL, SHEEPCOTE VALLEY, SUSSEX. FESTIVAL. B.K.F. ** |
| 2nd JUNE      | SHREWSBURY BOROUGH KITE FESTIVAL. FESTIVAL. **                   |
| 21st JUNE     | FOKKER KITE FESTIVAL, SCHEVENINGEN, HOLLAND. FESTIVAL. V.O. **   |
| 22nd JUNE     | FOKKER KITE FESTIVAL, SCHEVENINGEN, HOLLAND. FESTIVAL. V.O. **   |
| 23rd JUNE     | FOKKER KITE FESTIVAL, SCHEVENINGEN, HOLLAND. FESTIVAL. V.O. **   |
| 23rd JUNE     | PETWORTH KITE DAY, SUSSEX. FESTIVAL. **                          |
| 27th JULY     | NETLEY FESTIVAL, SOUTHAMPTON. FESTIVAL. W.K.G. **                |
| 28th JULY     | NETLEY FESTIVAL. FESTIVAL. W.K.G. **                             |
| 25th AUGUST   | BOURNMOUTH FESTIVAL. HENGISTBURY HEAD. FESTIVAL. W.K.G. **       |
| 6th OCTOBER   | OLD WARDEN AIR FIELD. FESTIVAL. B.K.F.A. **                      |

|          |                                  |
|----------|----------------------------------|
| K.S.     | THE KITE SOCIETY.                |
| B.K.F.A. | BRITISH KITE FLIERS ASSOCIATION. |
| G.O.K.F. | GREAT OUSE KITE FLIERS.          |
| N.K.G.   | NORTHERN KITE GROUP.             |
| M.K.F.   | MIDLAND KITE FLIERS.             |
| E.K.G.   | ESSEX KITE GROUP                 |
| B.K.F.   | BRIGHTON KITE FLYERS             |
| W.K.G.   | WESSEX KITE GROUP.               |
| V.O.     | VLIEGER OP                       |
| **       | FESTIVAL.                        |



# An Alphabetical Guide to Kites & Kite Flying

- A** — Alpha star, Ace, Alloy tube, Aerobatic kites & Accessories.
- B** — Bat, Barndoor, Bonanza, Buzzard, an abundance of Box kites, Books, Boomerangs & Badges.
- C** — Cody Compound, Cody war kite, Conyne, Comet, Colarado roller, Cruiser roller, California dragon, Captain nemos & Centipedes.
- D** — Diamonds, Deltas & Dragons by the Dozen, Diamond roller, Douglas m2, Deep sky reels & D rings.
- E** — Eddy bow, Eagle, Eyelets & Eyelet pliers.
- F** — Flexifoil, French signal, Flare, Flutter, Facet, Four dekker, Fokker triplane, F3F-2, Fibreglass & Flying discs.
- G** — Griffon stunter, Gunther kites - a new range at The Kite Store!
- H** — Heart, Happy wings box, Hexagon, Hot air balloon & Handles.
- I** — Indian spools & Insects from China.
- J** — Jib rigged box, large & small.
- K** — Kite a maran, Kiskeedee, Kitelines, K.o.n.  
**Kite Store Ltd., 69 neal St., London. WC2H 9PJ. Tel 01-836 1666.**
- L** — Lamson, Larus star, Levitor & square Levitor.
- M** — Malay, Multiflare, Mini box, Mini dragon, Mylar & Magazines.
- N** — Neon star, Nylon line.
- O** — Octar the invincible Octopus, Open keel delta, Octagon & O rings.
- P** — Peter Powell stunter, Polycell, Phoenix variant, Parafoil, Photon, Prof waldof boxes, Patterned deltas & Paper kites.
- Q** — Quite the best selection of kites available at The Kite Store!
- R** — Ripstop nylon, Ramfoil, Reams of Rollers, Ramin dowel & Reels.
- S** — Strato box, Seagull, Sode, Suruga, Scirroco roller, Shooting Star, Sky pup, Spectra dragon, Sopwith camel & trainer, Spirit of St. Louis, Silk kites & Swivels.  
**Send S.a.e. for our latest price list.**
- T** — Tiger box, Thai jewel, Triplane roller, Tim bird & Tails.
- U** — Ufo hot air balloon.
- V** — Vampyre & some Very large kites!
- W** — Windspeed meter, Wright flyer, Wycombe delta & Windsocks.
- X** — heXagon, heXagon boX & heXagon diamond.
- Y** — Yakko, Yacht delta, YoYo bobbin.
- Z** — Zether ferrari ramfoil.