CHAPTER 1

The Invention of the Kite

1 Introduction

In May 2001, I gave a talk at The Kite Society of Great Britain's Convention at Weymouth. It used a set of notes and some visual aids; this is a written version which changes the argument only slightly to reflect some thoughts and information between then and now (May 2009). References in square brackets are listed at the end.

I first got interested in the how/where/when of kite invention when I realised some years ago that British books were quite clear that the country of origin was China (Hart [1] and Pelham [2]) whereas American texts, way back to Woglom [3] 100 years ago and carrying on to Yolen [4], mentioned Malaysia and South East Asia. Then, later, when I looked at the Chinese books available to me in English, I was struck by how implausible were their explanations of how the kite was invented. The original title for the talk was "What was the Name of the Man who Invented the First Kite?" because I was confident that the inventor was male but wasn't Chinese — and I guessed that at the start the audience would go for a Chinese name.

My original dissatisfaction with the explanations in English books was based on four factors.

Firstly, what I saw as European deference to things Chinese, particularly when compared to Malaysia/Indonesia. There had been European contact with Malaysia going back to the 16th century and in 1614 a Malay phrase book was printed in London (and no, it doesn't mention kites). In the 17th and 18th centuries as European empires were established in Asia, respect had to be given to China because of its size, its clear technical achievements and its lengthy recorded history. In contrast, Malaysians/Indonesians who hadn't built a Great Wall and couldn't point to an extensive written history were perhaps seen as uncivilised and not capable of major invention.

Secondly, Hart's great book has little to say about the origin and development of kites in the Indian subcontinent and Indonesia.

Thirdly, to look for the origin in the absence of written history you need some ideas about how kites spread in Asia and *what were they for?*

Lastly, I'm still unimpressed by most of the stories about the accidental invention of kites (see section 4 below).

The prime focus of this article is on the 'act of creation', i.e. the first time that a heavier than air device attached to the earth via at least one line was deliberately made to fly. My understanding of the current state of knowledge is that we will never know for sure but we can put forward theories and see to what extent they are supported by the facts.

My approach is to set out below what I know about the relevant factors and use them to make my proposal as to how the kite was invented.

The structure of the article is

2 Asia and the home of the kite

The 'Asia' shown on the map (Illustration 1) is centred on Indonesia (which for our purpose can include Malaysia and the Philippines). To the west we have Sri Lanka and the east coast of India (again for our purposes including Bangladesh), China, Japan, Polynesia and Melanesia with northern Australia to the southeast.

This is a large geographical area. Indonesia stretches east to west 3000 miles (about the same distance as from the east coast of the USA to the west coast). It also includes a sizeable part of the world's population. The four most populous countries are China, India, USA and Indonesia.

Illustration 1: Indonesia

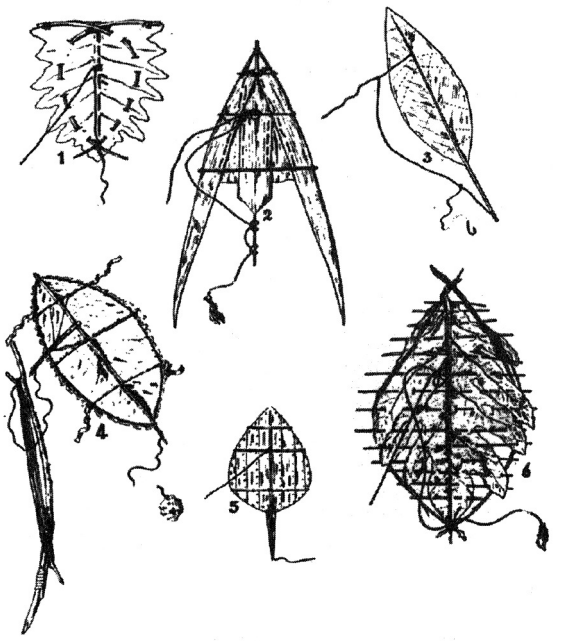
3 The materials used in kitemaking

There are three components of a kite-cover, frame and line; the first two can in some cases be combined, the third is indispensable.

3.1 Covers

Leaves — which may be both cover and frame.

There are many species of plants with large tough leaves, some of which may be flown by themselves as a kite, and others which can be reinforced with slivers of bamboo or leaf spines etc. In some cases the spines may project beyond the leaf outline and may have feathers, grass etc. attached. This helps to give balance directly and indirectly through the increased dihedral generated. Kites are also made by weaving leaves together and in some cases the pieces are stitched together with spines. Leaf made kites may be quite sophisticated, e.g. strips of leaves being used as a ribbon for interweaving. The Chinese still make a paper/silk kite in the shape of a bread-fruit leaf. Japan has a kite made with little adjustment from the leaf of the Japanese white-bark magnolia (see Hosking [5] p.80). Several types of leaf kite are used for fishing — see Illustration 2 and also Section 6 below.



Typical Fishing Kites. 1 Talaut Island. 2 Solomons
3 Banda 4 Admiralties 5 Marshall Bennet 6 Oleai

Illustration 2: typical fishing kites

Woven reeds — which can include woven split bamboo and similar.

These are used in Asia to make floor coverings and walls. Sails were made from reinforced woven reeds. Although woven materials of this type are porous by modern standards a woven hatch cover as described by Marco Polo undoubtedly will fly. 'Woven reeds' is an imprecise term — but look at the fishing kites illustrated in the stamps below from Palau, the British Solomon Islands and Papua New Guinea.

Illustration 3: stamps showing kite fishing

Silk

Developed about 2500 BC and capable of being spun into a fine thread, it can be woven into an ideal light wind-resistant fabric and has been used for kites for at least 2000 years. However until recent times it was not generally available and extremely expensive. So it was not found in applications where low cost was important, e.g. fishing.

Paper

Paper was invented in China about 100 AD and had spread to India within a hundred years but was not finally introduced to Europe until the 11th century. The original raw material was the bark of the mulberry tree, which was cultivated for silk worms. Originally its main use was for cheap clothing, being adapted for writing in about 100 AD. Paper seems to have allowed the spread of kite making within China and would seem to have been vital for the construction of the 'Indian Fighter'.

Other cover materials

Although papyrus could be used for making a kite, there is no convincing evidence that the ancient Egyptians did so.

Vellum, leather and woven wool are all north European products — again not used for kites.

3.2 Spars

While a fairly wide variety of wood is used for spars in the West and reeds are used in South America (yaripa in Columbia, also reed-framed kites around Lake Titicaca), until the growth of man-made materials, bamboo was the material of choice for kitemakers.

Bamboo is indigenous to much of our area. However, there is little bamboo in Africa, a very limited range of types in Australia and it is likely that until relatively recently it was unusual on smaller islands. Western kitefliers gradually understood that bamboo is not merely another form of timber but a material with unique qualities of strength, flexibility and lightness — with the ability to be cut into very narrow spars. I vividly remember bamboo scaffolding used for high-rise buildings in Hong Kong. Another property for kite makers is its ability to be simply heat-

treated in such a way as to retain quite complex shapes. Thin-walled bamboo is used for weaving into baskets, mats etc. So access to a range of bamboos allows a wide range of kites. Almost all kite designs until the box kite was developed at the end of the 19th century depended on the flexibility of the spars to produce dihedral and to survive impact — for which bamboo was ideal.

It is interesting that European kites, developed largely without bamboo, had to use devices such as tails to compensate for the lack of flexibility-induced dihedral.

3.3 Flying line

An essential component of a kite is the flying line. I don't know much about lines in Indonesia except that indigenous lines sank and European fine lines were a considerable technical advance. Fishing in this area traditionally used small nets, spears and fish traps in tidal waters — it often did not depend to a great extent on hooked lines. The main uses for line have been sailing and fishing. If, for the moment, we think of the first kite as being relatively small (e.g. 0.3 sq.m. or less) then fishing line is likely to have been the only available tether that was fine enough.

China developed a wide range of lines from lightweight to heavyweight rope.

4 The origins of kites as found in the literature

There are 'national' stories about the first kite, for example:

Bali — a goose feather

Egypt — a clay bird

Greece and China — a wooden bird

Japan — borrowed from the Chinese as part of one of the Japanese inspired technology transfers in the Nara period (649—794 AD)

There are also a series of explanations that basically claim that something, natural or manmade, suddenly behaved in a kitelike way. Hart[1] has a good selection, so has Hosking[5] and Chinese texts — which always claim the kite as Chinese and usually list several explanations (see also Needham [6] Vol. 4 Part 2).

The favourite is the 'coolies hat' i.e. the large (sometimes big enough to cover the shoulders) conical Chinese field workers' hat, made from woven bamboo/grass and with a long looped chin strap, long enough for the hat to hang on the back when not being worn. Non-kite fliers see it as obvious that one day, one was blown off in the wind and, held by the loop, flew. My response is to challenge anyone to fly a Chinese hat. In general cup shapes look as though they should fly — but don't.

Other explanations include

- the Chinese practice of shooting an arrow with the line attached. Apart from doubting whether an arrow would ever generate enough lift to fly as a kite, I have problems with using arrows attached to lines. I tried it once as part of an ill-starred attempt to get a kite down from a tree and found the initial short acceleration followed by long deceleration of the arrow very difficult to marry with a smooth line supply. But old-time harpooners did it.

- Hart[1] mentions a bull-roarer which I know of as a strip of wood rotated at high speed at the end of a line. The noise is impressive but how do you move from that to a kite?
- Tents and sails are suggested as providing 'chance' invention of the kite. I can well imagine that a tent in the Gobi desert blown away except for four guy ropes might fly. Similarly a sail might fly without need of a mast. My problem is that no early kite to my knowledge was in this form and the playsail was not invented until 1981 by Richard and Kathy Davey. I would have expected kites to have developed very differently if they had developed from sails.
- The best argument in favour of the sail is to imagine a square-rigged sail (particularly one having bamboo battens) and the mast flying free from the boat. That could produce something close to some early Asian kite shapes.
- Two 'chance inventions' remain. The first is that a leaf attached to a fishing line to give buoyancy in the wind might have become tangled so as to provide the bridling for lift and stability. This sounds convincing to me — see section 8 below.
- Lastly a long 'pennon' or 'pennant' banner with the first section stiffened to show the design when displayed from a pole could have been caught in its control lines in such a way as to fly flat to the wind — or become the Thai snake as we know it today. I don't know enough about early European kites to know how likely this is. Clearly it wasn't a major influence on Asian kites.

5 Kites in China

This section takes a brief look at early kite flying in China. This is relatively well recorded and available in English (Needham [6] Vol. 4 Part 2, Temple [7]).

Around 400 BC Mo Ti is said to have spent 3 years making a wooden (bird?) kite, which was wrecked after flying for one day. His disciples said how skilful he was. He said that making an ox yoke peg was more clever as it took one day, was very useful and lasted many years. If this exchange happened just after the crash then all kitemakers know how he felt.

Records tell us that 200 BC General Han Hsin flew a kite to measure the distance to a fort for his sappers to know the length of the trench required. I assume he wanted a very accurate measurement and I don't understand how he got this from a kite. If he measured the flying angle accurately and knew the length of the line he could calculate the horizontal distance to the kite. But he then had to look from the side to establish that the kite was flying over the walls. The word used in this story apparently means paper kite and paper hadn't been invented at that time. The records don't tell us the shape of the kite. This is also the case when kites were used for military purposes about 500 AD.

Up to about 800 AD kites seem to have been expensive (?silk) and confined to military uses. Later they were made from paper and cloth using bamboo frames. By

960 AD fitting them with wind harps was so common that the word for Wind Whistle came to mean kite.

At about this time the famous painter Suo Zhangshu was provided with a paper scroll by a friend who asked him to paint a picture on it. However, the scroll was several hundred feet long. Suo was annoyed — and then drew a child and a kite connected by a line the length of the scroll. The painting was seen as a masterpiece. I know this is a digression but I couldn't resist the story from Wang Hongxum.

The kite observed by Marco Polo in 1285 AD was made of a hurdle, or grating of withies and had eight lines. The incident is too well known to need repetition here but it includes a very practical account of how such a thing might fly. Interestingly it is the only kite recorded by him.

6 Kites and fishing

Having looked at the oldest documented kites, I now turn to kites for fishing. The jump is not as strange as it appears at first sight. My view of Chinese kites is that the documents have them appearing suddenly in a sophisticated form (wooden birds?) and if the kite were a relatively simple invention then the Chinese date of 400 BC is relatively recent. Fishing has a much longer history.

The use of kites in fishing is widespread and still practised. It is about 30 years since the keeper of the Eddystone Light specially adapted his kite to fly below the launch point, which was the top of the lighthouse, to enable him to clear the rocks and catch mackerel. Currently kites are used on various coasts of the USA. They are used for game fishing in South Africa. I have a contemporary New Zealand delta specially adapted for surf fishing using lines of lures.

Advantages of using kites are

- distance — the hook/bait/lure can be taken much further than by simply casting
- no shadow in clear water
- the bait can be danced on the water surface by moving the kite
- heavier and more fragile bait can be used.

Kite fishing is widespread in Indonesia and east to the Solomon Islands and Papua New Guinea (see Illustration 2 and the stamps in Illustration 3, above). Garfish and other top feeding fish with long teeth can be caught using a skein of cobwebs to entangle the fish's mouth.

Back in 1977 on Tobi Island (north of Papua New Guinea) fisherman used breadfruit leaf kites and coco-husk lines (*Kitelines*, Vol. 1 no. 3 (Fall 1977)).

In 1996 Ohashi observed fishing on Sumatra, the kites were 50/80m. from the boat and 5/8m. above the water. The catch was sold to a canning factory (*Kitelines*, Vol. 12 no. 1 (Summer 1996)).

In 1997 Peter Lynn saw kite fishing using natural materials in southeast Sulawesi. He also noted that manu was both the local word and a Maori word for kite.

In Lombok (east of Bali) the Nausatenggara kite was used, made from bamboo and banana tree bark — the traditional materials for canoe sails. The form of the kite –a central spine and two elliptical pockets– has a striking similarity to the wau of Malaysia, a Vietnamese kite, the rigid wing bird kites of northern China and, perhaps, Mr. Chula's Thai kite (see also *Kite Passion*, January 1997 and February 1998 and of course Tal Streeter in *Drachen* 9 (Spring 2002)).

There is more about kites and fishing in Appendix 3.

7 How kites spread across the world

I suggest that kites had five purposes in their early history:

- their use in fishing
- their use in traction (the Polynesians used kites to tow rafts)
- their religious symbolism (many religions have deities located in the sky)
- their use in divination/meteorology e.g. the Marco Polo observation, the Maori religion
- their use in war for various purposes (not just in China; kites were used to carry a fireball in 7th century Korea).

Kites, like any other innovation, spread in one or more of three ways:-

a) people who used kites moved
b) communication spreads good ideas
c) kites were traded.

Looking at a), b) and c) in more detail:

a) Since I don't think there is a clear idea as to when kites were invented, it is hard to know which population movements were relevant.

Although my knowledge is sketchy, I understand that there is evidence that 50,000 years ago the people living in coastal China migrated via Oceania to Australasia. About 10,000 years ago water levels rose in coastal China and there was emigration to Indonesia and Polynesia — a process which perhaps continued up to three thousand years ago. There is evidence that New Zealand Maoris originated in Indonesia or thereabouts, movement continuing as recently as 500 AD. There are linguistic links across our whole area from Madagascar to New Zealand via Indonesia (but excluding Australia which of course has no ancient kite flying tradition). There is abundant evidence of extensive seaborne movement across our area for thousands of years.

b) The only identifiable example of kites being imported is from China to Japan. Reading Hosking [5], I am struck by how differently kite making has been

traditionally organised in the two countries. The Chinese tradition seems to have allowed much greater freedom to experiment with form. But Japan has such superb graphics … dangerous stuff this. But of the 300 or so kites illustrated in Hosking's book [5], there are only half a dozen bird kites, compared to the wide range of Chinese birds. And about 20% of the total are some form of the multi-sparred multi bridled flat kite of which the Edo is the best-known example.

c) Trade and political links have existed across our region for a long time.

In 200 BC there was a Greek Ambassador to India. By 48 BC it was possible in Rome to decide to visit Western India — the route was to get to the Red Sea and then take a wind-assisted galley to India.

By 500 AD there was regular sea contact between India, Malaysia/Indonesia and China using 'trade winds'. These enabled ships to sail with the wind to Malacca/Jakarta and then wait for the trade wind reversal 6 months later to give them a favourable wind home.

The role of China in trade across the region is complicated. From many centuries BC until about 400 AD most trade was overland to Persia and beyond via 'the Silk Road' — this however became unusable for a period after that date but was back in operation before Marco Polo.

While China did have maritime contact with India –e.g. in 413 AD a Chinese Buddhist travelling to India complained of the seas near Indonesia being 'infested with pirates' (they still are)– it used Arab and Indian craft. China had ocean going ships only after about 800 AD and government support for ocean going craft really only developed in the 12th century AD.

My conclusion is that in the early part of the period China was less important than Indonesia and India for sea trade.The reasons why there was comparatively little trade with a country which certainly up to 1200 AD was not simply dominant by size, but led the world technologically were ideological — actually religious. Confucian thought, from 6th century BC, saw China as the whole world, and thought that farming and government service were worthwhile activities but that commerce was not. Not until the 6th century AD did the Tang Dynasty (partially Turkish) mix the Confucian view with broader horizons from the new multi-ethnic China. Emperors then started to 'trade' in order to obtain another source of income besides domestic taxes and used the idea of 'tribute' e.g. Chinese ships visited with 'presents' and received tribute in return. So for 150 years from the early 13th century China had the best ships in the world. The 'Treasure Fleet' that made several voyages 1405-33 included nine masted ships which were 120m. long (Columbus managed with 27m.). There were many ships over 60m. long. They visited Taiwan, the Persian Gulf and East Africa (and there is some evidence that one got to Northern Australia). They weren't interested in Europe's exports of wool and wine. Just as European shipping expansion started the Ming emperors withdrew China from ocean going which they made illegal. The reasons were partly

military requirements, partly internal politics and partly for Confucian reasons in which trade was again seen as not an honourable activity and certainly not a proper interest of government. By the time China started to trade again, with Portugal and Spain in the 1550's, its technical know-how had been lost.

8 Putting it together

In the previous sections I have set out what I know which is relevant to answering the question 'who invented the first kite?'

For me the kite was invented by an 'act of creation' which produced the first object which flew on the end of a line. The act of creation was not the result of someone answering the question 'How can we get a heavier than air device to fly on the end of a line?' by sitting down, working it out and then building a trial kite (sorry Mo Ti). Only observation and intelligence were available — a decent understanding of how lift arose didn't exist until the very end of the 19th century.

So the act of creation was something

- which had an immediate payoff and was therefore memorable
- which could be repeated.

I can think of three scenarios which might meet the requirements.

The sail — it is easy to think of situations in which a sail might fly rather than merely flap. There are two arguments against this being the source of kites.

- what would have been the immediate benefit to the sailor
- as mentioned in section 4 above, kites don't seem to have emerged as 'playsails'.

The ships hatch cover — Marco Polo vividly describes flying a hatch cover with a man attached. So perhaps a 'rogue' hatch cover led to the idea of using this flying object to lift a weight. Man carrying kites were an early use recorded in China. Their descendents might well be the Edo-type kites of Japan. However, this was not the type of kite which spread from Indonesia to Europe.

The leaf — The most convincing act of creation for me is the fisherman who, like his forebears and fellows, had used a large stiff leaf to blow his line and bait across the clear waters in an atoll. Distance was a good thing as it brought new fish into his scope. One day as he made his cast the line got tangled with the leaf, by chance providing the correct flying angle, and to his surprise his bait went further and the line wasn't in the water frightening the fish. More fish, worth trying it again, perhaps helped by competition from fellow fishermen. Developments would include larger, more stable leaves etc. Since this required simpler technology than large ships with hatch covers it could have occurred not in 400 BC but say, 4000 BC.

This type of kite which has a central axis is still widely found in our region, exists in a refined form as the 'Indian Fighter' of India, Pakistan, Bangladesh, Afghanistan and parts of China — and fits as an ancestor of the European Archtop and Peartop, the Diamond and Eddy.

Tal Streeter [8] points out (p. 169) that the Moon Orchid leaf is naturally symmetrical and dries to a natural dihedral curve.

9 Conclusion

I go for the fisherman, probably in the area today known as Indonesia. It is good to know that Peter Lynn also has that view (see his article 'What if the kite was only invented once?' in *Drachen* 20 (Fall 2005)).

I have no idea when that might have been. What is claimed to be the oldest representation of a kite — the Muna Cave painting (see *Drachen* 11 (Spring 2003)) remains undated. It is in that central Indonesia area where kite fishing is still practised, and not all that far away from where human remains are being steadily dated as being older and older. Perhaps our best estimate for the date of invention will come from archaeology establishing dates for fishing lines. I would find it easy to accept the idea that the kite was independently discovered in China in the form of the basically rectangular multi-sparred kite which is now associated with Japan.

Of course I realise that this chapter can do no more than suggest a solution to the question. I'm aware of the limits of my knowledge in various areas touched upon. I am also aware of the great holes in what is known in Europe. I understand a history of Indonesian kites is in preparation. I've read of research suggesting early kites in Hawaii. But I don't know of any history of Indian kites in English. Nor do I know of any work on the very old links between kites of Malaysia, Thailand and Indonesia.

My main hope is that readers might find the approach interesting and experts contribute to refuting, or supporting, the ideas which have been aired.

10 Bibliography

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