

**1 Introduction**

“The best thing about box kites is the crunch it makes when it hits the ground. It sounds like someone dropped a load of kindling in a parking lot”.

“Stormy Weathers” in *American Kite* (Fall 1996)

Chapter 3 on the ‘Golden Age of Kites’ dealt with the box kites of Hargrave, Cody & Bell — of whom Hargrave is generally agreed as the major influence on box kites. (Lecornu was omitted but is included here in Section 2.) Section 4 of Chapter 3 accepted that there are some box kite developments in the last half of the 20<sup>th</sup> Century which are different enough from Hargrave’s designs to be treated ‘as new’. They were developed in a different climate from the ‘Golden Age’ — for example the ‘needs for kites’ listed in that article had basically been satisfied in other ways and these kites were all recreational except for the Rogallo Corner Kite.

Of course there are those who argue that all box kites are descended from Hargrave — certainly a look at his designs (e.g. as shown in Hart [1] p.137-139 & Pelham [2] p.36-37) makes me wonder how many of the experiments using circles, tubes etc. rather than straight edged boxes might be worth further development using modern materials e.g. carbon fibre and Icarex. It also reminds me that contemporaries often used the word ‘cellular’ rather than ‘box’.

Hargrave certainly flew kites where the lifting and stabilising surfaces were the cross or circle types shown in Illustration 1, which shows front and side elevations of some experimental types. None of these have produced designs much used today. There is a very odd book indeed by Jordan [3], which includes his patent (Illustration 2). More relevant is the easily available book by Michael [4] which has a Ringwing kite made from card and carbon fibre (and also Dracula’s Cloak but more of that some other time).

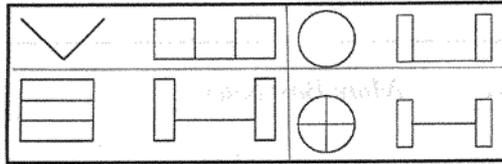


Illustration 1: front and side elevations of four Hargrave kites

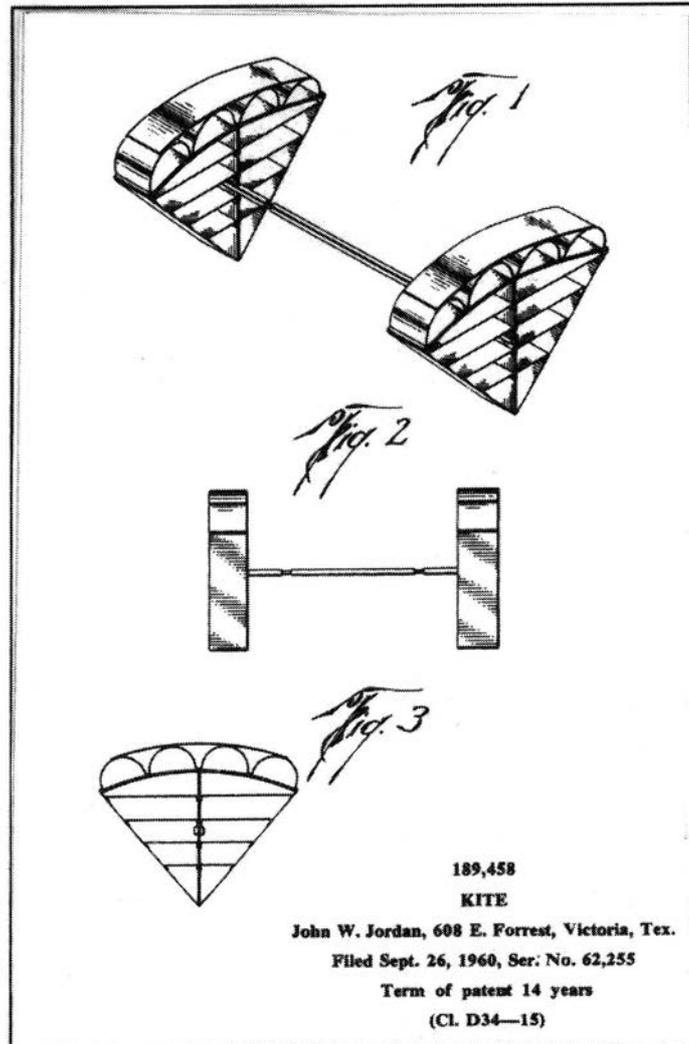


Illustration 2: Jordan's patent

The two key features of 'classic' Hargrave boxes are, firstly, cells which are given their shape by diagonal bracing and secondly the common use of identical cell shapes mounted one behind the other and connected by a single spar or system of spars.

## 2 Lecornu

Lecornu's boxes followed Hargrave very quickly and were quite different. J. Lecornu (there is a question about the spelling of his name. His descendants use Le Cornu, he himself used Lecornu) was a successful French administrator who developed a very different approach to cellular (or box) kites from those associated with Hargrave. Hargrave had a general form which was to have two cells or sets of cells joined by spars so that the kite flew with a front cell and a back cell. The distance between front and back was greatly influenced by the need to get clean air to provide lift to the back. One extreme variation was to reduce the distance to zero by making the top of the first cell extend to become the bottom of the second cell. (See Illustration 3, from *Kitelines* vol. 11 no. 1 (Fall 1994).)

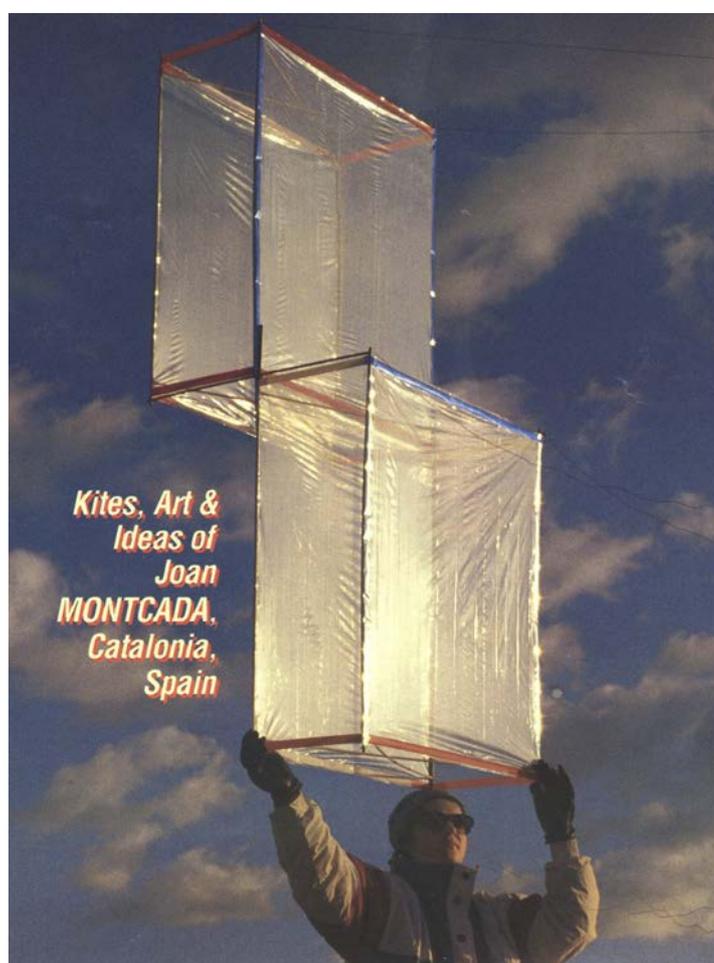


Illustration 3

Lecornu had all the cells of his kite designs mounted on one plane. I know of two main designs. The first is the 'ladder', 'bookcase' or *étagère* kite shown in Illustration 4. I've not seen one, but Paul Chapman, who has built one, claims that neither his nor the originals flew very well. Notice the use of a rod to keep the bridles apart, a device used on other French kites.

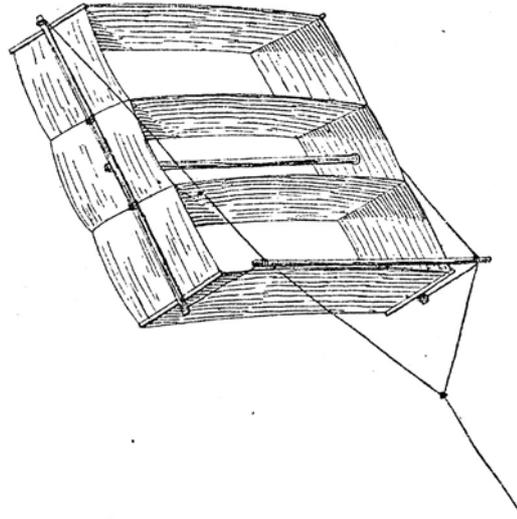


Illustration 4: Lecornu's Ladder Kite

The second is Le Gauffre (or Waffle) kite. The derivation from a single bird's dihedral is shown in Illustrations 5a, 5b and 5c. The kite can be flown 'square' as in 5c, or on a point as in Illustration 6. As a further variation, the cells can be at right angles to the face of the kite, which then flies tilting backwards at about  $15^{\circ}$ , as in Illustration 6, or can be arranged on a  $15^{\circ}$  diagonal resulting in a spectacular kite which flies vertically. See Illustrations 7 and 8.



Illustration 5a

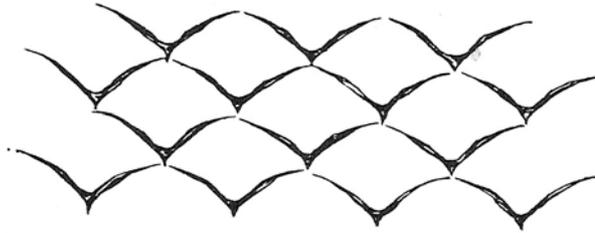


Illustration 5b

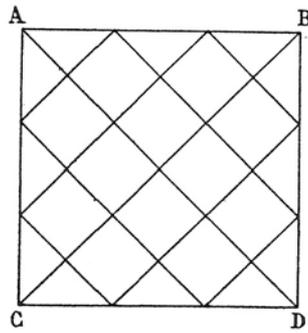


Illustration 5c

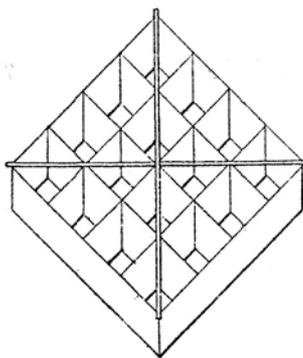


Illustration 6

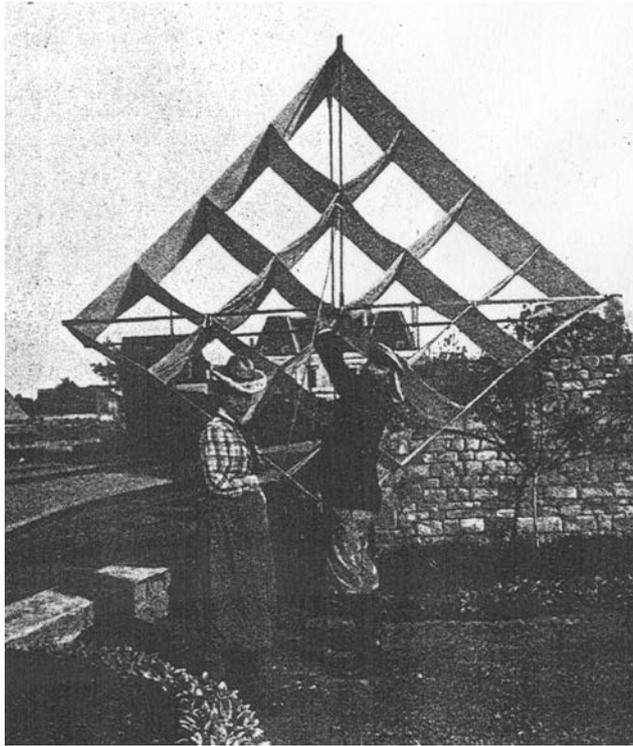


Illustration 7

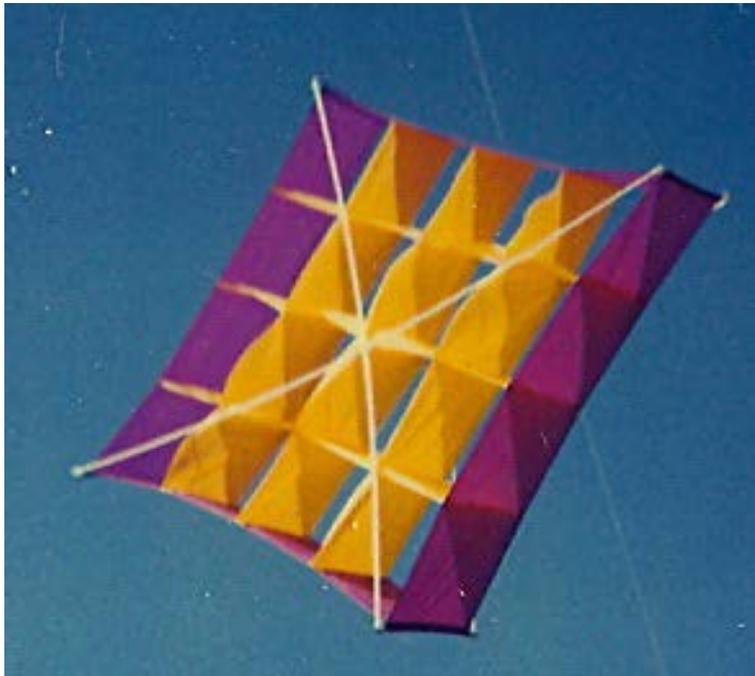


Illustration 8

Lecornu's excellent book *Les Cerfs-Volants* (1902) can be found, but not translated into English. There is a good article about his life in *Drachen* 5 (Summer 2000).

A common feature of modern box kites is that they use perimeter framing. As we will see this means no piercing of the kite fabric – better aerodynamically and generally tidier.

The three major types of modern box are

The Flaix/Rogallo Corner Kite

The Waldof Box

The Facet.

We will look at each in turn.

### 3 The Flaix/Rogallo Corner Kite

(see Illustrations 9 and 10)

The Flaix and Corner Kites. Shown front and side elevations.

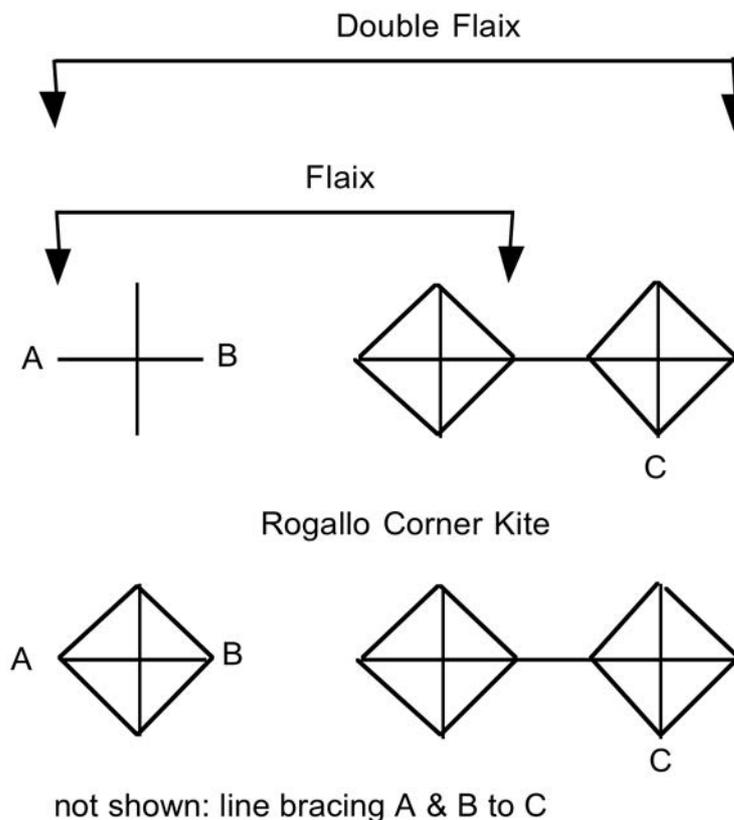


Illustration 9

Writing about the Flaix Kite, Mark Cottrell[5] called it ‘probably the only well known kite to have been successfully invented twice’, firstly by P. Flaix in 1910 (?) and secondly by Francis Rogallo who got a patent in 1957. But it might not be that simple; see below.

The original Flaix design (see Hart and Pelham (*ibid.*)) was a single cell kite comprising two squares of material joined at their diagonal with a central spine and two spars extending the four blades (see Illustration 8). The kite might be edge flown (+) or square flown (x) as was the original. Further work in the 80’s led to an increase in the number of blades using Rogallo’s perimeter sparring. Cottrell’s book suggests the best formats are five or nine blades square flown or seven or eleven blades edge flown. The few Flaix seen nowadays are almost always four-bladed. From slight personal experience bridling can be tricky with the kite susceptible to pitching. In the early 1980’s the double Flaix was produced (see Illustration 9). This solves pitching problems but does require bracing to keep the blades in line. That describes the development of a 1910 kite in the U.K.

There is a brief account of Francis Rogallo’s invention of the Corner Kite in *American Kite*, Fall 1988. From this it is apparent that neither he nor the writer knew of the Flaix. The US Navy in the 1950’s was looking for a radar reflector, imagining an angular metal object a few hundred feet up – but how to keep it there when the ship is moving? Rogallo’s solution was the aluminised Mylar Corner Kite. I don’t know whether the US Navy ever used it but for several years in the 1970’s a version for kite fliers was marketed in *Kitelines* magazine.



Illustration 10: Rogallo Corner Kite

For me the most important feature of the Corner Kite (see Illustration 10) is its construction – it was to my knowledge the first kite to use spars under compression around the perimeter of the points of the blades rather than cross-spars. My Rogallo Corner Kite used thick denim for its pockets. These gripped the spars sufficiently to hold them while you completed inserting the four spars around each cell. Kites using perimeter spars are notoriously difficult to erect single handedly. More significantly, the spars must be strong and rigid enough for the last one to be forced in under considerable pressure otherwise the kite will flap or distort too much when flying. Stretched cell edges are another problem. However, the great advantages of this system are that an odd number of blades can be in the design

and, more importantly, that the blade surfaces are clean, as they don't have to be pierced by crossing spars. All this and a weight saving. This opened the way to the Facet Kite; but first.....

(Since I first wrote the above I've read the book by Bill Thomas [6]. He mentions the 'Wide Fin-Keel' named after Lt. Wise who experimented with kites for military purposes (see Chapter 3). The version shown uses Tyvek and wooden blocks but does look like a Flaix and would predate it. But there is more. He shows plans for a cruciform kite (Illustration 11) saying

Little is known of the origins of this outstanding kite, except for a sketch that appeared in the German publication 'Flying Sport' prior to the Second World War.

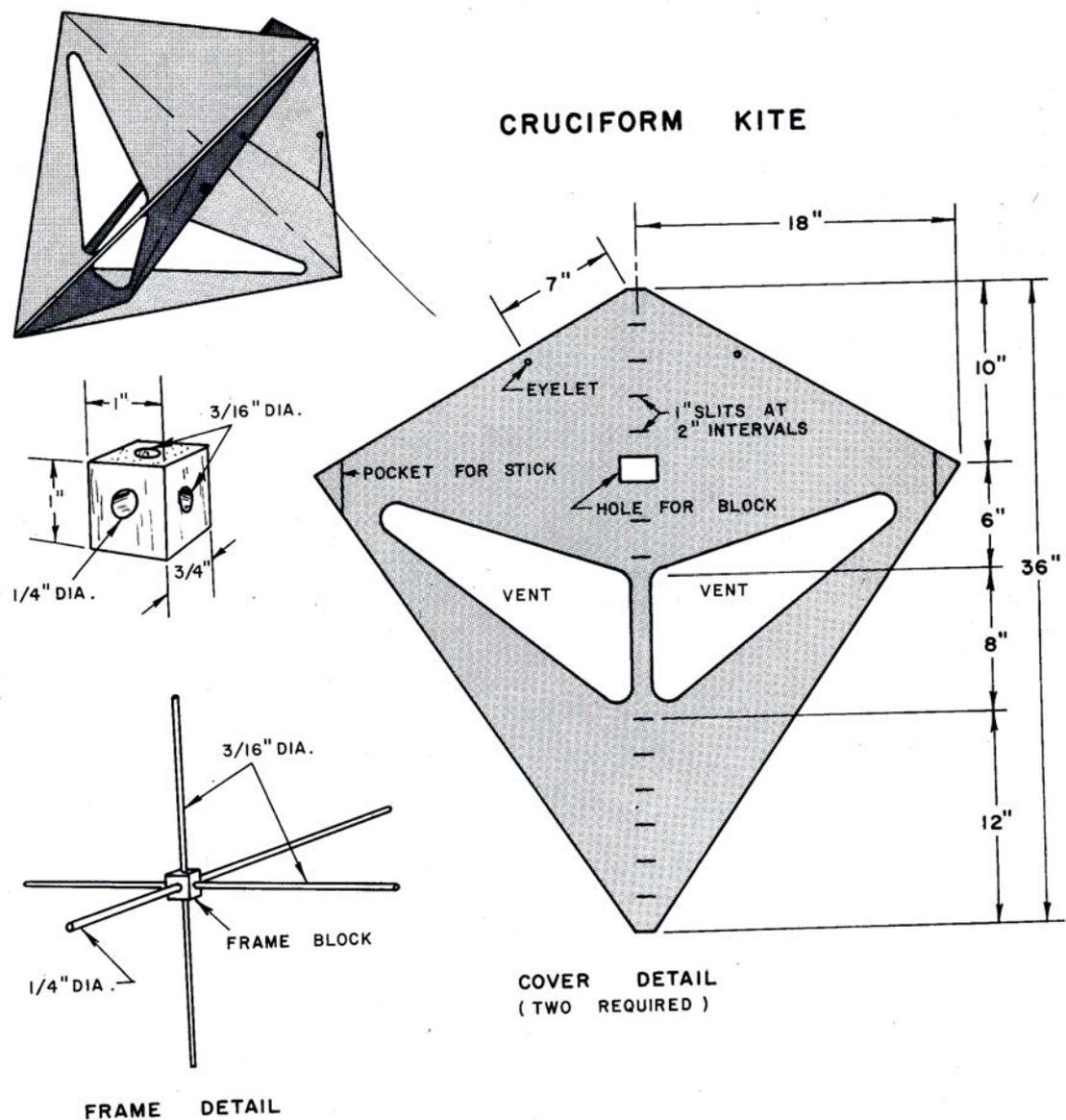


Illustration 11: from Thomas [6]

## 4 The Professor Waldof Box Kite

In the period roughly late 70's – mid 80's Peter Waldron developed several innovative box designs but this was easily his most influential design from 1977 (see Illustration 12). The kite was twice as wide as long and had a unique 'look' with its six points and internal cells (Bell influenced). However it was about the last cellular box that used cross spars, in this case joined at a machined nylon block central fitting. It has recently been revived and one or two originals can be seen – but I haven't spotted the triple celled version or the six in a cluster variant for years. (See *Kiteflier* 112 (July 2007).) Other Waldof kites were: Waldof Star, SuperStar, Magic Box and the Tetrahedral referred to in Chapter 3



Illustration 12: Waldof Box

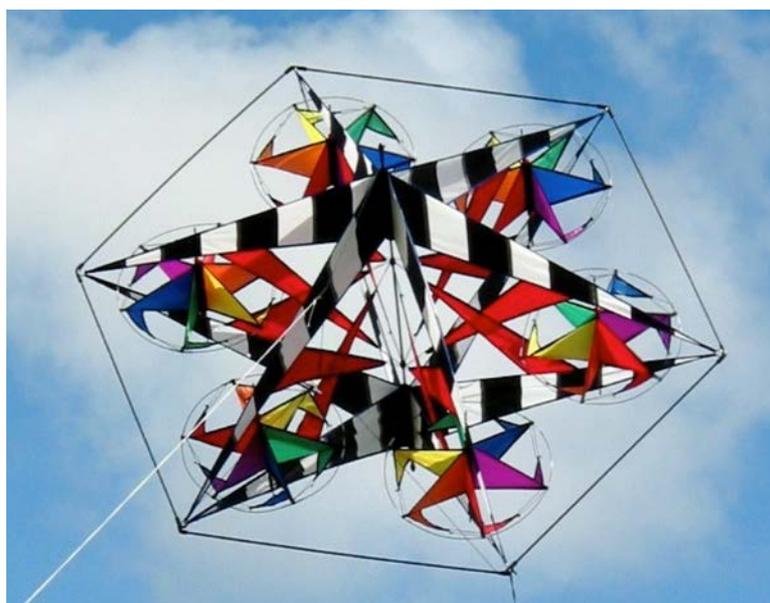


Illustration 13: Snowflake Kite

## 5 The Facet Kite

At about the same time Stephen Robinson developed the Facet Kite. He is the least well known of British kite inventors with his contribution recognised in *Kitelines* vol. 3 no. 1 (Winter 1979/80). This design exploited the property of perimeter spars to allow a large number of points (six or eight) which could then be developed with a honeycomb effect or more famously as the ‘Snowflake’ (see Illustration 13, although in the original version the kite was square). Many variations have been produced. Some (such as Mark Cottrell’s design, see Illustration 14) have similarities to Lecornu (acknowledged as an influence by Robinson); others, such as Peter Malinowski’s honeycomb stars had a very high aspect ratio and used his radial spars. I suspect this was because the pressure required on perimeter spars could cause the kite to twist. The minute shrinking of ripstop in warm dry conditions can cause the kite shown in Illustration 14 to twist.

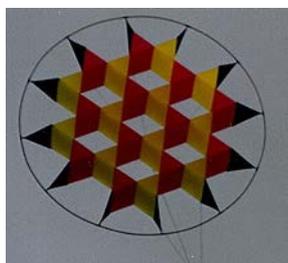


Illustration 14: kite by Mark Cottrell



Illustration 15: Starflake Kite

## 6 Conclusion

The first thought is that although ‘box’ is shorter, ‘cellular’ is a better description of these kites. The new box kites mentioned in Sections 3,4 and 5 had influences into the early 1990’s which interacted with each other. One example was Kathy Goodwind who seemed to be influenced by the Waldof Box and the Facet to produce the Asteroid and Starflake (see Illustration 15). Single celled and using cross spars the

kites would ‘tumble’. The technique was to let line out faster than the downwind drifting speed of the kite which would then rotate so as to wrap the line loosely around itself. Pull in the line and it would unwind and climb, a popular feature for a while in the 1980’s.

These three modern box kites don’t seem to have caused much further box kite development over the last ten years. Peter Lynn’s first design was not a soft kite for which he has been the leading developer but a ‘Tri-D’ Box Kite designed for ease of construction (see Illustration 16).



Illustration 16: Tri-D Box Kite

Older designs have made a ‘come-back’, notably the Cody – which is to be found in the range of the major American commercial suppliers. The ‘Cotton Club’ in Europe produces faithfully accurate representations of the early Hargrave based designs developed in Germany and France [7]. Two forms of recent cellular kite have made it to Chapter 10 on Exceptional Kites: Anke Sauer’s Jack-in-the Box and Phil McConnachie’s E.O.

## 7 Bibliography

- [1] Hart, C. (1982) *Kites: an Historical Survey*.
- [2] Pelham, D. (1976) *Kites*.
- [3] Jordan, J. W. (1982) *Make your own Kites*.
- [4] Michael, D. (2000) *Step-by-Step Making Kites*.
- [5] Cottrell, M. (1988) *The Kite Store Book of Kites*.
- [6] Thomas, B. (1977) *The Complete World of Kites*.
- [7] Diem, W. and Schmidt, W. (1993) *Drachen mit Geschichte*.