

All kite books with an historical section include something about Benjamin Franklin and his ‘electric kite’. This article reviews what is known about it and ends with an attempt to recreate part of it.

American books are particularly fulsome as Franklin was an important figure in their 18<sup>th</sup> century history. There is a book by Asimov [1] which claims that the kite experiment, by giving Franklin great prestige in England and France, meant that he was uniquely able in 1776 to get the French aristocracy sympathetic to the American Revolution so that they gave support to Washington through to his later victory.

‘The experiment’ was to stand inside a dry building (and therefore to be insulated) and to fly a kite topped with a metal spike up close to thunderstorm clouds. At the lower end of the line was a silk ribbon with a metal key and offering a knuckle to the key would produce a spark. Franklin could then store such charges in a Leyden jar and by experiment show that the force was the same as the electricity which was usually, at that time, generated by a friction device. He also advised that you would get a better charge if the kite and kite line were wet. Clearly there were dangers, not emphasised by Franklin, for someone outside the hut if the charge went to earth that way.

The experiment appears to many to be well documented as we have an account by J. Priestly and Franklin’s own words regarding the construction of the kite etc.

Priestly wrote 14 years after the event how Franklin took his kite to a shed in the fields but ‘dreading the ridicule which too commonly attends unsuccessful attempts in science’ had only his 21 year old son as a witness.

Franklin’s own description of the kite is famously ‘make a small cross, of two light strips of cedar; the arms so long as to reach to the four corners of a large thin handkerchief, when extended; tie the corners of the handkerchief to the extremities of the cross, so you have the body of a kite; which being properly accommodated with a tail, loop, and string, will rise in the air like those made of paper; but this, being of silk, is fitter to bear the wet and wind of a thunder-gust without tearing. To

the top of the upright stick of the cross is to be fixed a very sharp-pointed wire, rising a foot or more above the wood'. (Philosophical Transactions).

The general view is that de Romas and others in France did do it and that Franklin did it himself in June 1752 before he could have known about the French experiments. Further development in France by Le Monnier and Mazeas showed that in a blue sky you can get a charge (we can confirm this) and Cavallo showed that it was the line, not the kite, which collected the charge. This was already known from Wilson's experiments in England in the 1740's, who collected large charges from insulated twine quite close to the ground.

However, the American Tom Tucker has written a book [2] arguing that Franklin never actually did the experiment (see *The Kiteflier* Issue 96 for a review).

His reasons include:

- In his description he never actually said that he did it and there is no detail — unlike Franklin's usual scientific approach
- The only description of it being done was written 14 years later and suddenly introduces his son
- It is impossible (see below)
- He seemed not to know of the dangers in the experiment, to be unaware that a wet line wasn't needed etc.

But would Benjamin Franklin have made a false claim? Remember he was one of the foremost scientists in one of the 'cutting edge' areas of his age and he had earned great respect for his earlier work. It is Franklin who first used the terms 'positive' and 'negative' which we still use. The experiment was linked to the development of the lightning conductor, which undoubtedly was Franklin's invention and which has been extremely important. It was very important in his own time; east coast America has many electrical storms and lightning damage was a real and important problem, particularly with wooden buildings.

Remarkably it does seem possible that he made it up. He carried out many hoaxes in his long life of which the most famous was the story of Polly Baker defending herself against a charge of fornication having just given birth to her fifth illegitimate child. This was a well-known case which was debated in America and Europe — and it wasn't until 1778 that a laughing Franklin admitted that he had made it all up. Franklin did feel that some of his work had been 'stolen' in England and possibly felt that to describe a plausible –but risky– experiment might have interesting results.

Was it possible for a kite as described to fly and support 100g. (the weight of the key described)? Tucker claims to have tried and failed to lift such a weight. The kite made from a 75cm. ladies silk handkerchief (much larger than a man's) would have been 60cm. x 60cm. Tucker does describe using a modern kite with plastic cover and spars but gives no description and fliers know that much depends on the design of the kite. Even without the metal spike and using fishing line he couldn't

lift the key. The French used 1.8–2m. tall archtops. If you try to reduce the weight problem by having the key at the lowest point (i.e. also being raised by the fliers hand) you are still short of lift but more particularly how do you fly this out of a window, up to the kite but back far enough to allow you to keep dry.

So Franklin never categorically claimed to have flown a kite which anyway wouldn't have done the job. But what a gift to illustrators. There are some good ones in Tucker (and also Yolen[3]). Do look at some. The son is the youngest 21 year old I have ever seen. The kite is an archtop or a diamond, never square. The hut is often omitted and the wind incredible.

But it is a good story.

Two hundred and fifty years later, Malcolm Goodman asked me to assist him as he had been retained by a T.V. film company to provide the kite flying expertise in an attempt to recreate the results of Franklin's experiment. So early one morning in November 2004 we presented ourselves at Warcop Barracks, about 30km. west of our village. We were then given permission to drive through the firing ranges to a location on the outskirts of Murton — actual flying was up Murton Fell at about 450 metres — top of fell about 650m.



We were met by two setbuilders from Leeds whose main problem was that the girl needed a loo and was not prepared, given her one-piece outfit, to use the local public facilities — or stone walls. They left in search of succour to be replaced by a farmer and tractor hired to help move the kit up the mountain. He was followed by a

firm 'Borderloos' whose aim was to help but were a little late on site (see Photo). At this point it seemed to me that we were on a cheapo job as there was only one unisex loo. To my knowledge this was only used by the Director who was driven down for a visit during the lunch break.

Then dramatic action; four white painted Landrovers arrived and nosed in convoy out of the village and up to our field. They looked like the U.N. in Kosovo and I think helped to reassure the nearby farmer's wife that we were not terrorists.

It took fourteen people to do the shoot up on the hill (see Photo), including for example three specialist Landrover drivers and the young guy who produced soup and coffee with the sarnies. The only person who ranked below Malcolm in the



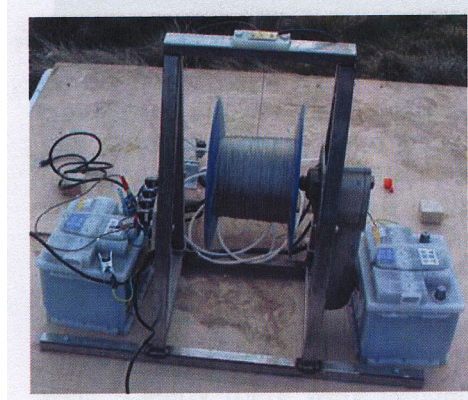
pecking order was me — but we did both manage to get a lift for a 15 minute drive to a relatively flat shoulder on the hill.

We were required to launch a kite (fortunately none was supplied) which would be flown off wire attached in such a way that we might produce static shocks and get ‘Franklin Bells’ ringing. The wind was 3 knots, tops. Fortunately Malcolm had a 3m. Carl Robertshaw genki-type (see Photo). We gave it a 60m. long launch and Malcolm pulled it



up — muttering that he was vulnerable to any electric discharge as he was standing on a wet bog. Not many could have got a kite up in those conditions so our mood wasn't helped when the Director required the launch to be re-shot as the cameraman hadn't got it. So we had a close-up of Malcolm and his special knot and we had a cameraman problem as they clearly thought that kites always launched at a

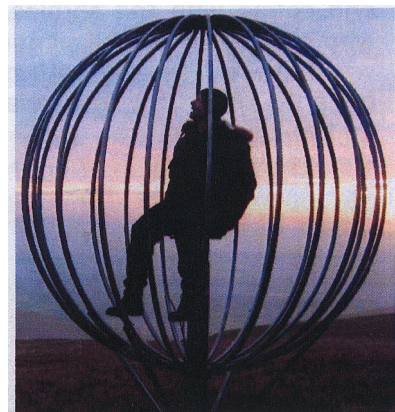
low angle going back rather than a steep angle and forwards. All this is on a mossy bog but not only in little wind but under a clear blue sky with a few clouds for most of the time several thousand feet up. We also had to bring the kite down for lunch.



After that it really got interesting. The kite continued to fly well at about 130m. The line (wire) came from a powered drum fixed on a thick polystyrene base (see Photo) with a beautifully built Perspex cover

(not shown) with a slot showing that the Leeds duo believed that kites flew at 89 degrees.

There were two experiments. In one an actor sat in a Faraday cage (see Photo) which means that even in a lightning strike he is safe as the current flows around him. He had an electric control to the pneumatically driven winch – where the controls were in-stop-out all at full speed. In fact he very quickly became good at flying the kite in the sense of fairly small up and down movement.





Secondly a pair of Franklin bells were rigged up (see Photo). One to the kite line, one to earth, with a nut (replaced by a kite swivel for superior performance) hanging between the two. I was very impressed that even on such a calm day with the kite well below the cloud level, there was enough positive/negative difference for the swivel to be attracted/repelled between the two bells producing a faint but real tinkling. You could also put your knuckle to the line above the launch pad and get a noticeable ‘spark’.

Who did this? A company making a series of programmes recreating well-known scientific experiments. They had some subsidy from the Canadian Government but were hoping to sell the programme to Discovery or National Geographic. Did they? I don’t know.

All this finished just before dark and we got a lift down in the last light. The presenters knew their science and were chatty; the Director might have waved goodbye. They seemed pleased with the days work.

Moral: unless you know what you are doing be prepared for shocks even when there is no storm cloud.

Malcolm split the fee with me.

## Sources

Pelham [4] has a fair account plus one of the more realistic illustrations, although the kite seems to have two side-by-side bridles.

Hart [5] has a good account.

Yolen [3] has most detail and three illustrations.

Eden [6] gives us the kite/revolution story.

Tucker [2] casts doubt on the story.

- [1] Asimov, I. (1963) *The Kite that won the Revolution*.
- [2] Tucker, T. (2003) *Bolt of Fate*.
- [3] Yolen, W. (1976) *The Complete Book of Kites*.
- [4] Pelham, D. (1976) *Kites*.
- [5] Hart, C. (1982) *Kites: an Historical Survey*.
- [6] Eden, M. (1998) *The Magnificent Book of Kites*.

