



Meet the Kite Maker

Lawrence Hargrave

If you drew a picture of a typical kite, what would it look like? Someone in the United States or Europe would probably draw a diamond. A Japanese would draw a rectangle, a Korean a rectangle with a hole in the middle. No one, anywhere in the world, would draw a box—not, at least, until Lawrence Hargrave invented the box kite in 1893. An observer at the time, J.B. Millet, admitted that, “at first sight it is not easy to understand why these forms (box kites) fly at all, for they violate all past ideas of kites.” But fly they did, and the worldwide scientific community immediately understood their potential for furthering meteorological investigation and heavier-than-air, controlled human flight.



Born in England in 1850, Hargrave had followed his father to Australia as a young man. There he prospected for gold, explored the interior of the continent, and took a job as assistant astronomical observer at Sydney Observatory. He was able to give up paid work at age thirty-three to pursue his own independent research. He made crucial contributions to the emerging field of aeronautics, despite his distance from other experimenters in France, England, and the U.S.

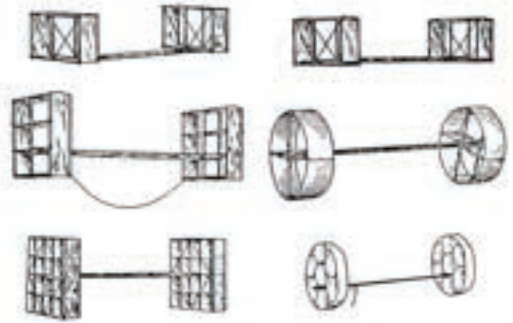


He did so by keeping careful notes about his trials—failures as well as successes. He regularly published articles about his work, in such journals as *Aeronautics*, and shared his work openly with other researchers, with whom he was in regular contact. He refused to patent any of his inventions (he called a patent holder a “legal robber”). He believed that scientific progress would inevitably result from collaboration. He argued,

“Workers must root out the idea that by keeping the results of their labors to themselves a fortune will be assured to them. Patent fees are so much wasted money. The flying machine of the future will not be born fully fledged and capable of a flight for a thousand miles or so. Like everything else it must be evolved gradually. The first difficulty is to get a thing that will fly at all. When this is made, a full description should be published as an aid to others.”

In his investigations, Hargrave concentrated first on engines: he invented the first rotary engine in 1887. He then turned his attention to the principles of flight. He openly acknowledged that he based his concept for the novel box kite (which he called a cellular kite) on research by Francis Herbert Wenham, from 1866.

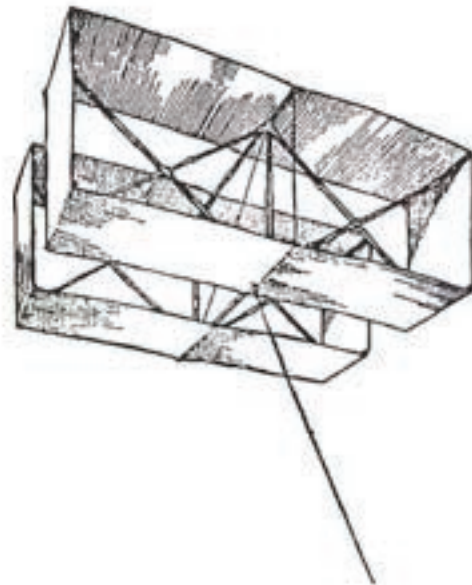
Hargrave had been building model flying machines, propelled by such methods as compressed air and rubber bands. He incorporated Wenham's idea of superimposed (that is, one above the other) lifting surfaces and added vertical surfaces between the superimposed planes to stabilize the structure of the kite. Through his experiments, he also confirmed that a curved lifting surface (a cambered airfoil, curved like the wing of a bird) provided double the lifting power of a flat plane.



Hargrave tested many different cellular designs (drawing above). The first he called "pieces of honeycomb on the end of a stick." Separating the cells gave the kite additional stability and pull, both highly valuable qualities for certain activities with kites. He moved forward with remarkable speed. On February 15, 1893, he first flew his "honeycomb." Only a year and a half later, on November 12, 1894, he lifted himself sixteen feet into the air, using four box kites and the assistance of his estate's caretaker, James Swain.

In an article called "Scientific Kiteflying," published in 1897, J.B. Millet described why he thought the box kite flew so stably. He said,

"The cellular construction permits bracing of parts so as to present to the wind reasonably rigid planes... moreover the force of the wind seems to stiffen the whole structure and compel all the parts to work together. The side planes act as fins to keep the kite in the wind. The rear cell acts as a rudder, and actually lifts about one third as much as the front cell when both are of the same area. This depends, however, on the distance between the front and rear cells, which must be great enough to allow the wind to escape freely, after it has deflected from the front cell, without interfering with the current acting on the rear cell."

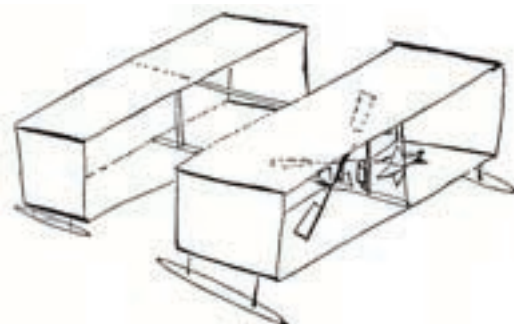


The entire aeronautical world had been watching Hargrave's progress. In August of 1893 Hargrave's paper on his cellular kite had been read, by invitation, at the International Conference on Aerial Navigation at the Chicago World Columbian Exposition (World's Fair). News of his invention spread through magazines and newspapers.

Aviation champions, such as Octave Chanute and James Means, described his work in their publications. Alexander Graham Bell began his kite experiments with the box kite, and European airplane builders Albert Santos-Dumont and Gabriel Voisin (whose airplane is pictured here) used box kites in constructing their flying machines. Voisin even called his a "Hargrave."



Chanute's descriptions of the box kite probably influenced the Wright Brothers as well. But the Wrights were eager to patent their work, and therefore did not admit to having learned anything from Hargrave's invention.



Hargrave himself drew designs for a flying machine (this drawing is from 1896), but never built it. He was willing to entrust the further development of his work to other researchers. He said,

"The particular steps gained are the demonstration that an extremely simple apparatus can be made, carried about, and flown by one man; and that a safe means of making an ascent with a flying machine, of trying the same without any risk of accident, and descending, is now at the service of any experimenter who wishes to use it."

Sources

- Bradshaw, Gary, et. al. "To fly is everything: a virtual museum covering the invention of the airplane," website (<http://invention.psychology.msstate.edu>).
- Drachen Foundation Archive.
- Gibbs-Smith, Charles. *Early Flying Machines 1799-1909*. London: Eyre Methuen, 1975.
- Gray, Carroll. "Flying Machines," website (www.flyingmachines.org), 1998-2006.
- Hart, Clive. *Kites: an historical survey (Revised and Expanded Second Edition)*. Mount Vernon, NY: Paul P. Appel, 1982.
- Naughton, Dr. Russell and Prof. John Bird. "Hargrave Aviation and Aeromodelling— Interdependent Evolutions and Histories," website hosted by Centre for Telecommunications and Information Engineering, Monash University, Australia (www.ctie.monash.edu.au/hargrave), 1999-2006.
- Pelham, David. *The Penguin Book of Kites*. London: Penguin Books, 1976.
- Robinson, M. "Hargrave—The Noble Inventor," in *Kiting: The Journal of the American Kitefliers Association*, Vol. 24, Issue 4, pp. 35-37; also online at "Sky's the Limit" website.

Photo and drawing credits: Science Museum, London; The Drachen Foundation Archive; *Aeronautical Annual*, edited by James Means.