LAWRENCE HARGRAVE

Notes from the address given at the site of the Lawrence Hargrave Memorial at Stanwell Park, December 2nd, 1945, by J. S. G. Worland, Esq.

Lawrence Hargrave was born at Greenwich, England, on Jan. 29th, 1850, the second son of John Fletcher Hargrave, a barrister of Lincoln's Inn, who migrated to Australia in 1856 and distinguished himself as a District Court Judge, Solicitor General Attorney General and, later, as a Judge of the Supreme Court in Equity and Divorce. It is interesting to note that, while a member of Parliament, Hargrave senr. represented this district of Illawarra at one period—June-October, 1859.

Lawrence was left in England to continue his education and in 1856 came out to Australia. He had shown a marked aptitude for mathematics, but did not matriculate and so was precluded (to his own satisfaction, it would seem) from following the traditional family calling of law. In voyage to Australia in La Hogue (1831 tons) developed a taste for adventure, and this he was able to realise, in no small measure, after serving some time as a draftsman with the Australian Steam Navigation Company, where he received a good training in engineering, and acquired that technical proficiency so largely responsible for his success and eventual fame. Fired by an address by Dr. Lang at a meeting of the Royal Society of N.S.W. in 1871 on "New Guinea—a highly promising field for settlement and colonisation," Lawrence formed one of the committee of the "New Guinean Prospecting Association" and, from 1872 to 1877, there followed a series of adventures, including shipwrecks and risky voyages of discovery in New Guinea. These adventures deserve a special chapter, but suffice it here to say that they were not without profit to the mind of Hargrave, for his experiences in these formative years undoubtedly provided matter for thought and speculation during the rest of his life, for he had "observed widely and acutely."

In 1877, he "settled down" and in June of that year was elected a member of the Royal Society of N.S.W. In 1878 he was appointed Extra Assistant Astronomical Observer at Sydney Observatory and in the same year married Margaret Preston Johnson. There were six children of the union—five girls and one boy (Geoffrey). Lawrence spent five years at the Observatory, where he gained much useful knowledge for the work to which he was to devote himself, from his retirement in 1883, as a man of moderate independent means, "exclusively to the task of scientific research and the expansion of man's knowledge of and mastery over, the powers of Nature."

It is with this research, and its results, more particularly in regard to aviation, that the name of Hargrave has come to be associated. Perhaps the most succinct description of Lawrence Hargrave's work in this field comes from—Germany! A memorial tablet set up in his honour at the German Museum at Munich (where most of his aerodynamical models are still housed) bears this translated inscription: "Lawrence Hargrave, in Sydney, made, in the years 1884-1909, pioneering researches into the problem of flight. In his experiments he made use of small models built by himself of both ornithopters and soaring machines driven by steam, petrol, compressed air, etc. He also made, independently of Lilienthal, attempts at gliding with aerofoils. His greatest success is in the introduction of box kites for meteorological purposes. He undertook ascents with great man-lifting kites. He early recognised, as the result of his experiments and calculations, the possibility of motor flight."

So much has been made, in some quarters and strangely enough, of Hargrave's contribution to success in dynamic flight that it is just as well to clear away some popular misconceptions of his achievements, which, of themselves, are so notable as not to require the many fanciful claims made by some of his more fervent admirers whose enthusiasm often outstrips their accuracy. Hargrave did NOT:

1. Invent the aeroplane. (Many must share that credit!)
2. Make the first heavier-than-air apparatus to fly. (Stringfellow, in 1848, did this).

3. Discover the principals of heavier-than-air flight. (Sir George Cayley propounded these in Nicholson's 'Journal of Natural Philosophy' in 1809-10).

Likewise, it has now been proved conclusively that Hargrave's work did not have the slightest influence with the pioneering Wright brothers in America in the construction of the world's first piloted aeroplane to fly (at Kittyhawk, N. C. on Dec. 17th, 1903). Paradoxically, his experiments with aeroplane models did not have the slightest influence on the development of the aeroplane. The question to be answered, then, is—what did Hargrave achieve in the development of aviation? The problem of flight should first be considered. As with a boat or a swimmer in the water, an aeroplane is also really 'swimming'—the aircraft 'swims' in the air. Each, therefore, requires (a) a supporting surface and (b) a method of propulsion. That is the problem of flight. Hargrave tackled this problem with a thoroughness that probably no other investigator in this field has ever equalled. He studied all forms of movement. He computed, charted and modelled even the movement technique of the lowly earthworm. The movement of slugs, birds and man did not escape him in his quest and he sought to reduce all forms of movement to a formula in his highly scientific "Theory of the Trochoidal Plane." In support of his theory he designed a contrivance with which he literally 'walked' on Sydney Harbour! His theory led him to adopt the ornithopter or 'wing flapping' type of model aeroplane. These models had the action of birds and actually flew with fair efficiency. The method of propulsion adopted was at first the twisted rubber band, followed by specially designed compressed air and steam engines. His ingenuity in devising these 'power plants' was indeed remarkable. His rotary engine, made in 1889 (and, like all his inventions, deliberately never patented) was exactly the same in principle and apperance as the famous 'Gnome' engine which was independently invented and patented by the French brothers Seguin nine years later! Although he did build a 'screw' propelled model, it is fairly obvious that he was convinced of the practicability of the 'wing flapping' aeroplane and even forecast that the pilot may be 'air-sick' through the wave like motion of the machine with each wing beat. His experiments with his aeroplanes occupied the years 1884-93. From then onwards he decided to concentrate on the other part of the problem of flight, viz., the nature of the supporting surface. He turned to the study of kites. It is what he achieved in this direction that will make the name of Hargrave endure. History was made and man's mastery of the air secured when at Stanwell Park on 12th November, 1894, a string of four box kites lifted the inventor a distance of 16 feet into the air, the wind blowing at 21 miles per hour and the total weight borne aloft being 203 lbs. An account of this experiment, illustrated with his careful drawings, was sent by Hargrave to the London journal—"Engineering," appearing in the issue of 16th Feb., 1895. This article was seen by A. Lawrence Rotch, a leading American meteorologist, who promptly made a Hargrave box-kite from the drawings and used it to carry aloft recording instruments for use in the upper atmosphere. Modified by Professor Marvin, the Marvin-Hargrave meteorological kite became standard equipment in a very short time. A set of nine Hargrave box-kites (arranged one above the other) attained a height of 9740 metres (32,000 ft. or about 6 miles) at Lindenberg in 1919! Because the entire apparatus was cheaper, lighter in weight, and more expeditious than a balloon, the Hargrave kite was eminently suitable for meteorology and contributed enormously to the study of atmospheric research. These kites were also adopted by various armies for reconnoitring from heights of 50 to 100 feet. But it was really through the installation at Trappes, near Paris, in 1898, of Hargrave meteorological box kites that their influence on aviation began. The sight of these kites aloft and their description in French journals had their effect on experimenters in aviation, and when, on
Nov. 13th, 1906, the Brizalian, A. Santos-Dumont made the first true flight ever made in Europe and the first public flight in the world, the machine he used was simply an arrangement of the Hargrave box kite. The influence of his cellular kite is easily discernible in the Farman and other early machines, although modern design has turned, or returned, to the monoplane.

Hargrave busied himself in so many scientific activities that a short account of any, apart from the foregoing, barely does him justice. He contributed papers frequently to the Royal Society on scientific subjects. He made a rather unfortunate incursion into local early history by putting forward his theory of a landing in Sydney by Lope de Vega a century or more before Captain Cook; but was so effectively crushed by competent authorities that the notoriety resulting was certainly not to Hargrave's advantage.

His son, Geoffrey, who had been his constant companion in their workshop at Rushcutter's Bay, and in whom he confided his desire to carry on his life's work, enlisted at the outbreak of the first world war, and, as a member of the 13th Battalion A.I.F., was killed on Gallipoli on May 24th, 1915. Lawrence Hargrave never recovered from this blow. His son's name was forbidden to be mentioned in the household, and it is feared that many important papers and apparatus were destroyed, in the father's despair, at this time. On July 6th, 1915, Lawrence Hargrave passed away, the cause of death being certified as due to appendicitis and peritonitis.

Here, then, at this splendid monument to one of Australia's most illustrious sons, we are able to gaze down on the beautiful valley of Stanwell Park, where Lawrence Hargrave made his epoch-making contribution to man's knowledge of and mastery over the air. And it is well to reflect, in these days, that here laboured a man who did not know the meaning of selfishness, who gave his knowledge freely to all his fellow men, and chose a life of high endeavour and true nobility when a life of ease had beckoned—and was thrust aside.

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