VINTAGE WORDS OF WISDOM

The Boys' Book of Aeroplanes

By

T. O'B. Hubbard and C.C. Turner

WITH A CHAPTER ON MODEL AEROPLANES BY
E. W. TWINING

THROUGH THE TOWER BRIDGE, LONDON
(F. K. McGean on a Short hydro-biplane)

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Publishers' Foreword

Most will agree that the advances made in aviation in little more than a century are remarkable. What was once a dramatic, and often perilous, adventure has become ubiquitous and a barely acknowledged part of modern life. But in 1912, when *The Boys' Book of Aeroplanes* was published, only nine years had elapsed since the Wright brothers made their first flight at Kittyhawk on 7 December 1903. Although many had attempted to fly, devising plans for all manner of craft, and much success with balloons, gliders and airships had been achieved, it was in this first decade of the twentieth century that the real practical issues were confronted and overcome, and this enabled controlled, sustained, powered, heavier-than-air flight to begin.

In this vintage title, written originally for enthusiastic boys (but, we suspect, also having a strong appeal for the more mature reader), the authors chart the history of man's attempt to fly in considerable detail. From Oliver of Malmesbury in 1065 to Clement Ader, via Leonardo da Vinci, the famous and some now forgotten pioneers are given their place in the development of flight. The authors provide a description of the sensation of flying based on their own experience and they attempt to place the reader in the pilot's seat. This is wonderfully evocative, given the risks then prevalent in these earliest of flying machines, and highlights the intrepid and pioneering characteristics required of the aviators. The science of flight is not disregarded and there is a wealth of detail on the fundamentals of how and why aircraft fly and also on the engineering and mechanics necessary to build a successful aircraft. The text is supported by numerous drawings and a wealth of period photographs that evoke the enthusiasm and demonstrate the courage of these flying trailblazers.

The potential military use of aircraft is explored and it can be seen that even at such an early stage of aircraft development it was this purpose that was driving much if not most of the innovation in engineering, navigation, meteorology and many other aspects pertinent to successful flying.

We think *The Boys' Book of Aeroplanes* will appeal not just to the aviation enthusiast but also to anyone interested in the impact that aviation has had upon the world in the last hundred years. The principles outlined remain relevant today and the historical account provides a context for the development of aviation through the twentieth and twenty-first centuries. The book is an authoritative *tour de horizon* for all things aeronautical at the dawn of powered flight.

VINTAGE WORDS OF WISDOM

The **Vintage Words of Wisdom** titles are not simply facsimiles of old books. They have been carefully selected and professionally produced as high quality ebooks. Our aim is to make the best vintage books on popular topics of interest more widely available again. The books range from practical titles that include wisdom from times past to unashamedly nostalgic works that will appeal to those who may remember these or similar titles from their childhood. Often amusing and quaint, these vintage volumes also contain wise words and advice that may have been forgotten in the intervening years. So often it is worth revisiting the past to remind ourselves that the best ideas stand the test of time. Above all, the **Vintage Words of Wisdom** titles are highly entertaining and provide a fascinating snapshot of life in days gone by. We have chosen books with wonderful illustrations, exciting stories of daring and adventure, practical advice and charming nostalgic descriptions of a simpler life.

Titles include:

Poultry-keeping

Room and Window Gardening

Ferns and Fern Culture

Woodwork Tools and How to Use Them

Home Carpentry: A Practical Guide for the Amateur

The Boys' Book of Aeroplanes

The Railway Age

Sky Roads of the World

Lillie London's Needlework Book

The Cottage Farm Month by Month

For further details and the most up-to-date information on our titles please visit our website www.wordstothewise.co.uk

AUTHORS' FOREWORD

THE keynote of modern life is the craving for romance, the desire for high adventure. It is not far to seek in the splendid idea of flying which began five hundred years ago with Leonardo da Vinci and ended triumphantly with the Wright Brothers ended, of course, in the sense that human flight was achieved. Thenceforward the desire of pilots was to explore seas of air as yet uncharted, and of constructors to solve completely the great problem of stability. Not only in mid-air, but when alighting and near the ground. It is for the boys of the world to take up and carry to its highest conclusion the work their fathers have begun and in the subsequent pages the authors have endeavoured to give them some notion of what has been accomplished and of what there still remains to do.

The arrangement of the book is somewhat unusual: the history is placed at the end, and its early phases, dealing solely with aviation as distinct from aerostation, are very fully recorded, with references, it is believed, for the first time in English. A short story of scouting aeroplanes in war is also included.

And if boys for whom it is written find a tithe of the pleasure in the reading that the authors had in the writing, they will consider that they have not laboured in vain.

I

PRINCIPLES OF FLIGHT

MANY an aviator and many a student of aeronautics has fervently wished that the air were visible. If the air could be seen, human beings would have been able to fly long before Wilbur Wright, Santos-Dumont, and the other pioneers showed the way; and it is certain that they would have been able to make progress with but a tenth of the accidents that the conquest of the air has cost them.

All along, nature gave men very little help. There was, indeed, some colour for the superstition entertained by many that man was not intended to fly, that it was presumption on his part to attempt it, and that irresistible forces were arrayed against him. Directly he began to experiment he discovered that the air was full of mystery, and that he had scarcely any means at hand with which to penetrate its secrets. If only he could see the air! There was, of course, the example of the birds, but centuries of study of bird-flight failed to show men how to imitate them. No one could say how it was done: they could but speculate upon it, and most of their speculations were entirely wrong.

Men used the air, however, in a variety of ways. They were aware of its power partially to support flat objects. They had some idea of its strength when in movement. They had used it for driving mills, and they had utilised the wind to sail their ships. They had observed its tremendous force when in rapid motion. They had even made the parachute. As we shall see, a few advanced thinkers had endeavoured to go further, trying to discover how the birds could be imitated, but progress in this direction was scarcely worth mentioning. The history of these early experiments, as well as the history of recent developments of flying, is far more interesting when we have in mind the simple principles of mechanical flight than as a mere narrative of adventure. Let us begin, therefore, with a brief introduction to the principles of flying.

FIG. I PRINCIPLE OF THE KITE
The arrows show the direction of the wind. In A the wind is horizontal.
In B the wind has an upward trend, and the kite, maintaining the same position relatively to the pressure of air, comes to a position nearly overhead.

In the kite (Fig. 1), which is certainly many centuries old, we have an apparatus which, although it is heavier than air, will remain aloft carrying not only its own weight, but, in addition, the string or wire with which it is held. It will remain in the air all the while its surface is held inclined slightly upward at an angle to the wind. So effective is the kite, that it can be made large enough and strong enough to carry a man with perfect safety to a great height. But to obtain support from the air the kite must have air in motion: it cannot rest upon still air. As every boy knows, when his kite is being successfully flown the air is always moving past it, and while the strength of the wind is sufficient the kite will not fall. The boy can measure the changes in the strength of the wind by observing that at times his kite suddenly soars upwards, when he knows that the wind has freshened, or droops downwards, when he knows that it has met a lull. Every boy is aware of the fact that if the kite were perfectly horizontal and the wind also were horizontal it would descend; in other words, the kite must be held with its forward edge tilted upwards. He also knows that some kites are more efficient than others, but that, generally speaking, weight for weight, the larger the kite until a certain size is reached, the lighter the wind in which it will fly.

There is no need to point out the resemblance between the kite and the soaring bird; that is, the bird that sails along without flapping its wings. The kite is kept to the wind by the control of the boy on the ground. The bird keeps its extended wings to the wind by its own power, and glides through the air with its own momentum, or in obedience to the law of gravity. If the direction-control and the power could be combined in a kite, and the boy and the string be dispensed with, the problem of mechanical flight was solved. That was the task that the early experimenters set themselves to accomplish. One of the earliest successful aeroplanes was nothing but a huge box-kite with a motor and propeller in it; and when S. F. Cody made his first aeroplane he called it a "power-kite."

The resemblance of a monoplane to a bird gliding, or soaring, on outstretched wings is obvious, and the flight of the machine depends upon the same principles as does the flight of a bird. On the one hand there is a supporting surface and mechanical power and the mind of the man; on the other hand there are

outstretched wings and the muscles and the instinct of the bird. The monoplane is like the single-surface kite flying at a slightly inclined angle. The string holds the kite against the air current, but the monoplane creates its own air current by being pulled along by the screw driven round at enormous speed by the motor.

It was the soaring bird that gave men the idea of the monoplane, and in some monoplanes the wings are shaped very much like the bird's wings. It is easy to make a paper bird which, given a slight impetus, will soar gracefully across a room, or, with the impetus derived from gravity, will glide gently downwards. The monoplane came before the biplane, doubtless, for the reason that it was suggested by bird-flight. But so far back as 1859 F. H. Wenham showed that in order to increase the lifting power of a flying machine it was not necessary to have a monoplane of enormous span, but that shorter planes could be arranged in tiers, one over the other; and it was believed that this gave better balance than a single plane. When this was inquired into, it was realised that the increased lifting power was largely due to the greater total length of the forward edge. For the rest, there were certain advantages and certain disadvantages, as we shall see.

When we examine the wings of the gliding bird we observe certain features common to all, and other features that are not invariable. In the first place, the extended wings are always greater in span from tip to tip than they are in "width" from front to back. The difference varies according to the bird. The wings of the albatross are fourteen times greater in span than in width, those of the lark are four times greater in span than in width. The proportion varies in different birds. The wings of a bird are always curved, but the amount and the nature of the curve vary. Now, the question of the proportion of the leading edge to the size of the wing is very important in the bird as in the aeroplane.

FIG. 2 DISTRIBUTION OF LIFTING POWER
The leading edge is C D. The half of the plane A has greater lifting power than the half B.

We will now talk about "planes" and not "wings," for we are dealing with "aeroplanes," and, although the dictionary meaning of the word "plane" is a flat surface, it is customary to speak of the curved surfaces of a flying machine as "planes." A plane 10 feet square will not lift so much as a plane 100 feet in span and 1 foot in width, although both have the same area. The albatross, whose wings are fourteen times as great in span as in width, is a better soaring bird than the lark, which nearly always flies by flapping its wings. Let us suppose that a plane 2.5 feet in width and 20 feet in span will lift 2 lbs. per square foot if driven through the air at a certain velocity with its front edge 3 inches higher than its rear edge. Such a plane has, for practical flying purposes, an unwieldy length of span: it is difficult to make strong as well as light. Therefore we cut it in half, making two lengths of 10 feet each, and place one over the other with a gap between, supporting them together by means of vertical struts. The result is a biplane 10 feet in length and 2.5 feet wide, with a lifting power, at a certain speed, of 2 lbs, per square foot. The total area being 50 square feet, the lifting power should be 100 lbs., but a fraction of the lifting power has been sacrificed owing to the fact that in the biplane there are four side edges instead of only two, and over each of these side edges a certain amount of air escapes without producing lifting effect.