

Navigating the Air (a compilation, I think, by different writers), published by the Aero Club of America, 1907.

Aerial Warfare, by R. P. Hearne. Published by John Lane, London, 1908. An alarmist, but useful book.

Aerodynamics, &c., by F. W. Lanchester. (Constable), 1908. A scientific and mathematical treatise.

Some of these older references may be useful to readers who are now going into the subject for the first time. They elucidate many main principles established by earlier investigations. For the same reason, I may be pardoned if I refer to four articles of my own which were published in the *Glasgow Herald* in 1897. I am emboldened to do so because, without any suggestion on my part, they were reprinted in pamphlet form by the Aeronautical Society for distribution among the members. These articles were designed to give the general reader, with as little technicality as possible, a comprehensive view of the whole subject as it then existed. As I had no engineering knowledge, I sought and obtained the assistance of the late Mr. P. S. Pilcher, who was then carrying on his gliding experiments. On the technical side, I believe these articles were correct, as he kindly revised them, and for beginners in the subject I should think they would still be of value. The idea of flying machines dropped out of sight in this country for two or three years after the fatal accident to Mr. Pilcher, but in America work continued. I again took up the subject from the general reader's point of view when interest began to revive here, and in several articles published within the last two years in the *Glasgow Herald* I have sketched events and prospects. I think it likely that anyone desiring in condensed and easily understood form a record of recent developments might find it of advantage to consult these articles. Consequently, I give the dates of publication:—*Flying Machine Development*, August 3rd, 1907; *The Coming Flying Machine*, October 12th, 1907; *Advent of the Flying Machine*, August 14th, 1908; *The Conquest of the Air*, August 27th, 1908; *The Achievement of Flight*, January 23rd and 30th, 1909.

Yours faithfully,
ALEX McCALLUM.

Clapham, London, Feb. 1st.

A METEOROLOGICAL OFFER TO AERONAUTS.

To the Editor of FLIGHT.

SIR,—As the result of long study, I have acquired a knowledge of the causes of wind and climatic conditions which, I claim, elevates meteorology to the status of a science, the which it is not as practised by others. The predictions of the meteorological departments all over the world are too speculative, the procedure being to ascertain by numerous telegrams the conditions obtaining at distant stations at a given time, then calculating which of those distant types of wind and weather is most likely to visit our locality during the ensuing 24 hours. Experience teaches us that such forecasts are generally wrong. My system recognises that every local wind is simply a branch from a great current, which latter I trace to its source. I have learnt precisely how and where the main currents are created, and when. I have learnt also what are the causes of local deviations from such main currents, and I am therefore equipped with special knowledge which enables me, as I have said, to predict the direction and approximate strength of carrying winds with greater certainty.

If any of your readers, sufficiently up-to-date to admit the possibility of such new discovery, and desirous of competing for any of many valuable prizes offered to aviators, will write to me I will—time permitting—assist him to select the most favourable time, when the wind will be most favourable for his aerial flight.

Yours sincerely,
GERRARD H. HICKSON.

Feb. 7th.

ANSWERS TO CORRESPONDENTS.

T.W.K.C. (Surbiton).—We are much obliged for your contribution to our bibliography. This will be embodied in it in due course.

E.C.C. (Laver Hill).—By all means bring the model for us to see. Any assistance we can give you is at your disposal. Thursday is our best day.

H.A.F. (Cambridge).—A reply is being sent direct by post.

R.L. (Stafford).—Our leader last week did not refer to any requests for advice or other individual assistance, but merely to the preparation and publication of articles of the character mentioned. See this week's leader.

A.Mc.C. (Clapham Park).—Very many thanks for further lists and other information, which will be incorporated later.

MECHANICAL FLIGHT.*

By E. STUART BRUCE, M.A.

OTTO LILIENTHAL, that gifted martyr of the air, tells us that in flying machines conception is nothing, construction is little, experiment is everything.

The year of 1908 will be memorable in aeronautical science for its demonstration of the possibility of mechanical flight. Day after day in France and America has been seen the spectacle of men, not holding in their hands an elaborate plan, not standing by some huge winged machine, but flying in the air with a grace equal to the soaring bird. This has been done with a machine not raised by the buoyancy of a gas, but with one that is heavier than the medium in which it travels, and whose sustentation and direction is accomplished by dexterity and skill.

It is, however, not without honour to the British nation, that one of the fundamental principles of the recent experiments was proposed and elucidated by a Briton in 1866. I refer to the important principle of superposed surfaces, advanced in that year by the late F. H. Wenham. He pointed out that the large monosurfaces necessary to carry a man are difficult of control, but that the lifting power of such a surface can be obtained by placing a number of small surfaces above each other. Wenham built flying machines on this principle, with appliances for the use of his own muscular power. He obtained valuable results as to the driving power of his superposed surfaces, but he did not accomplish flight.

It was in 1872 that H. von Helmholtz emphasised the improbability that man would ever be able to drive a flying machine with his own muscular exertions. After his statements there came a period of stagnation in aeronautical research. An all important link was then wanting; this was the light motor.

It is difficult to say how much aeronautical science owes to two illustrious names—Sir Hiram Maxim and the late Professor Langley. These two eminent men took up the subject of flight about the same time in the last decade of the last century, and applied to it all scientific knowledge of the time. Sir Hiram Maxim built the largest flying machine that has been constructed. It spread 4,000 sq. ft. of supporting surface, and weighed 8,000 lbs. The screw propellers were no less than 17 ft. in diameter, the width of the blades at the tip being 5 ft. The boiler was 363 h.p. The machine was run upon wheels on a railway line. It was restrained from premature flight by two wooden rails placed on each side above the wheels. But on one occasion the tendency to rise proved too strong for these measures of restraint. The machine burst through the wooden rails and flew for 300 ft. But Sir Hiram Maxim was not ready at that moment to fly further. When the machine took flight steam was shut off, the machine alighted and was damaged in the fall. The wisdom of Sir Hiram Maxim in not allowing the machine to take free flights was most commendable, for at that time the problem of the maintenance of equilibrium and stability was quite unsolved. But what could not be dared with a gigantic machine carrying human passengers, could be dared with an unmanned model. In 1896 Langley's tandem-surfaced model aerodrome had luck with the aerial currents, and flew for more than three-quarters of a mile over the Potomac River. This machine had 70 sq. ft. supporting surface, weighed 72 lbs., and had an engine of one-horse power, weighing 7 lbs. It is well known how in later years, Langley exaggerated his model into a machine which carried a man, and how twice when it was about to be put to the test over water, at the very moment of being launched, it caught in the launching ways and was pulled into the water. It is supposed that grief at not being able to put his work to a practical test hastened his death. But it is doubtful whether Langley's man-lifting aerodrome would have kept its balance had it escaped the clutches of the launching apparatus. In the light of recent experiments it has been seen that the maintenance of equilibrium and stability demands special contrivances.

It was the question of equilibrium which first led Lilienthal in Germany to experiment with what are called gliding machines. These are aeroplanes which are launched from some hillside against the wind, and depend upon gravity for their motive power. In this way the art of balancing can be practised on motorless gliders. With Lilienthal commenced the age of systematic experimental flight. It was Lilienthal who made the great discovery of the driving forward of arched surfaces against the wind. Lilienthal made some 2,000 glides. Sometimes from a height of 30 metres he glided 300 metres.

The underlying principle of maintaining equilibrium in the air has been recognised to be that the centre of pressure should at all times be on the same vertical line as the centre of gravity due to the weight of the apparatus. Lilienthal sought to keep his balance by

* Abstract of a paper read before the Royal Society of Arts on Wednesday, December 2nd, 1908.