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WRIGHT DESCRIBES IDEAL AEROPLANE

Day Near When Machine Will Be Balanced Almost Automatically, He Predicts.

The day is near when the flier will be almost entirely relieved of the work of maintaining the equilibrium of his machine, and his attention will be required only to keep it on its proper course and to bring it safely in contact with the ground when landing. This is the prediction of Orville Wright in an article entitled "Stability of Aeroplanes," just written for the Smithsonian Institution. He discusses some phases of fore-and-aft equilibrium in flying, and points out the danger of "stalling" to the average flier. By "stalling" he means coming to rest in the air.

Mr. Wright says that a flying machine is balanced in three directions. One is about an imaginary axis fore-and-aft in its line of motion, referred to as lateral equilibrium; the other about an axis extending in a lateral direction from tip to tip of the wings, known as fore-and-aft or longitudinal equilibrium, and a third about a vertical axis, which is generally referred to as steering, although its most important function is that of lateral equilibrium. Mr. Wright says that although a beginner finds most difficulty in mastering the lateral control, it is his lack of knowledge of certain features of the fore-and-aft equilibrium which leads to the most serious accidents.

"In an ideal flying machine," Mr. Wright writes, "the centre of gravity should lie in the line of the centre of resistance to forward movement, and also in the line of thrust, but in practice this is not always feasible, since the machine must be built to land safely as well as to fly. In a flying machine, that is, one below the centre of support, causes an oscillating movement about the lateral axis like that of a pendulum, which tends to form a disturbing turning movement. On the other hand, a high centre of gravity tends to cause the machine to roll over in landing, and, consequently, a compromise is adopted.

Two Methods Used.

The two principal methods used in preserving fore-and-aft equilibrium have been the shifting weights so as to keep the centre of gravity in line with the changing centre of lift, and the utilization of auxiliary surfaces, known as elevators, to keep the centre of pressure in line with the fixed centre of gravity. The first method has been found impracticable on account of the impossibility of shifting large weights quickly enough, but the second is used on most of the modern flying machines.

Flying machines of the latter type, Mr. Wright says, should have their auxiliary surfaces in the front or rear, and as far as possible from the main bearing planes, because the greater the distance the greater the leverage, and consequently the smaller amount of surface required. No part of either the main surface or auxiliary surface should be exposed on the upper sides in a way to create a downward pressure for maintain equilibrium. To overcome such a pressure it requires twice the propeller thrust that an equal carried weight would require.

The downward pressure of air is used to some extent, however, on account of its adaptability in producing more or less inherent stable aeroplanes. Mr. Wright describes an inherent stable aeroplane as one in which the equilibrium is maintained by an arrangement of surfaces so placed that when a current of air strikes one part of the machine, creating pressure, that tends to disturb the equilibrium, the same current striking another part creates a balancing pressure in the opposite direction. This compensating or correcting pressure is obtained without the mechanical movement of any part of the machine.

While this system will control the machine to some extent, Mr. Wright says, it depends so much on variation in course and speed as to render it inadequate to meet the demands of a practical flying machine. In order to obtain greater dynamic efficiency and greater manoeuvring ability, auxiliary surfaces mechanically operable are used in present flying machines instead of the practically fixed surfaces of the inherently stable type, but they depend to a greater extent upon the skill of the operator in keeping equilibrium.

"Feeling" the Angle.

Mr. Wright says that if the operator were able to "feel" exactly the angle at which his aeroplane meets the air, at least 90 per cent. of all aeroplane accidents would be eliminated. Instruments for this purpose have been produced, but they are not in general use. The average flier does not realize how dangerous it is to be ignorant of this angle, nor does he

know when he is "stalling" or coming to rest in the air or nearly so.

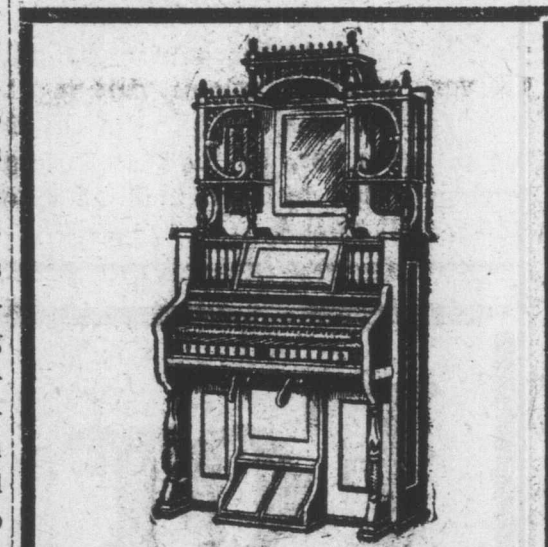
Mr. Wright says the danger from "stalling" comes when the operator attempts to check the machine's downward plunge by turning the main bearing surfaces to still greater angles of incidence. Instead of pointing the machine downward at a smaller angle of incidence, so that the speed can be recovered more quickly. Most of the serious accidents in flying occur after long glides from considerable heights with the power reduced, when an attempt is made to bring the machine to a more level course several hundred feet in the air. The machine quickly loses its speed and becomes "stalled." Those who have seen the novice make a "pancake" landing, Mr. Wright said, have seen the beginning of a case of "stalling," which might have been fatal had it taken place at a height of 100 or 200 feet in the air.

The inventor of the aeroplane adds that the greatest danger of flying comes from misjudging the angle of incidence. If a uniform angle were maintained there would be no difficulty in getting fore-and-aft equilibrium. Experiments made the last year have brought about a considerable advance in the development of automatic stability. A device described by Mr. Wright comprises a small horizontal wind vane mounted on the machine so as to ride sidewise to the wind when the machine is flying at the desired angle of incidence. In case the machine varies from the desired angle the air will strike the vane on either its upper or lower side.

Action of Wind Vane.

The slightest movement of the vane in either direction brings into action a powerful mechanism for operating the controlling surfaces. If the wind strikes the vane on the under side the elevator is turned to cause the machine to point downward in front until the normal angle is restored, and if the air strikes the vane from above an opposite action of the elevator is produced.

The author maintains that a machine controlled by regulating its angle with reference to the impinging air is not liable to one of the dangers of "stalling." He describes another method for maintaining fore-and-aft equilibrium. This utilizes the force of gravity acting on a pendulum or tube of mercury. Another method employs the gyroscopic force of a rapidly revolving wheel. In both these systems, however, the angle of the machine is regulated with reference to the horizontal, or some other determined plane, instead of the angle of the impinging air. He finds that other faults render the pendulum and mercury tube useless in regulating fore-and-aft equilibrium, although, he adds, the pendulum is found to be useful in regulating the lateral stability.



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London, July 28.—The award of a Victoria Cross to Jemadar Mir Dast of Coke's Rifles, an Indian force, for great gallantry at Ypres, has drawn attention to the picturesque Indian frontier detachments now serving in France.

Among the oldest and most celebrated of these is Jacob's Rifles. It is named in honor of a fine, but no little remembered soldier, John Jacob, who was a sort of prototype of Lord Roberts. Coke's Rifles are recruited from the warlike Beluchis, and there is special appropriateness in their serving in France, for a French traveler drew attention to their qualities long before the first Beluchi was recruited for the British army.

This traveler was Ferrier, the author of "Caravan Journeys," who was among the first Europeans to penetrate into the mysterious lands of Central Asia. In the course of his book he wrote, seventy-five years ago:

"The Beluchis call themselves Musulmans, but they do not observe the precepts of the Koran. They are ardent, impulsive, well built and energetic. Their complexion is olive, like that of the Arab, and these two nations have more than one analogous point between them. Their features express astuteness and ferocity, they are insensible to privations, and endure them and fatigue in the most admirable manner. No matter how painful and long the journey may be, they are always ready for the march. Their most extraordinary physical characteristic in the facility with which, camel-like, they can for so long a time go without drink in their burning country—a draught of water once in the twenty-four hours is sufficient for them even on a journey. They march with a rapidity which it is impossible to conceive, and they will walk faster than the best horse.

"Of their courage they boast and swagger as much as the Afghans, but ephraps with more reason. The latter are good for a rush, but they do not meet the shock of an attack or stand well under the fire of artillery. The Beluchis, on the contrary, though as ignorant as the Afghans of the art of war, surpass them in tenacity and bravery. They remain firm under the fire of the enemy and are bold in their advance. On many occasions they hold firm on the ground and die like real heroes. There are no better soldiers in Asia than these Beluchis."

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