FAI AEROMODELLING COMMISSION

CIAM FLYER

The Introduction to the Model Aircraft World

No. 3

Lilienthal's Dream Becomes Reality

Hans Langenhagen

In the world of aviation, the famous 25 m gliding "hop" achieved by Otto LILIENTHAL with his self-built aircraft in 1891 is seen as the beginning of *human flight*. His preliminary investigations on the wing profiles of storks helped him to develop the man-carrying designs with which he was eventually able to carry out successful gliding flights.

Only a few years later, with the flight stability and steerability of his glider still very inadequate, he sadly fell victim to gusty weather conditions. He died on 10th August 1896 from the spinal injuries suffered in a crash at Stölln-Rhinow the previous day.

K.-H. Helling explains the double-lift-wing model HE209 at the Long Night of Science.

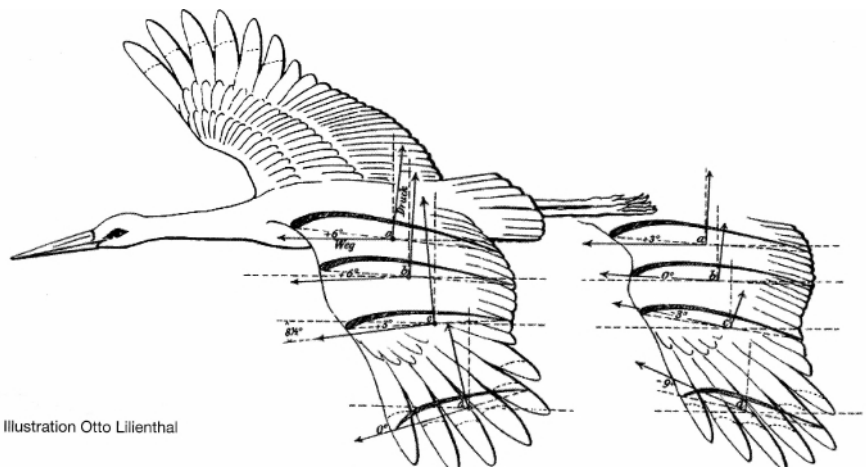


Illustration Otto Lilienthal

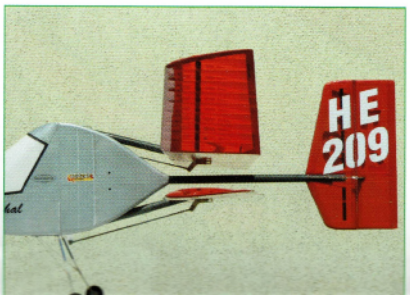
After researching gliding flight, it was Lilienthal's intention to trial powered flight with the aid of flapping wings, but despite having already built two machines, he was unable to complete this. An attempt to continue with this development was made by his brother Gustav however, this remained unsuccessful as the propeller introduced by the Wright brothers in 1903 appeared to be a better solution.

New solution

Now Karl-Heinz HELLING of the aeromodelling club Modellflugclub Rossendorf e.V. is proposing a new solution: Unlike with the flight of birds, whose wings are hinged at the shoulder, he found a straight and rigid wing moved up and down on a linear guide to provide more effective propulsion. The advantage becomes clear when the thrust of an aircraft is scaled onto the air column accelerated by the propulsion – compared to a propeller circle, the parallel flapping covers a section of the accelerated air column that is 10 times larger. The flying model HE209 has now been successfully trialled and on-board measurements have shown that the propulsion efficiency of around 90% exceeds that of a propeller by at least a factor of 2.

A large variety of applications

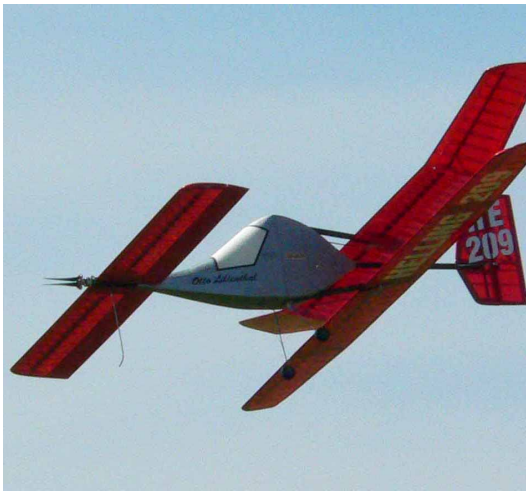
Applications in man-carrying flight could be ultralight aircraft with an electric motor as designers of these machines still struggle with the high power requirements, or rather insufficient battery capacities – using Helling's flapping wing principle would immediately double the range. But this type of propulsion could also be of interest for unmanned aircraft developed for a large variety of applications, some of which are larger than gliders and others of which have wingspans of as little as 8 cm.



For more Information

For more information on trialling this model, visit http://mfc-rossendorf.de > Projekte > Hubflügel.

Video: http://www.mfc-rossendorf.de/fileadmin/user_upload/Projekt/Hubfluegel/Projekt/SchlagfluegelProjekt.htm



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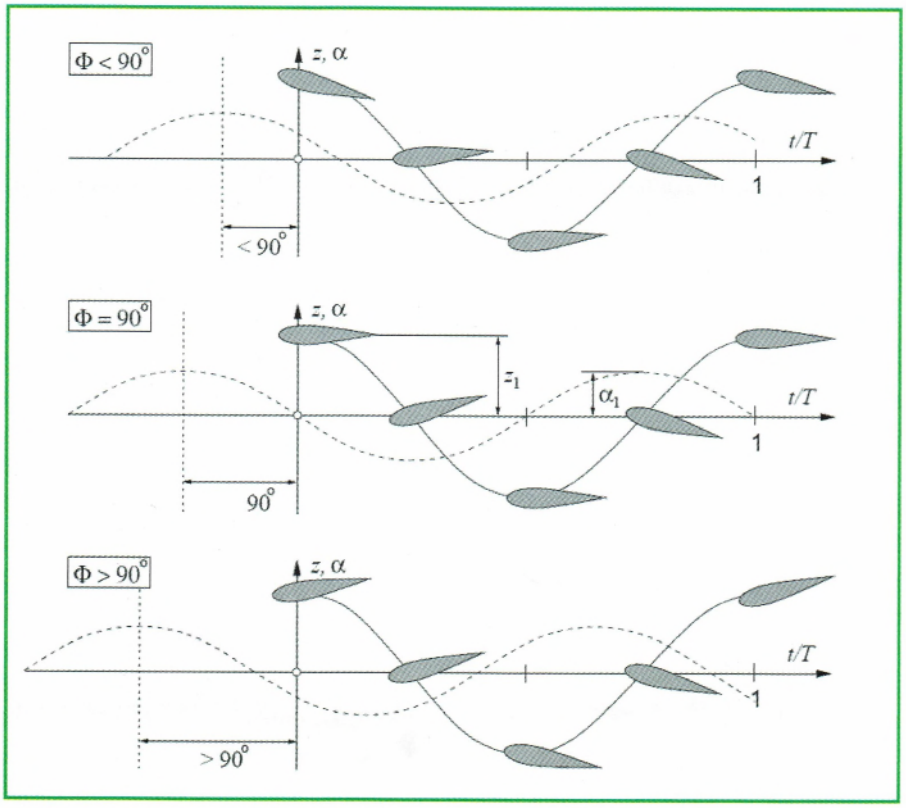

Motion sequence combined stroke/rotation with phase shifting
M. F. Neef, 2002 Dissertation Analysis of flapping flight by numerical flow computation. Technical University of Braunschweig, Institute of Fluid Mechanics.

Inspired by a fluke of a whale

Over 20 years, Karl-Heinz Helling developed a lifting wing propulsion system and thus realised Otto Lilienthal's dream of a mechanical implementation of the flight of birds.

For his solution, he was inspired by the fluke of a whale: the wing now did not need to be attached directly to the fuselage and it could be made continuous and rigid, because it did not need to twist during the stroke. Just changing the angle of attack during the up and down movements ensures that there is always constant lift and additional propulsion during the downstroke. However, the flapping amplitude is so large that propeller operation is necessary for the take-off process; after reaching the safety altitude, the system switches to flapping operation.

At the Inter-Ex competition in Nederweert (NL), where experimental flight models are presented every year, he won two of five cups: the one for the Best Model and the one for the Greatest Innovation.