

COLLOQUIUM

As part of his MSc thesis assignment

Group: Engineering Fluid Dynamics

Antoni Brentjes

will give a presentation, entitled:

Investigating Wake of Flapping Wing through Multiport Pressure Probe Measurements

Date: 26 August 2016

Time: 13:00

Room: OH-111

Summary:

Two recent studies, Mulder (2013) and Gijsman (2015), investigated the wake left by a flapping wing. In these studies a time averaged jet-like velocity profile was found in the wake, which was correlated with the production of thrust. In other literature it has been shown that, from a three-dimensional map of the wake, the amount of lift generated by flapping wings can be inferred as well.

The objective of the present study is to find a method to investigate the three-dimensional wake of a flapping wing, using a 7-hole pressure probe. No literature was found describing studies in which a 7-hole pressure probe had been used to measure unsteady flows, such as occur in the wake of a flapping wing. Through a theoretical analysis a 7-hole pressure probe was designed to function within the range of frequencies expected in the wake. Subsequently this probe was manufactured, tested and calibrated.

The 7-hole probe was used to perform measurements at various spanwise and vertical positions in the wake of the wing, within a fixed streamwise cross-sectional plane. It was found that, for a stationary wing, flow features such as the wingtip vortex and lift induced downwash, could be resolved. For a flapping wing the expected jet-like profile of the time-averaged streamwise velocity was found, in addition to the profiles of the time averaged vertical and spanwise velocity profiles. Analyzing the data collected at a single location it was possible to determine the flow velocity components and static pressure as a function of time.

It was not possible to combine the time-dependent data at various locations, because, unfortunately, the measurement setup could not be synchronized with the mechanism driving the wing. Nevertheless, it is concluded that it is possible to obtain the data necessary to create a time-dependent, three dimensional map of the wake, using a 7-hole pressure probe, provided that such synchronization is implemented.

Assessment committee:

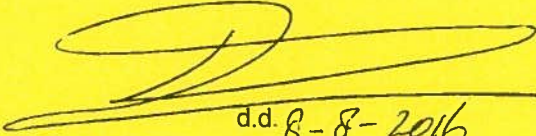
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d.d. 8-8-2016