



COLLOQUIUM

In accordance with article 4.6.8 of the SSNS-wb.

Group: Engineering Fluid Dynamics

As part of his MSc thesis

J.A.W. Meijerink

will give a presentation, entitled:

Exploratory Study of Plasma Actuators for Active Flow Control on Wind Turbine Blades

Date: Friday June 25, 2010

Time: 14:00

Room: Horstring N 109

Summary:

Within the field of aerodynamics flow control is an important theme of research. It consists of passive or active manipulation of the flow around an airfoil or wing with the aim of optimizing the performance.

A relative new method of flow control is the plasma actuator which uses local ionization of the air to allow manipulations due to electric fields. Preliminary research has shown that plasma augmented flow control could be very suitable for applications on wind turbines. The work presented describes a further exploratory study towards the feasibility of this type of flow control using both numerical and experimental techniques.

Experimental work was used to examine the physics behind the phenomenon of plasma generated wind and to explore the electrical equipment used for its generation. Particle Image Velocimetry (PIV) was used to quantify the induced velocity field and body forces (i.e. performance) of a plasma actuator and provide input data for numerical analysis.

The numerical work consists of the implementation of a basic electro-static model that can be used for quick analysis of the plasma actuator design. Using the model an estimate is obtained of the body force and induced velocity. Computational Fluid Dynamics (CFD) simulations have been performed for a NACA-0018 profile with emulated plasma actuators distributed along the chord to investigate different strategies of flow control.

Assessment committee:

Prof.dr.ir. H.W.M. Hoeijmakers (mentor/chairman)
Prof.dr.ir. A. Hirschberg
dr.ir. R. Hagmeijer
dr.ing. H.M.J. Bastiaens
ir. H. de Vries

Chairman:

d.d.