



COLLOQUIUM

Conform artikel 4.6.8 van het SSNS-wb.

Vakgroep: Technische Stromingsleer

In het kader van zijn doctoraalopdracht zal

I. Cleine

een voordracht houden getiteld:

Effect of Blowing on the performance of an Airfoil

Datum: 14 december 2007

Tijd: 9:30

Zaal: OH 114

Summary:

Airfoils have various applications in industry, of which we consider here in particular wind turbine blades. This research is part of a larger research project into the enhancement of wind turbine performance by means of flow control, carried out for ECN. Blowing air from the surface of an airfoil is a method of influencing the flow of air around the airfoil. The effects of blowing on the performance of an airfoil can only be assessed if the flow around the unmodified airfoil is known accurately.

The goal of this thesis is to establish a reliable method for determining the influence of blowing air from the surface of an airfoil near the trailing edge. It includes the development of an experimental setup for the $0.9 \times 0.7 \text{ m}^2$ closed test section of the silent wind tunnel and comparison of measured data with results of numerical simulations.

Using this new test set-up pressures have been measured on an unmodified 18%-thick airfoil, NACA 0018, at various points on the surface. The results of these measurements have been corrected for errors which occur due to the finite size of the pressure holes used as well as for errors which arise from the use of a closed wind tunnel test section. The measured results have been compared with data from numerical simulations, in order to validate both the experimental setup and the numerical method.

Finally the numerical method has been used to predict the effects of blowing air from the surface of the airfoil through a slit located close to the airfoil's trailing edge. The results of the numerical simulations have been confirmed by results from experiments on the NACA 0018 airfoil modified with slits parallel to and close to the trailing edge with and without blowing.

Examencommissie:

De afstudeerdocent,

prof.dr.ir. H.W.M.Hoeijmakers (afstudeerdocent)

prof.dr.ir. A. Hirschberg (mentor)

ir. H. de Vries

dr.ir. R.G.K.M. Aarts

d.d. _____