Faculty Engineering Technology
Program Mechanical Engineering

University of Twente.

COLLOQUIUM

In accordance with article 4.6.8 of the SSNS-wb.

Group: **Engineering Fluid Dynamics**

As part of his MSc thesis assignment

J.M. Tomas

will give a presentation, entitled:

Numerical Simulation of Active Flow Control on Airfoils

Date: Friday May 21, 2010

Time: 15.00 hr

Room: Horstring N 109

Summary:
The goal of this research is to investigate lift enhancement by active flow control methods for aircraft wings in landing and take-off configurations. The flow control methods are investigated numerically using a multi-block structured-grid flow solver, which solves the Reynolds-Averaged Navier-Stokes (RANS) equations. The computational method is validated for a test case described in the literature for which experimental data is available. The configuration is a two-dimensional wall-mounted hump model with flow control utilizing a synthetic jet, i.e. oscillatory blowing and suction from a hole just downstream of the crest of the hump. This test case is used to investigate the effect of synthetic-jet flow control on flow separation.
Subsequently this type of flow control is applied to a two-dimensional NACA-0018 airfoil, employing different actuator shapes. For the flow conditions considered this airfoil shows similar trailing edge flow separation as an aircraft wing in landing and take-off configuration. A numerical synthetic jet actuator model is implemented in MATLAB to give an estimate of the flow velocity achieved in the orifice of the actuator. Finally, the effect of a three-dimensional continuously blowing jet on the flow around the NACA-0018 airfoil is researched. For this airfoil a configuration with a row of continuously blowing jets is designed by applying an existing optimization method.

Assessment committee: **Chairman,**

Prof. dr. ir. H.W.M. Hoeijmakers (chairman)
dr. ir. E.T.A. van der Weide (mentor)
dr. ir. R. Hagmeijer
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