Faculty Engineering Technology
Program Mechanical Engineering

University of Twente.

COLLOQUIUM

Group: **Engineering Fluid Dynamics**

As part of her MSc thesis assignment

Ellen Norde

will give a presentation, entitled:

Splashing Model for Impact of Supercooled Large Droplets on a Thin Liquid Film

Date: Friday March 1, 2013

Time: 14:00

Room: Horstring N109

Summary:
Aircraft icing continues to be a main concern within the aeronautical industry. Recent aircraft incidents and accidents have revealed the existence and dangers of Supercooled Large Droplets (SLD) in icing clouds. SLD have a diameter that exceeds 50 μm. Specific problems due to SLD arise due to faster ice accretion at critical, unprotected, locations. Furthermore, conventional methods have difficulties in predicting the icing process accurately.
In June 2008 project Extice (acronym for EXTreme ICing Environment) took off in which six aircraft manufacturers, four research centres and four universities, including University of Twente, joined efforts to provide both numerical and test capabilities for SLD ice accretion.
University of Twente's main contribution consisted of the modelling of basic SLD physics. Within the Engineering Fluid Dynamics Group a computational method is available which models ice accretion on 2D airfoils. Within the interests of Extice project this computational method has been extended for SLD ice accretion by J.M. Hospers. The method now consists of four steps: (1) Flow simulation, (2) Eulerian droplet tracking resulting in the water catching efficiency, (3) Computing rate of ice accretion from Messinger's thermodynamic model, (4) Calculation of new ice shape. Together, these steps form a model that converts atmospheric and flow conditions into an ice shape on an airfoil.
Compared to conventional icing In SLD icing some additional phenomena have to be accounted for: splashing, rebound, breakup and deformation. In the present study an improved splashing model has been implemented in the existing computational method. This splashing model has been developed by Technische Universität Darmstadt and consists of a deposition model that accounts for splashing during impact of droplets on a liquid layer. This liquid layer can arise when SLD droplets freeze only partially on impact with the airfoil. The present results are compared with data from experiments commissioned by Extice, conducted by the French institute DGA.

Assessment committee: **Chairman,**
Prof.dr.ir. H.W.M. Hoeijmakers (chairman)
Ir. J.M. Hospers
Dr.ir. E.T.A. Van der Weide
Ir. B.J. Konijn
Dr.ir. G.R.B.E. Römer

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