Faculty Engineering Technology
Program Mechanical Engineering

UNIVERSITY OF TWENTE.

COLLOQUIUM

Group: **Engineering Fluid Dynamics**

As part of his MSc thesis assignment

Retno D.K. Wardhani

will give a presentation, entitled:

Investigation on Aeroacoustic Sound Sources using an Acoustic Camera

Date: **Thursday August 27, 2015**

Time: **09:30**

Room: **Horst Building Room N.109**

Summary:

The study of aeroacoustic noise generation has become a significant topic in engineering research. To localize aeroacoustic sources one can use an acoustic camera. The main advantages of an acoustic camera are the fast measurement and computation time.

The aim of the present experimental study is to assess the applicability of an acoustic camera in an aeroacoustic setting. At the present time, there is no research related to the acoustic camera available in the group of Engineering Fluid Dynamics. The sound field of several test cases are investigated using the CAE Noise Inspector™ acoustic camera, which consists of an array of 40 microphones and a digital camera.

In the first part of the study, initial measurements on a box consisting of 6 separated speakers are performed to evaluate the suitable measurement range and alignment of the acoustic camera. The sound field of 3 kHz is generated by a function generator connected to the input of the speakers. During the experiment, different speaker combinations have been used to tune the microphone array setting. The results show that the acoustic camera is able to locate the sound source accurately.

In the second part, a circular cylinder with a diameter of 5 mm is considered. The free stream velocity is varied in the range 4 - 48 m/s. The results show that the Strouhal number of the vortex shedding frequency is approximately 0.2, which agrees with available theory.

In the third part of the study, the acoustic field of an axial fan is investigated. The rotational speed of the fan is varied in the range 400 – 1380 rpm. The sound field at each rotational speed is measured by the acoustic camera. The results show that the Blade Passing Frequency and its higher harmonics dominate the noise spectra graphs.

The final part of the experiment investigates the aeroacoustics behavior of a helicopter model with two blades. The rotational speed is set around 400 rpm and the free stream velocity is 0 m/s, 5 m/s and 10 m/s respectively. The results show that the noise spectrum consists of tonal content related to the blade passing frequency and its harmonics, and the vortex noise.

Assessment committee:

Prof.dr.ir. C.H. Venner	(chairman)
dr.ir. R. Hagmeijer	(mentor)
dr.ir. Y.H. Wijnant	
ir. E. Norde	

Chairman,

i.o.

d.d. 3rd aug 2015