

# COLLOQUIUM

Group: Engineering Fluid Dynamics

As part of his MSc thesis assignment

**Driek Rouwenhorst**

will give a presentation, entitled:

## **Experimental Study on Pressure Oscillations Induced by Supersonic Flow past a Rectangular Cavity**

**Date:** Friday July 6, 2012

**Time:** 14:00

**Room:** HR N109

### **Summary:**

Self-sustained oscillations of the grazing flow of a fluid past a cavity in a wall can generate significant pressure pulsations. In many applications such oscillations cause unwanted noise or even structural fatigue. Practical examples are noise generation by the flow over landing gear bays of airplanes and by the flow past closed side-branches in piping systems in the process industry. The oscillations are caused by a feedback loop involving the shedding of vortices, acoustic modes of the cavity and possibly structural vibrations. Coupling of different flow phenomena makes the resulting frequencies and especially their amplitudes hard to predict. The rectangular cavity is a benchmark geometry for cavity flow oscillations. All relevant flow phenomena are present, while the simple geometry is particularly suitable for the experimental validation of numerical methods.

In the present study the flow phenomena are investigated that occur in the supersonic ( $M = 1.7$ ) flow over a rectangular cavity. Measurements of the fluctuating pressure have been performed for different length-to-depth ratios of the cavity. The results are analyzed also employing flow visualizations by the schlieren technique. Results are compared to data on supersonic cavity flow available in literature. Emphasis is on the coupling between the vortex shedding feedback loop and the acoustic eigenmodes of the cavity. Subsequently the cavity is equipped with a skewed leading edge, in an attempt to reduce the pressure fluctuations. The influence of this modification is related to the phenomena found for the benchmark cavity and sheds more light on the coupling mechanisms in oscillating supersonic flows over cavities.

### **Assessment committee:**

Prof.dr.ir. H.W.M. Hoeijmakers (chairman)  
Prof.dr.ir. A. Hirschberg (mentor)  
Dr.ir. E.T.A. van der Weide  
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### **Chairman:**

d.d.