## AERO-THERMAL INVESTIGATION OF RIB-ROUGHENED INTERNAL COOLING CHANNELS

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The increase of power output and efficiency of gas turbines requires the turbine inlet temperature to be raised and therefore cooling systems to be adopted. The thermal investigation of internal cooling channels has been carried out by means of scale models. Since, up to now, the walls of the channels were made of insulators, the heat conduction was not representative of the behaviour of an actual metallic blade.

To go beyond the limitation of this set-up, a new facility has been manufactured with a metallic wall. The infrared thermography has been used to measure the temperature distribution on the wetted surface of the channel. Software has been developed to analyse the IR image, correct the temperature-field spatial distortions and apply the radiation versus temperature calibration-curve to the measured data, I order to provide a reliable surface temperature pattern.

A commercial code (FLUENT) has been used to solve the energy equation into the wall and to determine the surface heat flux distribution. The convection coefficient on the inner surface has been calculated as a function of the measured wall temperature and computed wall heat flux.

A theoretical analysis of the coupled convection-conduction problem has been carried out to find out the parameters governing the problem and how they affect the temperature and heat flux distribution into a body.



Figure 1: IR image of the channel surface relative to a calibration test



Figure 2: Temperature spatial distortion – temperature profile extracted along the horizontal line