STEADY AND UNSTEADY TEMPERATURE FIELD DOWNSTREAM OF A HIGH PRESSURE TURBINE

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This project focuses on the characterization and understanding of the temperature field downstream of a turbine stage. Both the time averaged and the time resolved components, due to rotor blade passing events, are addressed.

Thermocouples are used to measure the time-averaged values. The probe should be able to resolve the temperature transient imposed by the blow-down facility. The problems that have been encountered deal with the transient conduction, i.e. the heat transferred from the wires to their supports due to their high thermal inertia. The first part of this work has consisted in designing, manufacturing and testing new types of probes (see figure 1) that ensure:

- a small transient conduction in order to improve the accuracy of the measurement and avoid corrections
- a good mechanical integrity in high speed flow the possibility of arranging the thermocouples in a rake.

Regarding the unsteady temperature fluctuations, a phase locked averaging routine has been applied to the existing temperature data that takes into account the pitch-wise displacement of the cold wire probe during the test. Significant temperature fluctuations are observed (figure 2) with a clear dependence on the pitch-wise probe location.

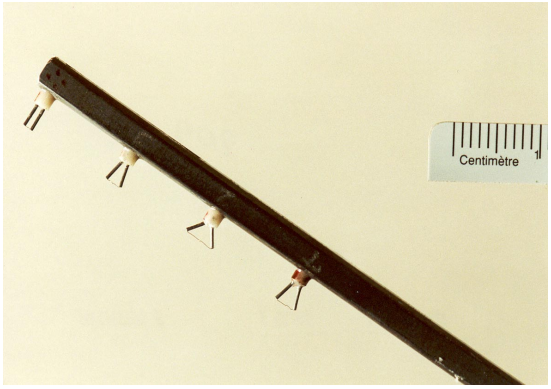

Figure 1: Thermocouples arranged in a rake

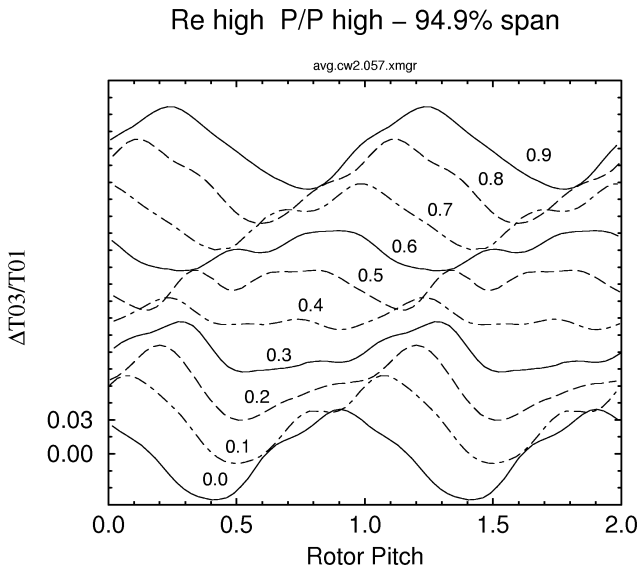

Figure 2: Phase locked average at 94.9% span over a stator pitch