EXPERIMENTAL THERMAL INVESTIGATION IN A NOVEL HP-LP ARQUITECTURE

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Gas turbine research is focused on efficiency enhancement, and cost reduction. Small increases in the efficiency results in a net reduction of their SFC and increase in either the payload or the range.

An innovative stator for the LP turbine with structural vanes has been recently mounted in the VKI compression tube facility. The new stator row contains large airfoils used to support the machine axis, houses the lubrication circuit and facilities the passage of instrumentation system. Additionally, to reduce the axial length of the whole aero engine a swan-neck diffuser is adopted to link the HP turbine to the LP guide vane.

This project aims to analyze the heat transfer and aerodynamics in a transonic high HP – LP turbine configuration. A particular novelty of the present research is the study of the adiabatic wall temperature. The measurement techniques comprise thin film gauges. Experiments are carried out at the CT3 turbine rig which allows testing turbine stages under engine representative conditions as Reynolds number, Mach number, gas to wall temperature and gas to coolant temperature ratios. The flow field characterization is carried out by measuring both steady and unsteady pressures and temperatures. Being the ratio of the airfoil number between the first and second stator not an integer, it is possible to distinguish and isolate the different source of the interactions with the rotor.

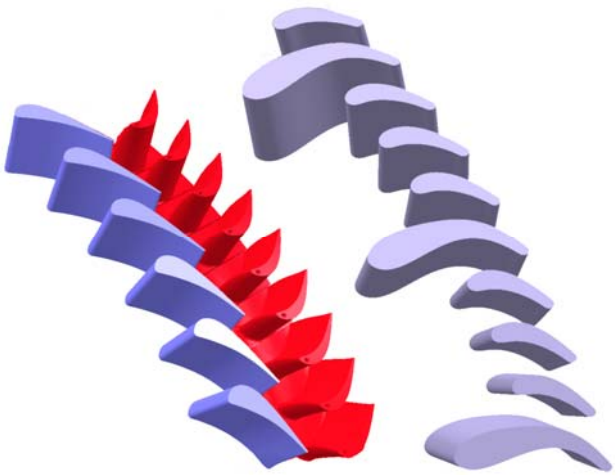

Figure 1: First turbine stage and multi-splitter vane