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Selected aerothermal CFD analyses of high-pressure turbine topics within the AITEB-2 project

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ABSTRACT

The AITEB-2 project (**A**erothermal **I**nvestigations of **T**urbine **E**ndwalls and **B**lades) is a running European Frame Work 6 project, now in its 4th year. The project consortium of 17 partners brings together major European aero engine and gas turbine manufactures as well as leading European experts in the field of Aerothermodynamics to jointly address future challenges associated with the design of high-lift turbine components which are feasible from an aerodynamic, aerothermal, economic and environmental point of view.

The project main technical and scientific objectives comprise: a) improved understanding of film cooling and heat transfer in regions of separated flow, b) decreased amount of coolant flow required by establishing advanced cooling concepts in regions of separated flow, as well as in trailing edge, rotor tip and platform regions, c) development of novel techniques to measure heat transfer in rotating systems and in unsteady flow, d) accelerated industrial design by developing CAD-to-Mesh tools for speeding up the CFD with overall significant impacts on turbine design as well as on the aircraft system in the short and mid-term.

Giving a brief overview of the project, the presentation to be given will focus on selected topics from all technical work packages in order to document the wide variety of aerodynamic and aerothermal topics investigated within the AITEB-2 project. Figures 1-3 show selected results of CFD application as well as of tool development. Moreover and based on the examples presented, it will point out limitations of modelling approaches using CFD based on steady RANS and draw conclusions on the needs of short and mid-term CFD developments efforts.

REFERENCES

[1] AITEB-2 project external website: http://www.aiteb-2.eu/

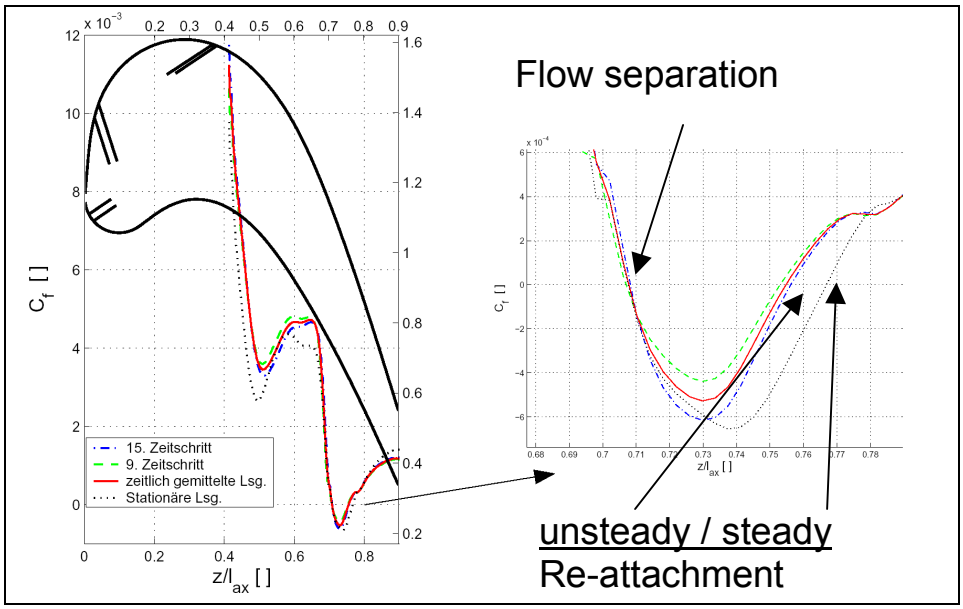

Figure 1: Film-cooling in regions of separated flow

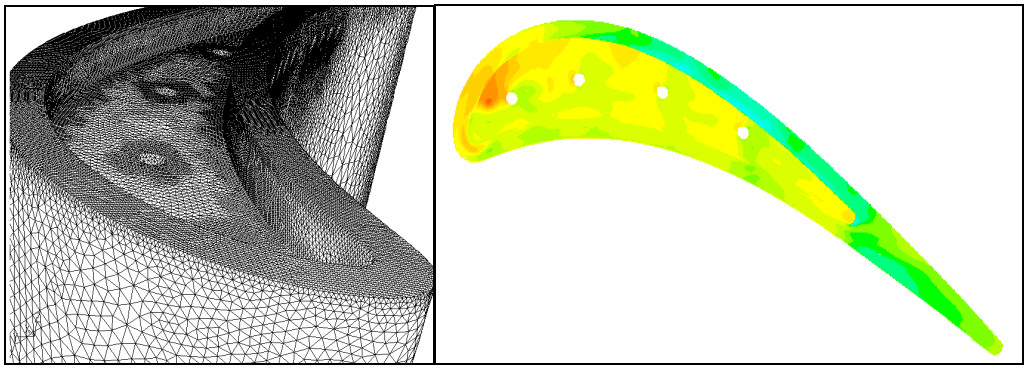

Figure 2: CFD for advanced tip-cooling concepts

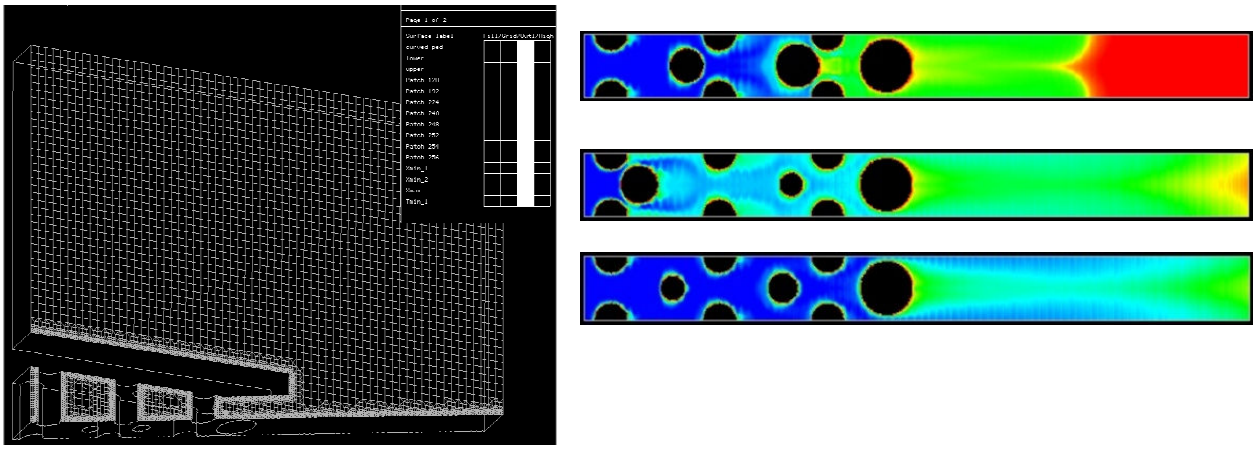

Figure 3: a) Rapid meshing capabilities as part of CFD optimisation process, and b) pin-fin array surface temperature contours resulting from the optimisation process.