Large Eddy Simulation of Wake Boundary Layer Interaction

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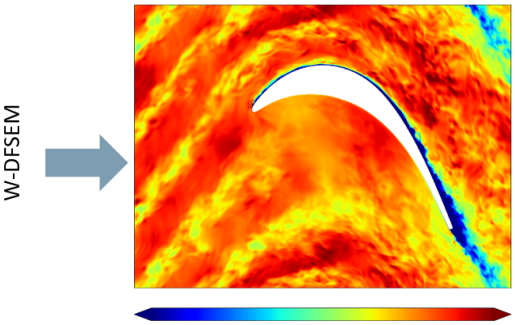
In Short

- Numerical test rig based on Large Eddy Simulation (LES)
- LES of wake induced transition
- Validation and development of RANS turbulence and transition models

The flow in turbomachinery is inherently unsteady due to the interactions between the wakes of support structures, rotor blades and stator blades. This can change the aerodynamics of the airfoil compared to airfoils with stationary inflow. In modern low-pressure turbines of aircraft engines, for example, the wakes can suppress flow separation on the suction side and, thus, allow for a higher aerodynamic loading. Such aerodynamic designs in an industrial context require a precise calculation of the flow by means of RANS, which models the influence of turbulence and transition on the time-averaged flow, completely. However, this is not always the case, e.g. when the RANS turbulence and transition models are used for a parameter range for which they have not been developed and calibrated. Developments in recent years made it possible to operate numerical test rigs utilising turbulence-resolving flow simulations like Large Eddy Simulation (LES). These provide an unlimited insight into the physics of the flow and, thus, enable better modelling for RANS methods. For this reason, a numerical test rig is to be used in the project applied for here in order to be able to better model the influence of the wake boundary layer interaction, afterwards. In this first step, the T106D profile with upstream rotating bars at a Reynolds number of 200000 and a Mach number of 0.4 serves as a test case.



LES of turbine cascade with synthetic turbulent wake boundary condition

Figure 1

WWW

http://www.tfd.uni-hannover.de

More Information

DFG Subject Area