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Comprehensive Experimental and Computational Investigations of the Unsteady Flow in an Axial Flow Low Speed Compressor Stage

Andrzej S. Witkowski, Tadeusz J. Chmielniak, Mirosław M. Majkut, Michał D. Strozik, Jacek M. Żukowski

The Silesian University of Technology, Gliwice, Poland

The objective of the study is experimental and computational investigation of the unsteady flow in the axial flow low speed compressor stage with the use of two systems based on totally different principles: – A 2-sensor fast response straight and 90 degree triple split fiber probes (TSFP) and, – Commercially available three-dimensional Laser Doppler Anemometer (3D-LDA) system. To account for the uniformity of the rotor absolute inlet flow field, measurements will be made at six tangential locations in the absolute frame equally spaced over one inlet guide vane (IGV) pitch. Using two measurement systems, one being intrusive and the other non-intrusive, in the same complex flow field gives the opportunity for: – Study of the structure and decay characteristics of turbulence downstream of the rotor and at the rotor-stator blade row spacing, – Investigations of three-dimensional unsteady flow field in rotor blade-to blade passages, – To understand the propagation of the IGV wake through the rotor at different relative positions of the rotor with respect to the IGV, – A concerted application of experimental (LDA) and computational fluid dynamics (CFD) calculations as well as basis for verification of computational results.

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