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Characterizing rotor stator interaction (RSI) using CFD and experimentally obtained wake flow fields MORTEN KJELDSEN, PAL H.E. FINSTAD, Norwegian University of Science and Technology, ROGER E.A. ARNDT, University of Minnesota — RSI is a major reason for noise and vibration, and reduced performance of turbomachinery. The stationary cascade upstream of the impeller stage is a source of variations in velocity due to angular momentum transfer, creating a cascade blade-to-blade variation. In addition a number of secondary flow fields due to boundary layer dynamics, such as wake flows, emerge from the cascade. At UMN a number of TR PIV fields have been captured downstream of a hydrofoil in liquid water, c=81mm and Re,c= (5 to 8)e5, for different AoAs and for selected passive flow control techniques. The wake trailing the foil is characterized by swirling structures, albeit far from regular shedding. One line of analysis of the captured wake flow fields has been to characterize the structures by a statistical averaged energy analysis over the structures. A second approach has been to use the experimentally obtained data as input in CFD analysis of the impingement of the wake on a rotating vane. Both the procedure and results are described.

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