

Abstract Submitted
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Dynamics and control of hydrofoil wakes ROGER ARNDT, University of Minnesota, MORTEN KJELDSEN, Flow Design Bureau, MARTIN WOSNIK, University of Minnesota — The problem of rotor-stator interaction has been an issue in the turbomachinery field for more than forty years. Manipulation of the stator wakes is one method to minimize the problem. In order to explore this concept, a comprehensive experimental program was carried out in a water tunnel utilizing a series of NACA 0015 hydrofoils. Baseline wake data were collected with a hydraulically smooth foil and compared with various foil modifications including foils covered with riblet tape aligned both span wise and parallel to the main flow, and a foil modified with 3 mm high and 10 mm total length vortex generators (VG), spaced 10 mm apart span wise, that were positioned close to the trailing edge of the foil. Not only was the effect of the modifications on wake spreading investigated but also the effect on wake dynamics such as vortex shedding was studied. PIV has been used for mapping the near wake region extending roughly 1 chord-length (1c) downstream the trailing edge over a range of angle of attack. The results show, as expected, that wake dynamics and wake characteristics such as maximum deficit and width, scale with average drag. It was demonstrated that the use of vortex generators would improve both the dynamics and spreading characteristics of the wake.

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