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Computational Design and Analysis of Flatback Airfoil Wind Tunnel Experiment

C.P. “Case” van Dam, Edward A. Mayda, and David D. Chao
Department of Mechanical and Aeronautical Engineering
University of California
One Shields Avenue
Davis, CA 95616-5294

Dale E. Berg, Sandia National Laboratories Technical Manager

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Abstract

A computational fluid dynamics study of thick wind turbine section shapes in the test section of the UC Davis wind tunnel at a chord Reynolds number of one million is presented. The goals of this study are to validate standard wind tunnel wall corrections for high solid blockage conditions and to reaffirm the favorable effect of a blunt trailing edge or flatback on the performance characteristics of a representative thick airfoil shape prior to building the wind tunnel models and conducting the experiment. The numerical simulations prove the standard wind tunnel corrections to be largely valid for the proposed test of 40% maximum thickness to chord ratio airfoils at a solid blockage ratio of 10%. Comparison of the computed lift characteristics of a sharp trailing edge baseline airfoil and derived flatback airfoils reaffirms the earlier observed trend of reduced sensitivity to surface contamination with increasing trailing edge thickness.