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Aerodynamic and Aeroacoustic Properties of a Flatback Airfoil (Will it Rumble or Whisper?)

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Abstract:

The blade design resulting from the Sandia National Laboratories (SNL) Blade Systems Design Study, known as the BSDS blade, utilizes “flatback” airfoils for the inboard section of the blade to achieve a lighter, stronger blade. Compared to a thick conventional, sharp trailing-edge airfoil, a flatback airfoil with the same thickness exhibits increased lift and reduced sensitivity to soiling. In order to quantify the aerodynamic and noise generation characteristics of flatback airfoils, Sandia National Laboratories has conducted a wind tunnel test to measure the noise generation and aerodynamic performance characteristics of a regular DU97-W-300 airfoil, a 10% trailing edge thickness flatback version of that airfoil, and the flatback fitted with a trailing edge treatment. Limited results from the test are presented. The flatback generates considerably more sound than the sharp trailing edge airfoil, but that sound is significantly reduced by the addition of a simple splitter plate to the flatback trailing edge. The data are shown to be consistent with prior aerodynamic tests on the sharp trailing edge configuration and with prior aeroacoustic tests on blunt trailing edge airfoils.

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