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**AEROELASTIC EFFECTS IN THE STRUCTURAL DYNAMIC
ANALYSIS OF VERTICAL AXIS WIND TURBINES**

D. W. Lobitz, T. D. Ashwill

Sandia National Laboratories; Albuquerque, NM 87185

ABSTRACT

Aeroelastic effects impact the structural dynamic behavior of vertical axis wind turbines (VAWTS) in two major ways. First, the stability phenomena of flutter and divergence are direct results of the aeroelasticity of the structure. Secondly, aerodynamic damping can be important for predicting response levels, particularly near resonance, but also for off-resonance conditions. The inclusion of the aeroelasticity is carried out by modifying the damping and stiffness matrices in the NASTRAN finite element code. Through the use of a specially designed preprocessor, which reads the usual NASTRAN input deck and adds appropriate cards to it, the incorporation of the aeroelastic effects has been made relatively transparent to the user. NASTRAN flutter predictions are validated using field measurements and the effect of aerodynamic damping is demonstrated through an application to the Test Bed VAWT being designed at Sandia.

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