STATISTICAL ANALYSIS OF INFLOW AND STRUCTURAL RESPONSE DATA FROM THE *LIST* PROGRAM*†

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ABSTRACT

The Long-Term Inflow and Structural Test (LIST) program is gathering inflow and structural response data on a modified version of the Micon 65/13 wind turbine at a test site near Bushland, Texas. Data from 491 ten-minute time data records are analyzed here to determine the dependency of fatigue and extreme loads on inflow parameters.

Flap and edge bending moment ranges at a blade root are chosen as the structural response variable, z. Various parameters related to the inflow (including, for example, primary parameters, the mean and standard deviation of the hub-height horizontal wind speed, and secondary parameters, Reynolds stresses, vertical shear exponent, etc.) are each considered in an inflow parameter vector, x. Time series for the structural response, z, are processed in order to obtain a structural response parameter, y, where in separate statistical studies, y is taken to be either an equivalent fatigue load or an extreme load. This paper first describes a procedure by which the important "dependencies" of y on the various variables contained in the inflow parameter vector, x, may be determined considering all the available data. These dependencies of y on x are then recomputed using only the data with above-rated mean wind speeds (taken to be approximately 13 m/s).

The procedure employed is similar to other previous studies, but we do not bin the data sets by wind speed since dependencies in one wind speed bin may be different from those in other bins. Also, our procedure, in sharp contrast to previous studies, examines each inflow parameter in the vector, x, in a sequential analysis, rather than by using multivariate regression.

*Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin company, for the U.S. Department of Energy under contract DE-AC04-94AL85000.