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A.M. Kaplan, S.M. Klute, D.K. Gifford, A.D. Heaney

Distributed Optical Fiber Sensing for Wind Blade Strain Monitoring and Defect Detection

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We present results from using optical frequency domain reflectometry for high-density distributed fiber optic measurement of strain in a composite wind blade during dynamic fatigue testing. Three optical fibers were bonded to the surface of a 9-m wind blade in a grid pattern at the root, and along both the spar caps of the high- and low- pressure sides. The fiber contained distributed fiber Bragg gratings each 50-mm long spaced 50-mm apart and strain measurements were taken with 82-um spatial resolution across each grating. Within the first 10k cycles at 100% load a region of concentrated strain less than 40 mm wide was identified. This work illustrates the evolution of this region as the blade fatigued, demonstrating the potential of distributed fiber optic strain measurement for early defect detection in large-scale composite structural health monitoring.

Ключевые слова:

Содержание.

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