

Wind Energy & Marine Operations Laboratory

Leadership:

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Damage tolerance and damage diagnosis of composite structures

The Wind Energy & Marine Operations (WEMO) lab facilitates interdisciplinary research at the interface of dynamics, control and mechanics of composite materials for onshore and offshore wind energy applications. In particular, we are focused on understanding the complex dynamics of marine operations, including transportation, assembly, and maintenance of offshore wind assets.⁹ ^BAmong our special interests is improving wind turbine blade reliability through their damage tolerance design and damage diagnosis. The lab's approach is based on both experiments and predictive simulations (analytical, numerical and stochastic models) as a means to fully comprehend the phenomena. Ultimately, the WEMO lab's mission is to generate knowledge that will improve wind turbine technology's efficiency, reliability, and safety. The following are the broad areas of research we conduct: Integrated methods for global dynamic load and response analysis of onshore and offshore wind turbines; Numerical modeling and time-domain simulations of installation operation for offshore wind turbine components; Response-based methods for weather window and operability assessment of marine operations; Fiber hybridization techniques for enhancing impact toughness of composites; Damage tolerance and damage diagnosis of fiber composite wind turbine blades; and Understanding wind turbine blade erosion with emphasis on rain and hail impact.