

## 2<sup>nd</sup> International Conference and Exhibition on **Mechanical & Aerospace Engineering** September 08-10, 2014 Hilton Philadelphia Airport, USA

### Progressive failure of shear web reinforced glass-fabric composite wind blade under static loads

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The progressive failure of shear web reinforced glass-fabric composite wind blades subjected to static loads are studied via both experimental and theoretical approaches. In the theoretical study, a nonlinear finite element model together with an incremental load procedure and a phenomenological failure criterion is used to establish the load-displacement relation and estimate the failure loads of the composite wind blade at different loading stages. Whenever failure occurs in the blade, a material constant reduction model is used to adjust the material constants of the elements in the damaged zones. The failure modes such as buckling, first-ply failure, failure zone expansion, and total collapse are identified in tracing the load-displacement curve of the blade. In the experimental study, several 1 m long composite wind blades were tested to failure under static load or stroke-control testing. During each test, the load-displacement curve was constructed to identify the failure modes and the associated failure loads of the blade. The results of the progressive failure tests have shown that the proposed failure prediction method can simulate the progressive failure behavior of the composite wind blades well. It has been shown that the first-ply failure load is around 1.6 higher than the buckling load of the blades while the total collapse load is 1.2 higher than the first-ply failure load.

#### Biography

Tai Yan Kam earned his PhD in the area of Structural Mechanics from Northwestern University, USA, 1982. He is presently Professor of Mechanical Engineering Department, National Chiao Tung University, Taiwan. He has served as Department Chair and Dean of the College of Engineering. In 1990, He was guest professor at the Department of Mechanical Engineering, University of Pretoria, South Africa. He was the recipients of the 2002 National Invention Award and 2003 Taiwan Product of Excellence Award (Taiwan). In recognition of his rectangular flat exciter invention, he was awarded the Gold prizes from 2011 Seoul International Invention Fair (Korea), 2012 Taipei International Invention Fair (Taiwan), 2013 Archimedes Invention Fair (Russia), and 2013 Malaysia International Invention Fair, respectively. He has served as the Guest Editor for *Procedia Engineering Journal* and Associate Editor for *International Scholarly Research Notices and ISRN Applied Mathematics Journal*.

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