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PROCEEDINGS

Progressive Failure Analysis of Composite Laminates Subjected to Transverse Loading with Augmented Finite Element Method

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ABSTRACT

In this paper, two-dimensional (2D) orthotropic augmented finite element method (A-FEM) is applied to account for progressive failure of composite laminates under transverse loading, which considers all major cracking modes (delamination, fiber kinking/rupture matrix cracking). High-fidelity simulations of different stacking composite laminates under transverse loading are implemented. Both predicted load–deflection curves and damage evolution are in good agreement with that of experimental results, which demonstrates the numerical capability of A-FEM. In addition, the influence of stacking sequence on the failure mechanism is also studied by predicted damage evolution of laminates with different stacking sequence. Results show that the tensile matrix crack in the bottom laminar is always the first damage mode for the composite laminate, and the subsequent crack propagation is related to ply orientation of adjacent plies which have a blocking effect on crack propagation.

KEYWORDS

Composite laminate; progressive failure; flexural deformation; augmented finite element

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