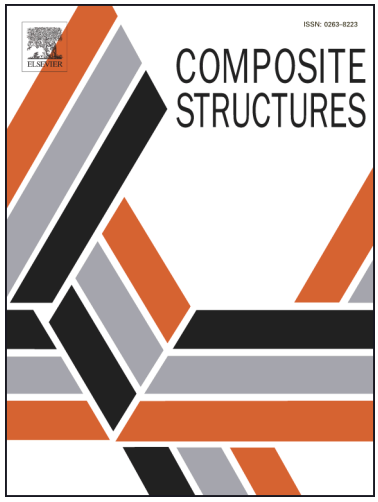

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Progressive Failure Prediction of a Landing Gear Structure of Braided Composites

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Abstract: Two simplified methods for progressive failure prediction of structures made of braided composites, mainly subjected to uniaxial in-plane loading or bending, were proposed, in order to bypass the complexity associated with meso- and micro-mechanics without losing much accuracy. One method models braided composites as equivalent one-dimensional material with different tensile and compressive strengths, for structures mainly subjected to uniaxial loading. The other more general method models braided composites using equivalent laminates, used together with Hashin's progressive damage model. The parameters required in two methods were calibrated using stress-strain curves generated through the multi-scale approach, which combines micromechanics of failure (MMF) and meso-mechanical models describing the geometries of braided composites. Good agreement was observed in the moduli and strengths estimated using both proposed methods and the multi-scale approach, for braided composites with braiding angles ranging from 15 to 75 degrees subjected to uniaxial tension and compression. Finally, the proposed methods were utilized to predict the response of a landing gear structure fabricated using braided composites under bending. Reasonable agreement between experimentally acquired load-displacement curve and prediction was achieved.

Keywords: braided composites, progressive failure, strength, landing gear