



Crushing behavior of a composite corrugated specimen representative of an aircraft subfloor: experiment and simulation

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ABSTRACT

The suitability of a progressive failure element to simulate the quasi-static crushing of a composite specimen is evaluated. The commercially available material model MAT54 "Enhanced Composite Damage" in LS-DYNA is often utilized to simulate damage progression in dynamic failure simulations because it requires a reduced number of experimental input parameters compared to damage mechanics-based material models. The composite specimen used for the experiments is a semi-circular sinusoid, and is comprised of carbon fiber/ epoxy unidirectional prepreg tape. Results show that MAT54 can successfully reproduce experimental results. However the simulation is highly sensitive to changes in model parameters, which are either non-physical (i.e. are purely mathematical expedients), or cannot be measured experimentally. These include element size, contact definition, load-penetration curve, and crush front softening parameter, among others. Therefore, achieving successful simulation results requires extensive calibration of these parameters by trial and error, and a deep understanding of the strengths and challenges of the selected modeling strategy.