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ABSTRACT

In this paper, the shear behaviour of a stiffened composite panel with a notch has been numerically simulated by means of a three-dimensional progressive degradation model, able to take into account the intra-laminar gradual degradation of composite laminates. As a relevant added value with respect to state of the art progressive damage models, the proposed methodology, based on energy balance considerations, on three-dimensional failure criteria and on gradual material degradation laws, allows to take into account the real three-dimensional stress distribution, failure onset, and gradual propagation in laminated composites in a Finite Element Analysis without any mesh dependency. A User Defined Material Subroutine (USERMAT) has been used to implement the proposed methodology within the FE commercial code ANSYS©. The resulting numerical tool has been firstly adopted, for preliminary validation purposes, to simulate the tensile behaviour of an Open Hole specimen, focusing on the mesh independency feature of the proposed methodology. Then, the shear behaviour of a stiffened composite panel with a large notch has been simulated taking into account the damage onset and propagation in the large notch area where the three-dimensional stress distribution drives the failure mechanisms. The outstanding agreement, for these applications, between the obtained numerical results and literature experimental data, in terms of damage onset, damage evolution and final failure, confirmed

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