

Modelling the Influence of the Scarf Ratio to the Integrity of Repaired Composite Structures

M. Papanou, O. Triantopoulos, S. Psarras, V. Kostopoulos

University of Patras - Department of Mechanical Engineering & Aeronautics - Greece

Abstract

The last decades composite materials have gained critical position in aerospace structures and the need of maintenance and repair is crucial.

In this work the effectiveness of stepped repair to damaged fiber reinforced composite materials was investigated by using validated FE numerical models that compared with tested repaired composite plates.

Attention was given at the actual failure modes of composites including delaminations. All FE models took into account the anisotropy in each ply in the laminate and in the repair patch by splitting the laminates to sublaminates. This method was introduced in order to take into consideration the effect of delamination caused by the failure between the plies due to shear stresses. Parametric studies were carried out in order to compare forces, displacements, stresses and stiffness properties. Namely, models were analyzed depending on the overlap segment's length with repair scarf ratios varying from the value of 20 to the value 60 with a step increase of 10. The FE models allowed a direct comparison of the influence that the step length to ply thickness ratio had to the strength and stiffness restoration of the repaired composite structures.

Keywords: composites, scarf repair, finite elements