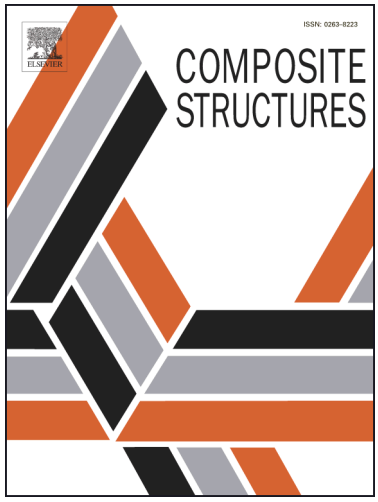

Analysis of tapered composite structures using a refined beam theory.

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Analysis of tapered composite structures using a refined beam theory.

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Abstract

This work presents some static analyses on reinforced thin-walled tapered structures made of composite material. These applications are performed through a refined one-dimensional model based on the Carrera Unified Formulation. This formulation uses polynomial expansions to describe the displacement field over the cross-section of the beam. In this way, a quasi three-dimensional solution can be obtained. In the present work the cross-sectional kinematic has been described using the Lagrange polynomials. The use of such models allows any component of the structure to be modelled separately and then the complex structure can be obtained thanks to the so-called component-wise approach. Different aeronautical structural components, gradually more complex, have been studied. The stress and displacement fields due to simple loads have been obtained. The results have been compared with those obtained by means of a commercial FEM tools using one-, two- and three-dimensional elements. The results obtained show how the present approach can deal with complex structures such as tapered aeronautical components. The use of refined beam models allows complex stress fields to be accurately evaluated that is composite materials can be investigated.

Key words: CUF, One-dimensional model, tapered beam, composite material, laminate.

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