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Study on the Lateral Torsional Buckling of Composite Thin-Walled Beam

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Abstract

Aircraft structures are made of thin-walled structures as it provides higher stiffness to weight ratio compared to solid sections, but it is prone to buckling due to its low stiffness and slenderness of the individual element. One of the types of buckling that can impact the integrity of a thin-walled beam is lateral torsional buckling which is caused by simultaneous lateral bending and twisting of the cross-sections and it happens before the beam's material strength is reached. Therefore, the design of such thin-walled structure should ensure that the applied load on a structure does not surpass the critical buckling load. Moreover, modern aircraft structures are made of laminated composites to achieve higher specific stiffness and specific strength. Thus in this work, an analysis on the lateral torsional buckling of composite thin-walled beam is performed to evaluate the critical buckling load of an cantilever beam. ANSYS is used to find the critical buckling load of a composite thin-walled beam and the results obtained from numerical method are compared with previous analytical studies. Finally parametric study is conducted for different layup stacking sequence and dimensions of the beam to find the best layup for to achieve the highest critical buckling load.

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