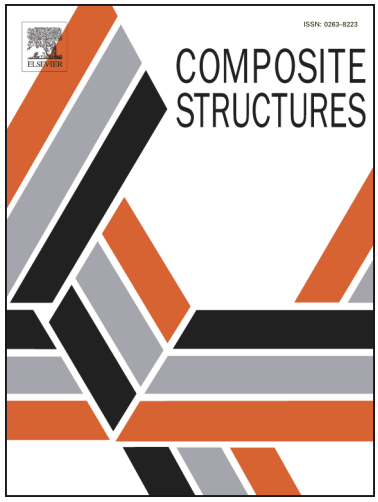

Experimental and numerical studies on the stability behavior of composite panels stiffened by tilting hat-stringers

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Experimental and numerical studies on the stability behavior of composite panels stiffened by tilting hat-stringers

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Abstract Due to the existence of sweepback angle of aircraft, the stringers of the stiffened panels in some parts may be declined instead parallel to the boundary. The paper deals with stability experiment investigation on the stiffened composite panels with tilting stringers. Two panels stiffened by six tilting stringers were manufactured and tested. Attempts were made to obtain the buckling load, ultimate load carrying capability and failure state of the panels. Finite element analysis was performed to investigate the tests and FE models were calculated by ABAQUS. The numerical results were assessed by comparing with the test data and good agreement was observed for both buckling and ultimate collapse load as well as the failure modes of the structure. Further investigation was performed to explore the influence of tilting angles on stability behavior of the panels which revealed that the buckling load exhibited a continuous decrease with the increasing tilting angles while the ultimate load showed an initial rise from 0º to 1º and then decreased.

Keywords Hat-stiffened panels; Stability experiment; Tilting stringers; Post-buckling; Finite Element Method (FEM)

1 Introduction

Composite materials have been increasingly used in aerospace industry due to their considerable stiffness and strength to weight ratio as well as designable characteristics. Stiffened composite panel is a very typical form of composite structures which has been widely adopted in aircraft structures, like the fuselages, tail planes and wings. In practice, the composite panels are often subjected to axial compression which would easily lead to the buckling of the structures. Moreover, it is found and acknowledged that the stiffened panels

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