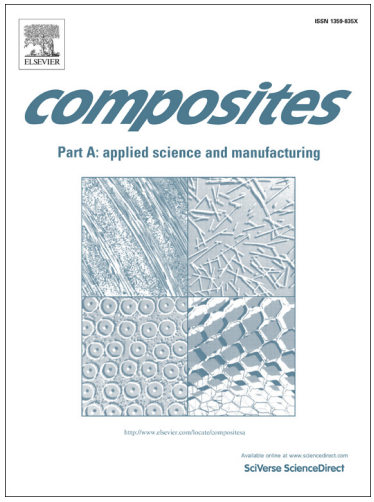

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Damage Resistance and Damage Tolerance of Hybrid Carbon-Glass Laminates

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ABSTRACT

The influence of impact energy and stacking sequence on the damage resistance and Compression After Impact (CAI) strength of hybrid Carbon and Glass Fibre Reinforced Plastic (CFRP and GFRP respectively) hybrid laminates is investigated. CAI tests demonstrate that, in comparison to fully CFRP laminates, hybrid laminates show increases in structural efficiency of up to 51% for laminates subject to a 12J impact and 41% for those subject to an 18J impact. Laminates displaying the highest stresses at failure are those that exploit stacking sequences and GFRP content to prevent delaminations from forming close to the outer surface of the laminate during impact. This favourable damage morphology inhibits both sublaminate-buckling-driven delamination propagation and asymmetric laminate buckling failures.

Keywords: A. Hybrid; B. Damage Tolerance; B. Impact behaviour; B. Strength.

1. Introduction

In order to meet emission and structural efficiency targets it is inevitable that the next generation of commercial aircraft will show a significant and increasing reliance on the favourable strength and stiffness properties of Carbon Fibre Reinforced Plastics (CFRP). However, a number of factors are preventing CFRP from being utilized to its full potential, amongst which Barely Visible Impact Damage (BVID) is of particular significance. BVID, which maybe caused by dropped tools and impact of small runway debris, leaves surface indentations which are too small to be seen on routine aircraft inspections yet can cause considerable internal