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## A strategy to improve the structural performance of non-crimp fabric thin-ply laminates

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### Abstract

The enhanced mechanical performance of thin-ply laminates results from their ability to delay the onset of damage typically observed in composite materials. However, in notched structures, subcritical damage growth causes beneficial stress redistributions in the vicinity of the notch, blunting the stress concentration. Precluding these damage mechanisms, as in thin-ply laminates, may potentially lead to inferior notched responses. To obviate this limitation of thin-ply laminates, a strategy based on the combination of standard grade 0° plies and thin transverse and off-axis plies is analysed in this paper. A detailed study of the effect of 0° ply blocking is carried out, with particular emphasis on the blunting mechanisms and notched response. Tests on scaled notched panels loaded in tension, with notch sizes between 6 mm and 30 mm, show that the combination of standard grade 0° ply blocks with thin transverse and off-axis plies promotes localised fibre-matrix splitting, which acts as an important notch blunting mechanism, while preventing matrix cracking and delamination. This results in an improved notched response and superior large damage capability. It is also shown that thicker 0° ply blocks provide higher stability in com-

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