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# A constitutive model for elastic-plastic behaviour and delamination damage in fibre metal laminates

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**Abstract**

This study focusses on the development of a constitutive material subroutine to simulate damage at the interfaces of elastic-plastic materials under quasi-static loading. The code, based on a novel cohesive zone model using a trapezoidal traction-separation law enables the definition of cohesive interfacial properties representative of those observed for Glare® fibre-metal laminates. It is implemented through a user-defined VUMAT subroutine for the Abaqus/Explicit software. By considering elastic-plastic damage behaviour, this model provides more accurate results for the simulation of ductile adhesives than the commonly used bilinear cohesive zone model. It is computationally more robust when compared with implicit techniques since it is coded for dynamic explicit solution schemes which can simulate highly nonlinear material behaviour easily. Results are validated against the bilinear cohesive zone model for cohesive elements available in Abaqus library and a good correlation was noticed between the two models in the elastic region. Also, a good representation for the standard trapezoidal traction law was noticed.

***Keywords:*** *Fibre Metal Laminates, Cohesive Zone Model, VUMAT subroutine, elastic-plastic behaviour, traction-separation law.*

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