

BLAST DAMAGE RESPONSE OF COMPOSITE PANELS

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ABSTRACT

Composite structures are increasingly being utilised in military maritime applications. Understanding the response of composite structures from the impact of blast loading is important for the evaluation of the vulnerability of vessels and expected damage envelope after a weapon strike. Testing of the response of composite materials to blast loading can determine failure limits, ideal material constructs and damage initiation and propagation characterization, to inform design of composite structures for military purposes. Additionally, the effect of sea water absorption on the performance of composite structures needs to be understood for military vessels operating in a military theatre, as these vessels may be subjected to air blast events from a weapon hit.

A series of experiments aimed at characterising the blast loading response of a variety of composite panels to plastic explosive (PE4) have been performed with variations in stand-off distances, and explosive weights. The blast loading profiles of the composite panels have been determined using the incident and reflected pressure gauges at similar stand-off distances. A Digital Image Correlation (DIC) technique has been employed to characterise the maximum displacement under blast loading and ultrasonic non-destructive testing (NDT) technique to examine damage such as matrix cracking, delamination and fibre fracture. Mechanical properties of the composite panels have also been measured pre and post failure.