

Accepted Manuscript

A strain-rate-dependent damage model for evaluating the low velocity impact induced damage of composite laminates

Kangkang Wang, Libin Zhao, Haiming Hong, Jianyu Zhang

PII: S0263-8223(18)30585-3
DOI: <https://doi.org/10.1016/j.compstruct.2018.06.046>
Reference: COST 9840

To appear in: *Composite Structures*

Received Date: 9 February 2018

Revised Date: 1 June 2018

Accepted Date: 15 June 2018



Please cite this article as: Wang, K., Zhao, L., Hong, H., Zhang, J., A strain-rate-dependent damage model for evaluating the low velocity impact induced damage of composite laminates, *Composite Structures* (2018), doi: <https://doi.org/10.1016/j.compstruct.2018.06.046>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

A strain-rate-dependent damage model for evaluating the low velocity impact induced damage of composite laminates

Kangkang Wang¹, Libin Zhao^{1,*}, Haiming Hong², Jianyu Zhang^{3,*}

1 School of Astronautics, Beihang University, Beijing 100191, China

2 Shenyang Aircraft Design and Research Institute, Shenyang 110035, China

3 College of Aerospace Engineering, Chongqing University, Chongqing 400044, China

Abstract. Low velocity impact (LVI) has always been a potential threaten to composite structures. This out-of-plane dynamic impact load easily leads to a dramatic increase of the strain state in the material transverse plane, which can affect the dynamic stress state and damage evolution of the composite laminate, especially for LVI with a relatively high energy. However, the strain rate effect was always neglected in existing investigations, thus introducing inevitable errors in numerical predictions for engineering practices. To accurately capture the failure process of composite laminates under LVI, a three-dimensional strain-rate-dependent damage model was proposed. This model was composed of three parts: a modified stress-strain relationship for composites under a dynamic stress state; a strain-rate-dependent progressive damage model to evaluate the intra-laminar damage; and a cohesive zone model to examine the inter-laminar delamination. LVI tests with different impact energies were conducted to provide validating data. It is shown that the numerical results from the strain-rate-dependent damage model are highly consistent with the experimental outcomes. The contact force history curves, intra- and inter-laminar damage evolution process are found to be strain rate dependent, and thus the numerical errors predicted by the strain-rate-independent damage model significantly increase with the

* Corresponding author: Libin Zhao, E-mail: lbzhao@buaa.edu.cn

* Corresponding author: Jianyu Zhang, E-mail: jy Zhang@cqu.edu.cn

Download English Version:

<https://daneshyari.com/en/article/6703435>

Download Persian Version:

<https://daneshyari.com/article/6703435>

[Daneshyari.com](https://daneshyari.com)