

Accepted Manuscript

Analytical Predictions of Delamination Threshold Load of Laminated Composite Plates subject to Flexural Loading

Jiawen Xie, Anthony M. Waas, Mostafa Rassaian

PII: S0263-8223(17)31255-2

DOI: <http://dx.doi.org/10.1016/j.compstruct.2017.07.009>

Reference: COST 8664

To appear in: *Composite Structures*

Received Date: 20 April 2017

Revised Date: 5 July 2017

Accepted Date: 8 July 2017



Please cite this article as: Xie, J., Waas, A.M., Rassaian, M., Analytical Predictions of Delamination Threshold Load of Laminated Composite Plates subject to Flexural Loading, *Composite Structures* (2017), doi: <http://dx.doi.org/10.1016/j.compstruct.2017.07.009>

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.

Analytical Predictions of Delamination Threshold Load of Laminated Composite Plates subject to Flexural Loading

Jiawen Xie^a, Anthony M. Waas^{b,*}, Mostafa Rassaian^c

^a*Dept. of Aerospace Engineering, University of Michigan, Ann Arbor, MI 48109-2140*

^b*William E. Boeing Dept. of Aeronautics and Astronautics, University of Washington, Seattle, WA 98195-2400*

^c*Boeing Company, Seattle, WA, 98124*

Abstract

An analytical approach is proposed to determine delamination threshold loads of fiber-reinforced laminated composite plates with arbitrary stacking sequences under transverse loading conditions. Following the concept of cohesive zone modeling, a laminated plate is considered as an assembly of two sub-laminates connected by a virtual elastic-brittle layer with infinitesimal thickness. The problem is formulated and solved by the Rayleigh-Ritz method based on first-order shear deformation theory. The problem of quasi-static face-on (transverse) indentation test is analyzed as an example. The results, including elastic stiffness of flexural response, traction distributions over the potential crack interface, and threshold loads and initiating locations of delamination, are found to be in very good agreement with finite element simulations using cohesive elements. The modeling strategy, therefore, is useful for aerospace structural engineers at the preliminary design stage of laminated composite aerospace structures.

Keywords: laminate, plate, analytical, Rayleigh-Ritz, FSDT, cohesive zone modeling, delamination threshold load, flexural response

*Corresponding author

Email addresses: jwxie@umich.edu (Jiawen Xie), awaas@aa.washington.edu (Anthony M. Waas), mostafa.rassaian@boeing.com (Mostafa Rassaian)

Download English Version:

<https://daneshyari.com/en/article/4911858>

Download Persian Version:

<https://daneshyari.com/article/4911858>

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