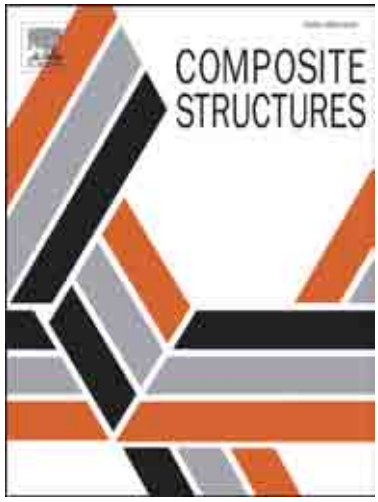

Flexural fatigue life prediction of CFRP-Nomex honeycomb sandwich beams

A. Rajaneesh, Z. Yian, G.B. Chai, I. Sridhar

PII: S0263-8223(17)32726-5
DOI: https://doi.org/10.1016/j.compstruct.2018.02.067
Reference: COST 9417

To appear in: *Composite Structures*

Received Date: 25 August 2017
Revised Date: 26 January 2018
Accepted Date: 21 February 2018

Please cite this article as: Rajaneesh, A., Yian, Z., Chai, G.B., Sridhar, I., Flexural fatigue life prediction of CFRP-Nomex honeycomb sandwich beams, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.02.067

Flexural fatigue life prediction of CFRP-Nomex honeycomb sandwich beams

A. Rajaneesh, Z. Yian, G. B. Chai*, I. Sridhar

School of Mechanical and Aerospace Engineering,Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798, Singapore.

Abstract

Long-term exural fatigue life of composite sandwich beams consisting of plain weave carbon 3K-70P/epoxy (CFRP) faceplates and Nomex honeycomb core is studied using time-temperature superposition principle (TTSP) by extending our previous study on laminates [Composites Part B: Engineering (19):539-547, 2016]. Considering negligible effect of temperature on the honeycomb core performance, time-temperature shift factors (TTSF) of the sandwich beams is assumed to be same as that of the CFRP faceplates. Hence, TTSFs are taken from previous laminates study. Constant strain rate (CSR) experiments at various temperatures and strain rates are conducted to construct the CSR master curve, followed by prediction and validation of creep strength master curve. Flexural fatigue tests were then conducted at various temperatures and load levels to construct S-N curves at respective temperatures. Finally, fatigue strength master curve is constructed. Within experimental scatter, predicted fatigue behavior at any given (a) frequency and (b) load ratio is con rmed to be in reasonable agreement with the experimental measurements.

Keywords: A. Polymer-matrix composite sandwich, B. Durability, B. Fatigue, B. Mechanical properties, D. Life prediction

1. Introduction

Sandwich structures have proved their superiority for high speci c stiffness compared to metallic structures. However complex failure mechanisms under real world loading conditions inhibits us to exploit the full potential of these structures in many weight sensitive domains viz., aerospace, wind, marine applications. Current article is con ned to study the long-term exural fatigue behavior of composite sandwich structures with carbon ber reinforced polymeric (CFRP) faceplates and honeycomb core. This sandwich construction is widely used as hull structures in racing boats and yachts. Exhaustive reviews on the fatigue behavior prediction methodologies for

*Corresponding author.
Email address: mgbchai@ntu.edu.sg (G. B. Chai*)