Accepted Manuscript

Fatigue life prediction of metal structures subjected to combined thermal-acoustic loadings using a new critical plane model

Jingran Ge, Yi Sun, Jun Xu, Zhiqiang Yang, Jun Liang

PII: S0142-1123(16)30387-5
DOI: http://dx.doi.org/10.1016/j.ijfatigue.2016.11.023
Reference: JIJF 4138

To appear in: *International Journal of Fatigue*

Received Date: 28 May 2016
Revised Date: 14 November 2016
Accepted Date: 16 November 2016

Please cite this article as: Ge, J., Sun, Y., Xu, J., Yang, Z., Liang, J., Fatigue life prediction of metal structures subjected to combined thermal-acoustic loadings using a new critical plane model, *International Journal of Fatigue* (2016), doi: http://dx.doi.org/10.1016/j.ijfatigue.2016.11.023

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.

ACCEPTED MANUSCRIPT

Fatigue life prediction of metal structures subjected to combined thermal-acoustic loadings using a new critical plane model

Jingran Ge[a,b,c], Yi Sun[c,*], Jun Xu[b], Zhiqiang Yang[c], Jun Liang[a]

[a] Institute of Advanced Structure Technology, Beijing Institute of Technology, Beijing 100081, China

[b] Advanced Vehicle Research Center, Beihang University, Beijing 100191, China

[c] Department of Astronautic Science and Mechanics, Harbin Institute of Technology, Harbin 150001, China

Corresponding author: Tel.: +86-451-86418124; E-mall: sunyi@hit.edu.cn

Abstract

In this paper, the fatigue life of metallic structures under combined thermal-acoustic loadings is predicted based on critical plane model. In order to take into account the effect of mean stresses induced by temperature loading, a new critical plane model based on shear strain is proposed. The proposed model is validated with experimental data from literature through testing four metal materials under various strain paths with zero/non-zero mean stress. It has been shown that the results estimated by the proposed model agree well with the experiment. Furthermore, the proposed model is applied to predict the fatigue life of metal structures under combined thermal-acoustic loadings, and compared with the uniaxial Goodman model. The comparison indicates that the proposed model is conservative, and the thermal loading can significantly reduce the fatigue life.

Keywords: Multiaxial fatigue life prediction; Mean stress; Critical plane model; Combined thermal-acoustic loadings; Acoustic fatigue

1. Introduction

Sonic fatigue has been considered as an important problem for the design of aircraft panels. In addition, the surface panels of many high-speed flight vehicles are exposed to high levels of acoustic loading and elevated

Download English Version:

https://daneshyari.com/en/article/5015160

Download Persian Version:

https://daneshyari.com/article/5015160

Daneshyari.com