LOW-CYCLE FATIGUE OF FIBER-METAL LAMINATES - SOME ASPECTS OF FINITE ELEMENT ANALYSIS

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Keywords: Fibre Metal Laminates, Low cycle fatigue, Finite element method, Composites

Abstract
In this paper the possibilities of finite element analysis of low-cycle fatigue of selected Fiber Metal Laminates are presented and discussed. The main analytical models are presented and their suitability was assessed. The methods of modelling the components and global material have been proposed. Metal-composite laminated panels were modelled in Abaqus environment. The strain controlled tension-tension and tension-compression tests were performed. The elastic and elasto-plastic material definition was employed and the crack nucleation and propagation phases were calculated. Relations for a numerical model were derived from an experimental investigation. The results show various correlation relationships.

1. Introduction

The development of the aviation industry, which has been made over the last decades has forced the significant progress in the field of modern and lightweight aircraft structures such as Fiber Metal Laminates (FMLs). FMLs consist of thin metal sheets and fiber reinforced composites (Fig 1.). They have low density and good mechanical properties like high damage tolerance in fatigue and impact characteristics, corrosion and fire resistance[1,2]. Fibre metal laminates (FML) are advanced hybrid materials used in aircraft industry. They provide very good combination of metals and composites, especially in fatigue tolerance. FML's have superior properties in crack growth resistance because of the fibre bridging effect [3].

The project was funded by the National Science Centre allocated on the basis of Decision No. UMO-2011/03/N/ST8/06351

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