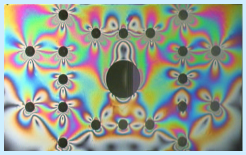
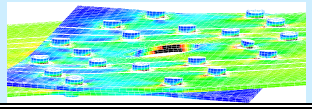
BOJCAS

FIFTH FRAMEWORK PROGRAMME
COMPETITIVE AND SUSTAINABLE GROWTH





Bolted Joints in Composite Aircraft Structures

Information Sheet

http://www.smr.ch/bojcas/

INTRODUCTION

This information sheet provides summary information on the EU-sponsored research project, BOJCAS. In this project a number of tools for analysis and design of composite bolted joints have been developed, and validated against experiments. While BOJCAS was focused on the aerospace industry, the tools developed may have uses in other industries where efficient joints between composite parts are required. To find out more about the tools developed, contact any of the partners listed overleaf or view the website.

THE BOJCAS PROJECT

BOJCAS is a three-year project, due to finish in 2003, with 11 partners including aerospace manufacturers, aerospace research laboratories, universities and a software producer. The project co-ordinator is the University of Limerick.

Developing improved analysis and design techniques for composite bolted joints is an important topic, since efficient joint design is crucial to producing lightweight structures. Designing joints in composites is more complex than in metals, so in order not to lose much of the weight advantage possessed by composites, it is vital to use the best available joint design methods.

TOOLS DEVELOPED

Global Design Tools These tools can be used to determine the bolt load distribution in complex multi-bolt joints and structures, and they can also be used for preliminary failure analysis using simple design rules. They need to be fast, but also accurate or they are of no value. Both *SAAB* and *QinetiQ* have developed global design methods based on 2D Finite Element Analysis (FEA), and have validated their tools against experiment and the more detailed methods below.

Detailed (Local) Design Tools These methods are intended for detailed design of critical joints. They are based on 3D FEA. A critical factor in making such techniques usable in a design environment is the model setup time. Both the *University of Limerick* and *KTH* have produced pre-processing software to allow quick and easy production of 3D models of common joint configurations. *CIRA* and *ISTRAM* have worked on 3D progressive damage analysis methods, to provide more accurate failure predictions.

Global-Local Coupling Tools *QinetiQ*, *SMR* and *Airbus Deutschland* have worked on tools to couple global and local analyses, to improve the accuracy of global methods. *FOI* have developed an advanced computational technique called the "splitting method" which makes possible extremely efficient full 3D analyses of complex joints.

VALIDATION

All the tools have been validated in BOJCAS against an extensive experimental programme involving relatively small specimens (*University of Limerick*, *NLR*, *KTH*, *CIRA*, *FOI*) as well as large multi-bolt joints more representative of aircraft joints (*Airbus UK* and *NLR*).

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