CPD4D Project **Project Number AH9/124**

Non-Destructive Evaluation of Composite Components (CPD4D)

Project CPD4D has developed practical procedures for the Non Destructive Evaluation (NDE) of composite materials. The CPD4D program is part of the DTI funded *Composites Performance and Design (CPD) Program 1997-2000* and more specifically CPD4 on specific issues of manufacture, safety and design.

Generic procedures have been developed for inspection of GRP and other composite materials by three selected techniques, ultrasonics, thermography and laser shearography followed by case studies interacting with the main suppliers of these technologies and end users to refine the procedures. This is the first time that such procedures have been available to UK industry. Field inspectors and experts with many years practical experience in the technologies have been involved in the procedure development.

This has led to procedures that are simple, practical, pragmatic and generic and would be suitable to put forward for standardisation. There is already evidence that their availability is increasing interest by UK industry in use of these NDE methods. Seven subsidiary procedures were produced on ultrasonic inspection of FRP including A-Scan, B-Scan, pulse-echo and through transmission C-Scan and probe selection. Each procedure was validated by a number of case studies.

A range of industries have been involved in the development from chemical, marine, automotive, oil, gas and petrochemical and aerospace. There has been a good exchange of best practice between these industries. The procedures consider the complex and thicker section components prevalent in the industries, as well as defect types such as erosion and impact damage, while still maintaining relevance to the thinner higher integrity components found in aerospace.

This document summarises the main achievements of the CPD4D. As well as the procedures and case studies these include: a critical review and NDE handbook, consideration of defect assessment methods and the practical assessment of current UK industry requirements. The report also describes the use of performance-based economic assessment methods (IVM) to examine the cost-benefits of different NDE methods and use of computer models to simulate inspection data and predict inspection reliability (POD). The latter could be have benefit at the design stage and in optimising an inspection programme.

The procedures have been practically applied in industrial applications such as refinery process vessels and have made a significant improvement in the quality of NDT data. The Laser shearography procedures have assisted the recent take-up of this technology, which is now replacing ultrasonic C-Scanning in many aircraft, repair and marine applications.

The main deliverables from the project have been placed on a dedicated website to make them accessible to industry and facilitate their use

(www.ndt.aeat.co.uk/Noticeboards/CPD4D/).

The work is complementary to issues covered in other CPD4 programmes including: Repair Technology (CPD4A), Manufacturing/Processing measurements (CPD4B), Implementation of Material Models in Design Procedures (CPD4C), Fire Test Programme (CPD4E), Machining and Specimen Preparation (CPD4F), Friction and Wear (CPD4G)

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