

## SEMINAR ANNOUNCEMENT

# Composite Materials and Structures – Design, Inspection and Assessment

### Venue

ITRC Seminar Room C08, University Park Campus, University of Nottingham, UK

### Date

Wednesday 19 October 2005

### Purpose of the Event

While the advantages of composite materials are generally appreciated, they are more complex than conventional engineering materials, and generally regarded a more difficult to design with and to inspect. Where manufacturing or service induced flaws can be detected, their significance in terms of performance reduction may also be difficult to assess. All these factors have to a degree inhibited the use of these materials by industry.

**This seminar presents the main findings from four DTI funded programmes that have been set up to address these issues.** Significant progress has been made in all four subject areas. Overviews will be given by the four project leaders (from QinetiQ, AEA Technology and NPL) with supporting contributions from industry.

### DRAFT PROGRAMME

10.00	Welcome and Domestic Details	Professor A. Long, University of Nottingham
10.05	MMS5B Review	J. Cook, QinetiQ
10.45	Industry Speaker	Oliver Wessley, Formax
11.05	Coffee	
11.20	MMS5A Review	J. McCarthy, AEAT
12.00	Industry Speaker	Roger Davidson, CTG
12.20	LUNCH	
13.20	MMS13 Review	M. Gower, NPL
14.00	Industry Speaker	TBD
14.20	Tea	
14.35	MMS15 Review	M. Wall, AEAT
15.15	Industry Speaker	TBD
15.35	Discussion	
16.00	CLOSE	

## MMS5A

### Design and Failure of Material Systems under Multi-Axial Loads

The performance of materials under the action of *multi-axial loads* is of key importance for the designers of engineering structures. This is especially the case for composites where the effect of anisotropy can result in a structure that is 'unforgiving' towards loads that have not been properly addressed. Whilst there are many published design methods and failure theories for composites, it remains the case that no single approach has broad application either in terms of material or structural form. This project, which has undertaken by a team consisting of [AEA Technology](#), [NPL](#) and [NetComposites](#), has established a technical framework to address the types of question typically posed by engineers concerned with the design of composite structures subjected to multi-axial loads.



The key data has been presented in the form of an *Interactive Knowledge Base (IKB)* accessible at the project website [www.mms5.co.uk](http://www.mms5.co.uk). Specific issues addressed include:

- What failure criteria are relevant for particular applications;
- What evidence or data are available to validate the choice of criteria
- How do the criteria relate to long term performance
- What test methods are available to measure multi-axial performance
- How can available criteria be applied to materials of different structure

What minimum amount of testing is necessary in order to define performance envelopes?

## MMS5B

### Design and Failure of Material Systems under Multi-Axial Loads



One important aspect in which composite materials differ from other engineering materials is that their behaviour under multi-axial loading is very complex. In recent years, this situation has eased due to a) the completion of a collaborative World-Wide-Failure Exercise on the subject and b) the availability of test data on aerospace composites together with a supporting theoretical framework. The purpose of MMS5B has been to distil this information into a form useful to UK industry generally and to supplement the available data with further bi-axial test results on other types of composite.

An important extension to this activity that has been carried out under MMS5B has been a comprehensive study on the behaviour of composites under tri-axial loading.

## MMS13 – Assessment and Criticality of Defects and Damage in Material Systems

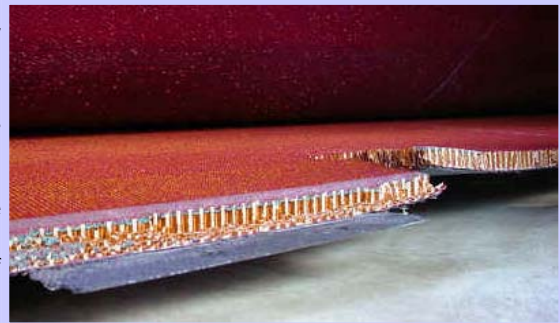


An important unresolved problem in composite technology across a range of sectors (e.g. aerospace, automotive, marine, pipes/vessels etc), lies in determining the significance and criticality of defects and damage on the residual performance of structures, together with the identification and validation of appropriate defect detection techniques.

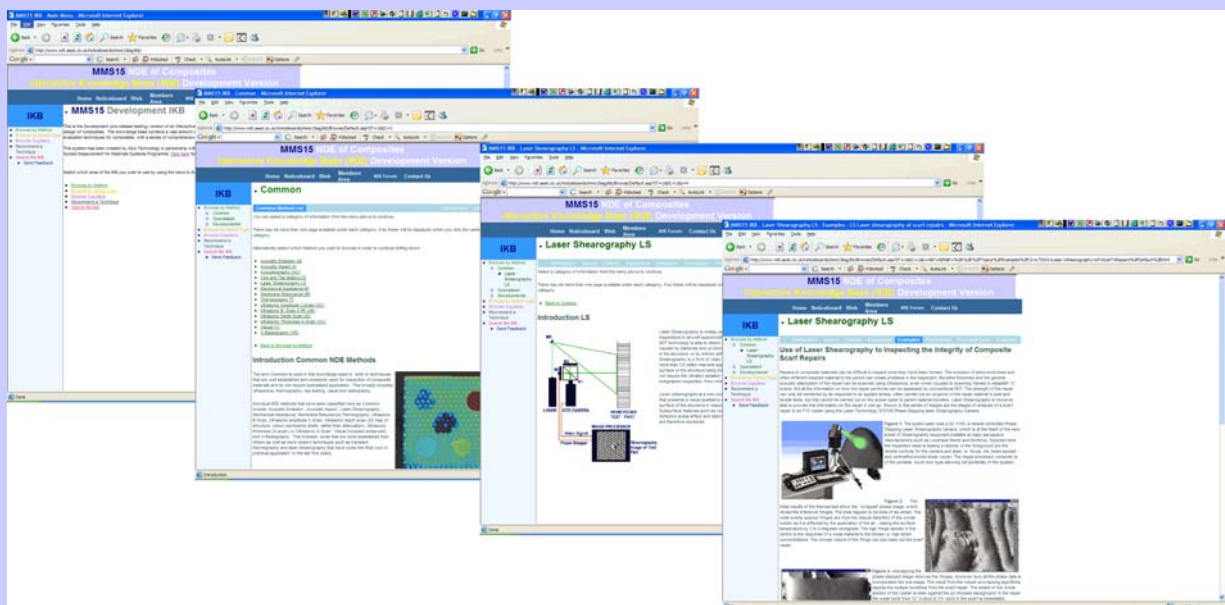
Within project MMS13, the National Physical Laboratory (NPL) and AEA Technology developed a general procedure for the assessment and criticality of defects and damage in composite material systems, based on the multi-level assessment philosophy contained within API (American Petroleum Industry) 579 - Recommended Practice for Fitness-For-Service and Continued Operation of Equipment.

## MMS15 Interactive Knowledge Base on NDE of Composites

Fibre reinforced composite materials are increasingly used in industry in the form of both monolithic and more complex sandwich structures. Their application has spread from high technology industries such as aerospace and defence to other sectors including chemical, offshore, marine and transport. As is well known, defects and damage can occur, and these reduce the strength and stiffness, and hence the safe working life of composite structures. The uptake of composites in industry has been limited by a perception that they are difficult to inspect.



As part of the MMS15 Project an Interactive Knowledge Base (IKB) has been developed by AEA Technology's National NDT Centre in partnership with QinetiQ and NetComposites. The IKB will be made accessible to industry through the NetComposites portal with links in the DTI Materials Solutions Portal. More information can be found at [www.mms15.com](http://www.mms15.com)



A linked series of pages from the IKB

**Registration**

Registration will be managed by the Advanced Research Partnership (ARP) at the University of Manchester. To register for this event, please complete and return the form below or visit [www.arp-manchester.org.uk](http://www.arp-manchester.org.uk) and follow the floating headline link to the MMS5 page where you will find a Registration Form for completion.

**THERE IS NO FEE FOR ATTENDING THIS EVENT.**

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**REGISTRATION FORM**

**Composite Materials & Structures – Design, Inspection and Assessment  
Wednesday 19<sup>th</sup> October 2005, University of Nottingham**

**Title.....Name.....**

(Prof, Dr., Mr, Mrs, Ms)

**Organisation.....**

**Address.....**

.....

**.....Post Code.....**

**Tel.....Fax.....**

**Email.....**

Please complete this form and return it to Helen Davies at ARP

By fax on +44 (0)161 306 3627 - By email to [helen.davies@manchester.ac.uk](mailto:helen.davies@manchester.ac.uk)

Enquiries on +44 (0)161 306 3625

Further details on MMS can be found at <http://www.arp-manchester.org.uk/mms5.asp>

Details of the venue (ITRC Seminar Room C08, University Park Campus) can be found at <http://www.nottingham.ac.uk/about/campuses/maps.php> or

<http://www.nottingham.ac.uk/about/campuses/documents/up-map.pdf> (Building 38)

The nearest VISITORS' CAR PARK is on Science Road, first right after entering via the South entrance.