

# MMS 5: Design & Failure of Materials Systems under Multi-Axial Loads

Presentation to the MMS IAG Meeting  
20th November 2003



## Rationale

- Multi-axial loading is the rule rather than the exception in real engineering structures
- It is therefore of great practical significance
- For polymer composites, prediction of failure under these conditions has historically been difficult
- Much work has been carried out in the aerospace sector, with a good measure of success
- There is a need to apply the knowledge and the techniques to industry sectors other than aerospace



# MMS5

Two parallel programmes - single IAG

3 year programme that commenced in September 2002

## MMS5 A

AEA Technology

NPL

NetComposites

## MMS5 B

QinetiQ

UMIST

Nottingham University



Qinet

# MMS5

## Both parts of the project are concerned with:

Providing designers with guidance as to the selection of failure theories appropriate to their types of application

Extending the database to other types of composite

Devoting effort to dissemination of information and results

## MMS5 A

Use of Interactive Knowledge Base (IKB)

Later in programme - incorporation of findings into Standards

## MMS5 B

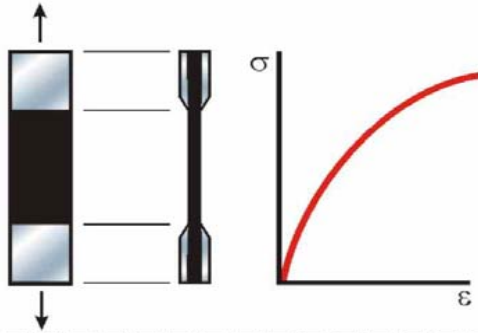
Testing programme - materials in the form of flat panels and tubes

Exploiting the findings of the World-Wide Failure Exercise

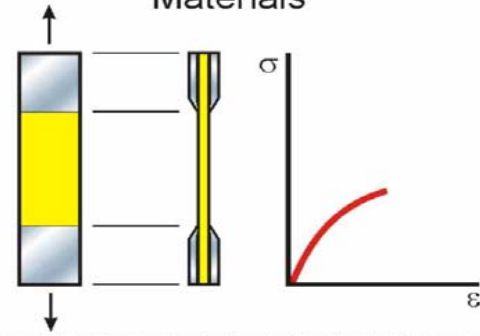


## Aerospace Materials

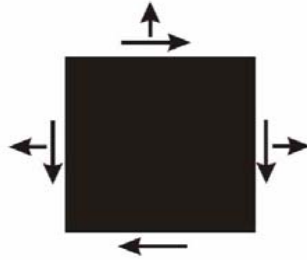
Uniaxial Testing



## Bulk Usage and Lower Performance Materials

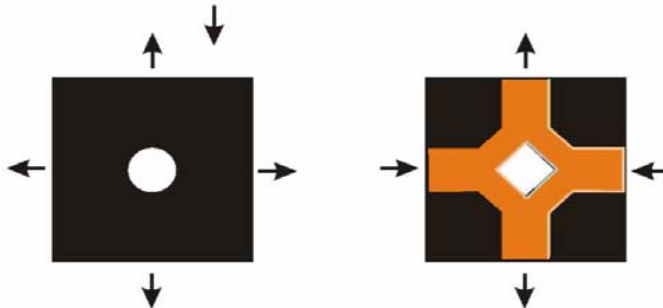


Biaxial Testing



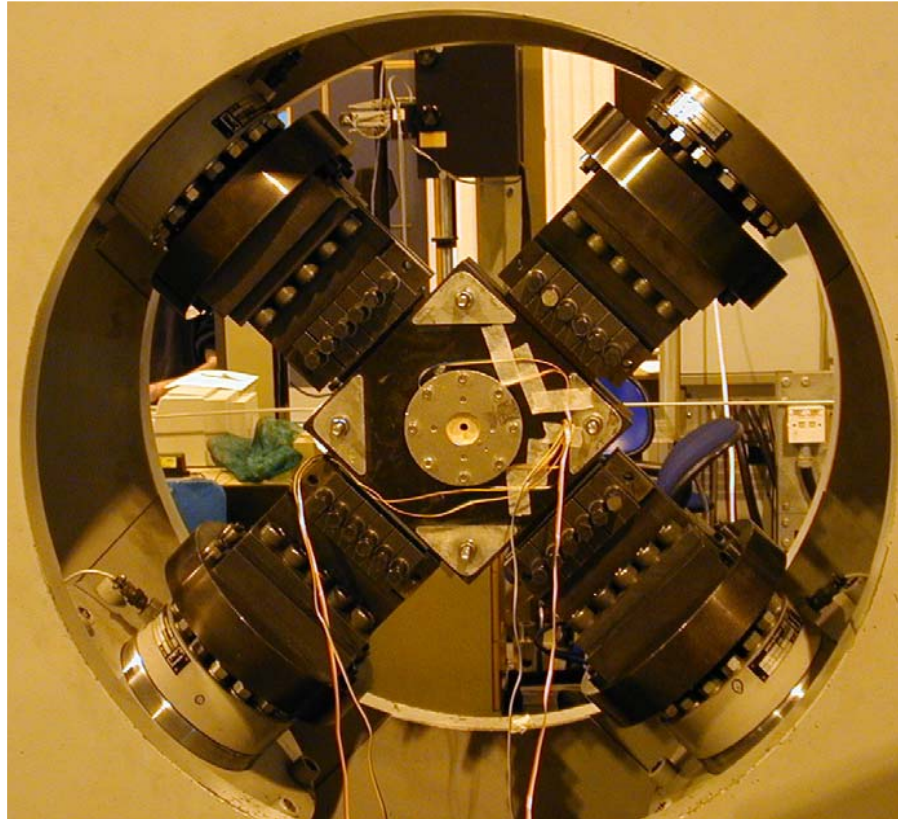
# MMS 5

Biaxial Testing with 2d & 3d Features



# The 500kN bi-axial testing machine at QinetiQ, Farnborough

There are also a 1500kN machine and facilities for the bi-axial testing of tubes



# Industry Participants

- Ford Motor Company
- Dowty Aerospace Propellers
- St Gobain Vetrotex International
- Formax
- Vosper Thornycroft Holdings
- Ameron  
complex)

## Interests

- Composites in vehicles
- Constructions with braids
- Material supplier
- 2D and 3D fabrics
- Blast protection, civil,  
ships
- Piping (GRP and



# AG Membership - Other Than Main Industry Participants

Bombardier

CGT

Reichold

Owens Corning

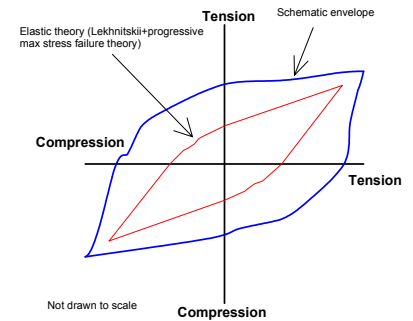
Williams F1

Lotus Cars

Instron

Shell

ESA



# MMS5 Summary to Date

- Responses received to questionnaire on industry needs, pattern emerging
- Test specimens being prepared for 4 industry partners
- A lot of progress on dissemination of results of the world wide failure exercise (available on web-site)
- Next IAG meeting at Nottingham in March 2004

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