

**2<sup>ND</sup> INTERNATIONAL CONFERENCE ON  
COMPOSITES TESTING AND MODEL IDENTIFICATION**

**21 - 23 September 2004  
University of Bristol  
UK**

**TUESDAY 21 SEPTEMBER**

08.30-08.45     **Conference Opening and Welcome to Bristol**

**SESSION 1 – STRUCTURES**

Chair: Dr Peter Davies, IFREMER, France

08.45-09.10     *Large Scale Composite Testing at AUK (Paper No. 109)*  
R Ferguson, Airbus UK

09.10-09.35     *Experimental Measurement and Finite Element Analysis of Load Distribution and Strength in Multi-Bolt Composite Joints with Variable Bolt Hole Clearances (Paper No. 43)*  
M A McCarthy, V P Lawlor, W F Stanley, G S Padhi, C T McCarthy  
University of Limerick/ University College Dublin, Ireland

09.35-10.00     *Characterisation of the Rotational Stiffness and Strength of Web-Flange Junctions of Pultruded GRP WF-Sections via Web Bending Tests (Paper No. 3)*  
G.J. Turvey and Y. Zhang, University of Lancaster, UK

10.00-10.25     *Towards a Standard Qualification Plan (SQP) for Composite Materials (Paper No. 96)*  
M R L Gower, G D Sims, National Physical Laboratory, UK

**10.25-11.10     Coffee + POSTER SESSION 1**

*Testing of Glass-Fibre Reinforced Polymer Composites (Paper No. 1)*  
N K Sookay, C J von Klemperer, V E Verijenko, University of Natal, South Africa

*Transverse cracking and stiffness in hygrothermal aged cross-ply laminates (Paper No. 2)*  
Pr Adda Bedia, A Tounsi, K H Amara, S A Meftah, Universiti de Sid Bel Abbhs, Algeria

*Strain Fields in the Picture Frame Test (Paper No. 5)*  
S V Lomov, T Stoilova, I Verpoest, Katholieke Universiteit Leuven, Belgium

*A 3-D Micromechanical Model for Predicting the Elastic Behaviour of Woven Fabrics (Paper No.6 )*  
M V Donadon, J M Hodgkinson, B G Falzon, L Ianucci, Imperial College, UK

*Identification of Elastic Properties in Stiffened Composite Shells (Paper No. 7)*  
R Rikards, H Abramovich, O Ozolinsh, E Skukis, S Ruchevskis, Riga Technical University,  
Latvia/Institute of Technology, Haifa, Israel

## POSTER SESSION 1 (Cont.)

*Modelling Damage Development in Off-Axis Plies of Laminated Composites (Paper No. 13)*

M Kashtalyan, C Soutis, University of Aberdeen/ University of Sheffield, UK

*Evaluation of the Exchange Magnetic Coupling in Nanocomposite Magnetic Materials (Paper No.14 )*

M-H Phan, H-X Peng, M R Wisnom, S-C Yu, N Chau, University of Bristol, UK/ Chungbuk National University, Korea/National University of Hanoi, Vietnam

*Design and Failure of Materials Systems under Multi-Axial Loads (Paper No. 15)*

J Cook, C Williamson, QinetiQ, UK

*Using 3D Fabric on Light Glider Fuselage (Paper No. 16)*

J Juracka, J Splichal, Brno University of Technology, Czech Republic

*Prediction of Impact-Induced Fibre Damage in Circular Composites Plates (Paper No. 21)*

J Lee, C Soutis, University of Sheffield, UK

*Tomography Based Approach for Finite Element Modelling of Particle Reinforced Metal-Matrix Composites (Paper No. 22)*

P Keensei, H Biermann, A Borbely, Eotvos Lorand University, Hungary/Technische Universitat Freiburg, Germany

*Modelling of a Steel Reinforced Thermoplastic Pipe (Paper No.23 )*

M P Kruijer, L Warnet, R Akkerman, University of Twente, Netherlands

*The Effects of Stiffness Variability on the Observed Flexural Performance of a Composite Box-Section Beam under Three Point Bending - a Statistical Approach (Paper No. 25)*

N Papadakis, N Reynolds, University of Warwick, UK

## SESSION 2 - SCALING EFFECTS AND NOTCHES

Chair: Prof. Paul Curtis, dstl, UK

11.10-11.35 *Size Effects in Unidirectional and Quasi-isotropic Composites Loaded in Tension (Paper No. 65)*

B Khan, K Potter, S R Hallett, M R Wisnom, University of Bristol, UK

11.35-12.00 *Strength Scaling Mechanics of Polymer Composites (Paper No. 37)*

T K Jacobsen, B F Sorensen, LM Glasfiber, Riso National Laboratory, Denmark

12.00-12.25 *Tensile Scaling Effects in Notched Composites (Paper No. 19)*

B Green, M R Wisnom, S R Hallett, University of Bristol, UK

12.25-12.50 *Mesh Independent Modelling and Moire Interferometric Examination of the Accumulation of Damage in Composites with Open-Holes (Paper No. 61)*

D Mollenhauer, E Iarve, R Kim, US AFRL/University of Dayton Research Institute, USA

12.50-14.00 **LUNCH**

**SESSION 3 – TESTING**

Chair: Dr Ivana Partridge, Cranfield University, UK

**14.00-14.50 Invited Lecture 1**

*Testing of Marine Composites: From Materials to Structures*

Dr Peter Davies, IFREMER, France

**14.50-15.15** *A Tensile Setup for the IDNS Composite Interlaminar Shear Test (Paper No. 73)*

K Petterson, J M Neumeister, Royal Institute of Technology, Sweden

**15.15-15.40** *Influence of a Near Free Edge on the Impact of Thick CFRP Panels (Paper No. 30)*

C Breen, F Guild, M Pavier, University of Bristol, UK

**15.40-16.25 Coffee + POSTER SESSION 2**

*Probabilistic Method to Define a Development Test Campaign in the Engineering Process (Paper No. 26)*

C R Gutierrez, School of Aeronautical Engineering, Madrid, Spain

*An Image Analysis Approach for the Structural Characterisation of Pyrocarbons (Paper No. 29)*

J P da Costa, C Germain, P Baylou, M Cataldi, ENSEIRB, ENITAB, France

*Strength Evaluations for Stitched CFRP Laminates (Paper No. 32)*

Y Iawahori, S Horikawa, M Yamamoto, T Ishikawa, H Fukuda, Japan Aerospace Exploration Agency/ Tokyo University of Science, Japan

*A Screening Method for Investigating Fibre Composite Residual Strength after Impact (Paper No. 33)*

A Jarneteg, CSM Materielteknik AB, Sweden

*Transverse Evolution of the Residual Stresses in Notched Epoxy Cylinders using the OLCR Technique and Embedded FBG Sensors (Paper No. 38)*

F Colpo, L Humbert, J Botsis, Swiss Federal Institute of Technology

*Computational Modelling of Fatigue-Driven Delamination (Paper No.39 )*

U Galvanetto, P Robinson, Imperial College, UK

*The Video Gauge - A New Tool for Simple and Accurate Measurement of Complex Composite Properties (Paper No. 41)*

K Potter, C Setchell, University of Bristol, UK

*Modelling of Effective Dielectric Properties of Composites using Expansion into Fourier Series and Finite Element Method (Paper No. 44)*

F Moravec, I Krakovsky, University of West Bohemia/Charles University, Czech Republic

*The Effect of Ply Orientation on the Peak and Delamination Threshold Loads of CFRP Composite Plates (Paper No. 45)*

O S David-West, D H Nash, W M Banks, University of Strathclyde, UK

## POSTER SESSION 2 (Cont.)

*Effect of Thermal Cycling on Stiffness and Strength Degradation of Polymeric Composite Materials (Paper No. 46)*

G C Papanicolaou, T C Theodosiou, T V Kosmidou, University of Patras, Greece

*Fatigue Damage Analysis of a Steel-Composite Hybrid Pin (Paper No. 47)*

A Avanzini, G Donzella, A Mazzu, V Zacche, University of Brescia, Italy

*Bending Characteristics of Carbon Fabric-Polymeric/Metallic Foam Sandwich Structures (Paper No. 62)*

Seong Sik Cheon, Tae Seong Jang, Seung Hwan Chang, Kongju National University/Satellite Technology Research Center/Chung-Ang University, Korea

*Synthesis of Al<sub>2</sub>O<sub>3</sub>/Al Co-continuous Composite by Reactive Melt Infiltration (Paper No. 116)*

C.M.L. Wu and G.W. Han, City University of Hong Kong

## SESSION 4 - FATIGUE AND DURABILITY

Chair: Prof. Paul Smith, University of Surrey, UK

16.25-16.50 *Methods of Monitoring Fatigue Damage under Variable Amplitude Loading in CFRP Composites (Paper No. 20)*

M Bourchak, I R Farrow, I P Bond, University of Bristol, UK

16.50-17.15 *On the Relation between Crack Densities, Stiffness Degradation, and Surface Temperature Distribution of Tensile Fatigue Loaded Glass-Fibre Non-Crimp-Fabric Reinforced Epoxy (Paper No. 70)*

A Gagel, D Lange, K Schulte, Technical University Hamburg/Harburg, Germany

17.15-17.40 *Off-Axis Fatigue Behaviour of Plain Woven Carbon/Epoxy Laminates at Room and High Temperatures (Paper No. 77)*

M Kawai, T Taniguchi, University of Tsukuba, Japan

17.40-18.05 *Durability of Glass Fibre Reinforced Composites Experimental Methods and Results (Paper No. 40)*

H Cuyperes, J Wastiels, E de Bolster, G Moselmans, M Alshaaer  
Vrije University of Brussels, Belgium

18.30-20.00 **Reception at Bristol Industrial Museum**

## WEDNESDAY 22 SEPTEMBER

### SESSION 5 - FULL FIELD TECHNIQUES I

Chair: Prof. Fabrice Pierron, ENSAM, France

#### 08.30-09.20 **Invited Lecture 2**

*Full-field Optical Methods for Mechanical Engineering: Essential Concepts to find One's Way*

Prof Yves Surrel, CNAM, Paris

#### 09.20-09.45 *Experimental Investigation of Composite Patches with a Full-Field Measurement Method (Paper No. 11)*

J-D Mathias, X Balandraud, M Grediac,

French Institute for Advanced Mechanics/LERMES, Blaise Pascal University, France

#### 09.45-10.10 *Quantitative Thermoelastic Stress Analysis of Laminated Composite Components (Paper No. 90)*

J S Earl, J M Dulieu-Barton, University of Southampton, UK

#### 10.10-10.35 *Use of Full Field Strain Measurements to model the behaviour of CFRP woven ply laminates (Paper No. 10)*

C Bordreuil, C Hochard, N Lahellec, F Mazerolle, LMA/CNRS, France

### 10.35-11.15 **Coffee + POSTER SESSION 3**

*A Continuum Damage Model for the Simulation of Delamination under Variable Mode Ratio in Composite Materials (Paper No. 48)*

A Turon, P P Camanho, J Costa, C G Davila, Universitat de Girona, Spain/ Universidade do Porto, Portugal/NASA Langley, USA

*Analysing the Flexural Strength Properties of Unidirectional Carbon/Epoxy Composites (Paper No.50)*

Z Racz, Z L Simon, L M Vas, Budapest University of Technology and Economics, Hungary

*Intralaminar Fracture in CFRP Laminates (Paper No.51)*

N Vrellos, S L Ogin, P A Smith, N Balthi, F J Guild, B W Drinkwater, University of Surrey, University of Bristol, UK

*Deformation and Fracture of Unidirectional GFR Composites at High Strain Rate Tension (Paper No. 52)*

G Makarov, W Wang, R A Shenoi, University of Southampton, UK

*A Digital Image Analysis for Determining Mode I and Mode II Stress Intensity Factors (Paper No.55)*

S M'Guil, N Bahlouli, C Husson, S Ahzi, Universite Louis Pasteur/CNRS, France

*Square Grid Analysis for Intraply Shear in Thermoformed Thermoplastic Composites (Paper No. 57)*

G F Nino, O K Bergsma, H E N Bersee, TU Delft, Netherlands

*A Mixed Numerical-Experimental Identification Method for Evaluating the Constitutive Parameters of Composite Laminated Shells (Paper No. 58)*

J Cugnoni, T Gmur, A Schorderet, Swiss Federal Institute of Technology

### POSTER SESSION 3 (Cont.)

*Flexure Tests for Determining Tensile and Compressive Modulus (Paper No. 59)*

F Mujika, I Mondragon, EUP, Spain

*Comparison of Moire Interferometry and Image Correlation Deformation Measurement Techniques (Paper No. 60)*

D Mollenhauer, J Tyson, US AFRL/Trillion Quality Systems, USA

*Development of Design System for FRP Gears for Power Transmissions (Paper No.64 )*

T Hirogaki, E Aoyama, T Katayama, K Sugimura, Y Yagura, Doshisha University/ Ishida Co Ltd, Japan

*Impact Damage and CAI Strength of MR50K/PET15 Carbon/Tough-Polyimide Composite Material (Paper No.69 )*

H Katoh, T Shimokawa, A Ueda, Y Hamaguchi, Japan Exploration Agency/Tokyo Metropolitan Institute of Technology

*The Application of the Interphase Model for the Description of the Filled Composite Properties with Nanoparticles. Identification of the Parameters of the Model (Paper No.71 )*

S A Lurie, N P Tuchkova, V I Zubov, Dorodicyon Computing Centre of the Russian Academy of Science, Russia

*Thermal Fatigue Behavior of SiCp/ Al Composite Synthesized by Metal Infiltration (Paper No. 117)*

C.M.L. Wu and G.W. Han, City University of Hong Kong

### SESSION 6 - FULL FIELD TECHNIQUES II

Chair: Dr Bill Broughton, National Physics Laboratory, UK

11.15-11.40 *Non-homogenous CFRE Strain Field Monitoring with the Electronic Speckle Pattern Interferometry Technique (Paper No. 49)*

J-P Bouquet, A H Cardon, SABCA/Vrije Universiteit Brussel, Belgium

11.40-12.05 *Use of Phase-Stepping Photoelasticity to Measure Interfacial Shear Stress in Single Fibre Model Composites (Paper No. 56)*

F M Zhao, S A Simon, E A Patterson, R J Young, F R Jones  
University of Sheffield/ UMIST, UK

12.05-12.30 *Identification of the Through-thickness Elastic Constants of Thick Laminated Tubes using the Virtual Fields Method (Paper No. 89)*

R Moulart, S Avril, F Pierron, LMPF-ENSAM, France

12.30-12.55 *Application of the Open Hole Tensile Test to the Identification of the In-Plane Characteristics of Orthotropic Plates (Paper No. 115)*

J Molimard, R Le Riche, A Vautrin,  
SMS/MeM, GDR CNRS & URA CNRS, France

12.55-14.00 **LUNCH**

**SESSION 7 - IDENTIFICATION OF DAMAGE MODELS**

Chair: Dr. Kevin O'Brien, U.S. Army Research Laboratory

14.00-14.25 *Experimental Identification of a Damage Model for Composites using the Grid Technique Coupled to the Virtual Fields Method (Paper No. 88)*

H Chalal, F Meraghni, S Avril, F Pierron, ENSAM, France

14.25-14.50 *Identification of a Delay-Damaged Mesomodel for the Localization and Rupture of Composites: Feasibility and Identification Strategy (Paper No. 104)*

P Feissel, O Allix, P Thevenet

Laboratoire de Mécanique et Technologie, France

14.50-15.15 *Extracting Matrix Creep Parameters for Modelling the Consolidation of Matrix-Coated Fibre Composites (Paper No. 12)*

H-X Peng, M R Wisnom, F P E Dunne, P S Grant, B Cantor

University of Bristol /University of Oxford /University of York, UK

15.15-15.40 *Identification of Parameters in Nonlinear Viscoelastic, Nonlinear Viscoplastic Material Model (Paper No. 112)*

J Varna, L-O Nordin, Lulea University of Technology, Sweden

**15.40-16.20 Coffee + POSTER SESSION 4**

*Microscopic Observation of Tow Deformation for Carbon Fabric-PVC Foam Sandwich Structures during Forming (Paper No. 63)*

Seung Hwan Chang, Chung-Ang University, Korea

*Experimental Determination of Composite In-Plane Shear Properties (Paper No. 72)*

L N Melin, J M Neumeister, Royal Institute of Technology, Sweden

*An Investigation of the Pull-Out and Shear-Out Processes in Z-Pin Reinforced Laminates (Paper No. 74)*

M Fert, P Robinson, D Hitchings, Imperial College, UK

*Off-Axis Creep Rupture Behaviour of Unidirectional CFRP Laminates at Elevated Temperature (Paper No. 76)*

M Kawai, Y Masuko, T Sagawa, University of Tsukuba, Japan

*Experimental Analysis of RC Beams in Flexure Reinforced with CFRP Sheets (Paper No. 79)*

Z J Wu, M Xylouri, P Nedwell, UMIST, UK

*The Behaviour of Uncured Prepreg (Paper No. 82)*

C Langer, K D Potter, University of Bristol, UK

*Optimisation of the Mechanical Test Procedure for Testing of Unidirectional Carbon Fibre/Peek Specimens (Paper No. 83)*

J Kilroy, P McDonnell, C O'Bradaigh, Composites Testing Laboratory, Ireland

*Composite Deformation Controlled with a Source of Heat (Paper No. 84)*

H Drobez, G L Hostis, F Laurent, B Durand, G Meyer, CETIM/CRNS Mulhouse, France

*Multiscale Modelling of the Strain Rate Dependent Damage in Sheet Moulding Compound Composites (Paper No. 85)*

F Meraghni, Z Jendli, J Fitoussi, D Baptiste, ENSAM Chalons en Champagne/ENSAM Paris, France

#### POSTER SESSION 4 (Cont.)

*Neural Network Metamodelling for Optimisation of Negative Poisson's Ratio Chiral Honeycomb (Paper No. 86)*

T L Lew, F Scarpa, K Worden, University of Sheffield, UK

*Damage Extension and Failure Behaviour of CFRP Specimens in Open Hole Compression Tests and Analytical Simulation (Paper No. 91)*

T Kato, T Ishikawa, Y Hamaguchi, N Shikata, G Ben, Japan Aerospace Exploration Agency/ Nihon University, Japan

*Modelling of Left over Strength in Drilling of Composite Laminates (Paper No. 92)*

S K Malhotra, R Ktishnamurthy, J Ramkumar, IIT Madra/IIT Kanpur, India

#### SESSION 8 – FABRIC COMPOSITES

Chair: Professor Stepan Lomov, Katholieke Universiteit Leuven, Belgium

16.20-16.45 *3D Finite Element Damage Analysis of a Twill-weave Lamina Subjected to In-Plane Shear (Paper No. 81)*

G Baruffaldi, E Riva, G Nicoletto, Universita di Parma, Italy

16.45-17.10 *Failure and Impact Modelling of Braided Fabric Reinforced Composites (Paper No. 27)*

M Fouinneteau, A K Pickett, Cranfield University, UK

17.10-17.35 *Progressive Damage Characterization of Stitched, Bi-Axial, Multi-ply Carbon Fabric Composites (Paper No. 78)*

M Vettori, T Truong Chi, S V Lomov, I Verpoest

University of Parma, Italy/ Katholieke Universiteit Leuven, Belgium

17.35-18.00 *Measurement of Meso-scale Deformations for Modelling Textile Composites (Paper No. 75)*

P Potluri, D A Perez Ciurezu, UMIST, UK

19.30-22.30 **Conference Dinner on SS Great Britain**



## THURSDAY 23 SEPTEMBER

### SESSION 9 – NOVEL METHODS AND RESIDUAL STRESSES

Chair: Prof. Anoush Poursartip, University of British Columbia, Canada

#### 08.30-09.20 **Invited Lecture 3**

*Novel Methods for Testing and Modelling Composite Materials and Laminates*  
Prof CT Sun, Purdue University, USA

09.20-09.45 *Characterization of Manufacturing Residual Stresses in Wound Composite Tubes (Paper No. 95)*

P Casari, F Jacquemin, P Davies, GeM, Nantes, France

09.45-10.10 *Tests to Measure the Material Properties Relevant to the Modelling of Process Induced Deformations of Composite Parts (Paper No. 42)*

N Ersoy, T Gartska, K Potter, M R Wisnom, University of Bristol, UK

10.10-10.35 *Residual Strain Development in Laminated Thermoplastic Composites Measured using Fibre Bragg Grating Sensors (Paper No. 53)*

L Sorensen, T Gmur, J Botsis, Swiss Federal Institute of Technology

#### 10.35-11.15 **Coffee + POSTER SESSION 5**

*Damage Monitoring in Woven Composites Laminates Using the DC Electrical Method (Paper No. 80)*

E Riva, M Vettori, G Nicoletto, Universita di Parma, Italy

*Industrialised Shearography Testing on Aircraft Composites in Combination with 3D Imaging and Defect Location (Paper No. 98)*

J Collrep, R Berger, Interferometry, Steinbichler Optotechnik GmbH

*Mechanical Response of a Fiber Bragg Grating Sensor in a Non-uniform Stress Field (Paper No. 99)*

P Casari, X Chapeleau, D Leduc, GeM, Nantes, France

*Effect of Local Constraint on Measured Bearing Stress in Carbon/Epoxy Laminate (Paper No. 100)*

R Ferguson, Airbus UK

*Experimental Investigation into the use of Penetrant Enhanced X-ray Techniques for the Evaluation of Fatigue Damage Around an Open-hole in 4mm Thick Carbon Fibre Composite Panels (Paper No. 101)*

N J Rooney, T M Young, University of Limerick, Ireland

*Identification of the Elastic Constants of Composite Materials using Deflectometry (Paper No. 102)*

S Avril, M Grédiac, F Pierron, Y Surrel, E Toussaint, LMPF/LERMES/CNRS-LM3, France

*Identification of Elastic Properties of a Ceramic-based Joint using Kinematic Fields determined by Digital Image Correlation (Paper No. 103)*

M Puyo-Pain, F Hild, J Lamon, Universite Bordeaux/Universite Paris, France

*Non-Destructive Evaluation of Prosthetic Carbon Fiber Feet (Paper No. 106)*

R Unnporsson, University of Iceland

#### POSTER SESSION 5 (Cont.)

*Multi-instrumented Technological Demonstrator: a Multiscale Study of Composite Structures (Paper No. 107)*

M Mulle, F Collombet, B Trarieux, J-N Périé, Y-H Grunevald, LGMT/DDDL Consultants, FRANCE

*Generation of Design Allowables for Composite Materials at Airbus UK (Paper No. 110)*

S J Hallett, Airbus UK

*Strain Monitoring of Smart Concrete Cylinders with Overwrap Composite Materials using Fibre Optic Sensors (Paper No. 111)*

J S Leng, D Winter, R A Barnes, G C Mays, G F Fernando, Cranfield University, Shrivenham, UK

*Investigation of Parameters Dictating Damage Characteristics in Composite Honeycomb Sandwich Panels (Paper No. 113)*

G Zhou, M Hill, N Hookham, Loughborough University, UK

*Identification of Residual Strain and Stress in Cross-ply Laminate by using Embedded Fibre Bragg Sensor (Paper No. 114)*

S Vacher, J Molimard, H Gagnaire, A Vautrin, Université Jean Monnet, France

## **SESSION 10 – FRACTURE**

Chair: Dr. Pedro Camanho, DEMEGI, Portugal

11.15-11.40 *Measurement of Fracture Energy for Kink-Band Growth in Sandwich Specimens (Paper No. 24)*

W C Jackson, J G Ratcliffe, US Army Research Laboratory

11.40-12.05 *An Experimental Study of the Fracture Behaviour of Stitched RFI Composites – Evaluation of the Damage Process Zone to Calibrate a Strain-softening Model (Paper No. 94)*

J Mitchell, A Poursartip, University of British Columbia, Vancouver, Canada

12.05-12.30 *Modelling Delamination in an Explicit FE Code using 3D Decohesion Elements (Paper No. 93)*

S Pinho, L Iannucci, P Robinson, Imperial College, London, UK

12.30-12.55 *Development and Evaluation of Self Repairing Concepts for Composite Materials (Paper No. 9)*

J Pang, I P Bond, University of Bristol, UK

12.55-14.00 **LUNCH**

**SESSION 11 - PROPERTIES**

Chair: Dr Jonas Neumeister, Royal Institute of Technology, Sweden

- 14.00-14.25 *Mechanical Properties Balance in Novel Z-pinned Sandwich Panels (Paper No. 67)*  
A I Marasco, D D R Cartié, I K Partridge and A Rezai, Cranfield University/ BAE SYSTEMS ATC Sowerby, Bristol UK
- 14.25-14.50 *Failure Criteria for Prediction of Transverse Matrix Cracking in Composites (Paper No. 4)*  
P P Camanho, C G Davila, DEMEGI, Portugal
- 14.50-15.15 *Analytical Models for Assessing Environmental Degradation of Unidirectional and Cross-Ply Laminates (Paper No. 66)*  
W R Broughton, M J Lodeiro, National Physical Laboratory, UK
- 15.15-15.40 *Modelling the Thermoelastic Properties of Short Fibre Composites with Anisotropic Phases (Paper No. 17)*  
P Hine, C D Price, A M Cuhna, I M Ward, University of Leeds, UK/ Universidade Do Minho, Portugal
- 15.40-16.05 *Fibre Orientation Measurements in Composite Materials (Paper No. 28)*  
R Blanc, J P da Costa, Ch Germain, P Baylou, M Cataldi, ENSEIRB, ENITAB, France
- 16.05 **Conference Closes**

Version 2, 13/9/04