

Table of Contents

Sponsors

Committees

Preface

Keynote Papers

Identification of Materials Mechanical Properties from Full-Field Measurements: Latest Advances in the Virtual Fields Method

F. Pierron 3

Applications of Power Ultrasonics in Engineering

M. Lucas, A. Cardoni, E. McCulloch, G. Hunter and A. MacBeath 11

Novel Sensor Technology 1

Streaming Birefringence - A Step Forward

T. Spalton, R.A. Tomlinson, A.E. Garrard and S.B.M. Beck 23

A Signal to Noise Optimization Algorithm for Speckle Interferometry Applications

J. Molimard, R. Cordero and A. Vautrin 29

Component Analysis 1

A Principal Component Analysis of Acoustic Emission Signals from a Landing Gear Component

R. Pullin, M.J. Eaton, J.J. Hensman, K.M. Holford, K. Worden and S.L. Evans 41

Modelling of a Cervical Plate and Human Cervical Section C3 – C5 under Compression Loading Conditions Using the Finite Element Method

J.A. Beltrán-Fernández, L.H. Hernández-Gómez, R.G. Rodríguez-Cañizo, E.A. Merchán-Cruz, G. Urriolagoitia-Calderón, A. González-Rebatú, M. Dufoo-Olvera and G. Urriolagoitia-Sosa 49

Residual Stress

A Study of Stress Analysis for a Residual Stress Model by Digital Photoelasticity

T. Kihara 59

The Application of Digital Image Correlation for Measuring Residual Stress by Incremental Hole Drilling

J.D. Lord, D. Penn and P. Whitehead 65

Composite Structures and Materials

Introduction to the Characterization of Hygrothermal Microcracking of Crossply Composites Reinforced by Stitched Non-Woven UD Laminae

P.J. Liotier, A. Vautrin, J.M. Beraud and P. Henrat 77

Local Effects during Indentation of Fully Supported Sandwich Panels with Micro Lattice Cores

R.A.W. Mines, S. McKown, S. Tsopanos, E. Shen, W.J. Cantwell, W. Brooks and C.J. Sutcliffe 85

Nonlinear Stress and Deformation Behaviour of Composite Sandwich Beams

E.E. Gdoutos and I.M. Daniel 91

Material Properties for Quantitative Thermoelastic Stress Analysis of Composite Structures

R.K. Frühmann, S. Sambasivam, J.M. Dulieu-Barton and S. Quinn 99

Non-Destructive Evaluation of Damage Mechanisms in Composite Sandwich Structure

A. Puri, A.D. Fergusson, I. Palmer, A. Morris, F. Jensen and J.P. Dear 105

Defect and Damage Analysis

Locating and Classifying Defects with Artificial Neural Networks A. Luna Avilés, L.H. Hernández-Gómez, J.F. Durodola, G. Urriolagoitia-Calderón and G. Urriolagoitia-Sosa	117
A Neural Network Approach for Locating Multiple Defects S.J. Farley, J.F. Durodola, N.A. Fellows and L.H. Hernández-Gómez	125
Brittle Fracture-Based Experimental Methodology for Microstructure Analysis J.P.M. Hoefnagels, C.C. Tasan, M. Pradelle and M.G.D. Geers	133
Cumulative Damage Evaluation under Fatigue Loading L.E. Granda Marroquín, L.H. Hernández-Gómez, G. Urriolagoitia-Calderón, G. Urriolagoitia-Sosa and E.A. Merchán-Cruz	141
Experimental-Numerical Analysis of the Indentation-Based Damage Characterization Methodology C.C. Tasan, J.P.M. Hoefnagels, L.C.N. Louws and M.G.D. Geers	151

Materials Characterization 1

Plastic Deformation Quantified by Atomic Force Microscopy Measurements for Duplex Stainless Steel under Monotonic and Cyclic Loading I. Serre, D. Salazar and J.B. Vogt	163
Numerical Evaluation of the Crack Compliance Method (CCM) in Beams with and without Prior History G. Urriolagoitia-Sosa, G. Urriolagoitia-Calderón, J.M. Sandoval Pineda, L.H. Hernández-Gómez, E.A. Merchán-Cruz, R.G. Rodríguez-Cañizo and J.A. Beltrán-Fernández	173
First-Order Size Effects in the Mechanics of Miniaturized Components J.P.M. Hoefnagels, P.J.M. Janssen, T.H. de Keijser and M.G.D. Geers	183

Impact

Impact Compressive Failure of a Unidirectional Carbon/Epoxy Composite: Effect of Loading Directions T. Yokoyama and K. Nakai	195
An Error Analysis into the Use of Regular Targets and Target Detection in Image Analysis for Impact Engineering A. Jumpasut, N. Petrinic, B.C.F. Elliott, C.R. Siviour and M.R. Arthington	203

Materials Characterisation 2

Plastic General Instability of Ring-Stiffened Conical Shells under External Pressure C.T.F. Ross, G. Andriosopoulos and A.P.F. Little	213
Factors Influencing the Suitability of Thermal Methods for Stress Analysis of NiTi Shape Memory Alloys J. Eaton-Evans, J.M. Dulieu-Barton, E.G. Little and I.A. Brown	225

Novel Sensor Technology 2

Deformation Evaluation of Solder Ball Joints by Electromotive Force T. Kumazawa and K. Kaminishi	233
Strain Sensing with Nanoscale Carbon Fiber – Epoxy Composites F. Kempel and A.K. Schlarb	239
Real-Time Monitoring of Dynamic Stress Concentration by Mechanoluminescent Sensing Film C. Li, C.N. Xu, Y. Imai, W.X. Wang, L. Zhang and H. Yamada	247

Detecting and Identifying Artificial Acoustic Emission Signals in an Industrial Fatigue Environment		
J.J. Hensman, R. Pullin, M.J. Eaton, K. Worden, K.M. Holford and S.L. Evans		251
A Modified Algorithm for Reducing Calculation Errors in Large Strain Measurement with Strain Gauges		
G. Chen, Y. Deng, L. Sun and T. Xu		261

Component Analysis 2

Experimental Analysis and Quasi-Static Numerical Idealization of Dynamic Stresses on a Heavy Truck Chassis Frame Assembly		
K. Chinnaraj, M. Sathya Prasad and C. Lakshmana Rao		271
Gas Turbine Blade Stress Analysis and Mode Shape Determination Using Thermoelastic Methods		
D. Backman and R.J. Greene		281
Buckling by General Instability of Cylindrical Components of Deep Sea Submersibles		
C.T.F. Ross, K.O. Okoto and A.P.F. Little		289