

Structures and Materials in Extreme Environments

Papers Presented at the AIAA SciTech Forum and Exposition
2024

Orlando, Florida, USA
8 – 12 January 2024

Volume 1 of 2

ISBN: 979-8-3313-0465-2

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

The contents of this work are copyrighted and additional reproduction in whole or in part are expressly prohibited without the prior written permission of the Publisher or copyright holder. The resale of the entire proceeding as received from CURRAN is permitted.

For reprint permission, please contact AIAA's Business Manager, Technical Papers. Contact by phone at 703-264-7500; fax at 703-264-7551 or by mail at 34922 Uwptkug'Xcmg{ 'F tkxg."Uwkug"422, Reston, VA 20191, USA.

TABLE OF CONTENTS

VOLUME 1

STRUCTURAL OPTIMIZATION APPLICATION FOR AIRCRAFT AND SPACECRAFT I

Assessment of Truss-Based Modular Structures in the Wingbox Structural Design of Commercial Aircraft	1
<i>Pedro Davim Bastos, Higor Luis Silva</i>	
Moving Morphable Components Based on Strain-Based Beam Formulation for Topology Optimization.....	15
<i>Keisuke Otsuka, Shuonan Dong, Ryo Kuzuno, Hiroyuki Sugiyama, Kanjuro Makihara</i>	
Thermomechanical Performance of Sandwich Structures with Optimized Variable Thickness Lattice Cores.....	38
<i>Andrew J. Gross, Rimah Al-Aridi</i>	
Identifying and Overcoming Gaps Within Generative Design for Aerospace Structures.....	48
<i>Jason Action, Benjamin Gajus, Katherine Morehead</i>	
Application of Generative Design to Thin-Walled Aerostructure.....	60
<i>Jason Action, Katherine Morehead, Thomas Hiromoto, Benjamin Gajus</i>	

STRUCTURES AND MATERIALS IN EXTREME ENVIRONMENTS

Contact Mechanics Via FEM and BEM for Multibody Dynamics Modeling.....	77
<i>Li Lin, Ali R. Hadjesfandiari, Gary F. Dargush, Frank H. Fan</i>	
A Thermoplasticity Model of Pyrolyzing Solids for Thermal Protection Systems.....	97
<i>Daniel N. Pickard, Christopher T. Quinn, Theo A. Rulko, Raul Radovitzky</i>	
Calculating Effective Thermal and Mechanical Properties of Fibrous Materials Using Lattice Particle Method	112
<i>Donglai Liu, Hailong Chen</i>	

COMPOSITE STRUCTURAL ANALYSIS, DESIGN, TESTING, AND MANUFACTURING I

Stiffness Tailoring for Improved Buckling of Variable Angle Tow Composite Sandwich Plates	121
<i>Mohammed Abir Mahdi, Soumik Dutta, Wei Zhao</i>	
Structural Testing of Sandwich Composite Main Landing Gear Door	141
<i>Mary Dimitroff, Aditya K. Shah, Rani W. Sullivan, Stephen B. Clay</i>	
Demonstration of Predictive Capabilities of a Composite Pi Joint Model	159
<i>James Finlay, Anthony Waas, Jonathan D. Bartley-Cho, Nav Muraliraj</i>	
The Point Force Collocation Method for Generic Cutouts in Composite Structures.....	170
<i>Steven G. Russell</i>	

Verification and Validation of Progressive Damage and Failure Analysis Methods for Intralaminar Failure Modes in Thermoplastic Composites	185
<i>Vivian Johnson, Rebecca Cutting, Alex S. Selvarathinam, Julio Juarez</i>	

COMPOSITE STRUCTURAL ANALYSIS, DESIGN, TESTING, AND MANUFACTURING II

Root Boundary Conditions for Omega Deployable Booms	204
<i>Flavia Palmeri, Susanna Laurenzi, Sergio Pellegrino</i>	
Deformation Measurement of CFRP Skeletal Structure for the Twist Morphing Wing by Using the Stereo Vision	217
<i>Kazuaki Katagiri, Choong Sik Park, Sonomi Kawakita, Masato Tamayama, Shinya Honda, Katsuhiko Sasaki</i>	
Accurate Predictive Capabilities for Disbond Growth in Stitched Resin Infused Structures	229
<i>Brian Justusson, Philip Knoth, Brian S. Smith</i>	
Implementation of Manufacturability Constraints for NASTRAN-Based Design Optimization of VAT Fiber Composite Structures	243
<i>Varakini Sanmugadas, Mohamed Jrad, Rakesh K. Kapania, Jason Qian, Myles Baker</i>	
Enhancing Induction Heating Efficiency for Thermoplastic Composites: An Iterative Study on Coil-Based Design for High-Rate Heating	258
<i>Andrew C. Cromer, Harikrishnan Mohan, Pandher Jaspreet, Darun Barazanchy</i>	
First Failure Load of Rectangular Laminated and Sandwich Plates Using Isogeometric Analysis	288
<i>Amir Farzam, Romesh C. Batra, Rakesh K. Kapania</i>	

BUCKLING AND STABILITY OF AIRCRAFT AND SPACECRAFT STRUCTURES II

Propagating Instability in Deployable Propeller Blade Structures	304
<i>Bowen Li, Kawai Kwok</i>	
Energy Absorption Efficiencies of Honeycomb Structures with Buckling Initiators	319
<i>Young T. Choi, Norman M. Wereley</i>	
Nonlinear Post-Buckling Analysis of Stepped Circular Bi-Laminates	329
<i>Shuo Xu</i>	

SPECIAL SESSION IN HONOR OF ANTHONY PALAZOTTO AND IN MEMORY OF HARRY HILTON

A Study on Limitation Principles and Numerical Oscillations of Hellinger-Reissner Principle and Reissner's Mixed Variational Theorem	348
<i>Luciano Demasi, Michele D'Ottavio</i>	
Mixed MITC and Interface Shell Element Formulation for Complex Viscoelastic Shell Structures	392
<i>Sy-Ngoc Nguyen, Thuan N.-T. Ho, Jaehun Lee</i>	
Analytical Solution for Creep and Stress Relaxation of Linear Viscoelastic Single Lap Shear Joints Subject to Clamped-Roller Boundary Conditions	399
<i>Craig G. Merrett</i>	

Nonlinear Viscoelastic Model of an Adhesively Bonded, Single Lap Shear Joint	413
<i>Cole T. Cappon, Craig G. Merrett</i>	

COMPOSITE STRUCTURAL ANALYSIS, DESIGN, TESTING, AND MANUFACTURING III

Design Framework for Optimization of Curvilinearly Stiffened Variable Stiffness Composite Laminates with Direct Fiber Angle Parameterization.....	426
<i>Mayank Agarwal, Rakesh K. Kapania, Chris A. Minaya, Satchi Venkataraman, Daniel C. Hammerand</i>	
Uncertainty Quantification of High-Velocity Impact Fracture in Fiber-Reinforced Composites Using a Robust Stochastic Sampling Approach.	454
<i>Alessandro Polla, Riccardo Piani, Giacomo Frulla, Enrico Cestino, Raj Das, Pier Marzocca</i>	
Aeroelastic Analysis Through Non-Linear Beam Finite Elements with Bending-Torsion Coupling Formulation	465
<i>Cesare Patuelli, Enrico Cestino, Giacomo Frulla</i>	
SAFE Layerwise: Semi-Analytic Finite Element Formulation	480
<i>Darun Barazanchy, Michel van Tooren</i>	
Experimental Characterization of Non-Associative Plasticity Flow Rule Coefficients for the LS-DYNA MAT213 Model.....	493
<i>Ryan G. Premo, Jackob W. Black, Mike Pereira, Robert K. Goldberg, Trenton M. Ricks, Han-Gyu Kim</i>	

DESIGN AND ANALYSIS OF STRUCTURES AND MATERIALS IN EXTREME ENVIRONMENTS

Fully-Coupled Multiphysics Simulations of the Thermo-Mechanical Oxidation of Ceramics for Spacecraft Heat Shields	502
<i>Theo A. Rulko, Daniel N. Pickard, Raul Radovitzky</i>	
Eliminating Magnetic Phase Transitions with Microstructural Optimization in 2D Lattices	516
<i>Zekeriya Ender Eger, Pinar Acar</i>	
Flow Control of Hypersonic Shock-Wave/Boundary-Layer Interactions Using Phononic Metamaterials	530
<i>Juan D. Navarro, Juan Camilo C. Velasquez, Elijah J. LaLonde, Eugene N. Hoffman, Christopher S. Combs, David Restrepo</i>	
Pressure Signature and Damage Predictions Due to High-Speed Droplet Impacts	541
<i>Ugur Can, Manuel Viqueira-Moreira, Riza Kaan Gonuleri, Monal Patel, Christoph Brehm, Ibrahim Guven</i>	

STRUCTURAL HEALTH MONITORING & NON-DESTRUCTIVE EVALUATION

Boeing's Implementation of CVM Sensors on the 737NG Aft Pressure Bulkhead.....	550
<i>John Z. Tidwell, Walter Jarecki</i>	
Investigating the Application of Stress Wave Factors in Machine Learning for Delamination Location Prediction in a Composite Laminate	563
<i>Junyan He, Linqi Zhuang, Adarsh Chaurasia, Ali Najafi</i>	

High-Fidelity Digital Twins: Detecting and Localizing Weaknesses in Structures	570
<i>Rainald Lohner, Facundo Airaudo, Harbir Antil, Roland Wuechner, Fabian Meister, Suneth Warnakulasuriya</i>	

On the Use of Risk Measures in Digital Twins to Identify Weaknesses in Structures.....	598
<i>Facundo Airaudo, Harbir Antil, Rainald Lohner, Umarkhon Rakhimov</i>	

STRUCTURAL OPTIMIZATION APPLICATION FOR AIRCRAFT AND SPACECRAFT II

Creasing of Thin, Elastic Plates for Maximizing Fundamental Frequencies.....	612
<i>Avinkrishnan A. Vijayachandran, Othman Oudghiri-Idrissi, Hrishikesh Danawe, Xiaoming Mao, Ellen Arruda, Serife Tol, Anthony Waas</i>	

Analysis, Optimization, and Destructive Testing of Machined Isogrid Cylinders for Small Scale Rocket Airframes.....	621
<i>Hayden Reinhold, Davis Zarfas, Max Eltzroth, Peter McCloud, Andrew Greenberg</i>	

COMPOSITE STRUCTURAL ANALYSIS, DESIGN, TESTING, AND MANUFACTURING IV

Testing and Analysis of Fail-Safe Enabled Bonded Joints	643
<i>Jason Action, Vijay Goyal, Kevin H. Hoos</i>	

Efficient Design Methods for Variable Stiffness Composite Toroidal Pressure Vessels.....	670
<i>Shahrzad Daghighi, Giovanni Zucco, Paul M. Weaver</i>	

Inverse Method for Determination of CZM Parameters for Bonded Joints Under Static Loading	686
<i>Jonathan D. Bartley-Cho, Nav Muraliraj</i>	

Thermo-Folding Thermoplastic Composite Laminates	700
<i>Robert H. Shumpert, Pandher Jaspreet, Darun Barazanchy</i>	

High Energy Dynamic Impact Analysis of Thermoplastic Composite Laminates	709
<i>Aswini Kona Ravi, Akhil Bhasin, Luis Gomez, Gerardo Olivares</i>	

BUCKLING AND STABILITY OF AIRCRAFT AND SPACECRAFT STRUCTURES I

Experimental Studies on the Snaking Phenomenon of Cylindrical Shells Under Axial Compression Using a Multi-3D DIC Setup.....	718
<i>Vineeth Ravulapalli, Gangadharan Raju, Ramji Manoharan, Vijayabaskar Narayananamurthy</i>	

Buckling Behavior of Conical-Cylindrical Shells and Design Considerations for Launch-Vehicle Applications.....	731
<i>Michelle T. Rudd, Marc R. Schultz, Chiara Bisagni</i>	

Damage Evolution of Buckled Composite Stiffened-Panels Under Combined Static Shear and Compression.....	746
<i>Vijay Goyal, Shiya Lin, Brandon Fischetti, Anthony Waas</i>	

VOLUME 2

FATIGUE, FRACTURE, AND IMPACT DAMAGE OF STRUCTURES I

Accurate Predictions of Damage States in Structural Elements Subjected to Low Velocity Impact.....	766
<i>Brian Carpenter, Matthew Molitor, Rebecca Cutting, Landon K. Henson, Vipul Ranatunga</i>	
Low-Velocity Impact Analyses of Composite Panels Using Cohesive Zone Modeling and Continuum Damage Mechanics.....	782
<i>Frank A. Leone, Cheryl A. Rose, Wade C. Jackson, Banavara R. Seshadri</i>	
A Statistical Approach for Predicting Fatigue Life of Composites from Experimental Data	797
<i>Agam Sharan, Mira Mitra</i>	

FATIGUE, FRACTURE, AND IMPACT DAMAGE OF STRUCTURES II

Novel Multiscale Fatigue Model for Fiber-Reinforced Polymer Composites	804
<i>Jose F. Rojas Sanchez, Anthony Waas</i>	
Reliability-Based Damage Tolerance Framework for Achieving Highly Reusable Launch Systems	810
<i>Leland Shimizu, Vinay Goyal, Nikolas Nordendale, Xueyong Qu, Jon Strizzi, Deneen Taylor</i>	

STRUCTURAL JOINTS AND REPAIRS

Surface Roughness Effects on the Fracture Behavior of Adhesively Bonded Joints.....	835
<i>Manjima Bhattacharya, Stephanie C. TerMaath</i>	
Experimental Investigation of Strength and Time to Failure of Adhesively Bonded Double Lap Shear Joints.....	846
<i>Marcias Martinez, Mst. Jannatal Ferdausi, Craig G. Merrett, Priscilla Fonseca</i>	
Analytical Solution for Tensile Loading of Linear Elastic Single Lap Shear Joint Subject to Clamped-Roller Boundary Conditions	858
<i>Craig G. Merrett, Marcias Martinez</i>	
Stress Relaxation of Adhesively Bonded Single Lap Shear Joints	872
<i>Trevor Irwin, Marcias Martinez, Craig G. Merrett</i>	
High Fidelity Digital Twin Machining Tool for Quality Informed Composite Drilling	886
<i>Jim Lua, Jian Xiao, Xiaodong Cui, Caleb Saathoff</i>	

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR MATERIALS AND STRUCTURES I

Adaptive Surrogate Models with Unbalanced Data for Material Design	901
<i>Yulun Wu, Yumeng Li</i>	
Generative Adversarial Networks for the Inverse Design of 2D Spinodoid Metamaterials	911
<i>Sheng Liu, Pinar Acar</i>	
Multiphysics-Informed Machine Learning for Uncertainty Quantification on Si Anode Based Battery Performance.....	924
<i>Parth Bansal, Yumeng Li</i>	

Failure Modeling in Notched Twill Textile Composites Using Machine Learning	940
<i>Eugene R. Kheng, Royan Dmello, Anthony Waas</i>	
Integrating Experiments, Simulations, and Artificial Intelligence to Accelerate the Discovery of High-Performance Green Composites	951
<i>Christos Athanasiou, Bolei Deng, Ahmed A. Hassen</i>	

ADDITIVE STRUCTURES I

An Additive Manufacturing Process Model for Powder-Bed Fusion: Implementation and Predictive Capability	956
<i>James Sobotka, Matthew Kirby, Carl Popelar</i>	
Designing Benchmark Artifacts of Thin-Walled Components to Improve 3D Printing of Aeroelastic Wind Tunnel Models	972
<i>Federico Venturi, Nicholas Caballero, Mikaela Leevy, Robert M. Taylor</i>	
Characterization of Triply Periodic Minimal Structures for Additive Manufacturing Production and Residual Stress Analysis.....	983
<i>Katie Bruggeman, Anthony N. Palazotto</i>	
Design, Manufacturing, and Experiments of Additive Manufactured Stiffened Thin-Walled Plates	989
<i>Adam F. Leicht, Mohammed Abir Mahdi, Kathleen McNamara, Hadi Noori, Wei Zhao</i>	
Characterization of Anisotropy in Additively Manufactured Ti-6-4 with Varied Build Heights and Surface Treatments	1010
<i>John S. Brewer, Ryan Kemnitz, Joseph Puglisi, James Gunderson, Elizabeth Bartlett</i>	

CLEAN AVIATION SPECIAL SESSION: NEXT GENERATION MULTIFUNCTIONAL FUSELAGE DEMONSTRATOR I

Investigation of Innovative Technologies for Automated Assembly and Joining of a Full-Scale Thermoplastic Composite Fuselage.....	1034
<i>Benjamin Diehl, Simon M. Kothe</i>	
Aircraft Without Rivets – Laser Welding Makes the Impossible Possible	1041
<i>Eric Pohl, Jens Standfuß, Maurice Langer</i>	

CLEAN AVIATION SPECIAL SESSION: NEXT GENERATION MULTIFUNCTIONAL FUSELAGE DEMONSTRATOR II

Assembly of Thermoplastic Fuselage Structures by Induction Welding of Unidirectional Carbon Fiber Composites.....	1048
<i>Joachim C. de Kruijk, Senne Sterk, Albert de Wit, Niels van Hoorn</i>	

STRUCTURAL ANALYSIS, DESIGN, TESTING AND MANUFACTURING (JOINT DE/STR)

Design, Optimization and Additive Manufacture of Generalized Helium Outflow Unit for Latex Balloons to Float	1060
<i>Jeremy J. Kuznetsov, Akemi Takeuchi, Daniel Grammer, Michael Kalin, Kruti Bhingradiya, Jack Bishop</i>	

Rheological Study of Property Variation of Virgin Polymer with the Introduction of Recycled Content During Polymer Processing a Parametric Analysis.....	1086
<i>M Burhan Bin Shuaib, Jehanzeb Masud, Mehr Nigar, Muhammad Muneeb Safdar</i>	

Analysis Directed Design of a Novel Composite Quasi-Zero Stiffness (QZS) Shock Isolator Based on Onset Theory	1093
<i>Douglas J. Neill, Jonathan H. Gosse, Kuna Kanthasamy, Terry L. Schneider</i>	

Development of a Payload Module for the Phoenix-1C Hybrid Sounding Rocket	1106
<i>Mthobisi Tshomela, Jean Pitot, Glen Sneden</i>	

COMPOSITE STRUCTURAL ANALYSIS, DESIGN, TESTING, AND MANUFACTURING V

A Multiscale Thermomechanical Design Tool for Tailorable Composites and Hybrid Material Systems.....	1112
<i>Su Tian, Twinkle Kothari, Xin Liu, Wenbin Yu</i>	

OHT and OHC Predictions of Laminated Tape Composites Using a High-Fidelity and Efficient Semi-Discrete Computational Framework	1128
<i>Minh Hoang Nguyen, Vignesh Shankar Iyer, Royan Dmello, Anthony Waas</i>	

Transient Analysis of Composite Plates Introducing the Inverse Differential Quadrature Method.....	1137
<i>Hasan M. Khalid, Aniket G. Chanda, Saheed O. Ojo, Paul M. Weaver</i>	

Failure Mechanisms of Composite Laminates with Embedded Ply Waviness Under Tension.....	1153
<i>Gabriela Gonzalez Ayala, Jarod Heise, Paulina Diaz Montiel, Melih Papila, Satchi Venkataraman</i>	

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR MATERIALS AND STRUCTURES II

Zero-Bias Deep Neural Network for Defect Detection in Composite Additive Manufacturing Using Multisource In-Situ Data	1176
<i>Nicholas Phillips, Deepak Kumar, Yongxin Liu, Sirish Namilae</i>	

Revisiting Cylindrical Buckling Under Axial Compression Using Explainable Machine Learning	1184
<i>Muhammad G. Wafi, Pramudita S. Palar, Mohammad D. Robani, Annisa Jusuf, Zuhal Lavi, Joseph Morlier</i>	

Analysis of Tow-Steered Laminates of Composites Using a Mixed-Fidelity Neural Network Model.....	1198
<i>Xin Liu, Bangde Liu, Su Tian, Wenbin Yu</i>	

3D WOVEN COMPOSITES FOR MATERIALS AND STRUCTURES

Probabilistic Sensitivity Studies of a Multiscale Process-To-Performance Model for Bonded Composite Pi-Joints.....	1210
<i>Matthew Kirby, Marcus L. Stanfield, Carl Popelar, David Riha, Kevin H. Hoos, Endel Larve, Eric G. Zhou, Alex S. Selvarathinam, David Mollenhauer</i>	

Direct 3D Printing of Strain Sensors onto 3D Woven Orthogonal Composite Structures: Evaluating Two Distinct Approaches for Sensor Performance.....	1232
<i>Merve Karabal, Melisa Dincer, Dilan Arslan, Ramazan Yüksel, Zeynep Nur Akyazici, Alptekin Yıldız, Hulya Cebeci</i>	

Establishing Architectural Effects of Variable Binder on 3D Orthogonal Woven Composites: RVE Model and Experiment Validation.....	1245
<i>Zeynep Nur Akyazici, Ibrahim Halil Sahin, Melisa Dincer, Yusuf C. Sudutemiz, Hulya Cebeci</i>	
A Quantitative Analysis of Waviness in Complex 3D Textile Using Least Squares Regression with Sinusoidal Wave Form.....	1262
<i>Eric G. Zhou, Carl Popelar, Vikram Bhamidipati, David S. Riha, Endel Larve, Kevin H. Hoos, Hari Adluru, David Mollenhauer, Keith Ballard</i>	
Nonlinear Beam Based Digital Chain Modeling for 3D-Woven Textiles.....	1272
<i>Vikram Bhamidipati, John D. Whitcomb, Michael K. Ballard</i>	

OTHER TOPICS IN STRUCTURES

Loft, an Automated Parametric Mesh Generator for Stiffened Shell Aerospace Vehicles.....	1283
<i>Lloyd B. Eldred</i>	
Continuation of Generating Structural Weight Estimation Equations for Lift+Cruise Aircraft.....	1297
<i>Shaadi Sabeti, Thomas Nascenzi, Timothy Cuatt, Tyler Winter</i>	
A Constructal Aeroelastic Design Approach for Cross-Section Configuration of Flying Wing Aircraft	1330
<i>Hadi Ebrahimi Fakhari, Mojtaba Moshtaghzadeh, Pezhman Mardanpour, Adrian Bejan, Jose A. Camberos</i>	
Swappable Multifunctional Wings for Use on a Small UAS.....	1346
<i>Samuel A. Ross, Emily Arnold, Alex Ottinger</i>	
Tailorable Multifunctional Sensors for Structural Health Monitoring of Composite Structures	1360
<i>Adel Alrai, Yelda Yorulmaz, Onur Zirhli, Fevzi Ç. Cebeci, Deniz Köken, Hulya Cebeci</i>	

ADDITIVE STRUCTURES II

Experimental Investigation of the Structural Performance of Composite Structures Produced Using Additive Manufacturing	1367
<i>Hunter Watts, Ryan G. Premo, Wayne Huberty, Christopher Bounds, Han-Gyu Kim</i>	
Stress Corrosion Cracking Studies of Additively Manufactured Aluminum Alloys.....	1375
<i>Remelisa Esteves, Ranajay Ghosh, Seetha Raghavan</i>	
Multiscale Modeling of Quasi-Static Crushing Behavior of Body-Centered Cubic Lattices with I-Shape Beams and Reinforced Joints.....	1382
<i>Xin Liu, Twinkle Kothari, Fei Tao, Md Humaun Kobir, Yiran Yang</i>	
3D Printed Multi-Material Solutions for Minimizing Stress Concentrations Around Cutouts in Thin Plates Under Axial Tension	1393
<i>Adam Kelly, Elisheva Phillips, Avinkrishnan A. Vijayachandran, Anthony Waas</i>	
Hybrid Additively-Manufactured Satellite Technology Experiments (HASTE)	1406
<i>Chris Hartney, Lisa Toda, Kelvin Chen, Jacob Rome</i>	

STITCHED COMPOSITE STRUCTURES

History of Structural Stitching Development for Aerospace Applications	1416
<i>Dawn C. Jegley, Andrew E. Lovejoy, Patrick Thrash, Alexander Velicki</i>	
Out-Of-Plane Behavior of Selectively Stitched Curved Beams Subjected to Four-Point Bending.....	1431
<i>Daniel A. Drake, Andrew E. Lovejoy</i>	
Effect of Stitch Seam Orientation on the Mode I Fracture Energy of Stitched Composites.....	1439
<i>Aditya K. Shah, Rani W. Sullivan, Andrew E. Lovejoy, Daniel A. Drake</i>	
Effects of 3D Periodic Stitch Patterns on the Flexural Properties of Polymer Matrix Composite Structures.....	1449
<i>Radwa Alaziz, Shuvam Saha, Rani W. Sullivan</i>	
Experimental Multi-Scale Characterization of mode-II Interlaminar Fracture in Geometrically Scaled Stitched and Unstitched Resin-Infused Composites	1461
<i>Dawson A. Ozborn, Jackob W. Black, Wayne Huberty, Christopher Bounds, Han-Gyu Kim</i>	

CLEAN AVIATION SPECIAL SESSION: EMERGING TECHNOLOGIES AND INNOVATIONS

Clean-Sky 2 Large Passenger Aircraft Platform 1 Advanced Engine and Aircraft Configurations	1470
<i>Daniel Kierbel</i>	

CLEAN AVIATION SPECIAL SESSION: FAST ROTORCRAFT

Next Generation Civil Tiltrotor Technology Demonstrator Program: Towards Flight Test.....	1484
<i>Massimo Biggi, Pierre Abdel Nour, Giorgio Vicenzotti</i>	
T-WING: The Italian Wing for the Next Generation Civil Tiltrotor.....	1500
<i>Marika Belardo, Aniello Menichino, Gianluca Diodati, Antonio ChiarIELLO, Jacopo Beretta, Pierpaolo Ariola, Pasquale Vitale, Filomena Starace, Salvatore D. Orlando, Vittorio Giacalone, Domenico Alberotanza, Pasquale Villano, Federica Dell'Anno, Claudio Pezzella, Luigi Di Palma</i>	

Author Index