

# **57th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference 2016**

Held at the AIAA SciTech Forum 2016

San Diego, California, USA  
4-8 January 2016

Volume 1 of 5

ISBN: 978-1-5108-2060-9

**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 Uwytkug'Xcmg{'Ftkxg.'Uwky'422, Reston, VA 20191, USA.

# TABLE OF CONTENTS

## VOLUME 1

### NANOSTRUCTURED MATERIALS I

<b>Structure-Process-Property Study of Aligned Carbon Nanotube Interlaminar Reinforcement in Woven Carbon Fiber Prepreg Laminate (AIAA 2016-0148)</b> .....	1
<i>Estelle Kalfon-Cohen, Elisheva Shuter, Diana J. Lewis, Brian L. Wardle, Lingchuan Li, Paul Kladitis, Jessica Orr</i>	
<b>Woven Hierarchical Aerospace Composite Laminates with Aligned Carbon Nanotube Bulk Reinforcement (AIAA 2016-0149)</b> .....	7
<i>Richard Li, Erica F Antunes, Andrew H. Liotta, Christian Parschau, Mark Payne, Brian L. Wardle</i>	
<b>Nanoparticle Alignment using Oscillating Magnetic Fields for Scalable Nanocomposite Manufacturing (AIAA 2016-0150)</b> .....	16
<i>Mychal P. Spencer, Namiko Yamamoto</i>	
<b>Influence of Waviness on the Elastic Properties of Aligned Carbon Nanotube Polymer Matrix Nanocomposites (AIAA 2016-0151)</b> .....	27
<i>Itai Y. Stein, Brian L. Wardle</i>	
<b>Thermal Conductivity Via Atomistic Modeling for Epoxy-SWNT Composites (AIAA 2016-0152)</b> .....	36
<i>Nicholas A. Fasanella, Veeraraghavan Sundararaghavan</i>	
<b>Mode I Fracture Toughness of Aligned Carbon Nanotube Epoxy Nanocomposites (AIAA 2016-0153)</b> .....	51
<i>Dale L. Lidston, Christian Parschau, Christine Chappelle, Diana Lewis, Brian L. Wardle</i>	
<b>Non-covalent Functionalization of CNT and Graphene and Its Application to Hybrid Carbon/Epoxy Composites (AIAA 2016-0154)</b> .....	61
<i>Antonio F. Avila, Viviane C. Munhoz, Aline M. Oliveira, Nathalia C. Menezes, Suchilla G. Leao, Camila F. Silva</i>	

### FATIGUE & FRACTURE I

<b>Multiscale Modeling of Effective Piezoresistivity in Nanocomposite Bounded Explosives (AIAA 2016-0155)</b> .....	73
<i>Adarsh K. Chaurasia, Gary D. Seidel</i>	
<b>Utilization of a Linear Solver for Multiscale Design and Optimization of Microstructures in an Airframe Panel Buckling Problem (AIAA 2016-0156)</b> .....	85
<i>Pinar Acar, Veeraraghavan Sundararaghavan</i>	
<b>High-energy Hydroforming for the Aerospace Industry (AIAA 2016-0157)</b> .....	101
<i>Sjoerd O. Van Der Veen, Leonardo Barcenas, Hugo D. Groeneveld, Vishal Bhoelai, Jos Sinke</i>	

### AERO & STRUCTURAL TECHNOLOGY INVESTIGATIONS

<b>Flight Vehicle Structural Design Processes for a Common Bulkhead and an MPCV Spacecraft Adapter (AIAA 2016-0158)</b> .....	109
<i>Pravin Aggarwal, Patrick V. Hull</i>	
<b>Performance Evaluation of a Morphing Trailing Edge Using Multipoint Aerostructural Design Optimization (AIAA 2016-0159)</b> .....	117
<i>David A. Burdette, Gaetan K. Kenway, Joaquim Martins</i>	
<b>Aerostructural Optimization of a Low Sweep Transonic Wing with Shock Control Bump (AIAA 2016-0160)</b> .....	132
<i>Ali Elham, Bram Timmer</i>	
<b>Cure Rate Tailoring of Thick Composites Via Temperature Controlled Vascular Pathways (AIAA 2016-0161)</b> .....	143
<i>Matthew P. O'Donnell, Yusuf Mahadik, Carwyn Ward</i>	
<b>Co-Design of Strain-Actuated Solar Arrays for Precision Pointing and Jitter Reduction (AIAA 2016-0162)</b> .....	157
<i>Christian M. Chilan, Daniel R. Herber, Yashwanth K. Nakka, Soon-Jo Chung, James T. Allison, Jack B. Aldrich, Oscar S. Alvarez-Salazar</i>	
<b>Adaptive Variable-Fidelity Analysis and Design for A Tailless Aircraft with Innovative Control Effectors under Model-Form Uncertainty (AIAA 2016-0163)</b> .....	175
<i>Youngmin Jo, Jangho Park, Seongim Choi, Duckjoo Lee</i>	
<b>Aerodynamic Optimisation of Non-planar Lifting Surfaces (AIAA 2016-0164)</b> .....	193
<i>Shaun N. Skinner, Hossein Zare-Behtash</i>	

### STRUCTURAL DYNAMIC MODELING AND ANALYSIS

<b>Joining 3-D Finite Elements to Variational Asymptotic Beam Models (AIAA 2016-0200)</b> .....	214
<i>Hanif S. Hoseini, Dewey H. Hodges</i>	
<b>Constrained-Energy Cross-Well Actuation of the Duffing-Holmes Oscillator (AIAA 2016-0201)</b> .....	225
<i>Masoud Zarepoor, Onur Bilgen</i>	
<b>The Evaluation of an Icosahedron' Eigenvalue (AIAA 2016-0202)</b> .....	241
<i>Anthony N. Palazotto, Lucas Just</i>	

<b>Evaluating the Stiffness of Conic Interfacing Parts : A Practical Method for Finite Element Model Updating Based on Experimental Modal Testing (AIAA 2016-0203)</b> .....	247
<i>Antoine Letarte, Simon Joncas, Annie Ross, Francis Martin</i>	
<b>Force Reconstruction from Ejection Tests of Aircraft Stores Used for Model Predictions and Missing/Bad Gages (AIAA 2016-0204)</b> .....	258
<i>Michael R. Ross, Michael Starr, Angel Urbina, Jerome Cap, Adam Brink</i>	
<b>Towards a Fluid-Structure Interaction Solver for Problems with Large Deformations Within the Open-Source SU2 Suite (AIAA 2016-0205)</b> .....	293
<i>Ruben Sanchez, Rafael Palacios, Thomas D. Economon, Heather L. Kline, Juan J. Alonso, Francisco Palacios</i>	

## **ENERGY HARVESTING**

<b>Toward Broadband Resistive-inductive Piezoelectric Energy Harvesters (AIAA 2016-0206)</b> .....	324
<i>Hichem Abdelmoula, Abdessattar Abdelkefi</i>	
<b>The Role of Sweep Rate in Energy Harvesting (AIAA 2016-0207)</b> .....	335
<i>Taylor D. Hynds, Jeffrey L. Kauffman</i>	
<b>Representation and Comparative Study of Electromagnetic-piezoelectric Galloping Energy Harvesters (AIAA 2016-0208)</b> .....	343
<i>Umer Javed, Huiyang Dai, Abdessattar Abdelkefi</i>	
<b>Piezoaeroelastic Investigation on the Control and Energy Harvesting of Galloping Systems (AIAA 2016-0209)</b> .....	353
<i>Hichem Abdelmoula, Abdessattar Abdelkefi</i>	
<b>Energy Harvesting From Aeroelastic Instabilities (AIAA 2016-0210)</b> .....	364
<i>Nathan S. Hosking, Zarha Sotoudeh</i>	
<b>Enhanced Stability Identification and Global Response Prediction of Galloping Energy Harvesters (AIAA 2016-0211)</b> .....	380
<i>Umer Javed, Abdessattar Abdelkefi, Imran Akhtar</i>	

## **AIRCRAFT STRUCTURAL DESIGN I**

<b>Conceptual Design and Structural Optimization of NASA Environmentally Responsible Aviation (ERA) Hybrid Wing Body Aircraft (AIAA 2016-0229)</b> .....	390
<i>Jesse Quinlan, Frank H. Gern</i>	
<b>Moving Aerospace Structural Design Practice to a Load and Resistance Factor Approach (AIAA 2016-0230)</b> .....	406
<i>Curtis E. Larsen, Ivatury S. Raju</i>	
<b>A Historical Assessment of Building Block Development Test Programs for Modern Military Aircraft (AIAA 2016-0231)</b> .....	419
<i>Donald S. Norwood, Gail L. Hahn, Patrick F. Joyce, Robin J. Wippich-Dienhart</i>	
<b>Structural Loads Analysis of a Carrier Onboard Delivery Aircraft (AIAA 2016-0232)</b> .....	439
<i>Barrett D. Flansburg</i>	
<b>Determination of Load Path Using Streamline Analogy and Galerkin Method (AIAA 2016-0233)</b> .....	454
<i>Kaveh Gharibi, Ali Tamijani</i>	
<b>Preliminary Wing Study of General Aviation Aircraft with PRSEUS Panels (AIAA 2016-0234)</b> .....	463
<i>Vasileios S. Papapetrou, Ali Tamijani, Daewon Kim</i>	
<b>Bi-Level Optimization of a Conceptual Metallic Wing Box with Stiffness Constraints (AIAA 2016-0235)</b> .....	495
<i>August T. Noever, Alan W. Wilhite</i>	

## **CHALLENGES IN THE DESIGN OF JOINED WINGS**

<b>Minimum Induced Drag Theorems for Multi-Wing Systems (AIAA 2016-0236)</b> .....	512
<i>Luciano Demasi, Giovanni Monegato, Rauno Cavallaro</i>	
<b>Transonic Aeroelastic Analysis for Multidisciplinary Design Optimization Applications (AIAA 2016-0237)</b> .....	556
<i>Wrik Mallik, Rakesh K. Kapania, Joseph A. Schetz</i>	
<b>A Historical Perspective on the Aeroelasticity of Box Wings and PrandtlPlane with New Findings (AIAA 2016-0238)</b> .....	570
<i>Rauno Cavallaro, Luciano Demasi, Rocco Bombardieri</i>	
<b>Distributed Optical Sensing in Composite Laminated Adhesive Bonds (AIAA 2016-0239)</b> .....	593
<i>Leeanna Meadows, Rani W. Sullivan, Keith Vehorn</i>	

## **MATERIALS TESTING & CHARACTERIZATION I**

<b>Investigating Sub-surface Microstructure in Fiber Reinforced Polymer Composites via X-Ray Tomography Characterization (AIAA 2016-0409)</b> .....	600
<i>Ronald F. Agyei, Bhisam Sharma, Michael Sangid</i>	
<b>Interpreting High Temperature Deformation Behavior of a Ceramic Matrix Composite via High Energy X-rays and Numerical Simulation (AIAA 2016-0410)</b> .....	606
<i>Albert C. Manero, Stephen Sofronsky, Katia Artzt, Stefan Hackemann, Janine Wischek, John Okasinski, Peter Kenesei, Jonathan Almer, Marion Bartsch, Seetha Raghavan</i>	

<b>Computationally Intelligent Image Processing Techniques for Crack Detection in Structural Components from Imaged Data (AIAA 2016-0411)</b> .....	614
<i>Daniel Gillaugh, Joseph A. Beck, Jeffrey M. Brown, Tommy George, Onome Scott-Emuakpor, Casey Holycross</i>	
<b>Real Time In-Situ Sensing of Damage Evolution in Carbon Nanotube-Polymer Nanocomposite Bonded Surrogate Energetics (AIAA 2016-0412)</b> .....	624
<i>Engin C. Sengazer, Gary D. Seidel, Stefan Povolny</i>	
<b>Aircraft Tire Spin-Up Wear Analysis through Experimental Testing and Computational Modeling (AIAA 2016-0413)</b> .....	634
<i>Andrew J. Zakrajsek, Jonathan Childress, Michael H. Bohun, Sam Naboulsi, Ryan N. Vogel, Ned J. Lindsey, Shankar Mall</i>	

## **DESIGN SPACE EXPLORATION**

<b>An Evolutionary Multi-Architecture Multi-Objective Optimization Algorithm for Design Space Exploration (AIAA 2016-0414)</b> .....	651
<i>Christopher Frank, Renaud Marlier, Olivia J. Pinon-Fischer, Dimitri N. Mavris</i>	
<b>A Heuristic Approach to Finding the Preferred Design Variable Parameterization for Optimization (AIAA 2016-0415)</b> .....	670
<i>Jeffrey D. Sinsay, Juan J. Alonso</i>	
<b>Comparison of Adaptive Design Space Exploration Methods Applied to S-Duct CFD Simulation (AIAA 2016-0416)</b> .....	680
<i>Andrea Garbo, Brian German</i>	
<b>Adaptive Model Refinement in Surrogate-based Multiobjective Optimization (AIAA 2016-0417)</b> .....	700
<i>Souma Chowdhury, Ali Mehmani, Achille Messac</i>	
<b>Rapid Multi-Objective Aerodynamic Design Using Co-Kriging and Space Mapping (AIAA 2016-0418)</b> .....	716
<i>Slawomir Koziel, Yonatan Tesfahunegn, Anand Amrit, Leifur T. Leifsson</i>	
<b>Multi-Fidelity Aerodynamic Shape Optimization Using Manifold Mapping (AIAA 2016-0419)</b> .....	726
<i>Jie Ren, Leifur T. Leifsson, Slawomir Koziel, Yonatan Tesfahunegn</i>	
<b>Aircraft Wing Optimization based on Computationally Efficient Gradient-Enhanced Kriging (AIAA 2016-0420)</b> .....	742
<i>Charles Mortished, Jonathan Ollar, Vassili Toropov, Johann Stenz, Royston Jones, Peter Benzie</i>	

## **REDUCED ORDER MODELING I**

<b>Reduced Order Modeling of Turbulent Flows using Sparse Coding (AIAA 2016-0462)</b> .....	752
<i>Rohit Deshmukh, Zongxian Liang, Jack J. McNamara</i>	
<b>Expedient and Parallelizable Sparse Coding Algorithm for Large Datasets (AIAA 2016-0463)</b> .....	776
<i>Zongxian Liang, Rohit Deshmukh, Jack J. McNamara, Matt Wytock, J. Z. Kolter</i>	
<b>Reduced Order Models for Generation of Large, High Speed Aerodynamic Databases with Jet Interactions (AIAA 2016-0464)</b> .....	793
<i>Anton Vanderwyst, Andrew B. Shelton, Christopher Martin, Lynn Neergaard, Zach Witeof</i>	
<b>Efficiency Enhancement of Reduced Order Model using Variable Fidelity Modeling (AIAA 2016-0465)</b> .....	804
<i>Saeil Lee, Taehyoun Kim, Sang Ook Jun, Kwanjung Yee</i>	
<b>Reduced-Order Modeling of Flow-Induced Vibrations in Bellows Joints of Rocket Propulsion Systems (AIAA 2016-0466)</b> .....	814
<i>Stephen L. Higgins, Robert Davis, Andrew M. Brown</i>	

## **DYNAMIC LOADS, RESPONSE, AND VIBRATION I**

<b>Aeroelastic Response of the ACTE Transition Section (AIAA 2016-0467)</b> .....	824
<i>Claudia Herrera, Natalie Spivey, Shun-Fat Lung</i>	
<b>Dynamic Behavior of Initially-Stressed and Post-Buckled Laminated Composite Beams (AIAA 2016-0468)</b> .....	843
<i>John B. Kosmatka</i>	
<b>Dynamic Response of Aeroelastically Tailored Composite Wing: Analysis and Experiment (AIAA 2016-0469)</b> .....	849
<i>Jurij Sodja, Noud Werter, Johannes K. Dillinger, Roeland De Breuker</i>	
<b>The Influence of Wing Flexibility on the Stability of a Biomimetic Flapping Wing Micro Air Vehicle in Hover (AIAA 2016-0470)</b> .....	869
<i>James E. Bluman, Madhu K. Sridhar, Chang-Kwon Kang</i>	

## **VOLUME 2**

<b>Damped Free Vibration Response of An Adhesively Bonded Stiffened Plate with Plate-Strip Stiffeners (AIAA 2016-0471)</b> .....	896
<i>Naveed Ahmad, Rakesh K. Kapania</i>	
<b>Impact of the Wing Sweep Angle and Rib Orientation on Wing Structural Response for Un-Tapered Wings (AIAA 2016-0472)</b> .....	916
<i>Guillaume Francois, Jonathan E. Cooper, Paul Weaver</i>	
<b>Energy Based Representations of Mechanical Shock for Failure Characterization (AIAA 2016-0473)</b> .....	942
<i>Vit Babuska, Carl Sisemore, Jason Booher</i>	

## AIRCRAFT STRUCTURAL DESIGN II

<b>Parameterization Framework for Aeroelastic Design Optimization of Bio-Inspired Wing Structural Layout (AIAA 2016-0485)</b> .....	961
<i>Arthur Dubois, Charbel Farhat, Abdullah H. Abukhwejah</i>	
<b>Analysis of Designer / Tailored Linear Aero-Piezo-Viscoelastic Energy Harvesting (AIAA 2016-0486)</b> .....	977
<i>Harry H. Hilton, Yuta Saito</i>	
<b>Design and Structural Analysis of Unique Structures Under an Internal Vacuum (AIAA 2016-0487)</b> .....	1009
<i>Brian C. Cranston, Anthony N. Palazotto, Mohammad Alghofaily</i>	
<b>Effects of Shallow-Angle, Thin-Ply Laminates on the Structural Performance of Composite Wing (AIAA 2016-0488)</b> .....	1024
<i>Yong Han Noel Kim, Seunghyun Ko, Wei-Siang Lay, Jingmeng Tian, Paochen Chang, Seiji Umeda Thielk, Hyung-Jun Bang, Jinkyu Yang</i>	
<b>Optimization, Manufacturing and Testing of a Composite Wing with Maximized Tip Deflection (AIAA 2016-0489)</b> .....	1032
<i>Yasser M. Meddaikar, Johannes K. Dillinger, Jurij Sodja, Holger Mai, Roeland De Breuker</i>	
<b>Thermal Response of a Spatially Graded Metal-Ceramic Structural Panel to Non-Uniform Heating in Hypersonic Flow (AIAA 2016-0490)</b> .....	1043
<i>Phillip Deierling, Olesya I. Zhupanska, Crystal L. Pasiliao</i>	

## DESIGN PROCESSES AND TOOLS

<b>A High-Fidelity Approach to Conceptual Design (AIAA 2016-0578)</b> .....	1057
<i>John Watson, Richard W. Wlezien, Thomas Gielda</i>	
<b>Thermo-Mechanical Analysis and Design of Threaded Fasteners (AIAA 2016-0579)</b> .....	1069
<i>Balakrishnan Devarajan, Davide Locatelli, Rakesh K. Kapania, Ryan J. Meritt</i>	
<b>Sizing Study for a First-Order Feasibility Assessment of a Space Vehicle Applied to Space Transportation (AIAA 2016-0580)</b> .....	1084
<i>Sarah M. Hussein, Bernd Chudoba</i>	
<b>Electric Multirotor UAV Propulsion System Sizing for Performance Prediction and Design Optimization (AIAA 2016-0581)</b> .....	1096
<i>Dmitry Bershadsky, Steve Haviland, Eric N. Johnson</i>	
<b>The Full-Scale Helicopter Flight Simulator Design and Fabrication at CCSU (AIAA 2016-0582)</b> .....	1118
<i>Fu-Shang Wei, Zachary Coppola, Luz Amaya-Bower, Alfred Gates, Daniel Rose, Thomas Vasko, James Root</i>	
<b>Ascendancy of Extinction-Reignition on Single-Stage Hybrid Sounding Rocket in View of Fuels (AIAA 2016-0583)</b> .....	1127
<i>Kazuhiisa Chiba, Hideyuki Yoda, Shoma Ito, Masahiro Kanazaki, Shin'Ya Watanabe, Koki Kitagawa, Toru Shimada</i>	

## MATERIALS TESTING & CHARACTERIZATION II

<b>Effect of Silane Treated Electrospun SiO<sub>2</sub> Nanofibers Interleaving on Mode I Fracture Toughness of Glass Epoxy Composites (AIAA 2016-0663)</b> .....	1141
<i>Vinod Suryawanshi, Lifeng Zhang, Ajit D. Kelkar</i>	
<b>Acoustic Emission Beamforming for Detecting and Localizing Damage in Composite Materials (AIAA 2016-0664)</b> .....	1147
<i>Joshua C. Rivey, Gil-Yong Lee, Jinkyu Yang, Youngkey Kim, Sungchan Kim</i>	
<b>Experimental Investigation of Laser Machining of Sapphire for High Temperature Pressure Transducers (AIAA 2016-0665)</b> .....	1156
<i>Harman Singh Bal, William S. Oates, Rajan Kumar, David A. Mills, Mark Sheplak</i>	
<b>Comparisons between Forced-Response and Hysteretic Energy Damping Assessment Methods (AIAA 2016-0666)</b> .....	1165
<i>Onome E. Scott-Emuakpor, Bryan Langley, Casey Holycross, Tommy George, Brian Runyon, John Justice</i>	
<b>Development of Creep-dominant Creep-fatigue Testing for Alloy 617 (AIAA 2016-0668)</b> .....	1174
<i>Fraaz Tahir, Yongming Liu</i>	

## PROPULSION & THERMAL DESIGN CONSIDERATIONS

<b>Thermodynamics of Gas Turbine Cycles With Analytic Derivatives in OpenMDAO (AIAA 2016-0669)</b> .....	1181
<i>Justin S. Gray, Jeff Chin, Tristan Hearn, Eric S. Hendricks, Thomas M. Lavelle, Joaquim Martins</i>	
<b>Fuel Thermal Management System Consideration in the Aircraft Conceptual Design Process (AIAA 2016-0670)</b> .....	1202
<i>Edward J. Alyanak, Darcy L. Allison</i>	
<b>Aircraft System Effects Including Propulsion and Air Cycle Machine Coupled Interactions (AIAA 2016-0671)</b> .....	1220
<i>Darcy L. Allison, Edward J. Alyanak, Kyle Shimmin</i>	
<b>Impact of High Energy Pulsed Systems on an Aircraft's Power and Thermal Management System (AIAA 2016-0672)</b> .....	1236
<i>Rory A. Roberts, Adam Donovan, Sean R. Nuzum, Mitch Wolff</i>	
<b>Dynamic Modeling at a Vehicle Level of a Cryogenic Based Thermal System for a High Powered System (AIAA 2016-0673)</b> .....	1252
<i>Sean R. Nuzum, Rory A. Roberts, Mitch Wolff, Adam Donovan</i>	
<b>An Overview of the Optimized Integrated Multidisciplinary Systems Program (AIAA 2016-0674)</b> .....	1267
<i>Robert A. Reuter, Steve Iden, Richard D. Snyder, Darcy L. Allison</i>	

## **TURBOMACHINERY / STRUCTURAL HEALTH MONITORING**

<b>Analysis of Damage Assessment of Large Hailstone Ingestion into Advanced High Bypass Propulsion System (AIAA 2016-0705)</b> .....	1278
<i>Yangkun Song, Javid Bayandor</i>	
<b>Reduced Order Geometric Mistuning Models using Principal Component Analysis Approximations (AIAA 2016-0706)</b> .....	1292
<i>Emily B. Henry, Jeffrey M. Brown, Joseph A. Beck</i>	
<b>The Development of an Active Damping and Stiffness Technique for Turbomachinery using Shape Memory Alloys (AIAA 2016-0707)</b> .....	1309
<i>Rachel J. Wischt, Nicholas G. Garafolo</i>	
<b>Evaluation of Fiber Optic Strain Sensors for Applications in Structural Health Monitoring (AIAA 2016-0708)</b> .....	1323
<i>Benjamin L. Martins, John B. Kosmatka</i>	
<b>Frequency Domain Statistical Damage Identification Development and Analytical Study (AIAA 2016-0709)</b> .....	1346
<i>Joseph A. Oliver, John B. Kosmatka, Charles R. Farrar, Joel P. Conte</i>	
<b>Frequency Domain Statistical Damage Identification Applied to an Experimental Composite Plate (AIAA 2016-0710)</b> .....	1364
<i>Joseph A. Oliver, John B. Kosmatka, Charles R. Farrar, Joel P. Conte</i>	

## **DYNAMICS, FEEDBACK CONTROL, AND AEROSERVOELASTICITY I**

<b>Model-Predictive Control of Flexible Aircraft Dynamics using Nonlinear Reduced-Order Models (AIAA 2016-0711)</b> .....	1379
<i>Yinan Wang, Andrew Wynn, Rafael Palacios</i>	
<b>Optimal Selection of Control Surfaces for Active Aeroelastic Control of Prescribed Modes (AIAA 2016-0712)</b> .....	1390
<i>Richard Brown, Kumar V. Singh</i>	
<b>Inverse Dynamics for Deceleration Control of Deployment of Linked Panel Structure in Space (AIAA 2016-0713)</b> .....	1408
<i>Masao Takatsuka</i>	
<b>Feedback Control of Integrally Actuated Membrane Wings: A Computational Study (AIAA 2016-0714)</b> .....	1420
<i>Stefano Buoso, Rafael Palacios</i>	
<b>Active Piezoelectric Actuation and Control of Highly Flexible Multifunctional Wings (AIAA 2016-0715)</b> .....	1439
<i>Natsuki Tsushima, Weihua Su</i>	
<b>Spacecraft Docking with Type II Superconductor Flux Pinning and Potential Energy Capture (AIAA 2016-0716)</b> .....	1463
<i>Ryan A. Caracciolo, Frances Zhu, Mason A. Peck</i>	

## **SPECIAL SESSION: USAF BENCHMARKING OF COMPOSITE FATIGUE PREDICTION METHODS**

<b>Assessment of Multiscale Design System for Fatigue Life Prediction of Advanced Composite Aircraft Structures (AIAA 2016-0722)</b> .....	1477
<i>Jacob Fish, Zheng Yuan, Jeffrey Wollschlager, Robert Crouch</i>	
<b>Fatigue Damage Prediction in Quasi-Isotropic Open-Hole Tension Coupon using the Kinetic Theory of Fracture (AIAA 2016-0723)</b> .....	1484
<i>Richard W. Dalgarno, Don Robbins, Jason Action, Stephen P. Engelstad</i>	
<b>3D Delamination Profile Reconstruction for Composite Laminates Using Inverse Heat Conduction (AIAA 2016-0724)</b> .....	1494
<i>Tishun Peng, Yongming Liu</i>	
<b>Assessment of Composite Damage Growth Tools for Aircraft Structure Part II (AIAA 2016-0725)</b> .....	1504
<i>Stephen P. Engelstad, Stephen Clay</i>	
<b>Progressive Failure Simulation in Laminated Composites under Fatigue Loading by Using Discrete Damage Modeling (AIAA 2016-0726)</b> .....	1520
<i>Kevin H. Hoos, Endel V. Jarve, Michael Braginsky, Eric Zhou, David H. Mollenhauer</i>	
<b>A Continuum Damage and Discrete Crack Approach for Fatigue Damage Prediction of Laminated Composites (AIAA 2016-0727)</b> .....	1531
<i>Eugene Fang, Xiaodong Cui, Jim Lua</i>	
<b>A Micromechanical Approach to Low Cycle Fatigue Analysis and Life Prediction of Heterogeneous Materials (AIAA 2016-0728)</b> .....	1544
<i>Hamsawee Sertse, Wenbin Yu</i>	

## **FAILURE ANALYSIS AND PREDICTION I**

<b>Micro-Scale Crack Propagation Using the eXtended Finite Element Method (AIAA 2016-0729)</b> .....	1560
<i>Vijay Goyal, Rafael Jorge</i>	
<b>The EST Model for Predicting Progressive Damage and Failure of Open Hole Bending Specimens (AIAA 2016-0730)</b> .....	1584
<i>Ashith P K Joseph, Anthony M. Waas, Evan J. Pineda</i>	
<b>Effect of Strength Variation Along a Single Fiber on Micro-Scale Damage Development in UD-FRPs (AIAA 2016-0731)</b> .....	1598
<i>Nithin K. Parambil, K. M. P. Fathima, Suhasini Gururaja</i>	

<b>A Comparative Study of Local and Nonlocal Domain Integration for XFEM Based Stress Intensity Factor Extraction for Fatigue Life Prediction (AIAA 2016-0732)</b> .....	1605
<i>Xiang Ren, Ali Sadeghirad, Neethi Simon, Jim Lua</i>	
<b>Effect of Notch on the Failure Response of Oxide/Oxide Ceramic Composites (AIAA 2016-0733)</b> .....	1611
<i>Dianyuan Zhang, Pascal Meyer, Anthony M. Waas</i>	
<b>In Situ Study of Static and Dynamic Strain Energy Density at Notch Roots and Fatigue Cracks Using Digital Image Correlation (AIAA 2016-0734)</b> .....	1623
<i>Casey Holycross, Herman Shen, Onome Scott-Emuakpor, Tommy George</i>	
<b>A Selectively Activated Continuum-Coupled Extrinsic Cohesive Model (AIAA 2016-0735)</b> .....	1642
<i>William M. Peterson, Doug S. Cairns</i>	

## **INNOVATIVE DESIGNS IN AEROSPACE / DESIGN EDUCATION**

<b>Framework for Probabilistic Analysis of Future Energy Technologies: Hybrid-Electric Propulsion (AIAA 2016-0823)</b> .....	1649
<i>Cedric Y. Justin, Arun Ramamurthy, Simon Briceno, Dimitri N. Mavris</i>	
<b>Design of an Automated On-Demand Meal Delivery System Under Emerging and Evolving Passenger Requirements (AIAA 2016-0824)</b> .....	1665
<i>Christopher Frank, Mathilde N. Deveraux, Rosemonde Ausseil, Dimitri N. Mavris</i>	
<b>Extending Low-Cost Linux Computers for Education and Applications in Embedded Control and Robotics (AIAA 2016-0825)</b> .....	1683
<i>Hugh C. Briggs, James Strawson, Thomas Bewley</i>	
<b>A Beagle Bone Black Baed AHRs for Control of Small UAS and Small Sounding Rockets (AIAA 2016-0826)</b> .....	1695
<i>Charles E. Hall</i>	
<b>AREND: A Sensor Aircraft to Support Wildlife Rangers (AIAA 2016-0827)</b> .....	1700
<i>Jean N. Koster, Aaron Buysse, L Smith, Joachim Huyssen, Joseph Hotchkiss, Jonathan Malangoni, Johannes Schneider</i>	

## **FATIGUE & FRACTURE II**

<b>Improved Pre-Strain Method for Generating Goodman Data with Vibration-Based Fatigue Testing (AIAA 2016-0925)</b> .....	1721
<i>Kevin Knapp, Onome E. Scott-Emuakpor, Tommy George, Casey Holycross, Anthony N. Palazotto</i>	
<b>Experimental, Numerical, and Analytical Free Vibration Analyses of Open-hole Composite Plates (AIAA 2016-0926)</b> .....	1733
<i>Bilel Aidi, Mohamed Shaat, Abdessattar Abdelkefi, Scott Case</i>	
<b>A Micromechanical Approach to High Cycle Fatigue Analysis and Life Prediction of Heterogeneous Materials (AIAA 2016-0927)</b> .....	1752
<i>Hamsasew Sertse, Wenbin Yu</i>	
<b>A Novel Crack Growth Equation Based on Crack Tip Opening Displacement Variation (AIAA 2016-0928)</b> .....	1766
<i>Shan Jiang, Wei Zhang, Zili Wang</i>	
<b>Anisotropic Fatigue Crack Growth in High-Strength Aluminium Alloys (AIAA 2016-0929)</b> .....	1779
<i>Sjoerd O. Van Der Veen, Hugo P. Dijkers, Rene C. Alderliesten</i>	
<b>An Equivalent Crack Growth Model for Creep Fatigue Life Prediction of Metals (AIAA 2016-0930)</b> .....	1790
<i>Dong Pan, Fraaz Tahir, Yongming Liu</i>	

## **NANOSTRUCTURED MATERIALS II**

<b>Effect of Suspended Particle Shapes on Shear Thickening Fluid Behavior (AIAA 2016-0931)</b> .....	1797
<i>Christian Kabanda Mihigo, Justin Warren, Mahla Zabet, Thomas E. Lacy, Santanu Kundu, Charles U. Pittman, Hossein Toghiani</i>	

## **VOLUME 3**

<b>Grains Size and Rigid Rotations Effects on the Dynamics and Pull-in Instability of Electrostatically-actuated Beams (AIAA 2016-0933)</b> .....	1804
<i>Mohamed Shaat, Abdessattar Abdelkefi</i>	
<b>Effects of POSS Addition on Bisphenol-E Cyanate Ester Network (AIAA 2016-0934)</b> .....	1816
<i>Jessica Piness, Jeffrey Wiggins</i>	
<b>Modeling of Strain Gradient-based Nanoparticle Composite Plates with Surface Elasticity (AIAA 2016-0935)</b> .....	1831
<i>Mohamed Shaat, Abdessattar Abdelkefi</i>	
<b>A Coupled Electromechanical Peridynamics Framework for Modeling Carbon Nanotube Reinforced Polymer Composites (AIAA 2016-0936)</b> .....	1841
<i>Naveen Prakash, Gary D. Seidel</i>	
<b>Experimental Characterization and Computational Analysis of Mode I Fracture Toughness of a Nano-Cellulose Z-Pin Reinforced Carbon Fiber Laminate (AIAA 2016-0937)</b> .....	1862
<i>Krishna Kiran Talamadupula, Seth Berry, Jeremy O'Donnell, Gary D. Seidel, Barry Goodell</i>	

## **TOPOLOGY METHODS AND APPLICATIONS**

<b>Multi-scale Topology Optimization for Structures with Tailored Porous Structured Materials (AIAA 2016-0938)</b> .....	1878
<i>Peter Dunning, Hyunsun A. Kim, Raghavendra Sivapuram</i>	
<b>Large-Scale Compliance-Minimization and Buckling Topology Optimization of the Undeformed Common Research Model Wing (AIAA 2016-0939)</b> .....	1899
<i>Ting Wei Chin, Graeme Kennedy</i>	
<b>A New Topology Optimization Method for Simultaneous Design of Component Layout and Frame Structure of Aircraft Wing (AIAA 2016-0940)</b> .....	1916
<i>Mahsan Bakhtiarinejad, Soo Bum Lee, James J. Joo</i>	
<b>Experimental Validation of Structures Optimised for Frequency Constraints and Dynamic Loading (AIAA 2016-0941)</b> .....	1930
<i>David J. Munk, Nicholas F. Giannelis, Gareth A. Vio</i>	
<b>On a Bio-Inspired Design Methodology for the Simultaneous Topology, Shape, Sizing and Subsystem Placement Optimization of Aircrafts (AIAA 2016-0942)</b> .....	1945
<i>Marcelo Kobayashi, Raymond M. Kolonay, Joshua D. Deaton, Robert A. Reuter</i>	
<b>Combined Mesh and Penalization Adaptivity Based Topology Optimization (AIAA 2016-0943)</b> .....	1957
<i>Deepak K. Gupta, Matthijs Langelaar, Fred Van Keulen</i>	

## **COMPOSITE FATIGUE DAMAGE PREDICTION METHODS**

<b>Fatigue Analysis of Notched Laminates: A Time-Efficient Macro-Mechanical Approach (AIAA 2016-0977)</b> .....	1969
<i>Paria Naghipour, Evan J. Pineda, Brett A. Bednarczyk, Steven M. Arnold, Anthony M. Waas</i>	
<b>Fatigue Validation of Composite Open Hole Analysis Technique for Standard and Nonstandard Laminate - Part 2 (AIAA 2016-0978)</b> .....	1980
<i>Frank Abdi, Cody Godines, Saber Dormohammadi, Levon Minnetyan</i>	
<b>Fatigue Life Prediction of IM7/977-3 Composite Laminates with Multispatial/Multitemporal Homogenization (AIAA 2016-0979)</b> .....	2001
<i>Michael J. Bogdanor, Caglar Oskay</i>	
<b>Three-Dimensional Delamination Analysis in Composite Open Hole Tensile Specimens with Cohesive Zone Method (AIAA 2016-0980)</b> .....	2010
<i>Busra Bartan, Bülent Acar, Altan Kayran</i>	
<b>Interlaminar Fatigue Growth for Fail-Safe Life Limit Analysis (AIAA 2016-0981)</b> .....	2024
<i>Barrett D. Flansburg, Carl Rousseau, Jason Action</i>	
<b>Fatigue Life of Postbuckled Structures with Indentation Damage (AIAA 2016-0982)</b> .....	2036
<i>Carlos G. Davila, Chiara Bisagni</i>	

## **FAILURE ANALYSIS AND PREDICTION II**

<b>Micro Damage Initiation of Isotropic and Composites Structures Using Strain Invariant Failure Theory (AIAA 2016-0983)</b> .....	2048
<i>Vijay Goyal, Cesar Garcia, Emmanuel Irizarry</i>	
<b>A Residual Strength Prediction Methodology for Composite Laminates With Surface Damage Under Tensile Loading (AIAA 2016-0984)</b> .....	2079
<i>Steven G. Russell</i>	
<b>Probabilistic First Ply Failure Analysis of Wind Turbine Blade Laminates (AIAA 2016-0985)</b> .....	2093
<i>Ghulam Mustafa, Afzal Suleman, Curran A. Crawford</i>	
<b>Thermal Ablation in Fiber-Reinforced Composite Laminates Subjected to Continuing Lightning Current (AIAA 2016-0986)</b> .....	2106
<i>Yeqing Wang, Olesya I. Zhupanska</i>	
<b>Development of a Combined Cohesive and Extended Finite Element Method to Predict Delamination in Composite Structures (AIAA 2016-0987)</b> .....	2123
<i>Vijay Goyal, Emmanuel Irizarry</i>	
<b>Predicting Composite Fatigue Life of Wind Turbine Blades Using Constituent-Level Physics and Realistic Aerodynamic Load (AIAA 2016-0988)</b> .....	2152
<i>Faisal Hasan Bhuiyan, Dimitri Mavriplis, Ray S. Fertig</i>	
<b>A Beam Theory for Progressively Elastic Damage in Fiber-Reinforced Composite Structures (AIAA 2016-0989)</b> .....	2163
<i>Fang Jiang, Wenbin Yu</i>	

## **INTEGRATED COMPUTATIONAL MATERIALS ENGINEERING (ICME)**

<b>Material Design Using a NURBS-based Shape Optimization (AIAA 2016-1170)</b> .....	2182
<i>Ahmad Najafi, Masoud Safdari, Philippe H. Geubelle, Daniel A. Tortorelli</i>	
<b>Development of a Structural Finite Element Progressive Failure Simulation and Integration into the ICM2 Framework (AIAA 2016-1171)</b> .....	2194
<i>Josh Dustin, Richard W. Dalgarno, Matthew Hockemeyer</i>	

<b>Modeling of Shock Wave Propagation through Energetic Solid State Composites using a Taylor-Galerkin Scheme (AIAA 2016-1172)</b> .....	2203
<i>Adam V. Duran, Veeraraghavan Sundararaghavan</i>	
<b>Multi-Functional Topology Optimization of a Multi-functional Nanocomposite-enriched Structure (AIAA 2016-1173)</b> .....	2214
<i>David R. Seifert, Mayuresh Patil, Gary D. Seidel, Gregory W. Reich</i>	
<b>Information Management Workflow and Tools Enabling Multiscale Modeling Within ICME Paradigm (AIAA 2016-1174)</b> .....	2228
<i>Steven M. Arnold, Brett A. Bednarczyk, Nic Austin, Igor Terentjev, David Cebon, Will Marsden</i>	

### **AEROELASTIC SENSITIVITY ANALYSIS & APPLICATIONS**

<b>Development of a High-Fidelity Time-Dependent Aero-Structural Capability for Analysis and Design (AIAA 2016-1175)</b> .....	2244
<i>Dimitri Mavriplis, Evan Anderson, Ray S. Fertig, Mark Garnich, Zhi Yang</i>	
<b>Adjoint Based Structure and Shape Optimization with Flutter Constraints (AIAA 2016-1176)</b> .....	2258
<i>Zhichao Zhang, Ping-Chih Chen, Qiqi Wang, Zhiqiang Zhou, Shuchi Yang, Zhicun Wang</i>	
<b>Continuum Sensitivity Analysis for Aeroelastic Shape Optimization (AIAA 2016-1177)</b> .....	2281
<i>Mandar D. Kulkarni, Robert A. Canfield, Mayuresh Patil</i>	
<b>Gradient Based Optimization using Spectral Formulation-Based FSI and Coupled Sensitivity Analysis (AIAA 2016-1178)</b> .....	2298
<i>Rachit Prasad, Seulgi Yi, Seongim Choi, Dongkyun Im</i>	
<b>High-fidelity Aerostructural Optimization of a High Aspect Ratio Tow-steered Composite Wing (AIAA 2016-1179)</b> .....	2311
<i>Timothy R. Brooks, Graeme Kennedy, Joaquim Martins</i>	

### **DYNAMICS, FEEDBACK CONTROL, AND AEROSERVOELASTICITY II**

<b>Model Order Reduction of Aeroservoelastic Model of Flexible Aircraft (AIAA 2016-1222)</b> .....	2327
<i>Yi Wang, Hongjun Song, Kapil Pant, Martin J. Brenner, Peter M. Suh</i>	
<b>Optimal Manoeuvres with Very Flexible Wings (AIAA 2016-1223)</b> .....	2340
<i>Salvatore Maraniello, Robert J. Simpson, Rafael Palacios</i>	
<b>Alternative Unsteady Aerodynamic Uncertainty Modeling Approaches for Aeroservoelastic Reliability Analysis (AIAA 2016-1224)</b> .....	2357
<i>Eli Livne, Sang Wu</i>	
<b>Nonlinear Passive Control Strategies for Suppression of Transonic Flutter (AIAA 2016-1225)</b> .....	2381
<i>Zhimiao Yan, Saad A. Ragab, Muhammad R. Hajj</i>	
<b>Aeroelastic Responses Identification of a High-aspect-ratio Flexible Wing Model and Its Active Flutter Suppression Strategy (AIAA 2016-1226)</b> .....	2392
<i>Zhenbo Lu, Yongdong Cui, Douglas Schneider, Zijie Zhao, Xudong Chen, Kwok Leung Lai, Kai-Yew Lum</i>	
<b>Active Flutter Suppression Combining the Receptance Method and Flutter Margin (AIAA 2016-1227)</b> .....	2405
<i>Zhigang Wu, Jonathan E. Cooper</i>	
<b>Active Vibration Control Applications for Adaptive Aircraft Wings Modelled as Thin-Walled Composite Beams (AIAA 2016-1228)</b> .....	2423
<i>Kaan Yildiz, Seher Eken, Metin Orhan Kaya</i>	

### **DESIGN, TEST AND ANALYSIS OF COMPOSITE STRUCTURES I**

<b>Role of FEA, Closed-Form, and Empirical Models in Certifying Aircraft Composite Structures (AIAA 2016-1232)</b> .....	2433
<i>Alex S. Selvarathinam, Carl Rousseau, Stephen P. Engelstad, Lori Flansburg</i>	
<b>Extension of Automated 3D Digital Reconstruction to Multi-Directional Fiber Reinforced Composite Microstructures (AIAA 2016-1233)</b> .....	2446
<i>William Whitacre, Michael Czabaj, Richard J. Wood</i>	
<b>Determining Effective Interface Fracture Properties of 3D Fiber Reinforced Foam Core Sandwich Structures (AIAA 2016-1234)</b> .....	2455
<i>Zachary T. Kier, Anthony M. Waas</i>	
<b>Approach of Interlaminar Characterization for Thick Aircraft Composite Structures (AIAA 2016-1235)</b> .....	2474
<i>Mark R. Gurvich, Patrick L. Clavette, Mark E. Robeson</i>	
<b>Impact Response of Woven Composites with Interlaminar Reinforcement (AIAA 2016-1236)</b> .....	2483
<i>Alejandra G. Castellanos, Shariful M. Islam, Mohammad Shuvo, Yirong Lin, Pavana Prabhakar</i>	
<b>Hybrid Textile Composites as Potential Cryogenic Tank Materials (AIAA 2016-1237)</b> .....	2492
<i>Md S. Islam, Raudel Avila, Alejandra G. Castellanos, Pavana Prabhakar</i>	

### **OTHER TOPICS IN STRUCTURES**

<b>An Open Source Reverse Engineering Workflow: Geometry to Optimization (AIAA 2016-1238)</b> .....	2504
<i>Peter A. Gustafson, Andrew G. Geeslin, James R. Jastifer</i>	

<b>The Effects of Reducing the Structural Mass of the Transit Habitat on the Cryogenic Propellant Required for a Human Phobos Mission (AIAA 2016-1239)</b> .....	2524
<i>John J. Zipay</i>	
<b>Simple Test Functions in Meshless Local Petrov-Galerkin Methods (AIAA 2016-1240)</b> .....	2545
<i>Ivatury S. Raju</i>	
<b>Thermally-Driven Morphing with High Temperature Composites (AIAA 2016-1241)</b> .....	2555
<i>Eric Eckstein, Michael C. Halbig, Paul Weaver</i>	
<b>Nonlinear Modelling of Axially Deformable Elastica based on Hyperelasticity (AIAA 2016-1242)</b> .....	2573
<i>Fang Jiang, Su Tian, Wenbin Yu</i>	

### **AIR AND SPACE SURVIVABILITY I**

<b>Crew Compartment Fire Survivability (AIAA 2016-1243)</b> .....	2590
<i>Adam Goss, Leonard F. Truett</i>	
<b>Characterization of Hydrodynamic Ram Cavity Dynamics to Transient Spray (AIAA 2016-1244)</b> .....	2611
<i>Andrew J. Lingenfelter, David Liu</i>	
<b>Development for Orifice Entrainment Velocity Characterization During a Hydrodynamic Ram Event (AIAA 2016-1245)</b> .....	2620
<i>Andrew J. Lingenfelter, David Liu</i>	
<b>Wing Design Utilizing Topology Optimization and Additive Manufacturing (AIAA 2016-1246)</b> .....	2629
<i>David Walker, David Liu, Alan L. Jennings</i>	
<b>Topology Optimization and CFD Analysis of a Hypersonic Vehicle Nose Cone (AIAA 2016-1247)</b> .....	2644
<i>Kan Liu, Dylan Stelzer, Austin Williamson, David Liu, Alan L. Jennings</i>	

### **ADVANCED MATERIALS AND PROCESSING**

<b>Characterizing Mechanical Properties of Hybrid Alumina Carbon Fiber Composites with Piezospectroscopy (AIAA 2016-1413)</b> .....	2662
<i>Imad Hanhan, Alex P. Selimov, Declan Carolan, Ambrose Taylor, Seetha Raghavan</i>	
<b>Development of Advanced Conformal Ablative TPS Fabricated from Rayon- and Pan-Based Carbon Felts (AIAA 2016-1414)</b> .....	2670
<i>Matthew Gasch, Mairead Stackpoole, Susan White, Tane Boghoozian</i>	
<b>Flexible Lightweight Adjustable Stiffness Hinge (FLASH) for Advanced Cable Technology (AIAA 2016-1415)</b> .....	2698
<i>Juan M. Mejia-Ariza, Thomas W. Murphey</i>	

## **VOLUME 4**

<b>Fabrication of High Thermal Conductivity NARloy-Z-Diamond Composite Combustion Chamber Liner for Advanced Rocket Engines (AIAA 2016-1416)</b> .....	2716
<i>Biliyar N. Bhat, Sandra Greene, Jogender Singh</i>	
<b>Development of a Novel Self-Healing Polymer with High Temperature Stability (AIAA 2016-1417)</b> .....	2729
<i>Yun Seon Heo, Henry A. Sodano</i>	
<b>An Experimental Study into Active Damping Mechanisms in CNT Nanocomposite (AIAA 2016-1418)</b> .....	2736
<i>Frank Gardea, Dimitris C. Lagoudas, Mohammad Naraghi</i>	

### **DESIGN INCLUDING UNCERTAINTY & FRAMEWORKS**

<b>Uncertainty Quantification for Cargo Hold Fires (AIAA 2016-1419)</b> .....	2750
<i>Anthony Degennaro, Mark W. Lohry, Luigi Martinelli, Clarence W. Rowley</i>	
<b>Using Multiple Information Sources to Construct Stochastic Databases to Quantify Uncertainty in Certification Maneuvers (AIAA 2016-1420)</b> .....	2760
<i>Andrew Wendorff, Juan J. Alonso, Stefan R. Bieniawski</i>	
<b>Optimization Under Uncertainty of Parallel Nonlinear Energy Sinks (AIAA 2016-1421)</b> .....	2776
<i>Ethan R. Boroson, Samy Missoum</i>	
<b>Kona: A Parallel Optimization Library for Engineering-Design Problems (AIAA 2016-1422)</b> .....	2790
<i>Alp Dener, Pengfei Meng, Jason E. Hicken, Graeme Kennedy, John Hwang, Justin S. Gray</i>	
<b>Sensitivity Analysis Methods for Uncertainty Budgeting in System Design (AIAA 2016-1423)</b> .....	2817
<i>Max M. Opgenoord, Karen E. Willcox</i>	
<b>A Multi-Disciplinary Study of Future Fuel Efficient Regional Aircraft (AIAA 2016-1424)</b> .....	2836
<i>Ryan M. Palma, Matthew E. Thomas, Andre Balasiu, Leonardo Takamatsu, Will Noonan, Timothy T. Takahashi</i>	

### **PASSIVE CONTROL AND DAMPING**

<b>Damping of Sandwich Panels via Acoustic Metamaterials (AIAA 2016-1476)</b> .....	2869
<i>Tianliang Yu, George A. Lesieutre</i>	
<b>Finite Element Modeling of Longitudinal Metastructures for Passive Vibration Suppression (AIAA 2016-1477)</b> .....	2882
<i>Katherine K. Reichl, Daniel J. Inman</i>	

<b>Design of Three Parameter Isolator for the RWA Disturbance Considering Flexible Structural Effects (AIAA 2016-1478)</b> .....	2887
<i>Geeyong Park, Dae-Oen Lee, Jae-Hung Han</i>	
<b>Finite Element Modeling of Fluidic Flexible Matrix Composite (F2MC) Treatments for Bending and Torsional Vibration Control (AIAA 2016-1479)</b> .....	2897
<i>Matthew J. Krott, Kentaro Miura, Christopher Rahn, Edward C. Smith</i>	
<b>Cellular Lattices with an Internal Topology for High Stiffness and Damping (AIAA 2016-1480)</b> .....	2915
<i>Matthew Dipalma, Farhan Gandhi</i>	
<b>Structural Dynamics Analysis and Passive Control of Wind Turbine Vibrations with Tuned Mass Damper (TMD) Technique (AIAA 2016-1481)</b> .....	2927
<i>Touraj Farsadi, Altan Kayran</i>	
<b>Interfacial Micromechanics and Load Transfer of Off-Aligned Nanocomposites (AIAA 2016-1482)</b> .....	2947
<i>Reed Kopp, Bryan J. Glaz, Jaret C. Riddick, Edward C. Smith</i>	

## **GUST LOADS, RESPONSE, AND CONTROL**

<b>Probabilistic Gust Loads Analysis Accounting for Aeroservoelastic System Uncertainty (AIAA 2016-1483)</b> .....	2969
<i>Sang Wu, Eli Livne</i>	
<b>Gust Reconstruction from Flight Data Recording via Numerical Optimisation (AIAA 2016-1484)</b> .....	2992
<i>Simone Simeone, Christian Agostinelli, T. Rendall, Abdul Rampurawala</i>	
<b>Reduced Order Gust Response Simulation using Computational Fluid Dynamics (AIAA 2016-1485)</b> .....	3011
<i>Philipp Bekemeyer, Sebastian Timme</i>	
<b>Aeroservoelastic Response of Nonlinear Wind Tunnel Model to Non-Uniform Gust Field (AIAA 2016-1486)</b> .....	3024
<i>Rami Veiberman, Martin Weiss, Moti Karpel, Federico Fonte, Lorenzo Travaglini, Sergio Ricci</i>	
<b>Adaptive Finite Element in Time Method for Rotorcraft Analysis Using Element Size Control (AIAA 2016-1487)</b> .....	3038
<i>Soonwook Kwon, Inderjit Chopra, Sung Lee</i>	
<b>Derived Gust Velocities Extracted from Flight Data for Various Aircraft (AIAA 2016-1488)</b> .....	3045
<i>Kamran Rokhsaz, Linda K. Kliment</i>	
<b>Examination of Methods to Separate Gust and Maneuver Load Factors (AIAA 2016-1489)</b> .....	3058
<i>Linda K. Kliment, Kamran Rokhsaz</i>	

## **DESIGN, TEST AND ANALYSIS OF COMPOSITE STRUCTURES II**

<b>Ultra-Flexible Advanced Stiffness Truss (U-FAST) for Large Solar Arrays (AIAA 2016-1496)</b> .....	3067
<i>Juan M. Mejia-Ariza, Thomas W. Murphey</i>	
<b>Optimization of a Composite Lattice Satellite Central Cylinder Structure Using an Efficient Semi-automated Approach (AIAA 2016-1497)</b> .....	3085
<i>Leonid Pavlov, Bart J. Smeets, Sahak M. Simonian</i>	
<b>Imperfection Insensitivity Analyses of Advanced Composite Tow-Steered Shells (AIAA 2016-1498)</b> .....	3101
<i>K Chauncey Wu, Babak Farrokh, Bret Stanford, Paul Weaver</i>	
<b>Modeling the Bistability of Laminated Composite Toroidal Slit Tubes (AIAA 2016-1499)</b> .....	3117
<i>Geoffrey P. Knott, Andrew Viquerat</i>	
<b>Vibrational Analysis of Unitized Curvilinearly Stiffened Composite Panels Subjected to In-plane Loads (AIAA 2016-1500)</b> .....	3130
<i>Wei Zhao, Rakesh K. Kapania</i>	
<b>Adhesive-Bonded Shape Memory Alloy Strip Joint for Composite Fan Blade Shape Changing Concept (AIAA 2016-1501)</b> .....	3165
<i>James B. Min, Tiffany Williams, L. W. Kohlman, G. D. Roberts, S. G. Miller</i>	

## **STRUCTURAL JOINTS AND REPAIRS**

<b>Analytical and Experimental Studies on Delamination Arrest in Bolted-Bonded Composite Structures (AIAA 2016-1502)</b> .....	3184
<i>Luke I. Richard, Kuen Yuan Lin</i>	
<b>Delamination Growth of Redundantly Joined Sandwich Composites Under Compression (AIAA 2016-1503)</b> .....	3194
<i>Catherine N. Phan, Eric C. Lundgren, Dhruv N. Patel, Vinay K. Goyal, Daniel Friedman</i>	
<b>Sensitivity Analysis of Composite Patch Design Parameters under Low Velocity Impact Loading Conditions (AIAA 2016-1504)</b> .....	3206
<i>Stephanie C. Termaath, Rajendra Timilsina</i>	
<b>Finite Element Analysis and Testing of Countersunk Composite Bolted Joints in Double Lap Shear (AIAA 2016-1505)</b> .....	3212
<i>Manasi P. Palwankar, Alexandru P. Popescu, Satchi Venkataraman</i>	
<b>A Method for Predicting Fastener Hole Elongation in Composite Joints due to Cyclic Loading (AIAA 2016-1506)</b> .....	3238
<i>Jonathan D. Bartley-Cho, Donny P. Wang, Bill R. Sheppard, Tod E. Palm, Richard C. Holzwarth, Michael Wilkinson</i>	
<b>High Fidelity Bearing and Bypass Response and Failure Prediction of Composite Bolted Joints (AIAA 2016-1507)</b> .....	3249
<i>Neethi Simon, Eugene Fang, Jim Lua</i>	

## AIR AND SPACE SURVIVABILITY II

<b>Multiscale Simulation of Reacting Shock Physics (AIAA 2016-1508)</b> .....	3262
<i>Eric P. Fahrenthold, Sangyup Lee, Joseph Bass</i>	
<b>Topology Optimization of a Penetrating Warhead (AIAA 2016-1509)</b> .....	3269
<i>William T. Graves, David Liu, Anthony N. Palazotto</i>	
<b>Dynamic Properties of Additively Manufactured 15-5 Stainless Steel and Three-Dimensional Microstructure Characterization (AIAA 2016-1510)</b> .....	3282
<i>Allison Dempsey, David Liu, Anthony N. Palazotto, Rachel Abrahams</i>	
<b>On the Impact Tolerance of Tensegrity-based Planetary Landers (AIAA 2016-1511)</b> .....	3297
<i>Julian J. Rimoli</i>	
<b>Surface Roughness of Electron Beam Melting Ti-6Al-4v Effect on Ultrasonic Testing (AIAA 2016-1512)</b> .....	3305
<i>Evan Hanks, David Liu, Anthony N. Palazotto</i>	

## MATERIALS & DESIGN FOR ADDITIVE MANUFACTURING

<b>Cathodic Protection Tests for the Galvanic Corrosion of Airframe Grade CFRP/Al Systems (AIAA 2016-1654)</b> .....	3318
<i>Tetsuya Morimoto, Jun Koyanagi</i>	
<b>Fire-Retardant Polyamide 11 Nanocomposites/Elastomer Blends for Selective Laser Sintering: Further Studies (AIAA 2016-1655)</b> .....	3324
<i>Rogelio Ortiz, Hao Wu, Joseph H. Koo, Renan A. Correa, Ethan Liu</i>	
<b>On the Fatigue Performance of Additively Manufactured Ti-6Al-4V to Enable Rapid Qualification for Aerospace Applications (AIAA 2016-1656)</b> .....	3333
<i>Peipei Li, Derek Warner, Ali Fatemi, Nam D. Phan</i>	
<b>Powder Bed Models - Numerical Assessment of As-Built Quality (AIAA 2016-1657)</b> .....	3352
<i>Mustafa Megahed, Hans-Wilfried Mindt, Brian Shula, Alonso Peralta, James Neumann</i>	
<b>Data-Driven Certification of Additively Manufactured Parts (AIAA 2016-1658)</b> .....	3359
<i>Deborah Mies, Will Marsden, Stuart Dyer, Stephen Warde</i>	

## MISSION DRIVEN DESIGN

<b>An EGO-like Optimization Framework for Simultaneous Aircraft Design and Airline Allocation (AIAA 2016-1659)</b> .....	3369
<i>Satadru Roy, William A. Crossley</i>	
<b>Wing Aerostructural Optimization under Uncertain Payload Weight and Aircraft Range (AIAA 2016-1660)</b> .....	3379
<i>Ali Elham, Luis Bahamonde Jacome</i>	
<b>An Aircraft Development Methodology Aligning Design and Strategy to Support Key Decision Making (AIAA 2016-1661)</b> .....	3400
<i>Frederic Burgaud, Christopher Frank, Dimitri N. Mavris</i>	
<b>Allocation-mission-design Optimization of Next-generation Aircraft Using a Parallel Computational Framework (AIAA 2016-1662)</b> .....	3419
<i>John Hwang, Joaquim Martins</i>	
<b>Waverider Design, Analysis and Performance Evaluation (AIAA 2016-1663)</b> .....	3439
<i>Frederick Ferguson, Nastassja Dasque, Mookesh Dhanasar, Isaiah M. Blankson, Chuka Onuorah</i>	

## REDUCED ORDER MODELING II

<b>Using Complex Variables to Estimate the Derivatives of Nonlinear Reduced-Order Models (AIAA 2016-1707)</b> .....	3457
<i>Joseph J. Hollkamp, Patrick J. O'Hara</i>	
<b>Large Deformation Modeling of a Beam Type Structure and a 3D Wingbox using an Enhanced Modal Approach (AIAA 2016-1708)</b> .....	3469
<i>Markus Ritter, Carlos E. Cesnik</i>	
<b>Optimum Thermal Modes for Coupled Structural-Thermal Reduced Order Models (AIAA 2016-1709)</b> .....	3489
<i>Raghavendra Murthy, Xiaoquan Wang, Andrew Matney, Marc P. Mignolet</i>	
<b>Modeling Fatigue Crack Propagation in a Ti-Alloy at Elevated Temperature within a Reduced-Order Model Framework (AIAA 2016-1710)</b> .....	3508
<i>Patrick J. O'Hara, Joseph J. Hollkamp</i>	
<b>Geometrically Non-linear Structural Dynamics using Increased-Order Modelling (AIAA 2016-1711)</b> .....	3525
<i>Lars Oliver Bernhammer, Moti Karpel, Manuel Reyes, Hector Climent Manez</i>	

## SPACECRAFT STRUCTURAL DESIGN

<b>The Ultimate Factor of Safety for Aircraft and Spacecraft - Its History, Applications and Misconceptions (AIAA 2016-1715)</b> .....	3542
<i>John J. Zipay, Clarence T. Modlin, Curtis E. Larsen</i>	

<b>Thermo-structural design of the Hexafly-INT Experimental Flight Test Vehicle (EFTV) and Experimental Service Module (ESM) (AIAA 2016-1716)</b> .....	3562
<i>Valerio Carandente, Roberto Scigliano</i>	
<b>Post-buckling Analysis of Curved Honeycomb Sandwich Panels Containing Interfacial Disbonds (AIAA 2016-1717)</b> .....	3570
<i>Evan J. Pineda, Brett A. Bednarczyk, Thomas K. Krivanek</i>	
<b>Integrated Composite Stiffener Structure (ICoSS) Concept for Planetary Entry Vehicles (AIAA 2016-1718)</b> .....	3596
<i>Sotiris Kellas</i>	
<b>Forward Skirt Structural Testing on the Space Launch System (SLS) Program (AIAA 2016-1719)</b> .....	3604
<i>Joe Lohrer, Roger Wright</i>	

## VOLUME 5

<b>Flutter Analysis of Laminated Curvilinear-Stiffened Plates (AIAA 2016-1720)</b> .....	3623
<i>Rossana Fernandes, Ali Tamijani</i>	

## BUCKLING, FATIGUE, AND FRACTURE OF STRUCTURES I

<b>Peridynamic Truss Element for Viscoelastic Deformation (AIAA 2016-1721)</b> .....	3648
<i>Mehmet Dorduncu, Atila Barut, Erdogan Madenci</i>	
<b>Bond-Based Peridynamics with an Arbitrary Poisson's Ratio (AIAA 2016-1722)</b> .....	3661
<i>Yile Hu, Erdogan Madenci</i>	
<b>Peridynamics for Predicting Tensile and Compressive Strength of Notched Composites (AIAA 2016-1723)</b> .....	3676
<i>Yile Hu, Erdogan Madenci, Nam D. Phan</i>	
<b>Mean Stress Effects in Strain Energy-based Criterion for Fatigue Life Prediction (AIAA 2016-1724)</b> .....	3689
<i>Shunpeng Zhu, Qiang Lei, Hong-Zhong Huang, Yuan-Jian Yang</i>	
<b>Fiber Path Optimization of a Symmetric Laminate with a Cutout for Thermal Buckling, Using a Novel Finite Element Algorithm (AIAA 2016-1725)</b> .....	3701
<i>Avinkrishnan A. Vijayachandran, Pinar Acar, Veeraraghavan Sundararaghavan, Anthony M. Waas</i>	
<b>Influence of Microstructure Arrangement on the Responses of Composites Beyond One Representative Unit Cell (AIAA 2016-1726)</b> .....	3714
<i>H. Sam Huang</i>	

## SENSITIVITY DERIVATIONS & OPTMIZATION APPLICATIONS

<b>A Scalable Adjoint Method for Coupled Flexible Multibody Dynamics (AIAA 2016-1907)</b> .....	3726
<i>Graeme Kennedy, Komahan Boopathy</i>	
<b>Shape Optimization of Two-Dimensional Acoustic Metamaterials and Phononic Crystals with a Time-Dependent Adjoint Formulation (AIAA 2016-1908)</b> .....	3743
<i>Weiyang Lin, William K. Anderson, James Newman, Xueying Zhang</i>	
<b>Implementation of Discrete Adjoint Method for Parameter Sensitivity Analysis in Chemically Reacting Flows (AIAA 2016-1909)</b> .....	3756
<i>Guillaume Houzeaux, M. Kouhi, F. Cucchietti, M. Vazquez, F. Rodriguez</i>	
<b>Time-dependent Aero-acoustic Adjoint-based Shape Optimization of Helicopter Rotors in Forward Flight (AIAA 2016-1910)</b> .....	3775
<i>Enrico Fabiano, Asitav Mishra, Dimitri J. Mavriplis, Karthik Mani</i>	
<b>Trajectory Optimization Procedure for Interplanetary Transfers based on Direct Collocation Method (AIAA 2016-1911)</b> .....	3793
<i>Dhathri H. Somavarapu, Eric Wahl, Alexander Westfall, Kamran Turkoglu</i>	
<b>Multi-parametric High-order Flow Sensitivity Analysis (AIAA 2016-1912)</b> .....	3804
<i>Alexander Hay, Corinne Belley, Dominique Pelletier</i>	

## SYSTEM ID

<b>Identification of Nonlinear Aeroelastic Behavior of a Wing with Pitching and Plunging Freeplay via Higher-Order Spectra Analysis (AIAA 2016-1953)</b> .....	3822
<i>Michael Candon, Hideaki Ogawa, Robert Carrese, Pier Marzocca</i>	
<b>Dynamic Beam Solutions for Real-Time Simulation and Control Development of Flexible Rockets (AIAA 2016-1954)</b> .....	3840
<i>Weihua Su, Cecilia King, Scott Clark, Edwin D. Griffin, Jeffrey D. Suhey, Michael G. Wolf</i>	
<b>Flight Shape Estimation of Very Flexible Unmanned Aerial Vehicle (AIAA 2016-1955)</b> .....	3860
<i>Zi Yang Pang, Carlos E. Cesnik</i>	
<b>Efficient Clustering Algorithm Using Modal Assurance Criterion for System Identification (AIAA 2016-1956)</b> .....	3881
<i>Zhicun Wang, Darius Sarhaddi, Ping-Chih Chen</i>	
<b>Operational Modal Analysis of a Rotating Cantilever Beam Using High-Speed Digital Image Correlation (AIAA 2016-1957)</b> .....	3902
<i>Sergio S. Rizo-Patron, Jayant Sirohi</i>	

<b>Modeling of Artificial Hair Sensors for Vibration Control of Flexible Wings (AIAA 2016-1958)</b> .....	3921
<i>Weihua Su, Gregory W. Reich</i>	

## **FLUTTER**

<b>Classical Aeroelastic Stability Analysis of Large Composite Wind Turbine Blades (AIAA 2016-1959)</b> .....	3936
<i>Touraj Farsadi, Altan Kayran</i>	
<b>Wind Tunnel Flutter Testing of a Highly Swept All-Movable Wing (AIAA 2016-1960)</b> .....	3963
<i>Dale M. Pitt, Bradley Sexton, Kwanhwa Byun</i>	
<b>Development and Wind Tunnel Test of W-WING Whirl Flutter Aeroelastic Demonstrator (AIAA 2016-1961)</b> .....	3972
<i>Jiri Cecrdle, Jaromir Malecek, Ondrej Vich, Petr Malinek</i>	
<b>Time to Flutter of a Maneuvering Viscoelastic Goland Wing (AIAA 2016-1962)</b> .....	3991
<i>Craig Merrett</i>	
<b>Uncertainties in Vibratory Mode Shapes and Their Effect on Flutter Speeds (AIAA 2016-1963)</b> .....	4008
<i>Dale M. Pitt, Prasun Bansal</i>	
<b>Optimization of High Altitude Long Endurance (HALE) Vehicle Subject to Flutter Speed Constraint (AIAA 2016-1964)</b> .....	4021
<i>Kevin Roughen, Myles Baker, Joe Robinson, Zhang Liu</i>	
<b>Experimental Investigation of an Airfoil Response Under Stall-induced Pitching Oscillations (AIAA 2016-1965)</b> .....	4033
<i>Flávio D. Marques, Rui M. Vasconcellos, Daniel D. Pereira</i>	

## **COMPOSITE LAMINATE OPTIMIZATION**

<b>Aeroelastic Tailoring of Blended Composite Structures using Lamination Parameters (AIAA 2016-1966)</b> .....	4042
<i>Terence Macquart, Noud Werter, Roeland De Breuker</i>	
<b>Gradient-Based Optimization of Postbuckled, Steered-Fiber Aircraft Shell Using Equivalent Static Loads (AIAA 2016-1967)</b> .....	4055
<i>Tanut Ungwattanapanit, Horst Baier</i>	
<b>Damping Optimization of Symmetrically Laminated Plates with Shear Deformation using Lamination Parameters (AIAA 2016-1968)</b> .....	4072
<i>Masaki Kameyama, Atsushi Takahashi</i>	
<b>Stacking Sequence Constraints in Non-conventional Composite Laminate Optimisation (AIAA 2016-1969)</b> .....	4080
<i>Daniël Peeters, Mostafa Abdalla</i>	
<b>Optimization of Variable Stiffness Composite Plates with Cut-outs Subjected to Compression, Tension and Shear Using an Adjoint Formulation (AIAA 2016-1970)</b> .....	4095
<i>Michael J. Van Tooren, Ali Elham, Ifat Jahangir</i>	

## **BUCKLING, FATIGUE, AND FRACTURE OF STRUCTURES II**

<b>A Discontinuous Shell Element for the Delamination Analysis of Composite Laminates (AIAA 2016-1971)</b> .....	4112
<i>Saleh Yazdani, Wilhelm J. H. Rust, Peter Wriggers</i>	
<b>Buckling Considerations in the Design of Monolithic Machined Aluminum Structures (AIAA 2016-1972)</b> .....	4123
<i>Jon A. Tucker, Steven G. Russell, Byron E. Mueller</i>	
<b>Efficient and Robust Shell Design of Space Launcher Vehicle Structures (AIAA 2016-1973)</b> .....	4136
<i>Linus Friedrich, Martin Ruess, Kai-Uwe Schröder</i>	
<b>Post-Buckling Load Redistribution of Stiffened Panels in Aircraft Wingbox Structures (AIAA 2016-1974)</b> .....	4154
<i>Mesut Mert, Altan Kayran</i>	
<b>Vibration and Buckling of Quadrilateral Variable Stiffness Laminated Composite Plates (AIAA 2016-1975)</b> .....	4166
<i>Michael C. Henson, Bo P. Wang</i>	
<b>Parametric Study of Stiffener Variables on Post-Buckling Response of Frame-Stiffened Composite Panels (AIAA 2016-1976)</b> .....	4184
<i>Gabriela J. Sanz-Douglass, Satchi Venkataraman</i>	

## **DYNAMIC LOADS, RESPONSE, AND VIBRATION II**

<b>Substructure Versus Property-Level Dispersed Modes Calculation (AIAA 2016-2170)</b> .....	4219
<i>Eric C. Stewart, Jeff Peck, Clay Fulcher, T. J. Bush</i>	
<b>Acoustic Analysis of A Partially Open Spacecraft Cavity using Multi-Domain Boundary Element Method (AIAA 2016-2171)</b> .....	4234
<i>Daisaku Inoyama, Ravindra Agarwal, Tom Stoubos</i>	
<b>Assessing Sine and Random Stresses and Fatigue Life (AIAA 2016-2172)</b> .....	4253
<i>Mary Baker</i>	
<b>Non-Stationary Random Vibration Analysis Using Multi-Correlated Random Processes Excitations (AIAA 2016-2173)</b> .....	4264
<i>Yanbin Li, Sameer B. Mulani, Rakesh K. Kapania, Shaoqing Wu, Qingguo Fei</i>	

<b>Exploring Entropy for Continuous Systems (AIAA 2016-2174)</b> .....	4292
<i>Dante Tufano, Zahra Sotoudeh</i>	

**SPECIAL SESSION: STIFFENED, STITCHED COMPOSITE STRUCTURES**

<b>Testing of a Stitched Composite Large-Scale Pressure Box (AIAA 2016-2175)</b> .....	4306
<i>Dawn C. Jegley, Marshall Rouse, Adam Przekop, Andrew E. Lovejoy</i>	
<b>Testing and Analysis of a Composite Non-Cylindrical Aircraft Fuselage Structure, Part I: Ultimate Design Loads (AIAA 2016-2176)</b> .....	4336
<i>Adam Przekop, Dawn C. Jegley, Andrew E. Lovejoy, Marshall Rouse, Hsi-Yung T. Wu</i>	
<b>Testing and Analysis of a Composite Non-Cylindrical Aircraft Fuselage Structure, Part II: Severe Damage (AIAA 2016-2177)</b> .....	4364
<i>Adam Przekop, Dawn C. Jegley, Andrew E. Lovejoy, Marshall Rouse, Hsi-Yung T. Wu</i>	
<b>Imparting Barely Visible Impact Damage to a Stitched Composite Large-Scale Pressure Box (AIAA 2016-2178)</b> .....	4390
<i>Andrew E. Lovejoy, Adam Przekop</i>	
<b>Compressive Loading and Modeling of Stitched Composite Stiffeners (AIAA 2016-2179)</b> .....	4405
<i>Frank A. Leone, Dawn C. Jegley</i>	
<b>Tension and Bending Testing of an Integral T-cap for Stitched Composite Airframe Joints (AIAA 2016-2180)</b> .....	4433
<i>Andrew E. Lovejoy, Frank A. Leone</i>	

**IMPACT DAMAGE IN COMPOSITES**

<b>Low Velocity Impact Test and Analysis of Laminated Structures (AIAA 2016-2181)</b> .....	4458
<i>Michael A. Falugi</i>	
<b>Modeling Axial Impact Response of Sandwich Panels using Probability-Based Finite Element Analysis (AIAA 2016-2182)</b> .....	4475
<i>Wooseok Ji, Anthony M. Waas</i>	
<b>Correlating Impact, Micro CT Inspection, and Residual Strength of Carbon/Epoxy Rods (AIAA 2016-2183)</b> .....	4483
<i>David W. Jensen, Lindsey Stanford</i>	
<b>Prediction of Low-Velocity Face-on Impact Response of Composite Laminates using High-Fidelity Finite Element Modeling Techniques (AIAA 2016-2184)</b> .....	4497
<i>Solver I. Thorsson, Akinori Yoshimura, Anthony M. Waas, Mostafa Rassaian</i>	
<b>Author Index</b>	