

Aerodynamic Analysis for Aircraft Configuration Design

Papers Presented at the AIAA SciTech Forum and Exposition
2024

Orlando, Florida, USA
8 – 12 January 2024

Volume 1 of 3

ISBN: 979-8-3313-0408-9

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

AERODYNAMIC ANALYSIS FOR AIRCRAFT CONFIGURATION DESIGN

Wingtip Treatments for Transonic Wing Planforms	1
<i>Oscar G. Puentes, Timothy T. Takahashi</i>	
Intake Performance Analysis for Extra-Design Variations in Local Flow Field of a Supersonic Aircraft	16
<i>Falak Niaz, Usman Zia, Jehanzeb Masud, Muhammad Muneeb Safdar</i>	
Wing Design Strategies for Vehicles Designed to Operate in Ground Effect.....	49
<i>Jose V. Valenzuela, Timothy T. Takahashi</i>	
Assessment of Structurally-Constrained Spanloads for Span-Extended Wing Design.....	75
<i>Estela Bragado Aldana, Atif Riaz</i>	

DESIGN METHODS, TOOLS AND PROCESSES IN SUPPORT OF AIRCRAFT DESIGN (JOINT ACD/DE)

Aircraft Design Assessment with Machine Learning Models Trained on Human Expert Opinions.....	95
<i>Yikang Wang, Scott Eberhardt</i>	
Agent-Based Discovery of Unexpected Falsification Scenarios in Aircraft Systems Virtual Testing	113
<i>Dennis Hillig, Frank Thielecke</i>	
Tackling the Dimensionality Increase in Multi-Level, Set-Based Aircraft Design Space Exploration	130
<i>Evanthia Kallou, Christian Perron, Burak Bagdatli, Dimitri N. Mavris</i>	
A Multi-Domain Simulation Framework for Modeling an Aircraft Ejection Event	153
<i>Sreenivasa Voleti, Angus L. McLean, Eric H. Upchurch, John L. Hampton, Hiroyuki Sugiyama, Himmelman A. Richard</i>	

AERODYNAMIC ANALYSIS METHODS FOR AIRCRAFT DESIGN

Airship Flight Model Creation: A Computational Approach for High Altitude Pseudo-Satellites (HAPS)	162
<i>Ahmed Aboezez, Mario Escarcega, Brenden Herkenhoff, Yan Pozhanka, Tyler Doyle, Mostafa Hassanalian</i>	
Evaluation of Steady and Periodic Trim Loads in Tiltrotors Using Multibody - Mid-Fidelity Aerodynamic Simulations	176
<i>Alberto Savino, Alessandro Cocco, Vincenzo Muscarello</i>	
Developing a Co-Design Framework for Hypersonic Vehicle Aerodynamics and Trajectory	191
<i>Kieran Mackle, Andrew Lock, Ingo Jahn, Chris van der Heide</i>	
Prediction of Aerodynamic Loads and Stability Derivatives Using the Unsteady Source and Doublet Panel Method for Preliminary Aircraft Design	205
<i>Grigorios Dimitriadis, Periklis Panagiotou, Thomas Dimopoulos, Kyros Yakinthos</i>	

Panel Method for Aero-Propulsive Design Space Exploration.....	226
<i>Jalendu Africawala, Aleksandar Joksimovic</i>	

CLEAN AVIATION SPECIAL SESSION: INNOVATIVE AIRCRAFT CONCEPTS AND NOVEL CONFIGURATIONS

Clean Aviation Ultra-Performance Wing (UP-Wing)	241
<i>Adrian Eberle, Bruno Stefes, Daniel Reckzeh</i>	
Parametric Study of a Switchable Vortex Generator for Load Alleviation in Transonic Conditions.....	255
<i>Luca Marino, Ilias Kiat, Adrian Eberle, Jurij Sodja</i>	
CS2-THT U-HARWARD Project: Final Assessment and Project Outcomes Evaluation.....	276
<i>Jonathan E. Cooper, Huaiyuan Gu, Sergio Ricci, Francesco Toffol, Stephan Adden, Michael Meheut, Emmanuel Benard, Philippe Barabinot</i>	
From Clean Sky 2 to Clean Aviation: Assessment Capabilities and Down-Selection of Promising Innovative Configurations and Aero-Propulsive Integrations	293
<i>Sebastien Defoort, Michael Meheut, Peter Schmollgruber, Olivier Atinault, Julie Gauvrit-Ledogar, Quentin Bennehard, Christophe David</i>	
Aero-Structural Design Optimization of a Morphing Aileron Considering Actuation Aspects.....	313
<i>Vittorio Cavalieri, Alessandro De Gaspari, Sergio Ricci</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.....	330
<i>Vineeth Ravulapalli, Gangadharan Raju, Ramji Manoharan, Vijayabaskar Narayanamurthy</i>	
Buckling Behavior of Conical-Cylindrical Shells and Design Considerations for Launch-Vehicle Applications.....	343
<i>Michelle T. Rudd, Marc R. Schultz, Chiara Bisagni</i>	
Damage Evolution of Buckled Composite Stiffened-Panels Under Combined Static Shear and Compression.....	358
<i>Vijay Goyal, Shiyao Lin, Brandon Fischetti, Anthony Waas</i>	

FRAMEWORK OPTIMIZATION FOR AIRCRAFT DESIGN

Multidisciplinary Optimization of a Transonic Truss-Braced Wing Aircraft Using the Aviary Framework.....	378
<i>Eliot Aretskin-Hariton, Jennifer Gratz, Jason Kirk, Kenneth Lyons, John Jasa, Kenneth Moore, Robert Falck, Darrell Caldwell, Caroline Kuhnle, Carl Recine, Eric Hendricks, Erik Olson</i>	
Integrated Vehicle and Subsystems Sizing and Optimization for Advanced Air Mobility Aircraft.....	394
<i>Stefanus H. Putra, Rajan Bhandari, Imon Chakraborty</i>	
Design Parametrization of an eVTOL and Its Effects on Battery Sizing.....	428
<i>Gabriel G. Souza, Higor Luis Silva</i>	

Incorporating Scenario Variation into Capability-Based and Value-Driven Design to Improve Complex System Architectures	448
<i>Christian Coletti, Samuel P. Ferguson, Oluwalonigba D. Akinola, Alexander Kehler, Adam Cox, Neil R. Weston, Alicia Sudol, Dimitri N. Mavris</i>	

Ontology-Based Generation of Onboard System Architectures	463
<i>Kristian Amadori, Christopher Jouannet, Ludvig Knöös Franzén</i>	

Incorporation of Producibility Considerations into an Aircraft Multidisciplinary Design Optimization Framework.....	477
<i>Michael Buonanno, Thomas Kwasniak, Nathan Quay, Amy Ross, Daniel Sagan, Christopher A. Lupp, Brench Boden</i>	

CLEAN AVIATION SPECIAL SESSION: ADVANCED ENGINE AND AIRCRAFT CONFIGURATIONS

Clean Sky 2 Advanced Rear End Demonstrator	492
<i>Enrique Guinaldo</i>	

Hybrid Laminar Flow Control Activities Within the Frame of Clean Sky 2	507
<i>Martin Wahlich, Alexander Bismark, Martin Radestock, Kfir Menchel, Matthieu Milot, David Cruz</i>	

Final Design, Manufacturing and Testing of the Clean Sky 2 Distributed Electric Propulsion Scaled Flight Demonstrator D08 DEP-SFD.....	520
<i>Carsten Doll, Maurice Hoogreef, Pierluigi Iannelli, Henk Jentink, Daniel Kierbel</i>	

LARGE BATTERY-ELECTRIC AIRCRAFT: DID WE UNDERESTIMATE THEIR POTENTIAL?

A New Perspective on Battery-Electric Aviation, Part I: Reassessment of Achievable Range.....	532
<i>Rob E. Wolleswinkel, Reynard de Vries, Maurice Hoogreef, Roelof Vos</i>	

A New Perspective on Battery-Electric Aviation, Part II: Conceptual Design of a 90-Seater	549
<i>Reynard de Vries, Rob E. Wolleswinkel, Maurice Hoogreef, Roelof Vos</i>	

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR MATERIALS AND STRUCTURES I

Adaptive Surrogate Models with Unbalanced Data for Material Design	574
<i>Yulun Wu, Yumeng Li</i>	

Generative Adversarial Networks for the Inverse Design of 2D Spinodoid Metamaterials	584
<i>Sheng Liu, Pinar Acar</i>	

Multiphysics-Informed Machine Learning for Uncertainty Quantification on Si Anode Based Battery Performance.....	597
<i>Parth Bansal, Yumeng Li</i>	

Failure Modeling in Notched Twill Textile Composites Using Machine Learning	613
<i>Eugene R. Kheng, Royan Dmello, Anthony Waas</i>	

Integrating Experiments, Simulations, and Artificial Intelligence to Accelerate the Discovery of High-Performance Green Composites.....	624
<i>Christos Athanasiou, Bolei Deng, Ahmed A. Hassen</i>	

VOLUME 2

INNOVATIONS IN AIRCRAFT PROPULSION DESIGN

High Speed Aircraft Power Generation with Liquid Natural Gas Combined Power and Thermal Management System	629
<i>Trevor J. Kramer, Rory Roberts, Aaron Bain, Jimmy W. Meacham, Jeff Webster</i>	
Noise and Field Performance Impacts of FADEC Speed Scheduled Thrust Derate.....	650
<i>Timothy T. Takahashi</i>	
An Enhanced Jig-Shape Approach to Lifting Propeller Design	667
<i>Felix Möhren, Ole Bergmann, Frank Janser, Carsten Braun</i>	
Energy Consumption of Aircraft with New Propulsion Systems and Storage Media	687
<i>Yri Amandine Kambiri, Thierry Druot, Pascal Roches, Nicolas Peteilh, Nicolas Monrolin, Xavier Carbonneau</i>	

UNMANNED SYSTEMS DESIGN

AI-Driven Multidisciplinary Conceptual Design of Unmanned Aerial Vehicles.....	714
<i>Hasan Karali, Gokhan Inalhan, Antonios Tsourdos</i>	
Development of a Electric Fixed Wing VTOL UAV for Challenging Sensor Deployments	727
<i>Thomas David, Duncan Hine, Hiran Goudarzi, Liam Fletcher, Tom Rendall, Matt Watson, Thomas S. Richardson</i>	
Integral-Backstepping for Crazyflie Quadrotor Trajectory Tracking Control	738
<i>Osama H. Zekry, Mahmoud Ashry, Ahmed Hafez, Tamer Attia</i>	
Deep Reinforcement Learning Based Real-Time Path Planning and Flight Validation of Small UAS Application.....	747
<i>JinHyuk Park, Junki Shim, Gwonyeol Lee, Seongim Choi</i>	

CLEAN AVIATION SPECIAL SESSION: FUTURE PROPULSION SYSTEMS & INTEGRATION

Optimization of Large-Scale Aeroengine Parts Produced by Additive Manufacturing	766
<i>Dirk Herzog, Maria I. Maiwald, Ashish Sharma, Nick Markovic, Philipp Manger, Ailsa McGugan, Andy Harris, Wieland Uffrecht, Markus Lingner, Malte Becker, Ingomar Kelbassa</i>	
Noise Reduction with an Optimized Scarfed Nozzle Concept	772
<i>Amandine Menasria, Stéphane Lemaire, Christoph Richter</i>	

EMERGING AIRCRAFT CONFIGURATIONS

Proximity Effects of Wings on System Performance in a Multi-Wing Configuration.....	788
<i>Nevin Jestus, Sidaard Gunasekaran, Michael Mongin, Aaron Altman</i>	

Aerodynamic Optimization of a Flying V Aircraft Based on the Reynolds-Averaged Navier-Stokes Equations.....	809
<i>Rasam R. Yazdi, Thomas A. Reist, David W. Zingg</i>	
Conceptual Design of Two-Seater Lift & Cruise Type Urban Air Mobility	830
<i>Jinyoung Kim, Sanghoon Lee, Dongkyun Im</i>	
Conceptual Design of a Semi Blended Wing Body for the Air Force Next-Generation Air-Refueling System.....	852
<i>Guilherme Fernandes, Nazir Gandur, Victor Maldonado, Aaron Mallory, Jinju Philip, Dwayne Kendrick, Calen Mills, Victor Esquivel, Hsa Ku Doh Moo, Eduardo Ruiz</i>	
Ephemeris: A TSTO Space Rescue Vehicle Conceptual Design.....	866
<i>Yahya H. Mirza, John W. Livingston, Ajay P. Kothari, Leon McKinney</i>	

AIRCRAFT DESIGN FOR SUPERSONIC AND BEYOND

Toward Quieter and More Efficient Supersonic Flight: Multi-Objective Optimization of a Bell-Shaped Lift Distribution Wing SSBJ.....	888
<i>Giordana Bonavolontà, Anirudh Manoj, Cristina Villena Munoz, Sai Tajesh Chilukuri, Craig Lawson, Atif Riaz</i>	
Conceptual Design of Supersonic Aircraft to Investigate Environmental Impact	908
<i>Cristina Villena Munoz, Craig Lawson, Atif Riaz, Robert Jaron</i>	
Guided Hypersonic Aerial Gunnery and Morphing Ramjet Missiles: Coevolution with 7th Generation Combat Aerospace Systems.....	932
<i>Ronald M. Barrett-Gonzalez, Olivia Caudillo</i>	
Determination of Optimal Cruise Points for General Purpose Hypersonic Airframes	944
<i>Timothy T. Takahashi, Jose A. Camberos, Ramana V. Grandhi</i>	

DESIGN FOR AIRCRAFT ELECTRIFICATION I

A Comprehensive Study on Hydrogen and Hybrid Electric Aircraft with Distributed Electric Propulsion.....	966
<i>Takaki Nishikawa, Kenichi Rinoie</i>	
Aerodynamic Analysis of Tandem Tilt-Wing eVTOL Aircraft in Cruise and Transition Flight.....	991
<i>Atsushi Shinozuka, Shota Taniguchi, Kanako Yasue, Ryota Fukuchi, Akira Oyama</i>	
Design and Performances of a Turbo-Electric and Distributed Propulsion Aircraft in the Small and Medium Range Segment: Intermediate Results from the European Project IMOTHEP	1009
<i>Eric Nguyen Van, Sebastien Defoort, Christophe Viguier, Jesús Ubaldo Sainz Ahedo, Smail Mezani, Noureddine Takorabet</i>	
Electrified Lift-Plus-Cruise Aircraft Sizing with Varying Battery Modeling Assumptions.....	1033
<i>Imon Chakraborty, Aashutosh A. Mishra, Robert A. McDonald</i>	

FLIGHT MECHANICS IN AIRCRAFT DESIGN

Study on Aerodynamic Characteristics and Flight Dynamics of Multi-Body Aircraft.....	1058
<i>Chao An, Guixi Huo, Yang Meng, Changchuan Xie</i>	

Integrating Stability and Control Considerations into the Sizing of an Advanced Air Mobility VTOL Aircraft	1076
<i>Aashutosh A. Mishra, Imon Chakraborty</i>	
Reintroducing the Formation Flight Problem Via Extremum Seeking Control.....	1112
<i>Benjamin Moidel, Ahmed A. Elgohary, Shivam Bajpai, Sameh Eisa</i>	
Lateral-Directional Controllability Impacts of Longitudinal Pitch Trim Strategies on the Space Shuttle Orbiter	1127
<i>Connor S. Hoopes, Timothy T. Takahashi</i>	
Attainable Moment Sets – Approaches to Understanding Trim Capability in Conceptual Design	1144
<i>Joshua H. Heinz, Timothy T. Takahashi</i>	
Tail Sizing Strategies to Ensure Low-Risk Maneuvering High-Speed Flight	1165
<i>Kevin P. OBrien, Timothy T. Takahashi</i>	

APPLIED COMPUTATIONAL FLUID DYNAMICS I

Aerodynamic Design of Shock Control Bumps on a Transport Aircraft Wing Considering Structural Constraints.....	1192
<i>Andreas Goerttler</i>	
Investigation of Wind Tunnel Support System Interference on a Business Jet Aircraft Model at Transonic Conditions Using Computational Fluid Dynamics	1212
<i>Nicholas J. Schwartz, Snorri Gudmundsson, Guilherme Oliveira, Thomas R. Wayman, Andrew Mosedale</i>	

VOLUME 3

Mid-Fidelity Numerical Approach for the Calculation of the Aerodynamic Static and Dynamic Stability Derivatives	1251
<i>Daniele Granata, Alberto Savino, Alex Zanotti</i>	
In Pursuit of CFD-Based Wind Tunnel Calibrations	1262
<i>Jan-Renee Carlson</i>	

AERODYNAMIC DESIGN: ANALYSIS, METHODOLOGIES, AND OPTIMIZATION TECHNIQUES I

Landing Trajectory Analysis of eVTOL Aircraft for Urban Air Mobility Considering Vortex Ring State	1279
<i>Taemin Jeong, Yoonpyo Hong, Daejin Lim, Kwanjung Yee</i>	
Global Multiobjective Aerodynamic Optimization of Wingtip Design for Micro Aerial Vehicle	1292
<i>Naruhiko Nimura, Akira Oyama</i>	
The Effects of Free-Stream Eddies on Optimized Martian Rotorcraft Airfoils	1302
<i>Lidia Caros, Oliver Buxton, Peter Vincent</i>	
Multi-Fidelity Bayesian Optimization of a Coaxial Rotor for eVTOL Aircraft	1318
<i>Racheal M. Erhard, Juan J. Alonso</i>	

Development and Assessment of an Inviscid Source Vortex Panel Method for Low-Reynolds Number Airfoil Cascades	1336
<i>Wenguang Zhao, Sahan Wasala, Tim Persoons</i>	

DESIGN FOR AIRCRAFT ELECTRIFICATION II

Design of a Hydrogen-Powered Crashworthy eVTOL Using Multidisciplinary Analysis and Design Optimization.....	1352
<i>Damien Keijzer, Carmelo Simon Soria, Jorick Arends, Barkin Sarigol, Fulvio Scarano, Saullo G. Castro</i>	
Testing and Low Order Modeling of a Speed-Controlled Rotor in Hover	1371
<i>Matthew S. Asper, Jayant Sirohi</i>	

AERODYNAMIC DESIGN: ANALYSIS, METHODOLOGIES, AND OPTIMIZATION TECHNIQUES II

Aeroelastic Simulation of Transonic Truss-Braced Wing Aircraft for Flight Dynamic Stability Analysis.....	1389
<i>Juntao Xiong, Nhan T. Nguyen</i>	
Aerodynamic Design of a Flying V Aircraft in Transonic Conditions	1406
<i>Yuri Laar, Daniel Atherstone, Justus Benad, Roelof Vos</i>	
Gradient Enhanced Surrogate Modeling Framework for Aerodynamic Design Optimization	1429
<i>Emre Özkaya, Jan Rottmayer, Nicolas R. Gauger</i>	
Automated Hyperparameter Tuning for Airfoil Shape Optimization with Neural Network Models.....	1443
<i>TaeHo Jeong, Pavankumar Koratikere, Leifur T. Leifsson</i>	

COMPONENT OPTIMIZATION FOR AIRCRAFT DESIGN

Design and Integration of a Liquid Hydrogen Tank on an Aircraft	1456
<i>Romain Parello, Sebastien Defoort, Emmanuel Benard, Yves Gourinat</i>	
Simple Causal-Network Descriptive Framework for Aeroplane Systems and the Application to Propulsive System Sizing	1474
<i>Duarte Manuel Paulo Negreiro, Aleksandar Joksimovic</i>	
A First Assessment of Adjoint Body-Force Modeling Capabilities for Fan Design	1497
<i>Cyril Dosne, Raphaël Barrier, Sébastien Bourasseau, Marco Carini, Rocco Moretti, Jacques Peter</i>	
Design-Sensitive Conceptual Aircraft Weight Estimation Utilizing a Modular Multi-Method Framework.....	1522
<i>Ian Stamm, Daniel Woods</i>	
Fixed-Wing Aeroplane (Sub)System Design Method: From Abstract to Material Architectures.....	1546
<i>Aleksandar Joksimovic, Xavier Carbonneau, Frances Brazier, Rob Vingerhoeds</i>	

DESIGN, BUILD, TEST, LEARN

- Reconstructing and Reassessing Neil Armstrong’s “First Man” Flight in the North American X-15 1565
Will P. Lorenzo, Timothy T. Takahashi
- Design, Control Law Development, and Flight Testing of a Subscale Lift-Plus-Cruise Aircraft 1599
Anthony M. Comer, Rajan Bhandari, Stefanus H. Putra, Imon Chakraborty
- Design Model Validation for Small UAS VTOL Using Flight Test Data 1620
Andrew P. Loughran, Thomas Jones, Simon Miller, Julia Cole
- Caelus Rocketry: Comprehensive Design of the First High School Liquid-Fueled Rocket 1639
Harika G. Akundi, Alan J. Zhu, Elijah Guison-Dowdy, Kritagya Khadka, Arjun Babla, Kiran Donnelly, Tanmay Neema

AERODYNAMIC DESIGN: ANALYSIS, METHODOLOGIES, AND OPTIMIZATION TECHNIQUES III

- Efficient and Flexible Methodology for the Aerodynamic Shape Optimization of Hypersonic Vehicle Concepts in a High-Dimensional Design Space 1660
Kieran Mackle, Ingo Jahn
- Design and Flow Characterization of Noise Reduction System for a Supersonic Wind Tunnel 1682
Jacopo Magnani, Sarah Baird, Steven Farr, Surabhi Singh
- Experimental and Numerical Investigation to Study the Effect of Mach Number on Conical Bodies at High Incidences 1694
Adrienne Brown, Jordan Wilkerson, Unnikrishnan Sasidharan, Redha Wahidi, Rajan Kumar
- Comparing the Momentum Contribution Field for RANS and DDES-Based Primal Solutions 1711
Maurice N. Nayman, Ruben E. Perez

COMMERCIAL AIRCRAFT DESIGN

- Simplified Applied Loads of a Transonic Truss-Braced Wing Derived from Computational Fluid Dynamics 1731
Christine V. Jutte, Brian Mason, Robert E. Bartels
- Assessing Uncertainties of an Evolutionary Baseline as Benchmark of Future Aircraft Designs 1743
Benjamin M. Fröhler, Marko Alder, Sebastian Wöhler, Thomas Zill
- Half a Tube&Wing: Function-To-Form Mapping Approach to Understanding Fixed-Wing Civil-Aeroplane Design Space 1766
Aleksandar Joksimovic, Frances Brazier, Xavier Carbonneau, Rob Vingerhoeds
- Review of the Commercial Aircraft Environmental Control Systems: Historical Developments to the Current State of the Art 1783
Spurthy Subramanya, Aleksandar Joksimovic, Xavier Carbonneau, Sarah Rebholz, Frederic Tong-Yette

CLEAN AVIATION SPECIAL SESSION: FAST ROTORCRAFT

- Next Generation Civil Tiltrotor Technology Demonstrator Program: Towards Flight Test..... 1805
Massimo Biggi, Pierre Abdel Nour, Giorgio Vicenzotti
- T-WING: The Italian Wing for the Next Generation Civil Tiltrotor..... 1821
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

CLEAN AVIATION SPECIAL SESSION: EMERGING TECHNOLOGIES AND INNOVATIONS

- Clean-Sky 2 Large Passenger Aircraft Platform 1 Advanced Engine and Aircraft Configurations 1835
Daniel Kierbel

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..... 1849
Benjamin Diehl, Simon M. Kothe
- Aircraft Without Rivets – Laser Welding Makes the Impossible Possible 1856
Eric Pohl, Jens Standfuß, Maurice Langer

CLEAN AVIATION SPECIAL SESSION: NEXT GENERATION MULTIFUNCTIONAL FUSELAGE DEMONSTRATOR II

- Assembly of Thermoplastic Fuselage Structures by Induction Welding of Unidirectional Carbon Fiber Composites..... 1863
Joachim C. de Kruijk, Senne Sterk, Albert de Wit, Niels van Hoorn

Author Index