

Applied Aerodynamics

Papers Presented at the AIAA SciTech Forum and Exposition
2021

Online
11-15 & 19-21 January 2021

Volume 1 of 5

ISBN: 978-1-7138-2607-1

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

MISSILE/PROJECTILE/MUNITION AERODYNAMICS, CARRIAGE AND STORE SEPARATION I

ROLL ORIENTATION-DEPENDENT AERODYNAMICS OF A LONG RANGE PROJECTILE	1
<i>Joseph D. Vasile, Jubaraj Sahu</i>	
COMPARISON OF AEROPREDICTION METHODS FOR GUIDED MUNITIONS	15
<i>Justin L. Paul, Joseph D. Vasile, James Despirito</i>	
EXPERIMENTAL AND NUMERICAL INVESTIGATION OF THE VORTEX ASYMMETRY ON THE BASIC FINNER CONFIGURATION	38
<i>Roopesh Kumar Sampath Kumar, Rajan Kumar, James Despirito</i>	
VORTEX INTERACTIONS IN THE WAKE OF THE AXISYMMETRIC BODY IN UNIFORM CROSS-STREAM	55
<i>Al Shahriar, Kourosh Shoele</i>	
STEREOSCOPIC PIV OF IMPINGING PLANAR SHOCK/TURBULENT BOUNDARY LAYER INTERACTIONS ON AN AXISYMMETRIC BODY	67
<i>Ramez M. Kiriakos, Arastou Pournadali Khamseh, Edward P. Demauro</i>	

SPECIAL SESSION: CH-53K EXHAUST GAS RE-INGESTION: CFD MODELING/FLIGHT TEST COMBINED REDESIGN I

AN OVERVIEW OF THE EXHAUST GAS REINGESTION CHALLENGES ON THE CH 53K KING STALLION	80
<i>Shyam Neerarambam, Patrick O. Bowles, Byung-Young Min, Donald Lamb, Alexander F. Dunn, Jonathan Frydman, Greg Harrington, Chenzhou Lian, Mike Kazlauskas, Brian E. Wake, Noopur Joshi, Noah Becker, James R. Forsythe, Russell W. Powers, Zachary Stratton, Craig Collins, John Spyropoulos, Buvana Jayaraman, Joseph Simonetti, Chris Foti, Jim Axtell</i>	
FLIGHT TEST EXECUTION AND DATA REDUCTION TECHNIQUES OF EXHAUST GAS REINGESTION ON THE CH-53K KING STALLION	94
<i>Noopur Joshi, Noah Becker, Roger Tull, James Kenna, Christopher Adams, Adam Chesser, Shyam Neerarambam, Patrick O. Bowles, Byung-Young Min, Donald Lamb, Alexander F. Dunn, Jonathan Frydman, Chenzhou Lian, Mike Kazlauskas, Brian E. Wake</i>	
STUDY OF EXHAUST GAS REINGESTION	111
<i>Byung-Young Min, Patrick O. Bowles, Alexander F. Dunn, Donald Lamb, Chenzhou Lian, Jonathan Frydman, Brian E. Wake, Shyam Neerarambam, James R. Forsythe, Russell W. Powers, Jacob Allen, Buvana Jayaraman, Noopur Joshi, Noah Becker</i>	

THE CH-53K EXHAUST GAS REINGESTION TRADE STUDY: USING A TIERED CFD MODELING APPROACH TO SOLVING THE EGR CHALLENGES ON THE CH-53K KING STALLION	129
<i>Patrick O. Bowles, James R. Forsythe, Byung-Young Min, Donald Lamb, Alexander F. Dunn, Erica Siegel, Jonathan Frydman, Greg Harrington, Chenzhou Lian, Matthew T. Kube-McDowell, Brian E. Wake, Russell W. Powers, Zachary Stratton, Craig Collins, John Spyropoulos, Jacob Allen, Buvana Jayaraman, Shyam Neerarambam</i>	

ENGINE BAY COOLING AND MODEL BASED DESIGN ON THE CH-53K KING STALLION	147
<i>Russell W. Powers, Zachary Stratton, Craig Collins, John Spyropoulos, Chenzhou Lian, Jonathan Frydman, Greg Harrington, Matthew T. Kube-McDowell, Mike Kazlauskas, Donald Lamb, Alexander F. Dunn, Patrick O. Bowles, Brian E. Wake, Shyam Neerarambam</i>	

SPECIAL SESSION: ENGINEERED SURFACES, MATERIALS, AND COATINGS FOR VISCOUS DRAG REDUCTION

PERFORMANCE IMPROVEMENT OF RIBLETTS IN A TURBINE CENTER FRAME AND THEIR MATERIAL DEVELOPMENT FOR HIGH TEMPERATURE ENVIRONMENTS.....	168
<i>Peter A. Leidl, Christoph Feichtinger, Asim Hafizovic, Yvonne Kowalik, Bernhard Reschenhofer, Filippo Merli, Andreas Brinkmann, Andreas Flanschger, Emil Göttlich, Volkmar Stenzel, Andeas Marn</i>	

MEASUREMENT OF RIBLET DEFECTS AND THEIR IMPACT ON PERFORMANCE	189
<i>Peter A. Leidl, Christoph Feichtinger, Jonathan W. Naughton, Andreas Flanschger, Nicholas M. Husen, Inigo Ortiz De Vinaspre, Frank A. Mier, Alexandra Forster</i>	

DRAG MEASUREMENT AND FABRICATION APPROACH FOR RIBLET EVALUATION IN WIND TUNNELS.....	206
<i>Nicholas M. Husen, Jonathan W. Naughton, Gary A. Dale</i>	

RIBLET DESIGN, MANUFACTURING, AND MEASUREMENTS – A NEW RAPID ITERATION PROCESS	215
<i>Peter A. Leidl, Christoph Feichtinger, Henry C. Bilinsky, Andreas Flanschger, Mitchell Quinn, Inigo Ortiz De Vinaspre, Barbara Forster</i>	

RIBLETTS FOR AIRCRAFT APPLICATION: MATERIAL QUALIFICATION AND SCALE UP.....	226
<i>Henry C. Bilinsky</i>	

AERODYNAMIC DESIGN: ANALYSIS, METHODOLOGIES AND OPTIMIZATION TECHNIQUES I

COMPARISON OF THEORETICAL AND HIGH-FIDELITY AEROSTRUCTURAL SOLUTIONS.....	234
<i>Jeffrey D. Taylor, Douglas F. Hunsaker</i>	

ROTOR BLADE DESIGN FRAMEWORK FOR AIRFOIL SHAPE OPTIMIZATION WITH PERFORMANCE CONSIDERATIONS	257
<i>Luke D. Allen, Joon W. Lim, Robert B. Haehnel, Ian D. Dettwiller</i>	

REAL-TIME DRAG OPTIMIZATION OF ASPECT RATIO 13.5 COMMON RESEARCH MODEL WITH DISTRIBUTED FLAP SYSTEM.....	272
<i>Nhan T. Nguyen, Juntao Xiong</i>	

ADJOINT-BASED AERODYNAMIC OPTIMIZATION OF A SIDE-VIEW MIRROR 289
Eduardo De Oliveira Carvalho, Andre Fernando De Castro Da Silva

ROBUST DESIGN OF TRANSONIC NATURAL LAMINAR FLOW WINGS UNDER ENVIRONMENTAL AND OPERATIONAL UNCERTAINTIES 310
Christian Sabater, Philipp Bekemeyer, Stefan Görtz

MISSILE/PROJECTILE/MUNITION AERODYNAMICS, CARRIAGE AND STORE SEPARATION II

AERODYNAMIC EFFECTS OF MOUNTING A FLIR POD ON THE CENTERLINE OF THE CF-18 AIRCRAFT 332
Melissa Richardson, Jean-Philippe Caron

EXPERIMENTAL STUDY OF AXISYMMETRIC PROJECTILE CONFIGURATIONS AT SUPERSONIC SPEEDS 343
Royce C. Pokela, Devon Foster, Melanie Munroe, Jacob Koos, Fraeman Mason, Rajan Kumar, Blake McPherson, Ron H. Taylor

THE PHYSICAL ORIGIN OF THE PERFORMANCE INCREASE IN SEPARATED ROCKET NOZZLES 361
Robert S. Hiers

NUMERICAL ANALYSIS ON AERODYNAMIC CHARACTERISTICS OF SLENDER BODY WITH ASYMMETRIC DOUBLE PROTUBERANCE 382
Fumiya Tsutsui, Yuya Takagi, Hiroyuki Takimoto, Keiichi Kitamura, Satoshi Nonaka

SPECIAL SESSION: CH-53K EXHAUST GAS RE-INGESTION: CFD MODELING/FLIGHT TEST COMBINED REDESIGN II

THERMOGRAPHY AND COMPUTATIONAL FLUID DYNAMIC COMPARISONS ON THE CH-53K KING STALLION 400
Alexander F. Dunn, Chris Yamamoto, Patrick O. Bowles, Byung-Young Min, Donald Lamb, Jonathan Frydman, Greg Harrington, Chenzhou Lian, Mike Kazlauskas, Bjorn Foote, Michael Alexander, Brian E. Wake, Shyam Neerarambam, Chris Kennedy, Noah Becker, James R. Forsythe, Russell W. Powers, Zachary Stratton, Craig Collins, John Spyropoulos

MODEL BASED ENGINE EXHAUST REDESIGN AND EVALUATION ON THE CH-53K KING STALLION 412
Donald Lamb, Patrick O. Bowles, Byung-Young Min, Chenzhou Lian, Xiaole Xie, Jonathan Frydman, Greg Harrington, Matthew T. Kube-McDowell, Mike Kazlauskas, Alexander F. Dunn, Brian E. Wake, Shyam Neerarambam, Noopur Joshi, Noah Becker, Joseph Simonetti, Chris Foti, James R. Forsythe, Russell W. Powers, Craig Collins, Jacob Allen, John Spyropoulos, Buvaneshwari Jayaraman

AERODYNAMIC DESIGN: ANALYSIS, METHODOLOGIES AND OPTIMIZATION TECHNIQUES II

HELICOPTER ROTOR OPTIMIZATION VIA OPERATOR OVERLOADING-BASED DISCRETE ADJOINT APPROACH 440
Reza Djeddi, Kivanc Ekici

RE-ENTRY SHAPE OPTIMISATION USING THE AXISYMMETRIC ANALOGUE METHOD WITH MODIFIED NEWTONIAN TECHNIQUE RESOLVED INVISCID FLOWFIELD.....	466
<i>Michaela Brchnelova, Erwin Mooij</i>	
NON-INTRUSIVE AERODYNAMIC SHAPE OPTIMISATION WITH A DISCRETE EMPIRICAL INTERPOLATION METHOD	489
<i>Simao P. Marques, Lucas Kob, Trevor T. Robinson, Weigang Yao, Liang Sun</i>	
DESIGN OF A CROSSFLOW ATTENUATED NATURAL LAMINAR FLOW FLIGHT TEST ARTICLE	499
<i>Michelle N. Lynde, Richard L. Campbell, Brett R. Hiller, Lewis R. Owens</i>	
AIRFOIL PERFORMANCE ANALYSIS USING SHALLOW NEURAL NETWORKS.....	524
<i>Furkan G. Oztiryaki, Tugba Piskin</i>	

BIO-INSPIRED AERODYNAMICS I

EFFECTS OF SWEEP-MOTION PROFILE ON RIGID AND FLEXIBLE FLAPPING-WING AERODYNAMICS	533
<i>Reynolds Addo-Akoto, Jae-Hung Han, Jong-Seob Han</i>	
INSIGHT INTO COLOR EFFECTS OF MIGRATORY MONARCH BUTTERFLIES ON THEIR FLIGHT PERFORMANCE	547
<i>Salomon Maestas, Joseph Martinez-Ponce, Ahmed Aboelezz, Nicole Zint, Humberto III Silva, Mostafa Hassanalian</i>	
BIOMIMICRY AND AERODYNAMIC PERFORMANCE OF MULTI-FLAPPING WING DRONES	558
<i>Ethan J. Billingsley, Mehdi Ghommem, Rui Vasconcellos, Abdessattar Abdelkefi</i>	

SPECIAL SESSION: 3RD AIAA SONIC BOOM WORKSHOP REPORT-OUT I: PROPAGATION CASES

SUMMARY OF PROPAGATION CASES OF THE THIRD AIAA SONIC BOOM PREDICTION WORKSHOP.....	566
<i>Sriram K. Rallabhandi, Alexandra Loubeau</i>	
PROPAGATION ANALYSIS OF THE 3RD SONIC BOOM PREDICTION WORKSHOP CASES USING SBOOM	593
<i>Sriram K. Rallabhandi</i>	
ANALYSIS AND COMPARISON OF THE RESULTS OF TWO RAY TRACING-BASED SONIC BOOM PROPAGATION CODES APPLIED TO THE SBPW3 TEST CASES	608
<i>Gerald G. Carrier, Pierre-Elie Normand, Patrice Malbequi</i>	

SPECIAL SESSION: CREATE HPC MULTI-PHYSICS I

THE HPCMP CREATE™ PROGRAM MANAGEMENT MODEL-PART I	620
<i>Richard P. Kendall, Nathan S. Hariharan, Robert L. Meakin, Keith Bergeron, Douglass A. Post</i>	

THE HPCMP CREATE™ MANAGEMENT MODEL – PART II, DEVOPS PRINCIPLES AND PRACTICES IN HPCMP CREATE™	632
<i>Keith Bergeron, Richard P. Kendall, Nathan S. Hariharan, Robert L. Meakin, Douglass A. Post</i>	
A SUMMARY OF NEW AND EMERGING FEATURES IN HPCMP CREATE™-AV KESTREL	644
<i>David R. McDaniel</i>	
NEW CAPABILITIES IN CREATE™-AV HELIOS VERSION 11	667
<i>Andrew M. Wissink, Dylan Jude, Buvanewari Jayaraman, Beatrice Roget, Vinod K. Lakshminarayan, Jayanarayanan Sitaraman, Andrew C. Bauer, James R. Forsythe, Robert D. Trigg</i>	
CAPABILITIES OF HPCMP CREATE™-AV KESTREL V11 FOR HYPERSONIC FLIGHT AND GROUND TESTING WITH A TWO-TEMPERATURE MODEL	679
<i>Ryan B. Bond, Kenneth Tatum, Greg D. Power, Todd Tuckey</i>	

AERODYNAMIC DESIGN: ANALYSIS, METHODOLOGIES AND OPTIMIZATION TECHNIQUES III

SPATIAL CONVOLUTION NEURAL NETWORK FOR EFFICIENT PREDICTION OF AERODYNAMIC COEFFICIENTS	695
<i>Wenhui Peng, Yao Zhang, Michel Desmarais</i>	
A HYBRID TIME-SPECTRAL APPROACH FOR AERODYNAMIC SHAPE OPTIMIZATION WITH UNSTEADY FLOW	704
<i>Ping He, Joaquim R. R. A. Martins</i>	
PERFORMANCE AND STABILITY ANALYSIS OF A HIGH-SPEED JET USING MULTI-DISCIPLINARY APPROACH	724
<i>Shuaib Salamat, Irsalan Arif, Hassan Raza, Dur-E Nayab</i>	
AERODYNAMIC SHAPE OPTIMIZATION USING AN EMBEDDED BOUNDARY METHOD WITH SMOOTHNESS GUARANTEES.....	736
<i>Jonathan B. Ho, Charbel Farhat</i>	
NEWTON-KRYLOV FULL-SPACE AERODYNAMIC SHAPE OPTIMIZATION	750
<i>Doug Shi-Dong, Sivakumaran Nadarajah</i>	

AERODYNAMIC DESIGN: ANALYSIS, METHODOLOGIES AND OPTIMIZATION TECHNIQUES IV

STUDY OF MACH 0.8 TRANSONIC TRUSS-BRACED WING AIRCRAFT WING-STRUT INTERFERENCE EFFECTS.....	759
<i>Juntao Xiong, Nhan T. Nguyen, Jason Fugate</i>	

VOLUME 2

AERODYNAMIC OPTIMIZATION OF MACH 0.745 TRANSONIC TRUSS-BRACED WING AIRCRAFT WITH VARIABLE-CAMBER CONTINUOUS TRAILING-EDGE FLAP.....	773
<i>Juntao Xiong, Robert E. Bartels, Nhan T. Nguyen</i>	

MULTI-POINT JIG TWIST OPTIMIZATION OF MACH 0.745 TRANSONIC TRUSS-BRACED WING AIRCRAFT AND HIGH-FIDELITY CFD VALIDATION	795
<i>Nhan T. Nguyen, Juntao Xiong, Jason Fugate</i>	

IMPACT OF TURBULENCE MODELS ON ROBUST AERODYNAMIC SHAPE OPTIMIZATION OF 3-D WING GEOMETRIES	819
<i>Aslihan Vuruskan, Serhat Hosder</i>	

AERODYNAMIC SHAPE OPTIMIZATION FOR DELAYING DYNAMIC STALL OF AIRFOILS USING COKRIGING REGRESSION	845
<i>Vishal V. Raul, Leifur T. Leifsson</i>	

BIO-INSPIRED AERODYNAMICS II

PRELIMINARY ANALYSIS OF BIO-INSPIRED SYMMETRIC AND ASYMMETRIC WINGLET DEFORMATION	863
<i>Sai B. Rao, Arnab Chatterjee, D Brian Landrum, Konstantinos Kanistras</i>	

THE EFFECT OF FLAPPING FREQUENCY ON THE AERODYNAMICS OF NACA0012 WING	876
<i>Marcel Ilie, Geoffrey Sullivan</i>	

PERFORMANCE EFFECTS OF WINGLETS WITH LEADING EDGE PROTUBERANCES ON A RECTANGULAR WING	884
<i>Juan Florez, Pedro D. Bravo Mosquera, Daniel Garcia Ribeiro, Hernán Dario Cerón Munoz</i>	

REDUCED-ORDER MODELING OF A BAT FLYING WITH HEAVY AND HIGHLY ARTICULATED FLAPPING WING	895
<i>Xiaozhou Fan, Kenneth Breuer</i>	

EFFECT OF VARIOUS CAMBERED AIRFOIL PROFILES TO WINGS WITH LEADING EDGE TUBERCLES IN TRANSONIC FLOW	909
<i>Robert R. Colpitts, Alexi Levert-Beaulieu, Ruben E. Perez</i>	

SPECIAL SESSION: 3RD AIAA SONIC BOOM WORKSHOP REPORT-OUT II: NEARFIELD CFD CASES

NEARFIELD SUMMARY AND ANALYSIS OF THE THIRD AIAA SONIC BOOM PREDICTION WORKSHOP C608 LOW BOOM DEMONSTRATOR	927
<i>Michael A. Park, Melissa B. Carter</i>	

NEAR FIELD SONIC BOOM SIMULATIONS FOR C608 AIRPLANE OF THE THIRD AIAA SPW BY UNSTRUCTURED/STRUCTURED OVERSET GRID METHOD	950
<i>Hiroaki Ishikawa, Shinya Koganezawa, Yoshikazu Makino</i>	

NEARFIELD ANISOTROPIC MESH ADAPTIVITY FOR THE THIRD AIAA SONIC BOOM WORKSHOP	964
<i>Julien Vanharen, Adrien Loseille, Frederic Alauzet, Michael A. Park</i>	

SPECIAL SESSION: CREATE HPC MULTI-PHYSICS II

CURRENT STATUS OF THE FINITE-ELEMENT FLUID SOLVER (COFFE) WITHIN HPCMP CREATE™-AV KESTREL	987
<i>Kevin R. Holst, Ryan S. Glasby, Jon T. Erwin, Douglas L. Stefanski</i>	

A PARATROOPER MODEL SENSITIVITY ANALYSIS FOR PERSONNEL AIRDROP	1017
<i>Mehdi Ghoreyshi, Terence M. Rose, Nathan J. Thompson, Adam Jirasek, Gregory Noetscher, Keith Bergeron</i>	

OPTIMIZATION OF EXTRACTION LINE DISTANCE FOR RINGSLLOT PARACHUTE EXTRACTION OF HEAVY CARGO FROM C-17	1043
<i>Gregory Noetscher, Mehdi Ghoreyshi, Terence M. Rose, Adam Jirasek, Keith Bergeron</i>	

**AERODYNAMIC DESIGN: ANALYSIS, METHODOLOGIES AND OPTIMIZATION
TECHNIQUES V**

DESIGN METHOD FOR WIND TURBINE AIRFOILS BY ADJOINT OPTIMIZATION CONSIDERING CLIMATE CONDITIONS	1058
<i>Eduardo P. Gamba, Rodrigo Cassineli Palharini</i>	

PRO-ML IDEAS: A PROBABILISTIC FRAMEWORK FOR EXPLICIT INVERSE DESIGN USING INVERTIBLE NEURAL NETWORK	1073
<i>Sayan Ghosh, Govinda A. Padmanabha, Cheng Peng, Steven Atkinson, Valeria Andreoli, Piyush Pandita, Thomas Vandeputte, Nicholas Zabarar, Liping Wang, Genghis Khan</i>	

A TOOLSET FOR CREATION OF MULTI-FIDELITY PROBABILISTIC AERODYNAMIC DATABASES	1093
<i>Nikhil Nigam, Seyedmohammad Mohseni, Jonathan Valverde, Sergey Voronin, Jayant Mukhopadhaya, Juan J. Alonso</i>	

**SPECIAL SESSION: 3RD AIAA SONIC BOOM WORKSHOP REPORT-OUT III:
NEARFIELD CFD CASES**

NEAR FIELD SUMMARY AND ANALYSIS OF THE THIRD AIAA SONIC BOOM PREDICTION WORKSHOP SHOCK-PLUME INTERACTION CASE	1113
<i>Melissa B. Carter, Michael A. Park</i>	

USM3D SIMULATIONS FOR THIRD SONIC BOOM WORKSHOP.....	1133
<i>Alaa A. Elmiligui, Mohagna J. Pandya, Melissa B. Carter, Boris Diskin, Sudheer N. Nayani</i>	

STRUCTURED OVERSET AND UNSTRUCTURED GRID SIMULATIONS FOR THE THIRD AIAA SONIC BOOM PREDICTION WORKSHOP	1159
<i>Jared C. Duensing, James C. Jensen, Jeffrey A. Housman, Michael G. Piotrowski, Gaetan K. Kenway, Daniel Maldonado, Emre Sozer, Cetin C. Kiris</i>	

DLR TAU SIMULATIONS FOR THE THIRD AIAA SONIC BOOM PREDICTION WORKSHOP NEAR-FIELD CASES	1199
<i>Jochen Kirz</i>	

CARTESIAN MESH SIMULATIONS FOR THE THIRD AIAA SONIC BOOM PREDICTION WORKSHOP.....	1215
<i>Wade M. Spurlock, Michael J. Aftosmis, Marian Nemec</i>	

SPECIAL SESSION: CREATE HPC MULTI-PHYSICS III

APPLICATION OF MACHINE LEARNING TO AUTOMATE FLOW-PHYSICS IDENTIFICATION IN COMPUTED SOLUTIONS: HOVER ROTOR WAKE VORTEX IDENTIFICATION AND BREAKDOWN ANALYSIS	1239
<i>Jennifer Abras, Nathan S. Hariharan</i>	

PREDICTING SHIP MANEUVERING THROUGH MACHINE LEARNING 1255
Jessica M. Puodziunas, John R. Somero

TOWARDS ADAPTIVE SURFACE MESHING IN STRAND GRID FRAMEWORK 1277
Vinod K. Lakshminarayan, Jay Sitaraman, Andrew M. Wissink

AERODYNAMIC AND PROPULSION SYSTEMS INTEGRATION

NUMERICAL INVESTIGATION OF PROPELLER–FLAP INTERACTION IN INCLINED
OVER-THE-WING DISTRIBUTED-PROPULSION SYSTEMS 1295
Sören Bölk, Reynard De Vries, Nando V. Arnhem, Leo L. Veldhuis

AERO-PROPULSIVE INTEGRATION EFFECTS OF AN OVERWING DISTRIBUTED
ELECTRIC PROPULSION SYSTEM 1316
Daniel Yu, Phillip J. Ansell, Georgi Hristov

ASSESSMENT OF PROPULSOR ON-DESIGN AND OFF-DESIGN IMPACTS ON BLI
EFFECTS 1331
Jai Ahuja, Dimitri N. Mavris

SENSITIVITY ANALYSIS OF NACELLE INTAKE HIGH-INCIDENCE AERODYNAMICS
INCLUDING A BODY FORCE FAN MODEL 1348
Andrea Magrini, Denis Buosi, Ernesto Benini

AERODYNAMIC DESIGN: ANALYSIS, METHODOLOGIES AND OPTIMIZATION TECHNIQUES VI

EVALUATING THE EFFECTIVENESS OF COMPLIANT LEADING EDGE CONTROL
SURFACES ON AN OBLIQUE FLYING WING FOR DIRECTIONAL CONTROL 1364
Joshua Deslich, Peter Flick, Chris M. Meckstroth, Doug Szczublewski

SENSITIVITY STUDY AND PRIMARY BOOM CARPET ASSESSMENT FOR CONCEPTUAL
LOW BOOM SUPERSONIC TRANSPORT 1380
*Hiroaki Ishikawa, Atsushi Ueno, Shinya Koganezawa, Yoshikazu Makino, Bernd Liebhardt,
Klaus Lütjens*

AERO-STRUCTURAL INTERACTIONS I

AEROSERVOELASTIC CONTROL LAW DEVELOPMENT FOR THE INTEGRATED
ADAPTIVE WING TECHNOLOGY MATURATION WIND-TUNNEL TEST 1394
Josiah Waite, Jared A. Grauer, Robert E. Bartels, Bret Stanford

TOWARDS GLOBAL STABILITY ANALYSIS OF FLEXIBLE AIRCRAFT IN EDGE-OF-
THE-ENVELOPE FLOW 1406
Jelle Houtman, Sebastian Timme

AEROELASTIC COUPLING EFFECTS IN GLOBALLY UNSTABLE TRANSONIC WING
FLOW 1422
Panagiotis Belesiotis-Kataras, Sebastian Timme

FREQUENCY ANALYSIS ON CANOPY MOTION AND SHOCK WAVE OSCILLATION
AROUND A HEMISPHERICAL WIND TUNNEL MODEL OF SUPERSONIC PARACHUTE 1433
Masato Taguchi, Koichi Mori, Masashi Kashitani

PROPELLER, ROTORCRAFT AND DISTRIBUTED PROPULSION AERODYNAMICS I

EFFECT OF VARYING PROPELLER PITCH ANGLE ON EFFICIENCY AND NOISE PRODUCTION	1447
<i>Charles F. Wisniewski</i>	
PROPELLER PARTIAL GROUND AND CEILING EFFECT PREDICTION	1461
<i>Jielong Cai, Sidaard Gunasekaran, Michael V. Ol</i>	
PROPELLER AND PROPELLER-IN-WING THRUST VECTORING.....	1477
<i>Grace G. Culpepper, Jielong Cai, Sidaard Gunasekaran</i>	
BLOWN WING AERODYNAMIC COEFFICIENT PREDICTIONS USING TRADITIONAL MACHINE LEARNING AND DATA SCIENCE APPROACHES	1497
<i>Samuel A. Barnhart, Barath Narayanan, Sidaard Gunasekaran</i>	

SPECIAL SESSION: HOVER PREDICTION WORKSHOP I

HVAB ROTOR HOVER COMPUTATIONAL PREDICTION: A COMPARATIVE STUDY USING OVERFLOW AND HPCMP CREATE™-AV HELIOS	1520
<i>Robert P. Narducci, Rohit Jain, Jennifer Abras, Nathan S. Hariharan</i>	
PREDICTIONS OF HVAB ROTOR IN HOVER USING HYBRID RANS/LES METHODS	1537
<i>Qiuying Zhao, Chunhua Sheng</i>	

VOLUME 3

NUMERICAL STUDY OF HVAB ROTOR USING A MIXED MESH FLOW SOLVER.....	1549
<i>Sang Hyun Park, Jaeseong Han, Oh Joon Kwon</i>	

AERO-STRUCTURAL INTERACTIONS II

SIMULATION OF THE AEROELASTOSTATIC CHARACTERISTICS OF AN AMERICA'S CUP AC75 MAST/MAINSAIL SYSTEM	1566
<i>Richard W. Smith, Jeffrey A. Wright</i>	
A STUDY OF THE ACTIVE AEROELASTIC WING CONCEPT FOR A DELTA WING AIRCRAFT	1577
<i>Sudipto Das, Kartik Venkatraman, Madhusudan A. Padmanabhan</i>	
ADAPTIVE MESH REFINEMENT FOR FLUID-STRUCTURE INTERACTION SIMULATIONS	1597
<i>Vivek Ojha, Krzysztof Fidkowski, Carlos E. Cesnik</i>	
MULTI-FIDELITY, AEROELASTIC ANALYSIS AND OPTIMIZATION WITH CONTROL SURFACE DEFLECTIONS OF AN EFFICIENT SUPERSONIC AIR VEHICLE.....	1612
<i>Markus P. Rumpfkeil, Madeline Lickenbrock, Philip S. Beran, Raymond M. Kolonay</i>	

PROPELLER, ROTORCRAFT AND DISTRIBUTED PROPULSION AERODYNAMICS II

OPTIMIZATION OF LEADING EDGE TUBERCLES APPLIED TO HELICOPTER ROTOR BLADES	1626
<i>Robert R. Colpitts, Maurice Nayman, Ruben E. Perez</i>	

SPECIAL SESSION: HOVER PREDICTION WORKSHOP II

DIRECT VOLUME VISUALIZATION FOR DEEPER INSIGHTS ON THE PHYSICS OF 3D VORTICITY DYNAMICS IN THE WAKE OF A HOVERING ROTOR	1653
<i>Jennifer Abras, Nathan S. Hariharan</i>	
INVESTIGATION OF THE IMPACT OF DEEP CONVERGENCE ON NUMERICAL WAKE BREAKDOWN OF HOVERING ROTORS.....	1671
<i>Jennifer Abras, Nathan S. Hariharan</i>	
THE EFFECT OF TIME MARCHING ON THE WAKE STRUCTURE BREAKDOWN IN A HOVERING ROTOR SIMULATION.....	1682
<i>Bumseok Lee, James D. Baeder</i>	
MODAL DECOMPOSITION ANALYSIS OF HOVERING ROTOR WAKE BREAKDOWN	1696
<i>Forrest Mobley, Jared Carnes, James G. Coder</i>	
ASSESSMENT OF THE VORTEX PARTICLE-MESH METHOD FOR EFFICIENT LES OF HOVERING ROTORS AND THEIR WAKES	1727
<i>Denis-Gabriel Caprace, Grégoire Winckelmans, Philippe Chatelain</i>	

AERODYNAMIC TESTING: GROUND, WIND-TUNNEL AND FLIGHT TESTING I

WIND TUNNEL TEST AND EMPIRICAL MODELING OF TILT-ROTOR PERFORMANCE FOR EVTOL APPLICATIONS.....	1744
<i>Michael Stratton, Drew Landman</i>	
COMPUTATIONAL FLUID DYNAMICS SIMULATIONS OF THE TRANSONIC DYNAMICS TUNNEL AIRSTREAM OSCILLATORS	1756
<i>Robert E. Bartels, Pawel Chwalowski</i>	
EXPERIMENTAL DETERMINATION OF PITCH DAMPING COEFFICIENTS USING A WIRE SUSPENSION.....	1775
<i>Christian Franzmann, Friedrich Leopold, Christian Mundt</i>	
EXPERIMENTAL INVESTIGATION ON THE DRONE-WAKE INTERACTION OF MULTI- ROTOR SYSTEMS IN FORWARD FLIGHT	1788
<i>Glen Throneberry, Adam Takeshita, Christopher M. Hocut, Fangjun Shu, Abdessattar Abdelkefi</i>	
EFFECT OF ENGINE INTEGRATION ON A 4.6%-SCALE FLYING-V SUBSONIC TRANSPORT.....	1796
<i>Sjoerd Van Empelen, Roelof Vos</i>	

HYPERSONIC AERODYNAMICS I

- NUMERICAL ANALYSIS OF SCRAMJET INTAKE WITH SPOON-SHAPED ISOLATOR..... 1811
Rahul Verma, Alokita Shukla
- ROTATIONAL AXISYMMETRIC METHOD OF CHARACTERISTICS FOR THE
DEVELOPMENT OF NOVEL WAVERIDER GEOMETRIES 1820
Christian L. Bachman, Evan W. Hyde, Jesse R. Maxwell
- PULSATING FLOW INVESTIGATION FOR SPIKED BLUNT-NOSE BODY IN
HYPERSONIC FLOW AND ITS CONTROL 1829
Ashish Vashishtha, Shashank Khurana

SPECIAL SESSION: CREATE HPC MULTI-PHYSICS IV

- OVERSET MOVING BODY 6-DOF SIMULATIONS USING HPCMP CREATE™ A/V HELIOS..... 1840
Beatrice Roget, Jay Sitaraman, Nicholas Peters, Andrew M. Wissink, James R. Forsythe
- AN OCTREE-BASED, CARTESIAN CFD SOLVER FOR HELIOS ON CPU AND GPU
ARCHITECTURES. 1857
Dylan Jude, Jay Sitaraman, Andrew M. Wissink
- EFFICIENTLY BUILDING, MAINTAINING AND DEPLOYING COMPLEX
MULTIDISCIPLINARY PHYSICS MODELS IN HETEROGENEOUS ENVIRONMENTS 1878
David R. Sears, Brian E. Pittman, Robert D. Trigg, Stephen A. Adamec

SPECIAL SESSION: SLOTTED, NATURAL-LAMINAR-FLOW AIRFOIL DEVELOPMENT FROM THE NASA UNIVERSITY LEADERSHIP INITIATIVE I

- WINGLET AND STRUT CONFIGURATION STUDY FOR A SLOTTED, NATURAL-
LAMINAR-FLOW STRUT-BRACED TRANSPORT AIRCRAFT 1889
Leonard P. Metkowsky, Mark Maughmer
- IMPROVED FLUID-STRUCTURE INTERFACE FOR AEROELASTIC COMPUTATIONS
WITH NON-MATCHING OUTER MOLD LINES 1907
Zhi Yang, Dimitri J. Mavriplis
- BOUNDARY-LAYER STABILITY OF A SLOTTED, NATURAL-LAMINAR-FLOW AIRFOIL
AT FLIGHT CONDITIONS 1921
Daniel T. Heston, Ethan S. Beyak, Koen J. Groot, Helen L. Reed

SUPERSONIC AERODYNAMICS AND PROPULSION SYSTEMS

- COMPUTATIONAL DESIGN METHODOLOGY OF ADAPTIVE OUTER MOLD LINE FOR
ROBUST LOW EN-ROUTE NOISE OF A SUPERSONIC AIRCRAFT 1942
*Jonathan M. Weaver-Rosen, Forrest L. Carpenter, Paul G. Cizmas, Richard J. Malak, Troy
A. Abraham, Douglas F. Hunsaker, David S. Lazzara*
- FLOW DISTORTION COMPUTATIONAL MODELING AND DESIGN OPTIMIZATION FOR
SUPERSONIC INLET 1958
*John A. Boles, Caleb E. Thomas, Giovanni Salazar, Jack R. Edwards, Venkateswaran
Narayanaswamy*

SIMULATIONS OF AN AIRFRAME-INTEGRATED TWO-DIMENSIONAL SUPERSONIC INLET AT OFF-DESIGN CONDITIONS.....	1979
<i>Stuart I. Benton, William Humphrey, Brock Pleiman</i>	

COMPUTATIONAL-EXPERIMENTAL HIGH-SPEED FLUID THERMAL STRUCTURAL INTERACTIONS

HYPERSONIC FLUID-STRUCTURE INTERACTION ON THE CONTROL SURFACE OF A SLENDER CONE	1993
<i>Anshuman Pandey, Katya M. Casper</i>	

FLUID-STRUCTURE INTERACTION ON A THIN PANEL INCLUDING SHOCK IMPINGEMENT EFFECTS.....	2022
<i>Kirk R. Brouwer, Ricardo Perez, Timothy J. Beberniss, Stephen M. Spottswood, David A. Ehrhardt</i>	

NUMERICAL INVESTIGATION OF FLUID-THERMAL-STRUCTURAL INTERACTION FOR A CONTROL SURFACE IN HYPERSONIC FLOW	2044
<i>Aravinth Sadagopan, Daning Huang, Haosen Xu, Xiang I. Yang</i>	

FLUID-THERMAL-STRUCTURAL INTERACTIONS IN RAMP-INDUCED SHOCK-WAVE BOUNDARY-LAYER INTERACTIONS AT MACH 6.....	2065
<i>Antonio Giovanni Schöneich, Thomas J. Whalen, Stuart J. Laurence, Bryson T. Sullivan, Daniel J. Bodony, Maxim Freydin, Earl H. Dowell, Larson J. Stacey, Gregory M. Buck</i>	

EFFECTS OF THREE-DIMENSIONAL PRESSURE GRADIENTS ON HIGH-SPEED TURBULENT BOUNDARY LAYERS	2078
<i>Scott J. Peltier, Brian E. Rice, Ethan Johnson, Venkateswaran Narayanaswamy, Marvin E. Sellers</i>	

HYPERSONIC AERODYNAMICS II

EFFECTS OF LOCAL COOLING ON HYPERSONIC BOUNDARY-LAYER STABILITY	2093
<i>Furkan Oz, Kursat Kara</i>	

EXPERIMENTAL INVESTIGATION OF FLOW INTERACTION DYNAMICS IN SUPERSONIC RETROPROPULSION	2112
<i>Nicholas Mejia, Bryan E. Schmidt</i>	

SPECIAL SESSION: CREATE HPC MULTI-PHYSICS V

KESTREL RESULTS ON A 2D CUT OF THE HIGH LIFT COMMON RESEARCH MODEL WING	2122
<i>James S. Masters, Ryan S. Glasby, Charles E. Lynch</i>	

IN SITU ANALYSIS AND VISUALIZATION WITH CREATE-AV™ HELIOS	2145
<i>Andrew C. Bauer, James R. Forsythe, Jay Sitaraman, Andrew M. Wissink, Buvaneshwari Jayaraman, Robert B. Haehnel</i>	

FIELDVIEW-CREATE: A UNIFIED MULTI-DISCIPLINARY POST-PROCESSING TOOL FOR CREATE™ SOLVERS	2156
<i>Earl P. Duque, Steve M. Legensky, Brad J. Whitlock, Gordon A. Acocella, Stephen M. Makinen</i>	

A COMPUTATIONAL PROTOTYPING ENVIRONMENT INTERFACE FOR DOD CREATETM-AV HELIOS SIMULATIONS	2165
<i>Robert B. Haehnel, Scott D. Christensen, J. L. Whitlow, Andrew C. Bauer, Ari Meyer, Gautham Rangarajan, Yonghu Wenren, Deanna L. Hardin, Brendon Hoch, Shyla Clark, Alex Eiseman</i>	

**SPECIAL SESSION: SLOTTED, NATURAL-LAMINAR-FLOW AIRFOIL DEVELOPMENT
FROM THE NASA UNIVERSITY LEADERSHIP INITIATIVE II**

COMPUTATIONAL STABILITY ANALYSIS OF A VARIABLY SWEPT, SLOTTED NATURAL-LAMINAR-FLOW AIRFOIL	2173
<i>Ethan S. Beyak, Koen J. Groot, Helen L. Reed</i>	

DESIGN OF AN AIRFOIL MORPHING LEADING EDGE FOR HIGH-LIFT APPLICATIONS USING A GENETIC ALGORITHM	2189
<i>Christopher Colletti, Phillip J. Ansell</i>	

FLOW CONTROL FOR ENHANCED HIGH-LIFT PERFORMANCE OF SLOTTED NATURAL LAMINAR FLOW WINGS	2205
<i>Christopher Colletti, Arvin Shmilovich, Abdollah Khodadoust</i>	

WIND TURBINE/ROTORCRAFT/PROPELLER MODELING APPROACHES

VERTICAL-AXIS WIND TURBINE STEADY AND UNSTEADY AERODYNAMICS FOR CURVED DEFORMING BLADES	2218
<i>Kevin R. Moore, Brandon Ennis</i>	

HIGH FIDELITY AERO-STRUCTURAL SIMULATION OF OCCLUDED WIND TURBINE BLADES	2233
<i>Thomas R. Wainwright, Daniel J. Poole, Christian B. Allen, Jamil Appa, Oliver Darbyshire</i>	

NEW STALL DELAY APPROACH FOR HAWT PERFORMANCE PREDICTIONS USING A CFD HYBRID METHOD	2249
<i>Mohammed Nadjib Hamlaoui, Arezki Smaili, Hachimi Fellouah</i>	

THREE-DIMENSIONAL COMPUTATIONAL FLUID DYNAMICS INVESTIGATION ON SIZE EFFECT OF SMALL-SCALE WIND TURBINE BLADES	2265
<i>Widad Yossri, Samah Ben Ayed, Abdessattar Abdelkefi</i>	

AERODYNAMIC TESTING: GROUND, WIND-TUNNEL AND FLIGHT TESTING II

AN EXPERIMENTAL INVESTIGATION OF FLOW INDUCED PRESSURE OSCILLATIONS IN RECTANGULAR CAVITIES	2272
<i>Caroline O. Hamilton Smith</i>	

WIND TUNNEL TO FULL SCALE MAPPING OF WINDS AND LOADS FOR LAUNCH- VEHICLE GROUND WIND LOADS	2291
<i>Thomas G. Ivanco, Donald F. Keller, Jennifer L. Pinkerton</i>	

HYPERSONIC AERODYNAMICS III

ANSYS FLUENT SCALE-RESOLVING SIMULATIONS WITH SBES & VALIDATION OF A RE-ENTRY CAPSULE AT HYPERSONIC SPEED	2312
<i>Shoaib Shah, Krishna Zore, John Stokes, Laith Zori</i>	

VOLUME 4

CFD VALIDATION STUDY OF A HYPERSONIC CONE-SLICE-FLAP CONFIGURATION.....	2329
<i>Laura White, Thomas K. West, Matthew N. Rhode, Elizabeth Rieken, Aaron J. Erb, Jacob Lampenfield, Daniel Rodriguez</i>	

COMPUTATIONAL SIMULATIONS OF THE AEROTHERMAL ENVIRONMENT OF HYPERSONIC FLIGHT VEHICLES.....	2353
<i>Abdollah Arabshahi</i>	

WALL-MODELED LARGE-EDDY SIMULATION OF HYPERSONIC TURBULENT BOUNDARY-LAYERS.....	2366
<i>Rozie Zangeneh</i>	

SPECIAL SESSION: CREATE HPC MULTI-PHYSICS VI

IMPLEMENTATION OF A DUAL-SOLVER HYBRID APPROACH FOR ROTATING SYSTEM SIMULATIONS IN HPCMP CREATE™-AV HELIOS	2372
<i>Alex Moushegian, Marilyn J. Smith, Glen R. Whitehouse, Daniel A. Wachspress</i>	

SCALABLE DOMAIN DECOMPOSITION FOR LARGE-SCALE MULTIBODY-3D FINITE ELEMENT STRUCTURES	2395
<i>Ravi T. Lumba, Anubhav Datta</i>	

TIME-PARALLEL SCALABLE SOLUTION OF PERIODIC ROTOR DYNAMICS FOR LARGE-SCALE 3D STRUCTURES	2413
<i>Mrinalgouda Patil, Anubhav Datta</i>	

COMPARISONS OF HPCMP CREATE™-AV KESTREL-COFFE, SU2, AND MIT SANS RANS SOLUTIONS USING OUTPUT-BASED ADAPTED MESHES FOR A MULTI-ELEMENT AIRFOIL.....	2433
<i>Marshall C. Galbraith, Carmen-Ioana Ursachi, Durgesh Chandel, Steven R. Allmaras, David L. Darmofal, Ryan S. Glasby, Douglas L. Stefanski, Jon T. Erwin, Kevin R. Holst, Ethan Hereth, Jayant Mukhopadhaya, Juan J. Alonso</i>	

FLOW CONTROL APPLICATIONS I

SURFACE-NORMAL ACTIVE FLOW CONTROL FOR LIFT ENHANCEMENT AND SEPARATION MITIGATION FOR HIGH-LIFT COMMON RESEARCH MODEL.....	2453
<i>Seyedeh Sheida Hosseini, C. P. Van Dam, Shishir A. Pandya</i>	

CROSS-FLOW INSTABILITIES UNDER PLASMA ACTUATION: DESIGN, COMMISSIONING AND PRELIMINARY RESULTS OF A NEW EXPERIMENTAL FACILITY	2475
<i>Kaisheng Peng, Marios Kotsonis</i>	

LOW SPEED AND LOW REYNOLDS NUMBER AERODYNAMICS

- WHAT IS THE EFFECT OF SELF-INDUCED PRESSURE WAVES AND THEIR WALL REFLECTIONS ON LOW REYNOLDS NUMBER AIRFOIL FLOW IN WIND TUNNELS?..... 2487
Bjoern F. Klose, Geoffrey R. Spedding, Gustaaf B. Jacobs
- LEADING EDGE VORTEX FORMATION ON FINITE WINGS USING VORTEX PARTICLES 2503
Hugh J. Bird, Kiran Kumar Ramesh, Shuji Otomo, Ignazio Maria Viola
- TIME SERIES BEHAVIOUR OF LAMINAR SEPARATION BUBBLES AT LOW REYNOLDS NUMBER..... 2519
Aritras Roy, Rinku Mukherjee
- HIGH ANGLE-OF-ATTACK AERODYNAMIC CHARACTERISTICS OF THIN-TRAILING-EDGE AIRFOIL WITH EXTERNAL RIBS 2530
Naruhiko Nimura, Shun Tamura, Akira Oyama

PROPELLER, ROTORCRAFT AND DISTRIBUTED PROPULSION AERODYNAMICS III

- ANALYSIS OF DISTRIBUTED ELECTRIC PROPULSION ON COMMUTER AIRCRAFT 2539
Nikolai Herzog, Andreas Reeh, Andreas Kümmel, Christian Breitsamter
- A LOW-COST AERO-PROPULSIVE ANALYSIS OF DISTRIBUTED ELECTRIC PROPULSION AIRCRAFT..... 2555
Racheal M. Erhard, Matthew A. Clarke, Juan J. Alonso
- THE USE OF PERIODIC REDUCED ORDER MODELS IN COUPLED FLIGHT MECHANICS ANALYSIS OF TILTROTOR AIRCRAFT 2567
Peter Bath, Ann Gaitonde, Dorian Jones

SPECIAL SESSION: INTEGRATION ENVIRONMENTS FOR LARGE-SCALE MULTIDISCIPLINARY MODELING AND SIMULATION I

- VIRTUAL AIRCRAFT TECHNOLOGY INTEGRATION PLATFORM: INGREDIENTS FOR MULTIDISCIPLINARY SIMULATION AND VIRTUAL FLIGHT TESTING 2593
Lars Reimer, Ralf Heinrich, Markus Ritter, Andreas Krumbein, Sven Geisbauer, Stefan Goertz, Tobias Leicht
- VIRTUAL AIRCRAFT TECHNOLOGY INTEGRATION PLATFORM: FROM VIRTUAL FLIGHT TESTING TOWARDS SIMULATION-BASED CERTIFICATION..... 2618
Markus Ritter, Vega Handojo, Wolf Krueger, Mathias S. Roeser, Wulf Mönnich, Tanja Kirmse, Lars Reimer, Ralf Heinrich, Sven Geisbauer, Stefan Goertz

FLOW CONTROL APPLICATIONS II

- DESIGN OF EXPERIMENTS FOR TWO- AND THREE-DIMENSIONAL BIO-INSPIRED FLOW CONTROL DEVICES 2639
Diaa A. Zekry, Chengfang Duan, Mihary R. Ito, Aimy A. Wissa
- STUDY OF MACH NUMBER EFFECT ON CRUISE EFFICIENCY FOR A CO-FLOW JET GENERAL AVIATION AIRPLANE 2655
Yang Wang, Gecheng Zha, Alexis Lefebvre

INVESTIGATION OF THE UNSTEADY EFFECTS OF ACTIVE BLOWING USING PHASE-LOCKED PIV	2673
<i>Tulasi Ram Vechalapu, Micajah Schweikert, Eli Merlock, Konstantinos Kanistras</i>	
SIMPLIFIED HYBRID LAMINAR FLOW CONTROL FOR THE A320 FIN. PART 2: EVALUATION WITH THE E ^N -METHOD	2687
<i>Geza H. Schrauf, Heiko Von Geyr</i>	
MODELLING OF THE PIEZOELECTRICAL DRIVEN SYNTHETIC JET ACTUATORS.....	2708
<i>Baris Gungordu, Mark Jabbal, Atanas Popov</i>	

PROPELLER, ROTORCRAFT AND DISTRIBUTED PROPULSION AERODYNAMICS IV

DEVELOPING A SMALL-SCALE PROPELLER THRUST MODEL USING EXPERIMENTATION AND CFD	2717
<i>Alexander H. Bryant, Dibbon K. Walters</i>	
EXPERIMENTAL INVESTIGATION ON AERODYNAMIC PERFORMANCE OF COAXIAL ROTOR AT LOW REYNOLDS NUMBERS.....	2734
<i>Atsushi Yamaguchi, Raoul S. Golani, Koji Fujita, Hiroki Nagai</i>	
PRELIMINARY INVESTIGATION OF WAKE VORTEX GENERATED BY SPINNING QUADROTOR PROPELLERS USING OVERSET MESH	2746
<i>Joshua C. Nathanael, Chung Hung J. Wang, Kin Huat Low</i>	
INVESTIGATION OF LONGITUDINAL AERO-PROPULSIVE INTERACTIONS OF A SMALL QUADROTOR UNMANNED AIRCRAFT SYSTEM	2759
<i>George Altamirano, Matthew McCrink</i>	

SHOCK-BOUNDARY LAYER INTERACTIONS

SHOCK WAVE INTERACTION WITH BOUNDARY LAYER AT RAMP SURFACE	2777
<i>Alexander Povitsky, James H. Miller, Himel Barua</i>	
CORNER EFFECTS FOR COMPRESSION CORNER SHOCK WAVE/BOUNDARY LAYER INTERACTIONS IN RECTANGULAR CHANNELS	2788
<i>Rhys D. Williams, Holger Babinsky</i>	
COMPARISON OF TWO HIGH-ORDER SOLVERS FOR SUPERSONIC FLOW OVER A WALL-MOUNTED HEMISPHERE	2803
<i>Philip E. Morgan, David Weston, Miguel R. Visbal</i>	
INFLUENCE OF INTERACTION STRENGTH ON SEPARATION CONTROL WITH AIR-JET VORTEX GENERATORS	2820
<i>Deepak Prem Ramaswamy, Anne-Marie Schreyer</i>	
NUMERICAL INVESTIGATION OF PASSIVE FLOW CONTROL USING PERMEABLE AND WAVY WALLS IN OBLIQUE SHOCK WAVE BOUNDARY LAYER INTERACTION.....	2835
<i>Anand Bharadwaj S, Surya Prakash Baskaran, Santanu Ghosh, Venkateswaran Narayanaswamy</i>	

**SPECIAL SESSION: INTEGRATION ENVIRONMENTS FOR LARGE-SCALE
MULTIDISCIPLINARY MODELING AND SIMULATION II**

ILLUSTRATIONS OF MULTI-DISCIPLINARY HIGH-FIDELITY ANALYSIS CAPABILITIES
FOR AERO-STRUCTURAL AND AERO-ACOUSTIC AIRCRAFT DESIGN 2849
*Gerald G. Carrier, Christophe Blondeau, Frédéric Moens, Marco Carini, Thomas Le Garrec,
Daniel Mincu*

APPLIED COMPUTATIONAL FLUID DYNAMICS I

CFD COMPARISONS WITH UPDATED NASA JUNCTURE FLOW DATA..... 2882
*Christopher L. Rumsey, Nashat N. Ahmad, Jan-Renee Carlson, Michael A. Kegerise, Dan
Neuhart, Judith Hannon, Luther N. Jenkins, Chung-Sheng Yao, Ponnampalam Balakumar,
Samantha Gildersleeve, Scott Bartram, Thomas H. Pulliam, Michael E. Olsen, Philippe
Spalart*

IN-TUNNEL SIMULATIONS OF THE NASA JUNCTURE FLOW MODEL 2921
Nashat N. Ahmad, Christopher L. Rumsey, Jan-Renee Carlson

LAG MODEL PREDICTIONS OF THE NASA JUNCTION FLOW..... 2947
Michael E. Olsen

CFD VALIDATION EXPERIMENTS: TOWARD A BROADER PERSPECTIVE 2967
Nigel J. Taylor, Christopher L. Rumsey

VALIDATION OF REYNOLDS-AVERAGED NAVIER-STOKES COMPUTATIONS OVER A
FIGHTER AIRCRAFT WITH EXPERIMENTAL DATA..... 2984
Berk Sarikaya, Tugcan Selimhocaoglu, H. Özgür Demir

TRANSONIC AERODYNAMICS

ASSESSMENT OF RANS-BASED TRANSITION MODELS BASED ON EXPERIMENTAL
DATA OF THE COMMON RESEARCH MODEL WITH NATURAL LAMINAR FLOW 3001
*Balaji Shankar Venkatachari, Pedro Paredes, Joseph M. Derlaga, Pieter G. Buning, Meelan
M. Choudhari, Fei Li, Chau-Lyan Chang*

TRANSITION ANALYSIS FOR THE CRM-NLF WIND TUNNEL CONFIGURATION 3030
*Pedro Paredes, Balaji Shankar Venkatachari, Meelan M. Choudhari, Fei Li, Nathaniel J.
Hildebrand, Chau-Lyan Chang*

DESIGN OF ASSISTED TRANSONIC PRESSURE RECOVERY USING PASSIVE FLOW
CONTROL FOR AIRFOIL GEOMETRIES..... 3049
Armando R. Collazo Garcia, Phillip J. Ansell

APPLIED COMPUTATIONAL FLUID DYNAMICS II

IMPROVEMENTS IN SIMULATING A MACH 0.80 TRANSONIC TRUSS-BRACED WING
CONFIGURATION USING THE SPALART-ALLMARAS AND K- ω SST TURBULENCE
MODELS 3069
*Daniel Maldonado, Craig Hunter, Jeffrey A. Housman, Sally A. Viken, Michael G.
Piotrowski, Susan N. McMillin, Cetin C. Kiris, William E. Milholen*

VOLUME 5

PREDICTION AND VALIDATION OF LAMINAR-TURBULENT TRANSITION USING SA-? TRANSITION MODEL	3100
<i>Bumseok Lee, James D. Baeder</i>	

ACTFLOW: A TARGET-ORIENTED FINITE VOLUME SOLVER FOR ALL-SPEED COMPRESSIBLE TURBULENT FLOW SIMULATIONS.....	3121
<i>Changsoo Lee, Eunsa Kim, Kyeol Yune, Chongam Kim</i>	

A STUDY OF MESH RESOLUTION IN WALL-PARALLEL DIRECTIONS FOR IMPLICIT LARGE EDDY SIMULATION	3157
<i>Salman K. Rahmani, Zhi J. Wang</i>	

UNMANNED VEHICLE AERODYNAMICS

AERODYNAMIC INVESTIGATIONS OF UAV SENSOR TURRETS - A COMBINED WIND-TUNNEL AND CFD APPROACH	3172
<i>Falk Goetten, Marc Havermann, Carsten Braun, Matthew Marino, Cees Bil</i>	

EXPERIMENTAL INVESTIGATION OF AERODYNAMIC INTERACTIONS DURING SHIPBOARD LAUNCH & RECOVERY OF UNCONVENTIONAL UAVS	3184
<i>Naipei P. Bi, Alan Schwartz, Jared Soltis, Kevin Kimmel, Anish Sydney</i>	

DRONES FOR VENUS EXPLORATION: ENERGY HARVESTING MECHANISMS AND THERMAL-BASED FLIGHT CONTROL	3200
<i>Zachary Rubin, Ahmed Aboelezz, Brenden Herkenhoff, Mostafa Hassanalian</i>	

SPECIAL SESSION: HIGH-FIDELITY CFD PREWORKSHOP

HIGH-FIDELITY CFD WORKSHOP 2022: MESH MOTION	3208
<i>Per-Olof Persson, Krzysztof Fidkowski, Nathan A. Wukie</i>	

VERIFICATION TEST SUITE FOR SPALART-ALLMARAS QCR2000 TURBULENCE MODEL.....	3220
<i>Boris Diskin, Nashat N. Ahmad, William K. Anderson, Joseph M. Derlaga, Mohagna J. Pandya, Christopher L. Rumsey, Li Wang, Stephen L. Wood, Yi Liu, Hiroaki Nishikawa, Marshall C. Galbraith</i>	

WALL-MODELED LARGE-EDDY SIMULATION AND RANS FOR WORKSHOP ON SMOOTH-BODY SEPARATION.....	3255
<i>Michael C. Adler, Logan P. Riley, David R. Gonzalez, Sanjiva K. Lele</i>	

AIRFOIL/WING/CONFIGURATION AERODYNAMICS I

MANIPULATION OF STREAMWISE VORTICES BY AIR INJECTION ON VORTEX GENERATORS.....	3273
<i>Lucas Weber, Giovanni Nino, Bingbing Han, Robert Breidenthal</i>	

MODAL ANALYSIS OF THE TRANSONIC SHOCK PROCESS OVER A GRIFFITH-TYPE, LAMINAR-FLOW AIRFOIL	3287
<i>Armando R. Collazo Garcia, Theresa Saxton-Fox, Phillip J. Ansell</i>	

UNSTEADY PRESSURE MEASUREMENTS ON A SIMPLIFIED HIGH-LIFT CONFIGURATION OF THE COMMON RESEARCH MODEL USING ACTIVE FLOW CONTROL	3303
<i>Keith Paschal, Michael A. Kegerise, Dan Neuhart, Mehti Koklu, John C. Lin</i>	

EXPERIMENTAL MODEL OF EFFECTS OF LARGE UPSTREAM OBSTRUCTIONS ON DRONE SCALE PROPELLERS	3318
<i>Ellande Tang, Soon-Jo Chung</i>	

GUST ALLEVIATION ON A FORWARD SWEPT TRANSPORT AIRCRAFT AT TRANSONIC SPEEDS	3329
<i>Rolf Radespiel, Jochen Wild, Ralf Heinrich, Thomas Streit, Lorenz Klug</i>	

UNSTEADY AERODYNAMICS I

INVESTIGATION OF FLOW TRANSITION EFFECTS ON A TRANSONIC LAMINAR AIRFOIL IN SMALL-AMPLITUDE PITCH OSCILLATION.....	3350
<i>Caleb J. Barnes, Miguel Visbal</i>	

COMPARING THE PERFORMANCE OF DIFFERENT TURBULENCE MODELS IN PREDICTING DYNAMIC STALL	3375
<i>Nabil M. Khalifa, Amir S. Rezaei, Haitham E. Taha</i>	

AN INVESTIGATION OF COMPRESSIBILITY EFFECTS ON DYNAMIC STALL FOR A PERIODIC PLUNGING AIRFOIL AT MODERATE REYNOLDS NUMBER	3389
<i>Renato F. Miotto, William Wolf, Datta V. Gaitonde, Miguel Visbal</i>	

DEVELOPMENT OF BUFFET FORCING FUNCTIONS USING FREQUENCY-DEPENDENT COHERENCE FACTORS	3399
<i>James M. Ramey, Martin K. Sekula, David J. Piatak, Patrick S. Heaney, Francesco Soranna</i>	

STABILITY ANALYSIS OF SUPERSONIC FLOWS OVER A MODIFIED BACKWARD FACING STEP	3420
<i>Nikhil Khobragade, Sasidharan Unnikrishnan, Rajan Kumar</i>	

AIRFOIL/WING/CONFIGURATION AERODYNAMICS II

NUMERICAL ANALYSIS OF JAXA STANDARD MODEL IN HIGH LIFT CONFIGURATION.....	3436
<i>Karsten Hendrickson, Ramesh K. Agarwal</i>	

NUMERICAL INVESTIGATION OF LONGITUDINAL STATIC STABILITY OF A HIGH-SPEED TANDEM-WING VTOL VEHICLE USING COFLOW JET AIRFOIL	3450
<i>Jeremy S. Boling, Gecheng Zha</i>	

EXPERIMENTAL INVESTIGATION OF THE EFFECT OF SWEEP ON A PITCHING FINITE-ASPECT-RATIO WING.....	3472
<i>Al Habib Ullah, Charles Fabijanac, William Reffling, Jordi Estevadeordal</i>	

OPTIMIZATION STUDY OF FRONT AND REAR WINGS OF MOTORSPORT USING COMPUTATIONAL FLUID DYNAMICS.....	3508
<i>Sam Wille, Karsten Hendrickson, Ramesh K. Agarwal</i>	

AERODYNAMIC REVIEW OF ALTERNATIVES TO CLASSICAL ELLIPTIC SPANWISE LOADINGS.....	3517
<i>Francois Fortin</i>	

AIRFOIL/WING/CONFIGURATION AERODYNAMICS III

PERFORMANCE ENHANCEMENT BY TANDEM WINGS INTERACTION OF COFLOW JET AIRCRAFT	3542
<i>Yan Ren, Gecheng Zha</i>	
INVISCID MODEL FOR UNSTEADY MULTI-AIRFOIL CONFIGURATIONS WITH LEADING-EDGE VORTEX SHEDDING	3559
<i>Andrew Mistele, Arun Vishnu Suresh Babu, Ashok Gopalarathnam</i>	
ESTIMATION OF INCOMPRESSIBLE SWEEP-WING AERODYNAMICS USING LOW-FIDELITY METHODS	3575
<i>Bruno Moorthamers, Dallin Wiberg, Douglas F. Hunsaker</i>	
A CONTROL ALLOCATION METHOD TO REDUCE ROLL-YAW COUPLING ON TAILLESS AIRCRAFT	3589
<i>Thomas R. Shearwood, Mostafa R. Nabawy, William Crowther, Clyde Warsop</i>	

PROPELLER/ROTORCRAFT/WIND TURBINE MODELING APPROACHES

COMPUTATIONAL FLIGHT PATH ANALYSIS OF A HELICOPTER IN AN OFFSHORE WIND FARM USING A LATTICE-BOLTZMANN METHOD	3602
<i>Bastian Horvat, Manfred Hajek, Juergen Rauleder</i>	
AN ACTUATOR SURFACE METHOD FOR SHIP-HELICOPTER DYNAMIC INTERFACE SIMULATIONS	3621
<i>Daniel Linton, Ben Thornber</i>	
EFFECTS OF FREESTREAM FLOW ON TIME DELAYS AND DYNAMICS IN COAXIAL ROTOR SYSTEMS	3636
<i>Cory A. Seidel, David A. Peters</i>	

UNSTEADY AERODYNAMICS II

STATE SPACE MODELING OF VISCOUS UNSTEADY AERODYNAMIC LOADS.....	3648
<i>Haitham E. Taha, Amir S. Rezaei</i>	
ACTIVE GUST LOAD ALLEVIATION BY COMBINED ACTUATION OF TRAILING EDGE AND LEADING EDGE FLAP AT TRANSONIC SPEEDS	3667
<i>Junaid Ullah, Thorsten Lutz, Lorenz Klug, Rolf Radespiel, Jochen Wild</i>	
ACTIVE CONTROL FOR TARGETED OBJECTIVES OF FLOW OVER AN OSCILLATING AIRFOIL	3690
<i>Nathan J. Webb, David Castaneda, Mo Samimy</i>	
ANALYSIS OF TRANSONIC UNSTEADY AERODYNAMIC ENVIRONMENTS USING UNSTEADY PRESSURE SENSITIVE PAINT FOR THE SPACE LAUNCH SYSTEM BLOCK 1 CARGO LAUNCH VEHICLE	3707
<i>Patrick S. Heaney, Francesco Soranna, Martin K. Sekula, David J. Piatak, James M. Ramey</i>	
COHERENCE ANALYSIS OF THE SPACE LAUNCH SYSTEM USING UNSTEADY PRESSURE SENSITIVE PAINT	3728
<i>Francesco Soranna, Martin K. Sekula, Patrick S. Heaney, James M. Ramey, David J. Piatak</i>	

APPLIED COMPUTATIONAL FLUID DYNAMICS III

ON THE CFD VALIDATION OF BI-WING ORNITHOPTER AERODYNAMIC MODELS	3760
<i>Harijono H. Djodihardjo, Muhammad Anas Abd Bari</i>	
NUMERICAL INVESTIGATION ON UNDERWATER SONIC BOOM CUTOFF PHENOMENON INDUCED BY HYPERSONIC AIRCRAFT	3774
<i>Po-Hsun Chen, Kojiro Suzuki</i>	
CORRELATION OF MULTIPLE CFD TECHNIQUES WITH EXPERIMENTAL DATA FOR HIGH PERFORMANCE JET CONFIGURATION.....	3790
<i>Kevin M. Langone, John Mangus, Caesar Pleitez</i>	
HEMLAB ALGORITHM APPLIED TO THE HIGH-LIFT JAXA STANDARD MODEL.....	3807
<i>Hulya Sukas, Mehmet Sahin</i>	
STUDY OF SEPARATION OF THREE-DIMENSIONAL BOUNDARY LAYER USING CRITICAL POINT THEORY	3824
<i>Vasanth Kumar, Rinku Mukherjee</i>	

Author Index