

Fluid Dynamics

Papers Presented at the AIAA Aviation Forum 2022

Chicago, Illinois, USA and Online
27 June – 1 July 2022

Volume 1 of 3

ISBN: 978-1-7138-5990-1

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

ACTIVE AND PASSIVE FLOW CONTROL DEVICES AND APPLICATIONS I

Improved Delayed Detached Eddy Simulations Applied to a NACA0015 Aerofoil Subject to Acoustic Excitation	1
<i>Seyfettin Coskun, Vassilios Pachidis, Iroizan Ubulom, Marko Bacic</i>	
Flow Analysis Around a VTOL Aircraft Near Stall Conditions and Application of Active Flow Control to Enhance the Aerodynamic Performances at Real Flight Conditions.....	12
<i>Hung D. Truong, Abderahmane Marouf, Agathe Chouippe, Yannick Hoarau, Dominique Charbonnier, Alain Gehri, Jan B. Vos</i>	
Parameter Influence on the Porous Bleed Performance with & Without Shock-Boundary Layer Interaction.....	26
<i>Julian Giehler, Pierre Grenson, Reynald Bur</i>	
Harnessing Phononic Materials for Aerodynamic Flow Control.....	52
<i>Srikumar Balasubramanian, Sangwon Park, Kathryn Matlack, Andres Goza</i>	
Investigation of High-Speed-Jet Actuation for Flow Separation Control Using Delayed Detached-Eddy Simulation	63
<i>Taeseon Kim, Ilyoung Sohn, Myungil Kim, Sol Keun Jee</i>	

FLOWFIELD ESTIMATION THEORY, MACHINE LEARNING, REDUCED-ORDER MODELING, AND DATA-DRIVEN MODELING I

Reservoir Computing Reduced-Order Model Based on PIV Data of Flow Field.....	81
<i>Yuto Iwasaki, Kumi Nakai, Takayuki Nagata, Taku Nonomura, Keisuke Asai, Masanobu Inubushi</i>	
A Machine Learning Prediction of the Wind-Driven Water Runback Characteristics Pertinent to Aircraft Icing Phenomena.....	92
<i>Jincheng Wang, Haiyang Hu, Ping He, Hui Hu</i>	
Machine-Learning-based Reconstruction of Transient Vortex-airfoil Wake Interaction	113
<i>Yonghong Zhong, Kai Fukami, Byungjin An, Kunihiko Taira</i>	
Optimal Force Control of the Flow Past Moving Cylinders with Adjoint-ROM Approach.....	123
<i>Bolun Xu, Mingjun Wei, John T. Hrynuk</i>	
On the Kármán–Pohlhausen Momentum-Integral Approach. Extension to Flow Over a Cylinder with a Variable Pressure Gradient.....	133
<i>Rudy Al Ahmar, Joseph Majdalani</i>	

STABILITY AND TRANSITION: HYPERSONIC I

Assessment of Linear Methods for Analysis of Boundary Layer Instabilities on a Finned Cone at Mach 6.....	158
<i>Daniel Araya, Neal Bitter, Bradley M. Wheaton, Omar Kamal, Tim Colonius, Anthony Knutson, Heath Johnson, Joseph Nichols, Graham V. Candler, Vincenzo Russo, Christoph Brehm</i>	
Computational Study of Transition on a Flared Cone Using Random Forcing.....	192
<i>Andrew J. Shuck, Jonathan Poggie, Gregory A. Blaisdell</i>	
Stability Analysis of Streaks Induced by Optimized Vortex Generators.....	205
<i>Connor W. Klaus, Clark C. Pederson, Pedro Paredes, Meelan M. Choudhari, Boris Diskin</i>	
Interaction of a Tunnel-Like Acoustic Disturbance Field with a Blunt Cone Boundary Layer at Mach 8.....	219
<i>Yuchen Liu, Mateus Schuabb, Lian Duan, Pedro Paredes, Meelan M. Choudhari</i>	

TURBULENT FLOWS (JETS, WAKES, SHEAR FLOWS, WALL-BOUNDED, ETC.) I

Simulation of a High Reynolds Number Compressible Turbulent Boundary Layer Developing in the Presence of a Sinusoidal Plane.....	243
<i>Jonathan Gaskins, Jonathan Poggie, Gregory A. Blaisdell</i>	
Interaction of Confined Jet Recirculation with Flow Entrainment and Compressions.....	263
<i>Joel Kramer, Chris Morton, Craig T. Johansen</i>	
The Spectral Decomposition of Skewness in the Turbulent Boundary Layer.....	277
<i>Samresh Midya, Flint O. Thomas, Stanislav Gordeyev</i>	
Drag Prediction in the Wake of a Linearly Tapered Rotationally Oscillating Cylinder.....	291
<i>Soumarup Bhattacharyya, Sanjay Kumar, Kamal Poddar</i>	

ACTIVE AND PASSIVE FLOW CONTROL DEVICES AND APPLICATIONS II

Design and Analysis of Phononic Material for Passive Flow Control.....	301
<i>Sangwon Park, Georgi Hristov, Srikumar Balasubramanian, Andres Goza, Phillip J. Ansell, Kathryn Matlack</i>	
Numerical Analysis of Flow Over Orthoconic Structure Inspired by Spyroceras.....	309
<i>Kee Horng Seh, Mitesh M. Thakor, Sareta R. Gladson, Martin Fernandez, Linda Ivany, Melissa Green, Yiyang Sun</i>	
Tripping Device Effects on the Turbulent Boundary Layer Development.....	321
<i>Fernanda Leticia dos Santos, C.H. Venner, Leandro D. de Santana</i>	
Boundary Layer Turbulence Characteristics and Mechanisms Due to Drag Reduction Initial Conditions.....	333
<i>Andrew Myers, Thomas C. Corke, Flint Thomas</i>	

FLOWFIELD ESTIMATION THEORY, MACHINE LEARNING, REDUCED-ORDER MODELING, AND DATA-DRIVEN MODELING II

Resolvent Analysis of Laminar and Turbulent Rectangular Duct Flows	349
<i>Barbara Lopez-Doriga, Scott T. Dawson, Ricardo Vinuesa</i>	
Sketch-Based Resolvent Analysis	364
<i>Dylan House, Calum Skene, Jean Helder M. Ribeiro, Chi-An Yeh, Kunihiko Taira</i>	
Optical Flow Velocimetry Using a Quasi-Optimal Basis with Implicit Regularization.....	378
<i>Gauresh R. Jassal, Julia A. Dobrosotskaya, Bryan E. Schmidt</i>	
Evolutionary Algorithm Applied to Differential Reynolds Stress Model for Turbulent Boundary Layer Subjected to an Adverse Pressure Gradient.....	390
<i>Erij Alaya, Cornelia Grabe, Bernhard Eisfeld</i>	
Approximating Turbulent Flows Using Knowledge-Guided Tensor Decomposition	417
<i>Christopher Coley, Joy Metzler</i>	

STABILITY AND TRANSITION: HYPERSONIC II

Flow Control Using Steady Blowing and Suction Strips in a Mach 6 Boundary Layer on a Flared Cone: “Natural” Transition.....	432
<i>Christoph Hader, Hermann F. Fasel</i>	
Combined Bluntness and Roughness Effects on Cones at Hypersonic Speeds	456
<i>Pedro Paredes, Anton Scholten, Meelan M. Choudhari, Fei Li, Bethany N. Price, Joseph S. Jewell</i>	
Nonlinear Wave Packet Simulation for a Cone at Mach 10 Using a GPU Accelerated Pseudo-Spectral Scheme	471
<i>Vasilis Tsakagiannis, Christoph Hader, Hermann F. Fasel</i>	

TURBULENT FLOWS (JETS, WAKES, SHEAR FLOWS, WALL-BOUNDED, ETC.) II

Benchmark Characterization of Separated Flow Over Smooth Gaussian Bump.....	485
<i>Patrick D. Gray, Igal Gluzman, Flint O. Thomas, Thomas C. Corke, Matthew T. Lakebrink, Kevin Mejia</i>	
Flow Field Characteristics of Asymmetric Turbulent Pulsed Jets.....	508
<i>Cesar A. Leos, Robert Freeman, Isaac Choutapalli</i>	
Turbulence Statistics of Supersonic Rectangular Jets Using Reynolds Stress Model in RANS and WALE LES	517
<i>Kalyani R. Bhide, Shaaban Abdallah</i>	
Three-Dimensional Spectral POD of Supersonic Twin-Rectangular Jet Flow.....	529
<i>Brandon Yeung, Oliver T. Schmidt, Guillaume A. Brès</i>	
Modeling Dissipation Scale Distributions at High Reynolds Number	547
<i>Nikolay Gustenyov, Sean Bailey, Margit Egerer, Marcus Hultmark, Alexander J. Smits</i>	

TURBULENT FLOWS (JETS, WAKES, SHEAR FLOWS, WALL-BOUNDED, ETC.) III

Resolvent Analysis of an Under-Expanded Planar Supersonic Impinging Jet	563
<i>Qiong Liu, Chitrarth Prasad, Datta V. Gaitonde</i>	
Interaction of a Tunnel-Like Acoustic Disturbance Field with a Normal Shock Wave: Theory and Simulation	575
<i>Yuchen Liu, Lian Duan</i>	
Application of Wray-Agarwal Turbulence Model for Predicting Flow Past NACA 0012, 0015, and 0018 Airfoils.....	593
<i>Dean M. Ryan-Simmons, Ramesh K. Agarwal</i>	
Numerical Investigation of Freestream Turbulence Effect on Flow Through Low-Pressure Turbine Cascade.....	602
<i>Andreas Gross, Christopher R. Marks, Rolf Sondergaard</i>	

ACTIVE AND PASSIVE FLOW CONTROL DEVICES AND APPLICATIONS III

Swept-Wing Flow Control with a Spanwise Row of Leading-Edge Fluidic Oscillators.....	624
<i>Alex Spens, Jeffrey P. Bons</i>	
Structure and Dynamics of Bleed-Controlled Impinging Shock/Turbulent-Boundary-Layer Interactions	640
<i>Matthew J. Schwartz, Datta V. Gaitonde, John W. Slater</i>	
The Effect of Spanwise Location of a VGJ Fluidic Fence on Swept Wing Performance	661
<i>Evan J. McFadden, Patrick J. Brandt, Jeffrey P. Bons</i>	
Development of Pulsed Jet Actuator for Power Efficient Actuation Concepts Testing	678
<i>Wit Stryczniewicz, Wienczyslaw Stalewski, Mark Jabbal, Faycal Bahri</i>	

STABILITY AND TRANSITION: HYPERSONIC III

Construction and Application of Transition Prediction Databased Method for 2nd Mode on Sharp Cone	684
<i>Xavier Chanteux, Guillaume Bégou, Hugues Deniau, Olivier Vermeersch</i>	
Linear Disturbance Amplification Over Blunted Flat Plates in High-Speed Flows	694
<i>Anton Scholten, Hemanth Goparaju, Datta V. Gaitonde, Pedro Paredes, Meelan M. Choudhari, Fei Li</i>	
An Assessment of the Particle Modeling Fidelity for Particle-Induced Transition Simulations	710
<i>Sayed Mohammad Abdullah Al Hasnine, Vincenzo Russo, Christoph Brehm</i>	

JOINT THERMOPHYSICS - FLUID DYNAMICS NONEQUILIBRIUM FLOWS I

Thermochemical Nonequilibrium Predictions for Nitrogen Flow Over a Wedge	733
<i>Ashley M. Verhoff, Maninder S. Grover, Paolo Valentini, Nicholas J. Bisek</i>	
Assessment of Detailed Thermochemistry and Excitation Models for Shock-Heated Oxygen Mixtures	747
<i>Timothy T. Aiken, Iain D. Boyd</i>	

Nitric Oxide Infrared Radiation Modeling from a Hypersonic Flow	777
<i>Irmak Taylan Karpuzcu, Shubham Thirani, Deborah A. Levin, Daniil Andrienko</i>	

VOLUME 2

One Dimensional Modelling and Sensitivity Analysis for the ACT-II Facility	790
<i>Mridula Kuppa, Przemyslaw Rostkowski, Tonghun Lee, Roger Ghanem, Marco Panesi</i>	

ACTIVE AND PASSIVE FLOW CONTROL DEVICES AND APPLICATIONS IV

Suction System Design for Transonic HLFC Wing	803
<i>Adarsh Prasannakumar, Anand Sudhi, Arne Seitz, Camli Badrya</i>	
Uncertainty Analysis of the Laminar Boundary Layer Control TSSD Concept.....	837
<i>Alexander Barklage, Ulrich Römer, Arne Seitz, Matthias Horn, Rolf Radespiel, Peter Scholz, Camli Badrya</i>	
Wind Tunnel Verification of Laminar Boundary Layer Control TSSD Concept.....	857
<i>Arne Seitz, Matthias Horn, Alexander Barklage, Peter Scholz, Camli Badrya, Rolf Radespiel</i>	
Simulation of 3D Co-Flow Jet Airfoil with Integrated Micro-Compressor Actuator.....	874
<i>Yan Ren, Paula A. Barrios, Gecheng Zha</i>	

STABILITY AND TRANSITION: HYPERSONIC IV

Numerical Investigation of the Nonlinear Transition Stages for a Sharp Cone at Mach 10.....	886
<i>Samantha Stevens, Christoph Hader, Hermann F. Fasel</i>	
Boundary-Layer Instability on a Highly Swept Fin on a Hypersonic Cone	910
<i>Madeline M. Peck, Koen J. Groot, Helen L. Reed</i>	
Input/output Analysis of a Mach-6 Cooled-wall Hypersonic Boundary Layer Using the One-Way Navier-Stokes (OWNS) Equations.....	925
<i>Omar Kamal, Georgios Rigas, Matthew T. Lakebrink, Tim Colonius</i>	

JOINT THERMOPHYSICS - FLUID DYNAMICS NONEQUILIBRIUM FLOWS II

Influence of Non-Boltzmann Radiation Around Titan Atmospheric Entry Vehicles.....	939
<i>Sung Min Jo, Przemyslaw Rostkowski, Alireza Doostan, Jae Gang Kim, Marco Panesi</i>	
Progress on Carbon Nitridation and Nitrogen Catalysis Studies in an Inductively Coupled Plasma Facility.....	953
<i>Jason M. Meyers, Jeffrey Schindler, Ian Ballou, Doulgas Fletcher</i>	
Electron Transpiration Cooling Platform for an Inductively Coupled Plasma Facility	966
<i>Jason M. Meyers, Andrew Morin, Jeffrey Schindler, Brian Stunkel, Doulgas Fletcher, Liam Fisher, Kaka Ma</i>	
Characterization of LaB ₆ Emitters in an Inductively Coupled Plasma Facility for Electron Transpiration Cooling Applications	983
<i>Jason M. Meyers, Brian Stunkel, Ian Ballou, Andrew Morin, Jeffrey Schindler, Doulgas Fletcher, Daniel Oropeza</i>	

Study of Electron Transpiration Cooling Under Rapid Laser Heat Flux Modulation	1000
<i>Junhwi Bak, Albina Tropina, Christopher Limbach, Richard B. Miles, James Creel</i>	

VARIOUS TOPICS IN FLUID DYNAMICS I

Transition to the Weak-Shock Solution Around a Cone Surrounded by a Duct Induced by Laser Energy Deposition.....	1005
<i>Hiroki Asai, Yusuke Nakamura, Akihiro Sasoh</i>	
Leading-Edge Parametric Study of the NACA0012-IK30 Airfoil	1014
<i>Emanuel A. Camacho, Flavio D. Marques, Andre R. Silva, Jorge M. Barata</i>	
Laminar-Turbulent Transition in a Swept Low-Speed Boundary Layer	1025
<i>Ladan Bahrainirad, Shirzad Hosseinverdi, Hermann F. Fasel</i>	
Further Analysis of Coflow Jet Flow Control for a NACA 6421 Airfoil Using LES.....	1041
<i>Philip E. Morgan, Daniel J. Garmann, Miguel R. Visbal</i>	
Design of Closed-Loop Control Strategies for Fluid Flows Using Deep Neural Network Surrogate Models.....	1058
<i>Tarcisio D. Oliveira, William Wolf</i>	

ACTIVE AND PASSIVE FLOW CONTROL DEVICES AND APPLICATIONS V

Experimental Study of a Wing with Hybrid Laminar Flow Control Application.....	1069
<i>Michelangelo Corelli Grappadelli, Anand Sudhi, Rolf Radespiel, Camli Badrya</i>	
On the Effect of Manipulating Large Scale Motions in a Boundary Layer.....	1095
<i>Akshit Jariwala, Alexandros Tsolovikos, Saikishan Suryanarayanan, David B. Goldstein, Efstathios Bakolas</i>	
Design of High Width-Diameter Ratio Injection and Suction Ducts for Co-Flow Jet Airfoil.....	1107
<i>Paula A. Barrios, Yan Ren, Gecheng Zha</i>	
Feedback Stabilization of Incompressible Flows Using Quadratic Constraints	1127
<i>Talha Mushtaq, Peter J. Seiler, Maziar Hemati</i>	
Effect of Door Angle and Leading Wedge on the Cavity Acoustics at Supersonic Speeds	1137
<i>Bryce S. Outten, Michael Sheehan, Yogesh Mehta, Rajan Kumar</i>	

STABILITY AND TRANSITION: HYPERSONIC V

Analysis of Ablation on Boundary Layer Stability of the Reentry F Flight Vehicle.....	1150
<i>Robert E. Rogers, Olivia M. Schroeder, Luke J. Melander, Graham V. Candler</i>	
Effect of the Reynolds Number on the Freestream Disturbance Environment in a Mach 6 Nozzle.....	1170
<i>Nathaniel J. Hildebrand, Meelan M. Choudhari, Lian Duan</i>	
Energy-Budget Analysis of the Crossflow Instability on a Hypersonic Yawed Cone.....	1190
<i>Jay M. Patel, Koen J. Groot, Caleb Saiyasak, James G. Coder, Douglas L. Stefanski, Helen L. Reed</i>	

ACTIVE AND PASSIVE FLOW CONTROL DEVICES AND APPLICATIONS VI

- Mechanisms for Turbulent-Separation-Control at Reynolds Number of 1.6×10^6 Using Vortex-Generator-Type Plasma Actuators - Comparison with Spanwise-Type Plasma Actuators 1206
Makoto Sato
- Vortex Flow Control Over a Circular Cylinder Using Plasma Co-Flow Jet..... 1221
Hexiang Zhang, Jianlei Wang, Weiwei Hui, Xuanshi Meng
- Turbulent Channel Flow with Riblets in Drag Reducing and Drag Increasing Regimes 1237
Yue Zhang, Jinsheng Cai, Wenfeng Li
- Over-Expanded Elliptical Jet Control Using Ventilated Truncated-Triangular Tabs..... 1249
Jerrin Thomas, Shashank Khurana
- Spanwise-Inclined Injection of Unsteady Jets in Supersonic Crossflow..... 1264
Robin Sebastian, Anne-Marie Schreyer

STABILITY AND TRANSITION: HYPERSONIC VI

- Perturbation Decomposition Over a Flared Cone with a Wavy Wall..... 1283
Wenkai Zhu, Cunbiao Lee
- Nonlinear Evolution of Instabilities in a Laminar Separation Bubble at Hypersonic Mach Number..... 1295
Fei Li, Meelan M. Choudhari, Pedro Paredes, Anton Scholten
- Gas Injection into Second Mode Instability on a 7° Degree Cone at Mach 7 1314
Philip Kerth, Sebastien Wylie, Raghul Ravichandran, Matthew McGilvray
- Effect of Freestream Noise on Fin-Cone Transition at Mach 6..... 1335
Franklin D. Turbeville, Steven P. Schneider

SUPERSONIC AND HYPERSONIC FLOWS I

- Validation of a High-Order Diffuse Interface Multi-Phase Method for High-Speed Droplet Shock Interaction and Impingement..... 1358
Manuel Viqueira-Moreira, Tyler D. Stoffel, Savio J. Poovathingal, Christoph Brehm
- Parametric Study of Cavity Flow 1382
Laura Holifield, Jonathan Poggie, Gregory A. Blaisdell
- ANN-Based Air Property Models Up to 25,000 K for Hypersonic Equilibrium Flow Simulations 1401
Juhyun Kim, Hojun You, Kyeol Yune, Chongam Kim
- Characterizing Surface Roughness Effects Through Direct Skin Friction Measurements 1427
Daniel Simmons, Ryan J. Meritt, Nicholas J. Molinaro

FLOWFIELD ESTIMATION THEORY, MACHINE LEARNING, REDUCED-ORDER MODELING, AND DATA-DRIVEN MODELING III

- A Low-Order Nonlinear Model of a Stalled Airfoil from Data: Exploiting Sparse Regression with Physical Constraints 1449
Alexander L. Heide, Katherine J. Asztalos, Scott T. Dawson, Maziar Hemati

Reduced-Order Modeling of Steady and Unsteady Flows with Deep Neural Networks..... 1469
Bryan Barraza, Zhuang Wei, Andreas Gross

Qualifying Training Datasets for Data-Driven Turbulence Closures 1483
Tania Banerjee, Jaideep Ray, Matthew F. Barone, Stefan P. Domino

LOW-REYNOLDS-NUMBER AND BIO-INSPIRED FLOWS I

Numerical and Experimental Study of a Covert-Inspired Passively Deployable Flap for
Aerodynamic Lift Enhancement..... 1504
Ahmed K. Othman, Nirmal J. Nair, Anushka Sandeep, Andres Goza, Aimy Wissa

Experimental Investigation into the Time-Varying Propulsive Performance and Unsteady Wakes of
Bio-Inspired Pitching Panels 1519
Justin T. King, Melissa Green

Flow Over a Seal Whisker Inspired Geometry at Swept Back Angles..... 1535
Trevor Dunt, Jennifer A. Franck

Unsteady Flow Field on Wing Surface in Propeller Slipstream at Low Reynolds Number 1546
Tsubasa Ikami, Koji Fujita, Hiroki Nagai

MULTIPHYSICS AND CROSS-DISCIPLINARY FLOWS (E.G. FLUID-STRUCTURE INTERACTION, COMBUSTION, ETC.) I

Low Order Analysis of Panel Vibration Under Ramp-Induced Shock / Boundary Layer Interaction..... 1557
Marc A. Eitner, Yoo-Jin Ahn, Mustafa N. Musta, Noel Clemens, Jayant Sirohi

Stability and Extinction of Premixed Flames at High-Altitude Pressures 1574
Anthony J. Morales, Max K. Fortin, Kareem A. Ahmed

VOLUME 3

Numerical Analysis of Flows Generated by a Two-Stage EHD Gas Pump with Different Electrode
Orientations 1583
A K M Monayem H. Mazumder, Feng C. Lai

SUPERSONIC AND HYPERSONIC FLOWS II

Side Jet Interactions for a Hypersonic Flow Over a Cone Geometry Using Kinetic and
Experimental Methods..... 1596
*Irmak Taylan Karpuzcu, Deborah A. Levin, Christopher Chinske, Zachary D. Lawless, Robert
N. Blackwell, Joseph S. Jewell*

Numerical Investigation of Turbulent Shock-Wave Boundary Layer Interaction for Two Different
Shock Strengths 1612
Sunyoung Lee, Andreas Gross

3D Flow Computations Over Blunt Bodies at Hypersonic Speeds Using Shock-Fitting Technique 1635
Alessia Assonitis, Renato Paciorri, Carl F. Ollivier Gooch, Aldo Bonfiglioli

The Transonic Flow Past a NACA0012 and the Von Neumann Paradox 1645
Renato Paciorri, Aldo Bonfiglioli, Alessia Assonitis

VORTEX DYNAMICS AND ROTATING FLOWS

- A Computational Study of Vortical Wakes Behind Oscillating Cylinder-Splitter-Plate Gust Generators 1661
Michael Jenkins, Arun Vishnu Suresh Babu, Matthew Bryant, Ashok Gopalarathnam
- Effect of Coriolis Acceleration on the Span-Wise Vorticity Field Over a Wind-turbine Airfoil 1675
Pedro T. Rodrigues, Elmer M. Gennaro, Daniel Sampaio Souza
- Experimental Sink Vortex Flow Analysis Using Image Processing Techniques 1686
Bradley Rafferty
- Vortex Interaction, Vorticity Flux and Torsion Over a Generic Double-Delta Wing Configuration 1700
Markus Ruetten, Jonas Zastrow

LOW-REYNOLDS-NUMBER AND BIO-INSPIRED FLOWS II

- Numerical Analysis on Hovering Performance of Hexacopter “HAMILTON” for Mars Exploration 1715
Yuki Kishi, Masahiro Kanazaki, Masahiko Sugiura, Yasutada Tanabe, Akira Oyama, Makoto Sato
- A Rotating Disk-Wing Operating at High Advance Ratio and Low Reynolds Number 1733
Joao P. Reis Rodrigues, Joao M. Melo De Sousa
- Experimental Investigation of a Wavy Leading Edge Cylinder 1746
Paulo H. Ferreira, Rodrigo C. Moura, Tiago B. de Araújo
- Influence of Trailing-Edge Shape on the Propulsive Performance of a Plunging Flat Plate 1760
Sullivan B. Gonçalves, Emanuel A. Camacho, Andre R. Silva

MULTIPHYSICS AND CROSS-DISCIPLINARY FLOWS (E.G. FLUID-STRUCTURE INTERACTION, COMBUSTION, ETC.) II

- Pressure and Strain Measurement on a 10° Control Surface of a Slender Cone in Hypersonic Flow 1771
Amruthkiran Hegde, Zach MacIntyre, James P. Hubner, Mingtai Chen, Anshuman Pandey, John T. Flood, Katya M. Casper
- Determination of Flow Field and Structural Parameters Using Inverse Interpolation Methods..... 1788
Sruthi Chengalrayan, Rodrigo Pascual, Sergey V. Shkarayev, Kyle M. Hanquist
- Effect of Micro-Vortex Generator on Panel Flutter in Shock Wave-Boundary Layer Interaction 1798
Seshendra Palakurthy, Anup Zope, Yonghua Yan, Eric M. Collins, Shanti Bhushan
- Computational Studies of Turbulent Reacting Flows in Rear-Wall Expansion Cavity Using LES 1828
Marcel Ilie, Matthew Chan, Jackson Asiatico

SUPERSONIC AND HYPERSONIC FLOWS III

- Computational Analysis of the HIFiRE-1 Hypersonic Test Model in ANSYS Fluent..... 1838
Aidan R. Murphy, Ramesh K. Agarwal

Near-Nozzle Flow Field and Thrust Performance of Plug Nozzles Under Continuum and Rarefied Regimes	1852
<i>Arantza Jency, Ahilan Appar, Aqib Khan, Rakesh Kumar Mathpal</i>	
Shock Boundary Layer Interactions in a Supersonic Flow Over a Flexible Compression Ramp.....	1866
<i>Sangeet S. Sunderroy, Pradeepa T. Karnick, Kartik Venkatraman</i>	
Effects of Finite Radius Leading Edges on the Performance of Capsule/Waveriders for Boost-Glide Missions	1884
<i>Patrick E. Rodi</i>	
A Weakly Nonlinear Analysis for Pressure Generation in Shock Vorticity Interaction.....	1902
<i>Pranav B. Thakare, Krishnendu Sinha, Vineeth Nair</i>	

FLUID DYNAMICS OF MULTIPHASE FLOWS I

Thermal Effects of Pressure Surge and Adiabatic Compression in the Priming of Propulsion and Propellant Transfer Systems	1917
<i>Max Kandula, Brian M. Nufer, Graham K. Webster</i>	
An Experimental Study to Compare Water Droplet Impinging Dynamics and Wind-Driven Water Runback Process Over Laser Treated Surfaces with Different Wettability Characteristics	1935
<i>Haiyang Hu, Chukwudum Eluchie, Wuji Huang, Hongtao Ding, Hui Hu</i>	
Numerical Study of Particle Non-Dilute Effects in Shock Dominated Two-Phase Flow.....	1947
<i>Akhil Marayikkottu Vijayan, Deborah A. Levin</i>	
Three-Dimensional Simulations of a Shock-Particle Curtain Interaction.....	1952
<i>Brian E. Romero, Eunmo Koo, Svetlana Poroseva</i>	
Features of a Splashing Drop on a Solid Surface and the Temporal Evolution Extracted Through Image-Sequence Classification Using an Interpretable Feedforward Neural Network	1962
<i>Jingzu Yee, Daichi Igarashi, Akinori Yamanaka, Yoshiyuki Tagawa</i>	

STABILITY AND TRANSITION: SUPERSONIC

Mesh-Free RBF-based Discretizations for Hydrodynamic Stability Analysis	1975
<i>Tianyi Chu, Oliver T. Schmidt</i>	
Supersonic Transition Measurements During the BOLT Flight Experiment Descent Phase	1988
<i>Cameron Butler, Daniel Araya, Gregory McKiernan, Bradley M. Wheaton</i>	
Extension of the Amplification Factor Correlations for Circular Cylinder Flow	2014
<i>Jose M. Garro, David Angland, Zhiwei Hu</i>	
Effects of Distributed Surface Roughness on Supersonic Boundary Layer Receptivity Mechanisms	2026
<i>Bijaylakshmi Saikia, Christoph Brehm</i>	
On Linear Stability of Compression Corner Flows Obtained by Kinetic Theory.....	2057
<i>Irmak Taylan Karpuzcu, Deborah A. Levin, Nicolas Cerulus, Vassilios Theofilis</i>	

UNSTEADY AERODYNAMICS AND MASSIVELY SEPARATED FLOWS I

- Simulation of Two Cross-Flow Turbines Under Confinement..... 2066
Vineet Pasumarti, Mukul Dave, Jennifer A. Franck
- Effect of Periodic Longitudinal Gusts on Airfoil Performance Under Separated-Flow Conditions..... 2075
Suraj Bansal, Philippe Lavoie
- A Reduced-Order Discrete-Vortex Method for Flows with Leading-Edge Vortex Shedding..... 2091
Pedro Hernandez Gelado, Kiran Kumar Ramesh

INSTRUMENTATION AND DIAGNOSTIC TECHNIQUES FOR FLUID DYNAMICS I

- Carbon Dioxide Seeding System for Enhanced Rayleigh Scattering in Sandia's Hypersonic Wind Tunnel..... 2105
Ashley J. Saltzman, Steven J. Beresh, Katya M. Casper, Brian P. Denk, Rajkumar Bhakta, Marie E. De Zetter, Russell W. Spillers
- Applying Single-Pixel Ensemble Correlation to Process of Calculating Displacements in Background Oriented Schlieren..... 2124
Hikaru Sugisaki, Chungil Lee, Yuta Ozawa, Kumi Nakai, Yuji Saito, Taku Nonomura, Keisuke Asai, Yu Matsuda

SHOCK-BOUNDARY LAYER INTERACTIONS I

- Comparison of Shock-Boundary Layer Interactions in Adiabatic and Isothermal Supersonic Turbine Cascades 2130
Hugo Lui, Tulio Rodarte Ricciardi, William Wolf, Carlos A. Junqueira
- Experimental Investigations of Incident Shockwave Boundary Layer Interactions in a Continuously Operating Supersonic Wind Tunnel 2138
Lennart Rohlf, Iona Stab, Julien Weiss
- Development of a PVDF Piezo-Film Sensor Array for Unsteady Wall-Pressure Measurements in a Turbulent SBLI..... 2152
Cosimo Corsi, Lennart Rohlf, Julien Weiss, Bei Wang, Maria Kahf, Pascal Obloch, Ha Duong Ngo
- Unsteadiness in Shock/Boundary-Layer Interaction Over a Compliant Panel at Mach 2 2164
Mustafa N. Musta, Yoo-Jin Ahn, Marc A. Eitner, Jayant Sirohi, Noel Clemens
- Tunnel Environment Effects on the Single Fin-Cone at Mach 6..... 2183
John Wirth, Rodney D. Bowersox

UNSTEADY AERODYNAMICS AND MASSIVELY SEPARATED FLOWS II

- Dynamic Detection of Flow Separation Using Integral Formulation of Unsteady Boundary Layer Equations..... 2197
Marc L. Paturle, Chandan Bose, Ignazio M. Viola, Kiran Kumar Ramesh
- Comparison of Cross-Flow Turbine Dynamics with Equivalent Planar Motion Simulations 2211
Riley D. Bridges, Sara Hartke, Jennifer A. Franck

Contributions to Power Extraction in a Dual Oscillating Foil System	2223
<i>Bernardo Luiz Rocha Ribeiro, Jennifer A. Franck</i>	

INSTRUMENTATION AND DIAGNOSTIC TECHNIQUES FOR FLUID DYNAMICS II

Statistical Analysis of High-Speed Jet Flows	2233
<i>Vasily Gryazev, Vladimir Riabov, Annabel P. Markesteijn, Elnaz Naghibi, Umberto Armani, Vassili Toropov, Sergey A. Karabasov</i>	
Improvement of Signal-To-noise Ratio of Schlieren Visualization Images in Low-density Wind Tunnel Tests Using Mode-selection Based Signal Processing	2241
<i>Tsuyoshi Shigeta, Takayuki Nagata, Taku Nonomura, Keisuke Asai</i>	
Aerodynamic Hysteresis and Reynolds Number Effect of Slanted Cylinder Afterbody in Magnetic Suspension and Balance System.....	2249
<i>Kodai Tashiro, Sho Yokota, Fernando Zigunov, Yuta Ozawa, Taku Nonomura, Keisuke Asai</i>	

FLUID DYNAMICS OF MULTIPHASE FLOWS II

On the Viscosity Term in the Droplet Ratio Deformation Model	2254
<i>Suthyann Sor, Adelaida Garcia-Magariño, Angel Velazquez</i>	
Lagrangian-To-Eulerian Mapping for Modal Decomposition of Multiphase Flows Via Smoothed-Particle Hydrodynamics	2275
<i>Liam K. Magargal, Steven N. Rodriguez, Justin Jaworski, Athanasios P. Iliopoulos, John G. Michopoulos</i>	
An Experimental Study of the Near Wake Characteristics of a Rotationally Oscillating Cylinder in a Flowing Soap Film	2287
<i>Izhar H. Khan, K Manoj, Sanjay Kumar, Kamal Poddar</i>	

SHOCK-BOUNDARY LAYER INTERACTIONS II

Numerical Study on Aerodynamic Heating of a Lateral Jet Controlled Rocket.....	2296
<i>Tan Jie, Min Gong, Xiaofeng Sun, Zheng Chen, Fuqun Liu</i>	
Transonic Buffet in the Finite Span Benchmark Supercritical Wing (BSCW)	2306
<i>Magan Singh, Pradeepa T. Karnick, Kartik Venkatraman</i>	
Shock Vortex Interactions and Transonic Buffet Over a Delta Wing	2321
<i>Adithya K. Mayya, Pradeepa T. Karnick, Kartik Venkatraman</i>	

VARIOUS TOPICS IN FLUID DYNAMICS II

Roles of Multi-Dimensional Velocity Components in All-Speed Numerical Flux SLAU	2331
<i>Yoshikatsu Furusawa, Keiichi Kitamura</i>	
Natural Laminar Flow Airfoil Design Via Adjoint-Based Transition Onset Delay	2340
<i>Reza Djeddi, Kivanc Ekici</i>	
Characteristics of Non-Equilibrium Turbulence in Couette Flow Under Compressible Conditions	2357
<i>Collin Lowery, Veeraghava Raju Hasti, Reetesh Ranjan</i>	

The Theory of Supersonic Combustion Turbulence in the Rotating Detonation Engine 2369
Foluso Ladeinde

A Dynamic Multi-Grid Block Lattice Boltzmann Method for Three-dimensional Moving Boundary
Problems 2377
Farhanuddin Ahmed, Nipun Arora

Author Index