

43rd AIAA Fluid Dynamics Conference and Exhibit 2013

**San Diego, California, USA
24-27 June 2013**

Volume 1 of 3

ISBN: 978-1-62748-891-4

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 1801 Alexander Bell Drive, Reston, VA 20191, USA.

TABLE OF CONTENTS

VOLUME 1

Flow Investigation and Acoustic Measurements of an Unconfined Turbulent Premixed Jet Flame	1
<i>Holger Nawroth, Christian O. Paschereit, Feichi Zhang, Peter Habisreuther, Henning Bockhorn</i>	
Computational Fluid Dynamics Investigation of Solar Chimney Power Plant	16
<i>Fanlong Meng, Andreas Gross, Hermann F. Fasel</i>	
Investigation of Subgrid Closure Models for Finite-Rate Scramjet Combustion	30
<i>Amarnatha Potturi, Jack R. Edwards</i>	
High Fidelity Design Optimization of a Three Dimension Supersonic Intake	55
<i>Mohamed A. Aziz, Hesham Elbanna, Mohamed M. Abdulrahman</i>	
A Unified Framework for Global Instability Mechanisms in the Plane Channel, Diverging Channel and Backward-facing Step Flow	81
<i>Mamta R. Jotkar, Jose M. Perez, Rama Govindarjan, Vassilios Theofilis</i>	
An Approach for Finding Quantum Leap of Drag Reduction: Based on the Weakly-stochastic Navier-stokes Equation	94
<i>Ken Naitoh, Tsuyoshi Nogami, Takahiro Tobe</i>	
On Continuous Spectra of the Orr-Sommerfeld/Squire Equations and Entrainment of Free-stream Vortical Disturbances in the Blasius Boundary Layer	110
<i>Xuesong Wu, Ming Dong</i>	
Transition on a Wing with Spanwise Varying Crossflow Evaluated with Linear Stability Theory	136
<i>Rouven Petzold, Rolf Radespiel</i>	
Nonlinear Development of the Multiple Gortler Modes in Hypersonic Boundary Layer Flows	149
<i>Jie Ren, Song Fu</i>	
Experimental Study of Two-Dimensional Flapping Wings in Tandem Configuration	166
<i>Xiaohu Zhang, Kim Boon Lua, T. T. Lim, Khoon Seng Yeo</i>	
Modeling of Instantaneous Passive Pitch of Flexible Flapping Wings	176
<i>Chang-Kwon Kang, Wei Shyy</i>	
High Reynolds Number Flow Past a Flapping Multi-element Airfoil	188
<i>Stavros Karampelas</i>	
Numerical and Experimental Analysis of Tandem Flapping Flight	203
<i>Wee Beng Tay, Mustafa Percin, Bas Van Oudheusden, Hester Bijl, Oksan Cetiner, Mehmet Unal</i>	
Adjoint-based Shape and Kinematics Optimization of Flapping Wing Propulsive Efficiency	227
<i>Martin Jones, Nail K. Yamaleev</i>	
PIV Data Analysis Around a Flapping Wing via Proper Orthogonal Decomposition	241
<i>Wataru Yamazaki, Hidenori Yamada</i>	
A Review of Fluidic Oscillator Development	253
<i>James Gregory, Mehmet N. Tomac</i>	
Experimental Analysis of the Effect of Interaction Parameters on Synthetic Jet Actuator Arrays	270
<i>Zohaib Hasnain, Alison Flatau, James Hubbard, Aaron Sassoon, Rose Weinstein</i>	
Development and Characterization of Ultra-High Frequency Resonance-Enhanced Microjet Actuator	287
<i>Puja Upadhyay, Jonas Gustavsson, Farrukh S. Alvi</i>	
Sweeping Jet Actuator in a Quiescent Environment	309
<i>Mehdi Koklu, Latunia P. Melton</i>	
Jet Interactions in a Feedback-Free Fluidic Oscillator at Low Flow Rate	330
<i>Mehmet N. Tomac, James Gregory</i>	
Axisymmetric Simulation of Turbulent Hypersonic Flows in Contoured Nozzle	340
<i>Khalil Bensassi, Guillaume Grossir, Patrick Rambaud</i>	
On Effectiveness of a Rank-1 Model of Turbulent Channels for Representing the Velocity Spectra	348
<i>Rashad Moarref, Ati S. Sharma, Joel A. Tropp, Beverley J. McKeon</i>	
A Systems Approach to Modeling Opposition Control in Turbulent Pipe Flow	362
<i>Mitul Luhar, Ati S. Sharma, Beverley J. McKeon</i>	
Numerical Experiments with Observable Euler and Navier-Stokes Equations in Shocks and Turbulent Flows	376
<i>Kamran Mohseni, Hareshram Natarajan</i>	
Hybrid Reynolds-Averaged and Large-Eddy Simulations of a Supersonic Cavity Flameholder	387
<i>David M. Peterson, Mark A. Hagenmaier, Campbell D. Carter, Steven G. Tuttle</i>	
A Survey of Airborne Particle Impact Characteristics Using High Speed Particle Shadow Velocimetry	407
<i>Steven M. Whitaker, Daniel Reilly, Jeffrey P. Bons, Jim Crafton</i>	

Application of a Novel Approach for Turbulence Model Initialization: Preliminary Results	424
<i>Bertrand Rollin, Nicholas A. Denissen, Jon M. Reisner, Malcolm Andrews</i>	
Droplet Impact and Solidification on Hydrophilic and Superhydrophobic Substrates in Icing Conditions	437
<i>Morteza Mohammadi, Dennis De Pauw, Moussa Tembely, Ali Dolatabadi</i>	
Modeling Turbulent Rayleigh-Taylor Mixing with Dynamic Interfaces	442
<i>Nicholas A. Denissen, Bertrand Rollin, Jon M. Reisner, Malcolm Andrews</i>	
Large Eddy Simulation of Spray Mixing and Combustion with Two-Phase Mass Density Function	455
<i>Abolfazl Irannejad, Farhad Jaber</i>	
A Numerical Study of Axisymmetric Compressible Non-Isothermal and Reactive Swirling Flow	465
<i>William E. Tavernetti, Mohamed M. Hafez</i>	
Experimental Investigation of an Unconfined Swirl-Stabilized Turbulent Premixed Flame	480
<i>Holger Nawroth, Kerry A. Moriarty, Jan Beuth, Christian O. Paschereit</i>	
Vortex Breakdown and Global Modes in Swirling Combustor Flows with Axial Air Injection	492
<i>Steffen Terhaar, Thoralf G. Reichel, Christina Schrodinger, Lothar Rukes, Kilian Oberleithner, Christian O. Paschereit</i>	
Flow Field Manipulation by Axial Air Injection to Achieve Flashback Resistance and its Impact on Mixing Quality	508
<i>Thoralf G. Reichel, Steffen Terhaar, Christian O. Paschereit</i>	
Experimental Investigation of Flashback in Premixed CH₄/H₂-air Swirl Flames	520
<i>Dominik Ebi, Noel T. Clemens</i>	
Study of the Flame Structure and Dynamics Using Non-intrusive Combustion Diagnostic Techniques	534
<i>Hamidreza Gohari Darabkhani, John Oakey, Yang Zhang, Amir Keshmiri</i>	
Hypersonics Into the 21st Century: A Perspective on AFOSR-Sponsored Research in Aerothermodynamics	542
<i>John D. Schmisser</i>	
Progress in Shock Wave/Boundary Layer Interactions	562
<i>Datta V. Gaitonde</i>	
Developing Mechanism-Based Methods for Estimating Hypersonic Boundary-Layer Transition in Flight: The Role of Quiet Tunnels	586
<i>Steven P. Schneider</i>	
Optical Diagnostics for High-Speed Flows	608
<i>Richard B. Miles</i>	
Rate-Dependent Energetic Processes in Hypersonic Flows	624
<i>Graham V. Candler</i>	
Progress and Future Prospects for Particle-Based Simulation of Hypersonic Flow	638
<i>Thomas E. Schwartzentruber, Iain D. Boyd</i>	
Numerical Investigation of the Effect of Free-Stream Turbulence on Separation Control by Pulsed Vortex Generator Jets	657
<i>Shirzad Hosseinverdi, Hermann F. Fasel</i>	
The Effect of Wavepacket Frequency Bandwidth on the Laminar-Turbulent Transition Process in a Blasius Boundary Layer	686
<i>Kean Lee Kang, Khoon Seng Yeo</i>	
VESTA Toolkit: a Software to Compute Transition and Stability of Boundary Layers	703
<i>Fabio Pinna</i>	
Direct Numerical Simulation of Transition in a Swept Wing Boundary Layer	712
<i>Lian Duan, Meelan M. Choudhari, Fei Li</i>	
Numerical Investigation of the Spatial Development of a Wave Packet in Laminar Boundary Layers with Zero and Adverse Pressure Gradient	727
<i>Anthony Haas, Hermann F. Fasel</i>	
On Self-Sustained Flow-Acoustic Resonant Interactions in Airfoil Transitional Boundary Layers	751
<i>Vladimir V. Golubev, Lap Nguyen, Reda R. Mankbadi, Jonathan G. Dudley, Miguel R. Visbal, Michel Roger</i>	
Global stability Analysis with Compressible CFD Solver	767
<i>Florian Guiho, Frédéric Alizard, Jean-Christophe Robinet</i>	
On the Two Classes of Global Primary Modal Instability in Laminar Separation Bubbles	781
<i>Daniel Rodriguez, Elmer M. Gennaro, Matthew P. Juniper</i>	
Active Control of Tip Leakage Flow for Low-Pressure Turbine by Ring-Type Plasma Actuators	796
<i>Takayuki Matsunuma, Takehiko Segawa</i>	
Geometry/Grid Generation for 3D Multi-Disciplinary Simulations in Multi-Stage Turbomachinery	806
<i>Roger L. Davis, John Clark</i>	

Aerodynamic Characterization of Three-dimensional Turbofan Bypass-flow Heat Exchanger Effects in an Intermittent Transonic Facility	817
<i>Laura Villafaña, Guillermo Paniagua</i>	
Effect of Number of Slots and Overlap on the Performance of Non-circular Ejector Air Diffuser	N/A
<i>Sidh N. Singh</i>	
Numerical Flow Analysis in Centrifugal Compressor Near Surge Condition	834
<i>V. Jyothishkumar, Mihai Mihaescu, Bernhard Semlitsch, Laszlo Fuchs</i>	
Three-Dimensional Numerical Modeling of Tip Leakage Flow over a Cylinder	847
<i>Ovais U. Khan, Javed Khan</i>	
Multi-Objective Design Optimization of a Transonic Compressor Rotor Using an Adjoint Equation Method	857
<i>Jiaqi Luo, Feng Liu</i>	
Impinging Shock Wave - Boundary Layer Interactions on a Three-Dimensional Body	871
<i>Eric J. Stephen, John A. Farnsworth, Christopher O. Porter, Robert Decker, Thomas E. McLaughlin, Jonathan G. Dudley</i>	
Analysis of the Large Eddy Simulation of a Shock Wave and Turbulent Boundary Layer Interaction	890
<i>Justine Li, Nathan E. Grube, Stephan Priebe, Pino Martin</i>	
Dynamics of a Shock-induced Separation in a Transonic Flow: a Linearized Approach	903
<i>Fulvio Sartor, Mettot Clement, Denis Sipp, Reynald Bur</i>	
Shock Induced Separation in Transitional Hypersonic Boundary Layers	919
<i>Leon Vanstone, David Estruch-Samper, Richard Hillier, Bharathram Ganapathisubramani</i>	
Traveling Crossflow Instability for HIFiRE-5 in a Quiet Hypersonic Wind Tunnel	928
<i>Matthew P. Borg, Roger L. Kimmel, Scott Stanfield</i>	

VOLUME 2

Boundary-Layer Transition Experiments in a Hypersonic Quiet Wind Tunnel	945
<i>Christopher Ward, Roger Greenwood, Andrew Abney, Steven P. Schneider</i>	
Simultaneous Pressure Measurements and High-Speed Schlieren Imaging of Disturbances in a Transitional Hypersonic Boundary Layer	965
<i>Katya M. Casper, Steven J. Beresh, Ross Wagnild, John Henfling, Russell Spillers, Brian Pruett</i>	
Numerical Investigation of Transition Delay Using Porous Walls	989
<i>Christoph Hader, Christoph Brehm, Hermann F. Fasel</i>	
Numerical Simulation of Freestream Waves Receptivity and Breakdown over Mach 6 Flared Cone	1012
<i>Jia Lei, Xiaolin Zhong</i>	
Study on Stabilization and Destabilization Effect of a Smooth Hump in Hypersonic Boundary Layers by PSE	1032
<i>Donghun Park, Seung Park</i>	
An Empirical Model of Nanosecond Pulsed SDBD Actuators for Separation Control	1054
<i>Zhenli Chen, Linzhao Hao, Binqian Zhang, Hua Liang, Yinghong Li</i>	
Numerical Simulations Exploring Dielectric Barrier Discharge-Induced Steady and Pulsed Suction	1067
<i>Philip E. Morgan, Miguel R. Visbal</i>	
Effects of Pulse Polarity on Nanosecond Pulse Driven Dielectric Barrier Discharge Plasma Actuators	1099
<i>Robert Dawson, Jesse C. Little</i>	
Aerodynamic Flow Acceleration with One Atmosphere Uniform Induced by Single and Multiple DBD Plasma Actuation Based on PIV	1112
<i>Feng Li, Chao Gao, Borui Zheng, Yushuai Wang, Zhe Lv, Donggang Cao</i>	
Local Acoustic Forcing of a Wing at Low Reynolds Numbers	1129
<i>Shanling Yang, Geoffrey Spedding</i>	
Significance of Three-dimensional Unsteady Flows inside the Cavity on Separated-flow Control around a NACA0015 using a Synthetic Jet	1147
<i>Yoshiaki Abe, Koichi Okada, Makoto Sato, Taku Nonomura, Kozo Fujii</i>	
On the Performance of Boundary Layer Suction for Secondary Flow Control in a High Speed Compressor Cascade	1163
<i>Karsten Liesner, Robert Meyer, Christoph Gmelin, Frank Thiele</i>	
Massive Parametric Study by LES on Separated-flow Control around Airfoil using DBD Plasma Actuator at Reynolds Number 63,000	1172
<i>Makoto Sato, Koichi Okada, Taku Nonomura, Hikaru Aono, Aiko Yakeno, Kengo Asada, Yoshiaki Abe, Kozo Fujii</i>	
Numerical Investigation of Separation Control for Wing Section at Re=300,000	1196
<i>Andreas Gross, Hermann F. Fasel</i>	

Effects of High Voltage Pulsed DBD on the Aerodynamic Performances in Subsonic and Transonic Conditions	1210
<i>Antonello Marino, Pietro Catalano, Claudio Marongiu, Philip Peschke, Christoph Hollenstein, R. Donelli</i>	
The Mixing Layer Perturbed by a Dielectric Barrier Discharge	1225
<i>Richard Ely, Jesse C. Little</i>	
Experimental Measurements of Convective Mass Transfer from a Surface Due to a Bound Vortex Flow	1244
<i>Nicholas M. Vachon, Darren L. Hitt</i>	
The Interaction of Hyperbolic and Shear Stretching in Geophysical Vortex Flows	1263
<i>Douglas M. Lipinski, Kamran Mohseni</i>	
Vortex Interactions with a High-lift Airfoil in a Low Speed Wind Tunnel	1273
<i>David G. Hahn, Simon Klein, Peter Scholz, Rolf Radespiel</i>	
Cascading of Vortical Structures and Transition to Turbulence	1287
<i>Viswanath R. Katta, William M. Roquemore</i>	
Stationary and Traveling Vortical Structures on Swept Cylinders and Turbine Blades	1297
<i>J Paul Gostelow, Aldo Rona, Stephen J. Garrett, William A. McMullan</i>	
Instabilities on a Hypersonic Yawed Straight Cone	1308
<i>Eduardo Perez, Helen L. Reed, Joseph Kuehl</i>	
Spatial Linear Global Instability Analysis of the HIFiRE-5 Elliptic Cone Model Flow	1319
<i>Pedro Paredes, Vassilis Theofilis</i>	
Effect of Local Volume Energy Supply on High-speed Boundary Layer Stability	1333
<i>Vitaly Soudakov, Alexander V. Fedorov, Alexander Ryzhov</i>	
Stability and Receptivity of High Speed Boundary Layers in Oxygen	1344
<i>Jill Klentzman, Anatoli Tumin</i>	
Statistical Inverse Analysis and Stochastic Modeling of Transition	1379
<i>Gennaro Serino, T. Magin, Patrick Rambaud, Fabio Pinna</i>	
Nonlinear Dimensionality Reduction for Parameterized Partial Differential Equation	1391
<i>Liqian Peng, Kamran Mohseni</i>	
Control of a Canonical Separated Flow	1403
<i>John C. Griffin, Matias Oyarzun, Louis N. Cattafesta, Jonathan H. Tu, Clarence W. Rowley, Rajat Mittal</i>	
Launch Vehicle Cavity Venting: Modeling Concepts & Validation	1422
<i>Dimal Patel</i>	
Film-Cooling Jets Analyzed with Proper Orthogonal Decomposition and Dynamic Mode Decomposition	1438
<i>Guillaume Bidan, Dimitris Nikitopoulos</i>	
Nonlinear Model Reduction via Piecewise Balance Truncation	1453
<i>Weigang Yao, Meng-Sing Liou</i>	
Enhanced Laminar Mixing in Multifluid Droplets via Multiphase Flow in a Microchannel	1473
<i>Michael R. McDevitt, Darren L. Hitt</i>	
Slip at the Triple Contact Point in Two Phase Flow in Microchannels	1488
<i>Joseph J. Thalakkottor, Kamran Mohseni</i>	
Spray Simulations to Support the Development of a Monte Carlo-Based Spray Cooling Model	1496
<i>Murat Dinc, Donald D. Gray, Nicholas L. Hillen, Jon Stephen Taylor, John Kuhlman</i>	
Droplet Impact Time Histories for a Range of Weber Numbers and Liquid Film Thicknesses for Spray Cooling Application	1520
<i>Nicholas L. Hillen, Christopher P. Menchini, Gary J. Morris, Murat Dinc, Stephen Taylor, Donald D. Gray, John M. Kuhlman</i>	
Numerical Investigation on RCS Jet Interactions for a Mars Entry Vehicle	1542
<i>Shingo Matsuyama, Hiroki Takayanagi, Kazuhisa Fujita</i>	
A Parametric Study of Ethylene-fueled Scramjet Combustion	1555
<i>Niccolo Cymbalist, Paul Dimotakis</i>	
Free-flight Tests of Reentry Capsule Models in Free-piston Shock Tunnel	1564
<i>Hideyuki Tanno, Tomoyuki Komuro, Kazuo Sato, Katsuhiro Itoh</i>	
On Global Linear Instability Analysis of Hypersonic Flow Around a Model Re-Entry Vehicle	1571
<i>Vassilios Theofilis, Miguel Hermanns, P. Paredes, E. M. Gennaro</i>	
Real Gas and Surface Ablation Effects on Hypersonic Boundary Layer Instability over a Blunt Cone	1581
<i>Clifton H. Mortensen, Xiaolin Zhong</i>	
Stability and Unsteadiness in a 2D Laminar Shock-Induced Separation Bubble	1606
<i>Andrea Sansica, Neil Sandham, Zhiwei Hu</i>	
High-Order Simulation of Induced Disturbance in a Mach 6 Boundary Layer	1624
<i>Harold L. Atkins</i>	

Linearized Navier-Stokes Simulation of the Spatial Stability of a Hypersonic Boundary Layer in Chemical Equilibrium	1637
<i>Leonardo Salemi, Hermann F. Fasel</i>	
Stabilization of Hypersonic Boundary Layer Waves Using 2-D Surface Roughness	1656
<i>Kahei Danny Fong, Xiaowen Wang, Xiaolin Zhong</i>	
An Efficient CFD-based PID Control of Free Shear Layer Flow	1676
<i>Utpender K. Kaul</i>	
Stability Analysis of the Flow Around a Cylinder Fitted with Helical Strakes	1692
<i>Francisco Gomez, Jose Hermida Quesada, Raquel Gomez, Vassilis Theofilis, Bruno Carmo, Julio Meneghini</i>	
On the Cylinder Wake Subjected to In-Phase and out-of-Phase Periodic Forcing	1710
<i>Anwar Ahmed, Michael H. Moore, Hamza A. Hafez</i>	
A Computational Analysis of the Flow Over a Side-supported Sphere with Localised Synthetic Jet	1720
<i>Nicholas Findanis, Noor Ahmed</i>	
Multi Objective Optimization of a Synthetic Jet Acting on a Separated Flow Over a Hump	1740
<i>Masamichi Nakamura, Taku Nonomura, Yoshifumi Inatani</i>	
Performance of Heaving and Passively Pitching Hydrofoils	1749
<i>Joris Matheijssens, Jean-Paul Marcel, Walter Bosschaerts, Dirk Lefebber</i>	
Effects of Planform Geometry and Pivot Axis Location on the Aerodynamics of Pitching Low Aspect Ratio Wings	1764
<i>Huai-Te Yu, Luis P. Bernal, Michael V. Ol</i>	
Wake Structure of Plunging Finite Wings	1802
<i>Dario E. Calderon, David Cleaver, Zhi-Jin Wang, Ismet Gursul</i>	
Compliance Effects in Dynamically Pitching Wind Turbine Airfoils	1815
<i>Andrew Magstadt, John Strike, Pourya Nikoueeyan, Michael Hind, Jonathan W. Naughton</i>	
Numerical Investigation of the Flow Prediction Around a Wall-mounted Rectangular Cylinder	1832
<i>Zixiang Chen, Mouhammad El Hassan, Zahra Hosseini, Robert Martinuzzi</i>	
Enforcement of Flow-induced Oscillations of a Circular Cylinder Due to Interference Effects - numerical Simulations and Experimental Studies-	1841
<i>Robert Heinze, Sebastian Beckers, Tim Wahl, Frank Kameier, Christian O. Paschereit</i>	
Detached Eddy Simulations of Supersonic Jets Impinging on Flat Plates	1859
<i>Yuvraj Dewan, Vladimir V. Golubev, Anastasios S. Lyrintzis, Reda R. Mankbadi, Konstantin A. Kurbatskii, El'haisam Osman</i>	
Direct Numerical Simulation of a Rectangular Supersonic Jet Impinging on a Solid Wall	1876
<i>Kareem Akhtar, Saad A. Ragab</i>	
Unsteady Modeling of Jet-in-Crossflow Problems	1893
<i>Srinivasan Arunajatesan, Mary A. McWherter-Payne</i>	

VOLUME 3

Numerical Investigation of Scalar Mixing in the Turbulent Wake of a Square Cylinder	1904
<i>Guido Lodato, Riccardo Rossi</i>	
Numerical Simulation of the Nozzle and Test Section of a Mach 6 Ludwig Tube	1921
<i>Brice Aghababian, Benoit Reymond, Russell M. Cummings</i>	
Visualization of Shock Train-Boundary Layer Interaction in Mach 2.5 Isolator Flow	1943
<i>Jonathan S. Geerts, Kenneth H. Yu</i>	
Oscillation of Bow-shock Waves at Hypersonic Speeds	1956
<i>Keisuke Fujii, Shoichi Tsuda, Tadao Koyama, Noriaki Hirabayashi</i>	
Nitric Oxide Chemistry Effects in Hypersonic Boundary Layers	1965
<i>Chris Arisman, Craig T. Johansen, Wagner Galuppo, Allison McPhail</i>	
Roughness Induced Transition in a Supersonic Boundary Layer	1986
<i>Ponnampalam Balakumar, Michael Kegerise</i>	
Uncertainty Quantification Based Receptivity Modelling of Crossflow Instabilities Induced by Distributed Surface Roughness in Swept Wing Boundary Layers	2004
<i>Mohammed S. Mughal, Richard M. Ashworth</i>	
Distributed-Roughness-Induced Transient Growth in a Flat Plate Boundary Layer	2025
<i>Matthew S. Kuester, Edward B. White</i>	
The Effect of Two-Dimensional Geometric Disturbances on Boundary-Layer Stability	2042
<i>Donald P. Rizzetta, Miguel R. Visbal</i>	
The Influence of a Cylindrical Roughness Element on a Perturbed Laminar Boundary Layer	2066
<i>Benjamin Plogmann, Werner Wuerz</i>	

Effect of a Small Surface Wave on Boundary-Layer Transition	2084
<i>Andres Garzon, Matthew W. Roberts</i>	
Studies of Roughness-induced Transition Using Three-Equation $k-\omega-\gamma$ Transition/Turbulence Model	2096
<i>Zhixiang Xiao, Minghua Zhang, Lianghua Xiao, Song Fu</i>	
Direct Numerical Simulation of Hypersonic Transition Induced by a Cylindrical Roughness Element	2109
<i>Zhiwei Duan, Zhixiang Xiao, Song Fu</i>	
Application of Aerospikes for Lifting-Body Configuration in Hypersonic Flow at Mach 7	2124
<i>Shashank Khurana, Kojiro Suzuki</i>	
A Novel Means of Dissipation of Shock Wave Induced Heat in a High Speed Flow	2135
<i>Yongying Zheng, Noor Ahmed</i>	
Plasma Control of SW Configuration in M=2 Inlet at Off-Design Mode	2144
<i>Sergey B. Leonov, Alexander Firsov, Francois Falempin, Marat A. Goldfeld</i>	
Active Shock Control in a Transonic Flow	2153
<i>Abraham N. Gissen, Bojan Vukasinovic, Ari Glezer, Gogineni Sivaram</i>	
Three - Dimensional Flowfield of Microjets in Supersonic Crossflow	2169
<i>Mohd Yousuf Ali, Nishul Arora, Farrukh S. Alvi</i>	
Closing the Loop: An Explicit Calculation of the Nonlinearity in the Resolvent Formulation of Wall Turbulence	2193
<i>Ati S. Sharma, Beverley J. McKeon</i>	
Turbulence Structure and its Signature in Hypersonic Turbulent Boundary Layers	2203
<i>Yin Chiu Kan, Beekman Izaak, M. Pino Martin</i>	
Examination of the Spatially Developing Wind Turbine Boundary Layer: Low Dimensional Analysis, Large Scales of Motion and Energy Entrainment	2229
<i>Luciano Castillo, Andrew J. Newman</i>	
Turbulence Diffusion Effects at Material Interfaces, with Application to the Rayleigh-Taylor Instability	2240
<i>Pooya Movahed, Eric Johnsen</i>	
Experimental and Numerical Investigations on Drag induced by Flat Plate Imperfections in Compressible Flow Regimes	2259
<i>Pascal Molton, David Hue, Reynald Bur</i>	
Characterization of Fluorescent Polystyrene Microspheres for Advanced Flow Diagnostics	2277
<i>Pietro Maisto, Kevin T. Lowe, Gwibo Byun, Roger Simpson, Max Verkamp, Jason E. Danley, Brian Koh, Pacita I. Tiemsin, Paul M. Danehy, Christopher J. Wohl</i>	
Compensation Method for the Estimation of the Autospectral Density Function of the Unevenly Spaced HIFiRE-1 Flight Data	2292
<i>Scott Stanfield, Roger L. Kimmel</i>	
Thermodynamic Characterization of Supersonic Expansions Using Shadowgraphy and Numerical Simulations	2313
<i>Juan M. Lorenzi, Carlos A. Rinaldi, Cynthia Toro Salazar, Mayo Villagran, Salvador C. Ortiz</i>	
Flow Interaction Analysis Near the Upstream Cavity Edge under Turbulent Incident Flow	2323
<i>Mariano Garcia Sainz, Sebastien Delnero, Julio Maranon Di Leo, Jorge Colman Lerner, Santiago Algozino</i>	
Experimental Investigation of Fluid-Structure Interactions in Compressible Cavity Flows	2338
<i>Justin L. Wagner, Steven J. Beresh, Katya M. Casper, John Henfling, Russell Spillers, Patrick Hunter, Randy Mayes</i>	
An Experimental Investigation of Supersonic Cavity Flow Control with Vertical Cylinders	2361
<i>Garrett J. Milne, Carolyn C. Thieman, Adam Vakili</i>	
Sensitivity Analysis and Passive Control of a Compressible Turbulent Flow in a Deep Cavity	2374
<i>C. Mettot, F. Renac, D. Sipp</i>	
Simulation of Wing Stall	2386
<i>Rolf Radespiel, Daniela G. Francois, David Hoppmann, Simon Klein, Peter Scholz, Katharina Wawrzinek, Thorsten Lutz, Torsten Auerswald, Jens Bange, Christoph Knigge, Philip Kelleners, Ralf Heinrich, Silvia Reuss, Axel Probst, Tobias Knopp, Siegfried Raasch</i>	
Non-planarity to Improve Subsonic Performance of Delta Wing at Low Angles of Attack	2406
<i>Noor Ahmed, Yongying Zheng</i>	
Shape, Lift, and Vibrations of Highly Compliant Membrane Wings	2413
<i>Rye M. Waldman, Kenny S. Breuer</i>	
Low Aspect Ratio Oscillating Flexible Wings at Low Reynolds Numbers	2433
<i>David Cleaver, Dario E. Calderon, Zhi-Jin Wang, Ismet Gursul</i>	
High-Fidelity Simulations of a Flexible Heaving Finite-Aspect-Ratio Wing	2453
<i>Caleb J. Barnes, Miguel R. Visbal, Raymond E. Gordnier</i>	
Effect of Wing Platform on Aerodynamic Characteristics at Low Reynolds Numbers using a Low Density Wind Tunnel	2483
<i>Masayuki Anyoji, Tianshu Liu, Taku Nonomura, Akira Oyama, Kozo Fujii</i>	

Three-Equation K-ϵ-V_n Turbulence Model for High-Speed Flows	2493
<i>Alexander M. Molchanov, Leonid V. Bykov</i>	
Application of a New One-Equation Turbulence Model to Computations of Separated Flows	2523
<i>Timothy Wray, Ramesh K. Agarwal</i>	
Large-Eddy Simulation of Particles and Bubbles Collisions in Homogeneous Isotropic Turbulence	2538
<i>Hassan Fayed, Saad A. Ragab</i>	
Implicit Large-Eddy Simulation of Isotropic Turbulent Mixing	2554
<i>Fernando F. Grinstein, Adam Wachtor, Carl R. Devore, J. R. Ristorcelli</i>	
LES of a High-Reynolds Number, Chemically Reacting Mixing Layer	2561
<i>Pietro Ferrero, Anand Kartha, Pramod K. Subbareddy, Graham V. Candler, Paul Dimotakis</i>	
Plunging and Heaving Airfoils: Imposed Forward Motion or Self-Propulsion?	2582
<i>S. Etienne, F. Plante, A. Hay, D. Pelletier, J. F. Cori, A. Garon</i>	
Jet Impingement on a Surface Using Pressure Sensitive Paint and CFD	2592
<i>Steve Palluconi, Jim Crafton, Haibo Dong</i>	
Experimental Investigation of Fluid-structure Interaction In Elastic Vessels	2615
<i>Kai Pielhop, Michael Klaas, Wolfgang Schroder</i>	
A Monolithic Approach for the Numerical Simulation of Fluid Structure Interaction Problems	2625
<i>Ali Eken, Mehmet Sahin</i>	
Direct Numerical Simulation of the Aeroelastic Response of a Panel Under High Speed Turbulent Boundary Layers	2644
<i>Christopher Ostoich, Daniel J. Bodony, Philippe H. Geubelle</i>	
Unsteady Shock Motion in a Transonic Flow over a Wall-Mounted Hemisphere	2674
<i>Steven J. Beresh, John Henfling, Russell Spillers, Brian Pruett</i>	
Study of Shock-shock Interactions for the HET Facility Double Wedge Configuration Using the DSMC Approach	2686
<i>Varun N. Patil, Deborah A. Levin, Sergey F. Gimelshein, Joanna M. Austin</i>	
Spectral Characteristics of Separation Shock Unsteadiness	2717
<i>Jonathan Poggie, Nicholas J. Bisek, Roger L. Kimmel, Scott Stanfield</i>	
Simulations of a Normal Shock Train in a Constant Area Duct Using Wall-Modeled LES	2740
<i>Zachary P. Vane, Sanjiva K. Lele, Ivan Bermejo-Moreno</i>	
Numerical Simulation of Transonic Buffet on Swept Wing of Supercritical Airfoils	2764
<i>Juntao Xiong, Feng Liu</i>	
Fundamental Study on Numerical Methods of Global Instability Analysis for Compressible Flows with Shock Wave	2781
<i>Yuya Ohmichi, Kojiro Suzuki</i>	
Numerical Simulation of Hydrodynamics of an Annular Hybrid Injector	N/A
<i>Souwick Chatterjee, Soumik Mahapatra, Achintya Mukhopadhyay, Swarnendu Sen</i>	
Towards Full-scale Numerical Simulations of a Traveling-wave Thermoacoustic Stirling Heat Engine	2790
<i>Carlo Scalo, Jeffrey Lin, Sanjiva K. Lele, Lambertus Hesselink</i>	
Range-dependent Propagation Modeling of Infrasonics in Complex Atmospheres	2805
<i>Grégory Dergham, Christophe Millet</i>	
Design of Free-surface Interfaces Using RANS Equations	2814
<i>Francisco Palacios, Juan J. Alonso, Antony Jameson</i>	
Effect of Mach Number on Linear Stability of Lid-driven Cavity Flows	2831
<i>Leandro F. Bergamo, Elmer M. Gennaro, Marcello Medeiros</i>	
Two Dimensional Numerical Study of the Flow over a Bridge Deck with the Open Source CFD Tool OpenFOAM	2840
<i>Gennaro Campitelli, Vesselin K. Krastev, Wade W. Huebsch, Mridul Gautam</i>	
Author Index	