# TABLE OF CONTENTS

## VOLUME 1

Aeropropulsion for Commercial Aviation in the 21st Century and Research Directions Needed .......................................................... 1

Alan Epstein

Aeroacoustics of Three-Stream High-Speed Jets from Coaxial and Asymmetric Nozzles .............................................................. 18

Dimtri Papamoschou, Andrew Johnson, Vincent Phong

Directivity Effects of Shaped Plumes from Plug Nozzles .................................................................................................................. 38

James Chase, Andres Garzon, Dimitri Papamoschou

A Comprehensive Investigation of Pulsed Fluidic Injection for Active Control of Supersonic Jet Noise .......................................... 54

Daniel Cappello, Ephraim Gutmark, Henklo Hjörnsson, Lars-Erik Eriksson, Erik Prissel

Prediction of Jet Noise Shielding with Forward Flight Effects ............................................................................................................. 76

Salvador Mayoral, Dimitri Papamoschou

Reduced Order Models for a High Speed Jet with Time-Resolved PIV .............................................................................................. 93

Zachary Berger, Kerwin Low, Matthew Berry, Mark Glauser, Stanislav Kostka, Sivaram Gopinath, Laurent Cordier, Bernd Mouck

Exhaust Nozzle Plume and Shock Wave Interaction ......................................................................................................................... 107

Raymond Castner, Alan Ehrlich, Susan Cliff

Numerical and Experimental Research of 3D Intake for Cruise Supersonic Business Aircraft ......................................................... 128

Vladimir Stepanov, Yakov Melnikov, Viacheslav Yinogradov

Effects of Hybrid Flow Control on a Normal Shock Boundary-Layer Interaction ................................................................................. 144

Stefanie Hirt, Manan Vyas

Pressure and Shock Dynamics of a Low-Boom Inlet .......................................................................................................................... 167

Michael Rybalko, Sean Canadon, Eric Loth

A Canonical Normal SBLI Flow Relevant to External Compression Inlets .......................................................................................... 185

Eric Loth, Holger Babinsky, Neil Titchen, Louis Povinelli

Hypervelocity Boundary Layer Studies for Inward-Turning Inlets ..................................................................................................... 208

William Faherty, Joanna Austin

The Effects of Various Vortex Generator Configurations on a Normal Shock Wave / Boundary Layer Interaction ............................. 219

Neil Titchen, Holger Babinsky, Eric Loth

Design, Build and Fly: NASA Lockheed P-3 Orion with External Antenna Fairings ........................................................................ 243

William Anusmai, Balaji Kaoosik, Wuspo Liu, Min Yang, Matthew Brown, Richard Hala

CFD Analysis of Waveriders Derived from Azimuthal Flowfields for Reentry Applications ......................................................... 265

Frederick Ferguson, Nasuassia Dasque

Japan's Supersonic Technology and Business Jet Perspectives ........................................................................................................... 274

Kimos Sakata

The Conceptual Design Study of a Patrol and Search and Rescue Wing-In-Ground Effect Craft .......................................................... 281

Andrzei Majka

A Case Study of Design, Performance and Economic Analysis of Light Sport Airplanes ................................................................ 292

Venkat Ksansa Sundararajan

Design of an Advanced Turboprop Aircraft for Regional Operations with Ninety Passengers ......................................................... 301

A. Felipe Giraldo, Julio E. Parra, Roy S. Soler, Maycol F. Escorcia, Julian D. Martinez, Guido A. Puentes, Hernan D. Ceron

Interactions in Over-Wing Nacelle Optimization .............................................................................................................................. 321

Steven Berguin, Dimtri Marvis

Uncertainty Quantification for Mars Entry, Descent, and Landing Reconstruction Using Adaptive Filtering ........................................... 336

Soumyo Dutta, Chris Karlgaard, Robert Braun

Entry, Descent, and Landing with Propulsive Deceleration: Supersonic Retropropulsion Wind Tunnel Testing and Shock Phenomena .................................................................................................................. 351

Bryan Palaszewski

Mars Entry Atmospheric Data System Trajectory Reconstruction Algorithms and Flight Results ...................................................... 374

Chris Karlgaard, Prasad Katty, Jeremy Shidner, Mark Schoenenger, Michelle Munk

Variable Angle-of-attack Profile Entry Guidance for a Crewed Lifting Body ....................................................................................... 401

Zachary Putnam, Michael Grant, Jenny Kelly, Robert Braun, Zachary Krever

Drag Modulation Flight Control System Options for Planetary Aerocapture .................................................................................... 420

Zachary Putnam, Robert Braun

Rapid Robust Design of a Deployable System for Boost-Glide Vehicles ............................................................................................ 441

Bradley Steinfeld, Grant Rossman, Robert Braun, Gregg Bartoson

Test Capabilities in the CCAPS/CSDL Augmentor Development Facility ......................................................................................... 460

Ryan Blanchard, Andrew Wickersham, Isaac Yeaton, Cory Fleischman, Srinath Ekkada, Wing Ng, Uri Vandsburger, Lin Ma, Todd Love

NO PLIF Visualizations of the Orion Capsule in LEN5 ......................................................................................................................... 470

Christopher Combs, Noel Clemens, Paul Danely, Brett Barthel, Ron Parker, Tim Wadhams, Michael Holden, Benjamin Kirk

OH PLIF Visualization of the UAV Supersonic Combustion Experiment: Configuration C .............................................................. 496

Colin McRae, Craig Johansen, Paul Danely, Emanuela Gallo, Luca Cantu, Gaetano Magnotti, Andrew Cuel, Robert Rockwell, Christopher Goyn, James McDaniel

Characterization of the H1 Arc Heater Facility by Laser-Induced Fluorescence ............................................................................. 512

Douglas Bamford, Elizabeth Cunnings, Dmitriy Panasenko, Harriort Legten, John Cronin, Andrew Alexander, Robert Howard, Joseph Wehrmeier, Jeff Stewart
Effect of Free-Stream Turbulence on Control of Laminar Separation Bubbles Using Pulsed Vortex Generator

Crossflow in Scramjet Engines Configurations

Characterization of Shape Memory Alloys Using Artificial Neural Networks

Fiber-based Emission Spectroscopy on a Cylindrical Body in the T-ADFA Hypersonic Shock Tunnel

Reducing Shock Interactions in a Single Stage High Pressure Turbine via 3D Aerodynamic Shaping

Development of the Chamber for Atmospheric and Orbital Space Simulation (ChAOSS) for Experimental Analysis of Combined Effects

Numerical Investigation of the HIFiRE-2 Scramjet Flowpath

Simplications of Serpentine Plasma Actuators in a Laminar Boundary Layer

Suppression of Vortex Shedding from a Circular Cylinder by using a Suction Flow Control Method

PIV Study of Conical Forebody Flow Control Using Plasma Actuators

Reduction of Aft Fuselage Drag on the C-130 Using Microvanes

Yaw Control of a Moving Axisymmetric Body using Synthetic Jets

Guidance on the Stand Down, Mothball, and Reactivation of Ground Test Facilities

A Proposed Approach for Prioritizing Maintenance at NASA Centers

FY11 Facility Assessment Study for Aeronautics Test Program

Performance and Emission of a Biofueled Micro Turbojet Engine

Conceptual Design of Aeropropulsion Engine Heat Exchangers Part 1: Micro channels and Selection of Advanced Configurations

Conceptual Design of Aeropropulsion Engine Heat Exchangers Part 2: Offset Fin Micro channels

VOLUME 3


Thermodynamic Characteristics of a Turboprop Engine with Heat Exchangers for Unmanned Aerial Vehicles

Computational Investigation of Fuel Injection with Various Injector Geometries and Mixing into Hypersonic Crossflow in Scramjet Engines

IDDES of a Dual-Mode Ethylene Fueled Cavity Flameholder with an Isolator Shock Train

Continued Hybrid LES /RANS Simulation of a Hypersonic Dual-Mode Scramjet Combustor

Design and Stream Thrust Analysis of a Scramjet Engine for Acceleration Mission from 2 to 3 km/s

Design and Analysis of an Active Leading Edge Wing

GPS Results for the Radio Aurora Explorer II CubeSat Mission

Wireless Strain Sensing for Spacecraft Application

Development of the Chamber for Atmospheric and Orbital Space Simulation (ChAOSS) for Experimental Analysis of Combined Effects

Reducing Shock Interactions in a Single Stage High Pressure Turbine via 3D Aerodynamic Shaping

Fiber-based Emission Spectroscopy on a Cylindrical Body in the T-ADFA Hypersonic Shock Tunnel

Fault Tolerant Model Predictive Control of a Turbofan Engine using C-MAPSS40k

Characterization of Shape Memory Alloys Using Artificial Neural Networks

Orbit Determination of an Uncooperative Maneuvering RSO During Proximity Operations
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color-Coded Three-Dimensional Micro Particle Tracking Velocimetry and Its Applications</td>
<td>2067</td>
</tr>
<tr>
<td>Fabrication and Characterization of Small-scale Pneumatic Artificial Muscles for a Bio-Inspired Robotic Hand</td>
<td>2078</td>
</tr>
<tr>
<td>Bidirectional Helical Motion in Tapered Rocket Chambers</td>
<td>2089</td>
</tr>
<tr>
<td>Numerical Simulation of Plasma Actuators for Flow Control</td>
<td>2100</td>
</tr>
<tr>
<td>Thrust Augmentation of a Solid Rocker Motor by Means of Inert Gas Injection</td>
<td>2111</td>
</tr>
<tr>
<td>Polar Orbiting Passive Atmospheric Calibration Spheres [POPACS]-Sphere and Container Development</td>
<td>2122</td>
</tr>
<tr>
<td>Design, Fabrication, and Testing of a Transport UAV</td>
<td>2130</td>
</tr>
<tr>
<td>Design, Build, and Testing of a Swept Back Free-Wing Aircraft</td>
<td>2141</td>
</tr>
<tr>
<td>DayStar: Modeling the Daytime Performance of a Star Tracker for High Altitude Balloons</td>
<td>2150</td>
</tr>
<tr>
<td>Multidisciplinary Optimization of Wing Structure Using Parametric Models</td>
<td>2161</td>
</tr>
<tr>
<td>Elastically Shaped Wing Optimization and Aircraft Concept for Improved Cruise Efficiency</td>
<td>2173</td>
</tr>
<tr>
<td>Multi-Objective Wing Shape Optimization of an Elastically-Shaped Aircraft Concept</td>
<td>2217</td>
</tr>
<tr>
<td>Aerelastic Characteristics of High-Aspect-Ratio Wing According to Wing Shape</td>
<td>2233</td>
</tr>
<tr>
<td>Transonic Wing-body Civil Transport Aircraft Aero-Structural Design Optimization using a Bi-Level High Fidelity Approach - A Focus on the Aerodynamic Process</td>
<td>2241</td>
</tr>
<tr>
<td>Economic Assessment of Morphing Leading Edge Systems in Conceptual Aircraft Design</td>
<td>2256</td>
</tr>
<tr>
<td>Adjoint Based Aerodynamic Optimisation of a UCAV</td>
<td>2270</td>
</tr>
<tr>
<td>A 2nd Generation Parallel Advancing Front Grid Generator</td>
<td>2291</td>
</tr>
<tr>
<td>Mesh Rupturing: A Technique for Geometry Insertion and Significant Mesh Movement</td>
<td>2309</td>
</tr>
<tr>
<td>Anisotropic Mesh Adaptation: Recovering Quasi-structured Meshes</td>
<td>2326</td>
</tr>
<tr>
<td>Using the Medial Axis to Represent Complex Flow Structures for Flow Feature-Aligned Mesh Generation</td>
<td>2346</td>
</tr>
<tr>
<td>Development of Overset CFD Technology in Unstructured, Compressible Flow Solver for Arbitrary Polyhedral Meshes, LS-FLOW</td>
<td>2363</td>
</tr>
<tr>
<td>Cavity-Based Operators for Mesh Adaptation</td>
<td>2374</td>
</tr>
<tr>
<td>Reduced Silane Chemical Mechanisms for Hypersonic Combustion</td>
<td>2382</td>
</tr>
<tr>
<td>Evaluation of the Chemical Interaction of Exhaust Gases of Methane / Oxygen Propelled Liquid Rocket Engines with the Atmosphere</td>
<td>2392</td>
</tr>
<tr>
<td>Chemical Kinetic Model Reduction Based on Partially-Stirred Reactor Simulations with Comparable Chemical and Mixing Time Scales</td>
<td>2406</td>
</tr>
<tr>
<td>Comparative Evaluation of Global Combustion Properties of Alternative Jet Fuels</td>
<td>2416</td>
</tr>
<tr>
<td>Ignition Characteristics of Propane Fuel Mixed with Different Halon Replacements</td>
<td>2424</td>
</tr>
<tr>
<td>Reduced Kinetic Models for the Combustion of Jet Propulsion Fuels</td>
<td>2437</td>
</tr>
<tr>
<td>Chemical Kinetics of Hypergolic Ignition in Hydrazine/Nitrogen-dioxide Gas Mixtures</td>
<td>2457</td>
</tr>
<tr>
<td>Ignition Delay Time Measurements and Modeling of n-Pentane and iso Pentane at Elevated Pressures</td>
<td>2466</td>
</tr>
<tr>
<td>Behavior of Alternative Fuels Injected as a Liquid Jet Into a Crossflow</td>
<td>2473</td>
</tr>
<tr>
<td>Investigation of Injection Characteristics of Alternative Aviation Fuels by Laser-induced Fluorescence Imaging</td>
<td>2488</td>
</tr>
</tbody>
</table>
Direct Numerical Simulations of N-heptane Spray Autoignition in the Low-temperature Regime ................................................................. 2498
Digital Holographic Analysis of Near-Field Aerated Liquid Jets in Crossflow. Part I: Algorithm Development ................................................................. 2510
Turbulent Non Premixed Ethanol-air Flame Experimental Study Using Laser Diagnostics ................................................................. 2532
Computational Investigation of Combustion Dynamics in a Lean Direct Injection Gas Turbine Combustor ................................................................. 2544
Large-Eddy Simulation of a Swirled Lean Premixed Gas Turbine Combustor: A Comparison of Two Approaches ................................................................. 2566
Large-Eddy Simulation of a Gas Turbine Model Combustor ................................................................................................................................. 2569
Large-scale Strain Rate Effects on the Premixed Flame Propagation in LES of a Lean Swirl-stabilized Gas Turbine Combustor ................................................................. 2671
Development of an LES Approach for Compressible Reacting Flows ................................................................................................................................. 2683
Experiments on Pulsed Linear MHD Accelerator ......................................................................................................................................................... 2705
MHD Influence on Parameters of the Flow Around Wing and on Change of the Lift ................................................................................................................................. 2713
Creation of Multi-system of Localized Microwave Discharges on Various Surfaces of Aerodynamic Models ................................................................................................................................. 2723
On Application of MW Discharges on a Dielectric Net Excited in the Field of Quasioptical Electromagnetic Beam in Plasma Aerodynamics ................................................................................................................................. 2742
Spatial and Temporal Evolutions of Microwave Scattering from Laser Spark in Air ................................................................................................................................. 2761
Computational Chemistry Studies of Phenolic Resin ......................................................................................................................................................... 2770
Quantitative Pyrolytic and Elemental Analysis of a Phenolic Resin ......................................................................................................................................................... 2784
Laminar Reactive Boundary Layer Simulation of an Ablating Heated Carbon Surface ................................................................................................................................. 2807
Preliminary Analysis of the Mars Science Laboratory’s Entry Aerothermodynamic Environment and Thermal Protection System Performance ......................................................................................................................................................... 2826
Radiation and Roughness Effects on the Thermochemical Erosion of Ablative Materials in Rocket Nozzles ......................................................................................................................................................... 2845
Computational Modeling of Gas-Surface Interactions for High-Enthalpy Reacting Flows ......................................................................................................................................................... 2861
Three-Dimensional Finite Element Analysis to Support Calibration of MEDLI Instrumented Sensor Plugs ......................................................................................................................................................... 2876
A GasKinetic Study on Round Jet and Impingement Flows in a Vacuum ................................................................................................................................. 2886
Numerical Rebuilding of Fire-II Flight Data With the Use of Different Physical-Chemical Kinetics and Radiation Models ......................................................................................................................................................... 2902
Modeling of Rotational Nonequilibrium in Post-Normal Shock Flow Analyses ......................................................................................................................................................... 2921
Analysis of Rarefaction Effects in the Hypersonic Rarefied Wind Tunnel ......................................................................................................................................................... 2932
Generation and Characterization of High Enthalpy CO₂ Flow by Laser Driven Plasma Wind Tunnel.................................................................2949
Makoto Matsui, Shingo Tonoeda, Satoshi Nomura, Yoshiko Yamagawa, Kimiya Komurasaki, Yoshihiro Arakawa, Ippen Nishiyama, Hiroshi Katsuyama

Derivation of a Consistent Multi-internal-temperature Model for Vibrational Energy Excitation and Dissociation of Molecular Nitrogen in Hypersonic Flows.................................................................2956
Aurélien Gay, Marie-Yvonne Perrin, Anne Bourdon

State-to-state Model for DSMC Simulation of Internal Energy Exchange in Hypersonic Flows .................................................................2973
Erik Torres, Thierry Magin

effect of Coupled Non linear Wave Kinematics and Soil Flexibility on the Design Loads of Offshore Wind Turbines.................................................................2983
Taeseong Kim, Anand Natrurajan

On the Use of a Large Database of Simulated Wind Turbine Loads to Aid in Assessing Design Standard Provisions .................................................................2995
Lance Manuel, Hieu Nguyen, Matthew Barone

Coupled Atmosphere-Wave-Ocean Modeling to Characterize Hurricane Load Cases for Offshore Wind Turbines .................................................................3004
Milan Curcio, Euroge Kim, Lance Manuel, Shuey Chen, Mark Donelan, John Michalakes

Toward a Framework for Aero-elastic Multidisciplinary Design Optimization of Horizontal Axis Wind Turbines .................................................................3012
Michael McWilliam, Stephen Lawson, Curran Crawford

Objectives and Constraints for Wind Turbine Optimization.................................................................3027
Andrew Ning, Rick Damiani, Patrick Moriarty

The New Modularization Framework for the FAST Wind Turbine CAE Tool.................................................................3058
Jason Jonkman

Numerical Stability and Accuracy of Temporally Coupled Multi-Physics Modules in Wind Turbine CAE Tools.................................................................3084
Jason Gassm, Michael Sprague, Jason Jonkman, Wesley Jones

Three Dimensional Simulation of Ion Thruster Plumes with Octree Adaptive Mesh Refinement.................................................................3100
Burak Korkut, Zheng Li, Deborah Levin

Ultraviolet Laser Plasma Preionization and Novel Thomson Scattering Method for Weakly Ionized Discharges .................................................................3117
Nick Wiibert, Sachin Joshi, Azer Yalin

Supersonic and Stable Flight of Beam Riding Vehicle Using Optimized Multiple Pulses .................................................................3132
Masayuki Takahashi, Nayfumi Ohtsuki

Magneto-hydrodynamics Simulation Study of Deflagration Mode in Co-axial Plasma Accelerators .................................................................3141
Hariswaran Sitaraman, Laxminarayan Raja

Numerical Simulation of a Free Molecular Electro Jet (FMEJ) for In-Space Propulsion.................................................................3156
Ariel Blanco, Subrata Roy

Numerical Study on Acceleration Performance in Electrode Configuration of Linear MHD Accelerator Using CIP Method.................................................................3170
Ulderic Spadavecchia, Toru Sasaki, Takashi Kituchi, Nobuhito Harada, Tsukasa Aso

A Strong Conservative Implicit Riemann Solver for Coupled Naviier-Stokes and Full Maxwell Equations.................................................................3180
Richard Thompson, Trevor Moeller, Charles Merkle, Andrew Wilson

Development of Advanced High Lift Leading Edge Technology for Laminar Flow Wings .................................................................3199
Michelle Bright, Andrea Kornthauer, Steve Komadina, John Lin

EBF3PanelOpt: A Computational Design Environment for Panels Fabricated by Additive Manufacturing.................................................................3211
Rakesh Kapania, Sameer Mulani, Ali Yetloglu Tamiizani, Pankaj Joshi, Mohammad Sunny

Development of Polyimide Foam for Aircraft Sidewall Applications.................................................................3226
Andrew Sanders, Michael McWilliam, Stephen Lawton, Curran Crawford

A Mission Adaptive Variable Camber Flap Control System to Optimize High Lift and Cruise Lift to Drag Ratios of Future N+3 Transport Aircraft .................................................................3237
James Urnes, Nhan Nguyen, Corey Ippolito, Joseph Totah, Khanh Trinh Eric Ting

On the Formulation and Numerical Solution of Vortico-Acoustic Fields .................................................................3261
Joshua Batterson

Evaluating the Accuracy of a Grid Singularity Strategy Using External Verification Analysis.................................................................3285
Daniel Ingraham, Ray Hixon

Aeroacoustic Testing of Open Rotor at Very Small Scale .................................................................3316
Alexander Truong, Dimitri Papamoschou

F-35B Auxiliary Air Inlet Analysis and Design Maturation.................................................................3331
Carey F. Cox

Serpentine Diffuser Performance with Emphasis on Future Introduction to a Transonic Fan .................................................................3341
Chase Nessler, William Copenhaver, Michael List

CFD Performance Predictions of a Serpentine Diffuser Configuration in an Annular Cascade Facility .................................................................3358
Darius Sanders, Michael McWilliam, Michael List

Flow Simulation of N-3 Hybrid Wing Body Configuration.................................................................3374
Hyoun Kim, Meng-Sing Liao

Towards a Collaborative and Integrated Set of Open Tools for Aircraft Design .................................................................3392
Daniel Bohnke, Arthur Rizzo, Mengmeng Zhang, Bjorn Nagel

Vehicle Sketch Pad Structural Analysis Module Capability Update.................................................................3404
Armand Chaput, Tejas Kulkarni, Sarah Brown, Joshua Esho, Jose Galvan, Alex Haecker

Propulsion Systems Modeling with Vehicle Sketch Pad .................................................................3417
Russell Denney, Jonathan Gladin, Jimmy Tai, Dimitri Masuir

The Construction of Analytic Hypersonic Pitch Moment Coefficients Using a Curl Transformation.................................................................3435
Michael Grant
Dynamic Stability Analysis of Blunt Body Entry Vehicles Through the Use of a Time-Lagged Aftbody Pitching Moment .................................................................................................................................................. 3452
Cole Kazemba, Robert Braun, Mark Schoenberger, Ian Clark

Physics-Based Rotorcraft/Ship Aerodynamic Interaction Modeling in Support of Real Time Flight Simulation ......................................................................................................................... 3468
Jinggen Zhao, Nischint Rajmoham, Chengjian He

Simultaneous Vibration and Acoustic Measurements of a Store in a Compressible Open Cavity Flow ........................................................................................................................................ 3482
Justin Wagner, Steven Beresh, Katya Casper, John Henfling, Russell Spillers, Patrick Hunter, Jill Blecke, Randall Mayes

Flow Visualizations of A Simplified Linear Aerospike Model Using Background Oriented Schlieren ..................................................................................................................................................... 3498
Hiromi Takahashi, Sadateke Tomioka, Noboru Sakuranaka, Takeno Tomita, Kohei Kanavomori, Goro Manaya

Mach-Zehnder Interferogram Analysis of Axisymmetric Underexpanded Sonic Jet Using Fourier-Hankel Methods ...................................................................................................................... 3511
Keitaro Shimomiyu, Daisuke Ono, Yoshiaki Miyazato

Extensible Rapid Transition Prediction for Aircraft Conceptual Design Using Modal Decomposition .......................................................................................................................... 3517
Dev Rajanarayan, Peter Starzda

Computational Fluid Dynamic Analysis and Shape Optimization of Trawl-Doors .............................................................................................................................................................. 3538
Eirikur Jonsson, Slawomir Kozel, Leifur Leifsson, Elvar Hermannsson, Magnus Juhlinsson

Shape Design to Minimize the Peak Heat-Flux of Blunt Leading-Edge ...................................................................................................................................................................................... 3552
Kai Cui, Shou-Chao Hu

VOLUME 5

The CAFE Green Flight Challenge Program (CGFCP) .............................................................................................................................................................................................................. 3566
Brian Seeley

Assessment of Aerodynamic Uncertainty Database Requirements for a Generic Missile Configuration ...................................................................................................................... 3599
Rick Graves

Dynamic Store Release of Ice Models from a Cavity into Mach 2.9 Flow ...................................................................................................................................................... 3624
Thomas Floris, Mark Reeder, Andrew Lothhouse, Neil Kraft

An Investigation of Coupled Roll-Yaw Oscillations of a Slender Delta Wing ...................................................................................................................................................... 3647
John Walker, Anvar Ahmed

Experimental Optimization of Leading-Edge Deflection Angles for an SST Configuration at Low Speed ...................................................................................................................... 3658
Zhong Lei, Dong-Youn Kwak, Kenichi Rinoi

Aerodynamic Performance Studies with a Trailing Edge Jet Flap .............................................................................................................................................................. 3670
Ibrahim Alqaadi, Mahmood Khalid, Salah Hafez

Flow Past Flat Plate at Angle of Attack; Numerical Studies Using S-A, LES and IDDES ...................................................................................................................... 3681
Marcel Bee, Carlos Velez

Wind Tunnel Evaluation In Powered Static Aerodynamics of an Aerobatic UAV .............................................................................................................................................................. 3691
Michael Oh, Cale Zane, Trenton White, Thomas Kadila

Comparison of Three Aerodynamic Models Used in Simulation of a High Angle of Attack UAV Perching Maneuver .............................................................................................................................................................. 3711
Michael Puopolo, Ryan Reynolds, Jamey Jacob

Aerodynamic Aspects of Helicopter Blade-Vortex Interaction; the Interaction with Vortex Streets Considering the Icing Effect .............................................................................................................................................................. 3720
Marcel Bee, Carlos Velez

Numerical Modeling for Eulerian Droplet Impingement in Supercritical Large Droplet Conditions ...................................................................................................................... 3732
Sungki Jung, Rho Myong, J. Kim

Study of a Swept Wing with Leading-Edge Ice Using a Wake Survey Technique ...................................................................................................................... 3742
Jeffrey Diebold, Michael Bragg

Ice Accretion Modeling Using an Eulerian Approach for Droplet Impingement ...................................................................................................................... 3758
Jeewon Kang, P. Garza Dennis, Lakshmi Sankar, Richard Kreeger

Development of a Digital Image Projection Technique to Measure Wind-Driven Water Film Flows ...................................................................................................................... 3769
Hai Hu, Kai Zhang, Song Zhang, Afric Rothmayer

The Vortical Structures in the Rear Separation and Wake Produced by a Supersonic Micro-Ramp ...................................................................................................................... 3783
Chaoqun Liu, Zhengchong Sun, Xiao Wang, Yonghua Yan

Experimental Investigation of the Flow over an 80°/45° Rounded Leading Edge Double-delta Wing-body Model ...................................................................................................................... 3790
Sampath Bilakanti, Karade Bharat, Rajeev Dubey, A. E. Sivaramakrishnan, V. Ganeshan

Aerodynamic Characteristics of Rectangular Wing with Square Laterall Tip .............................................................................................................................................................. 3811
Jayee Lee

Parametric Study of Vortex Generators on a Super Critical Infinite-Wing with Shock-Induced Separation ...................................................................................................................... 3822
Noob Namura, Shin'ya Jeong, Shigeru Okazaki

An Experimental Analysis of the Unsteady Wake Behind a Circular Cylinder Using Eulerian and Lagrangian Techniques .............................................................................................................................................................. 3834
Matthew Rockwood, Melissa Green

A CFD-Compatible Transition Model Using an Amplification Factor Transport Equation ...................................................................................................................... 3842
James Coder, Mark Maughmer

Dynamical System Model Reduction Through An Online Manifold Learning Technique ...................................................................................................................... 3859
Ligian Peng, Kamran Mohseni

Optimal Spatio-temporal Reduced Order Modeling of Burgers’ Equation with Large-amplitude Disturbances ...................................................................................................................... 3873
Allen Labyer, Peter Attar, Prakash Vedula

Application of Snapshot POD on a Varying Grid .............................................................................................................................................................. 3895
Christopher Ruscher, John Dannenhofer, Mark Glauser
<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Study for Plasma Actuator Performance Enhancement Through Various Electrode Geometric Shapes</td>
<td>5366</td>
</tr>
<tr>
<td>Active Flow Control on a Circular Cylinder via Streamwise-oriented Dielectric Barrier Discharge Plasma</td>
<td>5381</td>
</tr>
<tr>
<td>Stabilization of High-Dimensional Harmonic Balance Solvers Using a Temporal Spectral Viscosity Operator</td>
<td>5392</td>
</tr>
<tr>
<td>Unsteady-Low-Reynolds Number Flow Control in Different Regimes</td>
<td>5406</td>
</tr>
<tr>
<td>Supersonic Pitch Damping Predictions of Blunt Entry Vehicles from Static CFD Solutions</td>
<td>5420</td>
</tr>
<tr>
<td>Numerical Investigation for Optimal Sensor Placement on Flapping-wing MAVs</td>
<td>5438</td>
</tr>
<tr>
<td>Formation Airdrop Scaling Effects on Aircraft Wake Vortex Formation and Interaction</td>
<td>5463</td>
</tr>
<tr>
<td>Wake Evolution of High-Lift Configuration from Roll-Up to Vortex Decay</td>
<td>5481</td>
</tr>
<tr>
<td>Sensitivity Analysis of the Effects of Aircraft and Environmental Parameters on Aircraft Wake Vortex Trajectories and Lifetimes</td>
<td>5524</td>
</tr>
<tr>
<td>Performance Gains of Propellant Management Devices for Liquid Hydrogen Depots</td>
<td>5535</td>
</tr>
<tr>
<td>Techniques for Solving Stiff Chemical Kinetics on GPUs</td>
<td>5546</td>
</tr>
<tr>
<td>Parallel Eulerian-Lagrangian Method with Adaptive Mesh Refinement for Moving Boundary Computation</td>
<td>5563</td>
</tr>
<tr>
<td>Accelerating Reactive-Flow Simulations Using Graphics Processing Units</td>
<td>5586</td>
</tr>
<tr>
<td>GPU-accelerated Software Library for Unsteady Flamelet Modeling of Turbulent Combustion with Complex Chemical Kinetics</td>
<td>5599</td>
</tr>
<tr>
<td>Advances in Feflo</td>
<td>5605</td>
</tr>
<tr>
<td>Performance Tradeoff Considerations in a Graphics Processing Unit (GPU) Implementation of a Low Detectable Aircraft Security System</td>
<td>5625</td>
</tr>
<tr>
<td>Hypersonic Boundary-Layer Transition Experiments in the Boeing/AFOSR Mach-6 Quiet Tunnel</td>
<td>5637</td>
</tr>
<tr>
<td>High-Speed Schlieren Imaging of Disturbances in a Transitional Hypersonic Boundary Layer</td>
<td>5660</td>
</tr>
<tr>
<td>HIFIRE-5 Flight Test Preliminary Results</td>
<td>5683</td>
</tr>
<tr>
<td>High-Bandwidth Optical Measurements of the Second-Mode Instability in a Mach 6 Quiet Tunnel</td>
<td>5699</td>
</tr>
<tr>
<td>Continuing Experimental Studies of High Speed Boundary Layer Transition in LENS Facilities to Further the Development of Predictive Tools for Boundary Layer Transition in Flight</td>
<td>5713</td>
</tr>
</tbody>
</table>
Algorithms for the Adaptive Non-Linear Frequency Domain Method .......................................................... 5742
Mujeeb Malik, Wei Liao, Fei Li, Meelan Choudhari

A Strongly Implicit Method for the Solution of Transient Incompressible Viscous Flow Problems .............................. 5759
Ali Monabehri Mohammadi, Siva Ramaran Natarajah

Solutions of the Taylor-Green Vortex Problem Using High-Resolution Explicit Finite Difference Methods .................. 5770
James Debonis

Time-Accurate Flow Simulations Using an Efficient Newton-Krylov-Schur Approach with High-Order Temporal and Spatial Discretization ................................................................. 5790
Pioter Boom, David Zingg

Application-Oriented Processes for Implementation of Overset Grid Methodologies ............................................... 5810
Scott Sherer, Rick Graves

Accuracy Enhancement of Numerical Solution for Solving One-Dimensional Linear Simple Wave Equation via Reconstructed Polynomials ....................................................................................... 5828
Yih-Nen Jeng

Aerodynamic Characteristics of Ejection Seat and Occupant .................................................................................. 5854
Maximilian Tomac, Karl Pettersson, Arthur Rizzi

Structural Analysis on a Hemisphere-cylinder at Moderate Reynolds Number and High Angle of Attack .................. 5874
Benton Greene, Noel Clemens, Daniel Micka

High Order Solver for Blood Flow using WENO Scheme ....................................................................................... 5888
Hassan Khurshid, Klaus Hoffmann

Supersonic Flow over a Finite-Width Rectangular Cavity ......................................................................................... 5911
Steven Beresh, Justin Wagner, Brian Pruett

Numerical Studies of Turbulent Separation in Forward Facing Step Flows Using k-e, SST, S-A and LES ....................... 5927
Marcel Rie, Carlos Velez

Measurements of the Interaction of an Upstream Laser Perturbation with a Forward-Facing Cavity ......................... 5933
Amanda Chou, Steven Schneider, Steven Collicott

Towards a Unified K-Epsilon Turbulence Model for the Practical Analysis of Aeropropulsive Flows ......................... 5950
Kevin Brinckman, Gregory Rodebaugh, Sanford Dash

DDES of Aeropropulsive Flows Based on an Extended k-e RANS Model ................................................................. 5968
Gregory Rodebaugh, Kevin Brinckman, Sanford Dash

Closed-Loop Active Flow Control of a Three-Dimensional Turret Wake ................................................................. 5980
Patrick Shea, Mark Glauker

Closed Loop Flow Control of a Tangent Ogive at a High Angle of Attack ............................................................... 5992
Christopher Porter, Casey Fagley, John Farnsworth, Jurgen Seidel, Thomas McLaughlin

Body Force Produced by Plasma Actuator Using PIV and Pressure Measurements .................................................. 6008
Xuanshi Meng, Yuchuan Wang, Jianlei Wang, Jinheng Cai, Feng Liu, Shijun Luo

Effect of Dielectric Degradation on Dielectric Barrier Discharge Plasma Actuator Performance ............................... 6023
Ronald Hanson, Joel Kimelman, Philippe Lavoie, Nicole Houser

Parametric Investigation of Nanosecond Pulse Driven Dielectric Barrier Discharge Plasma Actuators for Aerodynamic Flow Control ............................................................................................................ 6036
Robert Dawson, Jesse Little

Phase-Locked 3D3-MRV Measurements in a Bi-stable Fluidic Oscillator ................................................................ 6047
Florian Wassermann, Daniel Hecker, Bernd Jung, Michael Marli, Sven Grundmann

Origin of Ring-like Vortices in the MVG Controlled Turbulent Boundary Layer ....................................................... 6057
Yonghua Yan, Chaoping Liu

Further Investigation on Shock Wave -Vortex Ring Interaction by the MVG Controlled Ramp Flow ....................... 6073
Yonghua Yan, Chaoping Liu

An Investigation of the Control Mechanism of Plasma Actuators in a Shock Wave-Boundary Layer Interaction ........ 6089
Nathan Webb, Christopher Clifford, Mo Sanmey

Vortical Structures on Three-dimensional Shock Control Bumps ............................................................................ 6102
Simon Collins, Holger Babinsky, Klemens Naber, Thorsten Lizet

Analysis of Unsteady Behavior in Shock/Turbulent Boundary Layer Interactions with Large-Eddy Simulations .......... 6117
Nathan Mullenix, Datta Gaisinonde

Control of Shock Boundary Layer Interaction Using Pulsed Plasma Jets ................................................................. 6157
Benton Greene, Noel Clemens, Daniel Micka

Numerical Investigation of the Effect of Turbulence Modelling for Flows with Shocks and Vortical Structures ............ 6167
Andreas Papoutsakis, John Ekaterinartis, Nikolaos Kyriakis, Konstantinos Panourgias

Calibration and Verification of a γR0m Transition Prediction Method for Airfoil Computations .................................. 6179
Yonghua Yan, Chaoping Liu

The Calculation of Second-order Accurate Curvatures Using Surface Normal Vectors ............................................ 6191
Mingyu Sun, K. Hirao

Development of a High-Order Flux Reconstruction Scheme for Body-Fitted Cartesian Unstructured Grids ............... 6199
Takanori Haga, Kazuto Kazuo, Ryoji Takaki, Eiji Shimizu

Status of Advanced Stitched Unitized Composite Aircraft Structures ................................................................. 6212
Dawn Jegley, Alex Velicki

Performance Enhancement of a Vertical Tail Model with Sweeping Jet Actuators .................................................... 6224
Roman Seele, Emilijo Grotz, John Lin, Israel Wynnmanik

DRE-Enhanced Swept-Wing Natural Laminar Flow at High Reynolds Numbers ....................................................... 6242
Mujeeb Malik, Wei Liao, Fei Li, Meelan Choudhari
VOLUME 8

Engineered Surfaces for Mitigation of Insect Residue Adhesion ................................................................. 6263
Karen Feigh, Amy Pritchett, Karen Cate

NASA Environmentally Responsible Aviation Project's Propulsion Technology Phase I Overview and Highlights

of Accomplishments ................................................................................................................................. 6286
Kenneth Sader, John Delaat, Chris Hughes, David Arend, Mark Celestina

The NASA Environmentally Responsible Aviation Project/General Electric Open Rotor Test Campaign ........................................ 6315
Dale Fan Zante

The 20mm Advantage - Shrinking an Internal Balance to Meet Clients' Demands ........................................... 6332
Ulrich Jansen, Bernd Hildebrand

A Check Tool for the Half-Model Balance of the Cryogenic Wind Tunnel Cologne DNW-KKK ............................... 6340
Jannai Zhai, Rudiger Rebstock, Klaus Hufnagel

Automatic Balance Calibration System (ABCS) Upgrades Large (Balances) Loading Rig (LLR) Re-commissioning ........ 6348
Dennis Booth, David King

Unsteady Vane Boundary Layer Response to Rotor-Rotor Interactions in an Embedded Compressor Stage .............. 6366
Eric Dow, Qui Wang

Prediction of a Transonic Rotor Fluid/Structure Interaction With a Travelling Wave Using a Phase-lag Boundary Condition ................................................................. 6378
Hongsik Im, Gechong Zha

Reynolds-Averaged Simulations of Shock-Wave/Boundary-Layer Interactions with Bleed ........................................ 6398
Tom I-P Shih, E-Jich Teh

Effect of Boundary-Layer Bleed Hole Inclination Angle and Scaling on Flow Coefficient Behavior .................... 6410
Michael Eichhorn, Paul Burnhart, David Davis, Maman Yyas, John Slater

Modeling and Simulation of Bleed Holes in the Presence of Shock Wave/Boundary Layer Interaction ................ 6426
Paul Orkvis, Mark Turner, Alex Apyan, Kyle Flener, Sean Duncan, Nathan Wulke, John Bendl

Flow Expansion Based Model for 3-D Multi Bleed Hole Rows ........................................................................ 6463
Albert Morell, Atul Hamed

LES/CMC Predictions of Spark Ignition Probability in a Liquid Fuelled Swirl Combustor ..................................... 6474
Artur Tyliszczak, Epaminondas Mastorakos

Analysis of Local Entropy Generation Using Large Eddy Simulation of Turbulent Reacting Flows .................... 6485
Mehdi Safari, Fatemeh Hadi, Reza Sherkhi

Large Eddy Simulation of Supercritical Combustion of Liquid Oxygen and Kerosene of a Bi-Swirl Coaxial Injector ................................................................. 6495
Hongsiu Huo, Vigor Yang

The Intrinsic Phase Shift and Its Effect Upon the Measurement of Airflow Velocities Using LITRA .......................... 6508
Sean McGuire, Sohail Zaidi, Arthur Dogarrius, Richard Miles, Chris Herde

Rotational Temperature Measurements by Pure Rotational O2 CARS in Repetitively Pulsed Low Temperature, 6517
Low Pressure Non-equilibrium Plasma

Suzanne Lanier, Sherric Bowman, Walter Lempert, Igor Adamovich

Absolute OH Number Density Measurements in Lean Fuel-Air Mixtures Excited by a Repetitively Pulsed 6532
Nanosecond Discharge

Zhiyao Yin, Igor Adamovich, Walter Lempert, Campbell Carter

Towards Quantitative Flame Species Concentration Measurements Using Radar REMPI ............................ 6566
Tat Looon Chng, James Michael, Arthur Dogarrius, Sohail Zaidi, Richard Miles

Measurements of Vibrational Energy Loading in a Diffuse Plasma Filament .................................................. 6575
David Burnette, Igor Adamovich, Walter Lempert, Aaron Montello

In-Situ Species Measurements Of Ethylene Oxidation In A Nanosecond Pulsed Plasma Discharge By Using Mid-IR 6595
Absorption Spectroscopy

Mrunaljaya Udli, Joseph Lejkowitz, YiGuang Ju

Concepts Leading to a Sustainable Architecture for Cislunar Development ................................................. 6609
Kurt Klaus, Kevin Post, Samuel Lawrence

Interfacial Water As a Mars ISRU Objective: Detection of Microscopic Water Using Fiber Optic Sensors .......... 6617
Osazonamen Igininsson, Steven Wood, Adam Brackner

Artemis Jr. Rover Mobility Platform ................................................................. 6624
Peter Visscher, Dale Boucher, Martin Picard, James Smith, Nick Cristello

Development and Testing of the RESOLVE Sample Acquisition System ......................................................... 6635
Dale Boucher

Lunabotics Student Paper Award: The Montana Autonomous Lunar Excavator .................................................. 6641
Logan Warberg, Jennifer Hane, Seth Bernardinelli, Kevin Love, Garth Grub, Daniel Benson, Allison Figueira, Lars Osborne, Bethany Higgins, Brock Lamerex

Development and Integration of a Mini Corer Drill ......................................................................................... 6656
Dale Boucher

Challenges in Achieving Trajectory-Based Operations .................................................................................. 6660
Karen Case

Modeling the Work of Humans and Automation in Complex Operations ......................................................... 6666
Karen Feigh, Amy Pritchett
Verification of Function Approximations .................................................................6675
A Model for Transient Combined Conduction and Radiation Heat Transfer in Fibrous Material .................................................................6680
Gareth Brown, Douglas Imeson
Critical Mass Flow Rate and Pressure Distribution through Horizontal Adiabatic Capillary Tubes for the Flow of R-134A .................................................................6687
Payy Javidmand, Klaus Hoffmann
Radiative Heat Exchange in a Hydrogen-Fueled Scramjet Combustion Chambers .................................................................6694
Joseph Shang, Sergey Sarchkhov
Modeling Radiative Heat Exchange in a Supersonic Flow .................................................................6714
Jonathan Nutzati Fontaine, Eric Perverel
Hybrid Propellant Rocket Engine Test Fixture and Research on the Combustion of Non-Conventional Fuels .................................................................6722
Vatcheslav Naoumov, Alexander Harulambous, Adam Goldreich, Elaine Monsy
Adaptive Vertical-Vane Control for Roll Motion of Floating Offshore Wind Turbine .................................................................6737
Zhongzhou Yang, Yaoya Li
Adaptive Disturbance Tracking Control with Wind Speed and Partial State Estimation, and State Feedback in Transition Region Control of Large Wind Turbines .................................................................6757
Kaman Thapa Magar, Mark Balas, Susan Frost
Adaptive Pitch Control for Speed Regulation of Floating Offshore Wind Turbine ; Preliminary Study .................................................................6766
Kaman Thapa Magar, Mark Balas, Ye Feng, Susan Frost
Active Structural Control with Actuator Dynamics on a Floating Wind Turbine .................................................................6776
Hazim Namik, Mario Rotrea, Matthew Lackner
An Active Power Control System for Wind Turbines Capable of Primary and Secondary Frequency Control for Supping Grid Reliability .................................................................6792
Jacob Aho, Lacy Pan, Paul Fleming, Andrew Buckspan
Wind Turbine Blades as a Strain Energy Source for Energy Harvesting .................................................................6805
Dongwon Lim, Susan Mantell, Peter Seiler, Rusen Yang
Numerical Simulation of a Nanosecond Pulse Discharge in Mach 5 Flow .................................................................6813
Jonathan Poggie, Igor Adamovich, Nikolas Baisek, Munetake Nishihara
Effect of Single- and Repetitive-Pulsed Thermal Actuator in a Mach 8 Bow Shock .................................................................6829
Yong Yan, Xiao Jing Yu
Study on Nonequilibrium Plasma Discharge in Hypersonic Flow over Flat Plate .................................................................6835
Yasunaga Watatani, Kojiro Suzuki
Effect of Nanosecond Pulse DBD Plasma Actuators on Oblique Shocks and on Shock / Boundary Layer Interaction .................................................................6848
Munetake Nishihara, Datta Gaitonde, Igor Adamovich, Andrei Klochko
Hybrid Wing Body (HWB) Slat Noise Analysis .................................................................6865
Yaping Guo, Leon Bronskiak, Michael Czech, Russell Thomas
Rudimentary Landing Gear Noise Predictions Using Scale-Resolving Simulations: Part 1 - Incompressible Approach .................................................................6883
Konstantin Kurbatski, Valerio Viti, Florian Menter, Yuri Egorov, Jochen Schuetze
An Experimental Study of the Rudimentary Landing Gear .................................................................6894
Robert Beger, Fei Liu, Louis Catiffesta
Design Considerations for Developing Composite Materials Providing Improved Acoustic Transmission Loss for UAVs .................................................................6909
Jeffrey Callicott, Andrew Arona, Richard Gartet, James Jacob
Characteristics of Future Military Aircraft Propulsion Systems .................................................................6918
Richard Scharnhorst
Liquid Hydrogen Fuel System for Small Unmanned Air Vehicles .................................................................6926
Critical Design Points for the Wing Anti-Icing System .................................................................6932
Yongfeng Zhu, Wenhao Han, Hongliang Chang, Sijun Zhang
Knowledge Based Design Methodology for Generic Aircraft Windshield and Fairing-A Conceptual Approach .................................................................6945
Anand Singh, M. Chaitanya, Vijay Kamar Govindarajan, Peter Kres
Development of a Modeling and Simulation Environment for Real-time Performance Analysis of Electric Actuators in Maneuvering Flight .................................................................6955
Imon Chakravorty, David Travis, Chaitanya Hegde, Hyun Choi, Eugina Mendez-Ramos, Dimitri Mavris
A Surrogate Model Based Constrained Optimization Architecture for the Optimal Design of Electrohydrostatic Actuators for Aircraft Flight Control Surfaces .................................................................6972
Toby Sorensen, Borja Martinez
A Comparison between Global and Local Aerodynamic Modeling from Flight Data .................................................................6989
Toy Sorensen, Borja Martens
Experimental Investigation of Helicopter Weight and Mass Center Estimation .................................................................7002
Bradley Taylor, Jonathan Rogers
Piloted Simulation Evaluation of Pitch Axis Feel System Characteristics .................................................................7022
David Klyde, Daniel Alvarez, Marco Lonero, Paul Schifferle, Tony Lammbracht
Free-Flight Aerodynamic Test with Projectile-Onboard Data Recorder in a Ballistic Range .................................................................7040
Hidetake Tantio, Tomoyuki Komuro, Kazuo Sato, Katsuhiko Ikoh, Manabu Kikuchi
Planar Mie Scattering Method for Measurement of Spray Characteristics .................................................................7048
Steve Lepora, Urs Vandshuler
Characterization of Three-dimensional Dense Spray Visualization Techniques ........................................ 7062
Benjamin Hall, Christopher Radke, Theodore Heindel, William Lobry, Song Zhang, Terrence Meyer, Malissa Lightfoot, Stephen Danczyk, Stephen Schumaker, Sakesh Roy, James Gord, Alan Kastengren

Development of Gas-Phase Mixing Measurements in Turbulent Spray Flows Using Filtered Rayleigh Scattering ................................................................. 7075
Randy Patton, Jeffrey Sutton

Simultaneous Krypton PLIF, LII and PIV Measurements in a Sooting Jet Flame ........................................ 7091
Oliver Baxton, Ross Burns, Noel Clements

Temperature Measurements by Radar REMPI in Methane/Air Flames at Atmospheric Pressure ............ 7107
Yue Wu, Zhih Zhang, Steven Adams

Two Color Polarization Spectroscopy for Measurements of Atomic Hydrogen Concentration Using Single-Mode Laser Systems ......................................................... 7114

Development of Pressure-Sensitive Paint Systems for Low Speed Flows and Large Wind Tunnels .......... 7125
Jim Crafton, Sergey Fonorov, Robert Forlines, Steve Pallusconi

Pressure Measurement on Rotating Propeller Blades by means of the Pressure-Sensitive Paint Lifetime Method ................................................................. 7139
Christian Klein, Ulrich Henne, Werner Sachs, Stephan Hock, Nora Falk, Uwe Beijas, Vladimir Ondrasic, Sven Schaber

VOLUME 9

Deconvolution-Based Algorithms for Deblurring PSP Images of Rotating Surfaces .................................. 7147
James Gregory, Kevin Distolli, Di Peng, Thomas Juliano, Jim Crafton, Naruyama Komera

Development of Ultrafast-Response Anodized-Aluminum Pressure-Sensitive Paints ................................ 7170
Shota Fujii, Daisuke Numata, Hiroki Nagai, Keisuke Asai

Phosphor Thermography for Global Heat Transfer Measurement in Gun Tunnel .................................... 7182
Shuangr Wu, Chaohua Wu, Jian Gong, Zhanbi Bi

Design of a Dropnose Configuration for a Coanda Active Flap Application ............................................ 7193
Marco Burnazzi, Rolf Radespiel

Flow Physics of Drag Reduction Mechanism Using Suction and Pulsed Blowing .................................... 7207
David Schatzman, Jacob Wilson, Eran Arad, Avraham Seiferet, Tom Shendel

Effect of Longitudinal Ridges on the Aerodynamic Characteristics of an Airfoil ........................................ 7233
Tufan Guha, Erik Fernandez, Rajan Kumar

Performance of a Co-Flow Jet Airfoil with Variation of Mach Number ...................................................... 7243
Alessio Leifrede, Bertrand Donin, Michele Di Franco, William Bartow, Gechung Zhu

Development of an Improved Performance Function for the Control of Flow Separation ...................... 7259
Brandon Reece, Furuuki Alvi, Emmanuel Collins

Numerical Simulation of a Supersonic Cruise Nozzle ............................................................................ 7277
Balasubramanyam Sasanapuri, Manish Kumar, Saitkno Wirgo, Konstantin Kurbsatov

80% Scaled NASA Common Research Model Wind Tunnel Test of JAXA at Relatively Low Reynolds Number .......................................................... 7286
Makoto Ueno, Takamasa Kohzai, Seigo Koga, Hiroshi Kato, Kazuyuki Nakakita, Norikazu Suda

Wind Tunnel Test and Computational Studies of a Supercritical Airfoil for Correlation and Advancement of Design Methodologies .................................................. 7314
Eddie Irani, Aaron Kuen

Analysis of NASA Common Research Model Dynamic Data in JAXA Wind Tunnel Tests ......................... 7324
Seigo Koga, Masatada Kohzai, Makoto Ueno, Kazuyuki Nakakita, Norikazu Suda

Numerical Investigation of Sabot Separation Process in a Ballistic Range Using Moving Overlapped Grid Method ........................................................ 7335
Fumito Takeuchi, Akiko Matsuo

Computational Modelling of Steady and Unsteady Low Speed Wing in Ground Effect Aerodynamics .......... 7345
Bachit Prasad, Muradi Damodaran

Design and Manufacturing of Composite Propellers for SUAS ............................................................. 7368
Jacob Stockton, Ben Bettiger, Andrew Arena, Richard Gaeta, Jamey Jacob

Subscale Modeling and Wind Tunnel Testing of Propellers ..................................................................... 7380
Blake Moffitt, Jongwook Joo, Patrick Bowles, Byungyoung Min, Brian Wake

Measurement of Static and Dynamic Performance Characteristics of Electric Propulsion Systems ........ 7393
Aron Brezina, Scott Thomas

Novel Cyclorotor Pitching Mechanism for Operation at Curtate and Prolate Advance Ratios ...................... 7423
Zachary Adams, Casey Fingley

Servo-Flap Rotor Performance Design Evaluation .................................................................................. 7436
Fu-Shiang Wei, Thomas Vasko, Alfred Gates

Unsteady Nonlinear Aerodynamics of Hovering MAVs/Insects .............................................................. 7448
Haitham Taha, Muhammad Hajj

Development of a Low-Speed Oscillatory-Flow Wind Tunnel ................................................................ 7461
Vergenti Purman, David Greenblatt, Hans Muller-Vahl

Numerical Analysis on Unsteady Lift Coefficient of Corrugated Wing Section in Low Reynolds Flow ........ 7475
Katsuoshibi Himasaki, Kojiro Suzuki

Investigation of Perfectly Matched Layer Boundary Condition for Nonlinear Euler Equations .................. 7484
Srinivasan Perumal Velu, Klaus Hoffmann

Development of an Improved Pulsed Pulsed Lidar Circulation Estimation Algorithm and Performance Results for Denver OGE Data ........................................................................... 7510
Don Jacob, David Lai, Donald Delisi
Mesoscale Simulation Data for Initializing Fast-Time Wake Transport and Decay Models........................................7517

Numerical Analysis of Clear Air Turbulence by Using Large Eddy Simulation Coupled with a Meteorological Model...........................................................................................................................................7534

Keita Morimoto, Yujiro Takeshima, Shinya Geong, Shigeru Obayashi, Hamaki Inokuchi

Atmospheric Turbulence Estimates from a Pulsed Lidar .............................................................................................7544

Matthew Praus, Nashat Ahmad, Donald Delisi, Fred Proctor

An Implicit Harmonic Balance Method with a Discontinuous Galerkin Spatial Scheme........................................7558

Robert Kothe, Marshall Galbraith, Mark Turner, Paul Orkisw

A Discontinuous Galerkin Chimera Scheme with Implicit Artificial Boundaries.......................................................7574

Marshall Galbraith, Robert Knapke, Paul Orkisw, John Benek

A Three-Dimensional Recovery-Based Discontinuous Galerkin Method for Turbulence Simulations....................7597

Eric Johnson, Sreenivas Varad, Bram Van Leer

A WENO Reconstruction-Based Discontinuous Galerkin Method for Compressible Flows on Hybrid Grids............7607

Hong Luo, Yidong Xia, Megan Fribey, Robert Nourgaliev

Influence of Resolution and Reynolds Number on Large-eddy Simulations of Channel Flow Using Relaxation Filtering........................................................................................................................................7626

Francois Kremer, Christophe Bogey, Christophe Bailly

Adjoint-Based Estimation and Control of Spatial, Temporal and Stochastic Approximation Errors for Aerodynamic Applications.........................................................................................................................................7641

Vinod Lakshminarayan, Karthikeyan Duraisamy, Juan Alonso

Butterfly-Effect for Massively Separated Flows........................................................................................................7657

Randall Lohner, Dominic Brino, Alexander Michailski, Eberhard Hang

Efficient Adaptation using Discrete Adjoint Error Estimates in Unsteady Flow Problems....................................7682

Bryan Flynn, Dimitri Mavrisplis

Differential Interferometric Measurement of Instability at Two Points in a Hypervelocity Boundary Layer.................7705

Nick Pazziale, Joseph Shepherd, Hans Hornung

Numerical Simulation of Graphite Ablation Induced Outgassing Effects on Hypersonic Boundary Layer

Receptivity over a Cone Frustum................................................................................................................................7721

Clifton Mortensen, Alexander Federov, Ivan Egorov

Transition Within a Hypervelocity Boundary Layer on a 5-Degree Half-Angle Cone in Air/CO2 Mixtures................7750

Joseph Jewell, Ross Wagnild, Ivett Leva, Graham Candler, Joseph Shepherd

Investigations of Laminar-turbulent Transition on a Sharp Cone with Localized Heating Or Cooling in High-speed Flow...................................................................................................................7784

Vitaly Soudakov, Alexander Fedorov, Ivan Egorov

An Interferential Streak Instability of Boundary Layer over a Cone at Mach 6............................................................7775

Feng Ji, Fuming Guan, Qing Shen, Xiangjiang Yuan, Qiang Wang

Flow Physics of a Normal-hole Bled Supersonic Turbulent Boundary Layer.................................................................7784

Joseph Oorebeck, Helger Babinsky

Effect on High Speed Boundary Layer Characteristics from Plasma Actuators..........................................................7807

Rebecca Otman, Thomas Herges, J. Craig Dutton, Gregory Elliott

Large-Eddy Simulations of Separated Supersonic Flow with Plasma Control............................................................7819

Nicholas Bisek, Jonathan Poggie

Fluidic Control of Transonic Shock-Induced Separation..............................................................................................7841

Vladimir Vlasinov, Abraham Gissen, Ari Gleser, Sivarul Gogineni

Near-Surface Discharge in Supersonic Inlet Control................................................................................................7856

Hong Yan

Shear Layer Stability Analysis in Later Boundary Layer Transition and MVG Controlled Flow.....................................7863

Yonghua Yan, Chaotian Liu

Numerical Study of Pressure Fluctuations due to a Mach 6 Turbulent Boundary Layer..................................................7875

Lian Duan, Meelan Choudhuri

DNS of Supersonic Turbulent Boundary Layers over Weakly and Strongly Adiabatic Walls....................................7891

Izaak Beekman, Pino Martin, Stephan Pruebe

Investigation of Turbulent Structure Modification by Momentum Injection Into Turbulent Flow Over a Rough Surface........................................................................................................................................7904

Mark Miller, Huatiao Zhang, Sean Bailey, Alexandre Martin

Flow Visualization of Three-Dimensional Large Scale Motions in ZPG and APG Turbulent Boundary Layers........7914

Michael Melnick, Brian Thurov, Bryan Brock

Study of Unsteadiness of Shock Wave Boundary Layer Interaction Using Rainbow Schlieren Deflectometry and Proper Orthogonal Decomposition........................................................................7925

Narendra Chaganti, Arathi Kurup, Semih Olcmen

Experimental Study of Shock Wave Oscillation on SC(2)-0714 Airfoil........................................................................7938

Zijie Zhao, Xiaodong Ren, C. Gao, Juntao Xiong, Feng Liu, Shijun Luo

Detailed Simulations of Shock-Bifurcation and Ignition of an Argon-diluted Hydrogen/Oxygen Mixture in a Shock Tube........................................................................................................................................7950

Mathias Bima, Yong Sun, Ralf Diezendrink

Evaluation of Ceramic Matrix Composite Technology for Aircraft Turbine Engine Applications..........................7964

Michael Halfzif, Martha Jaskaowski, James Kiser, Dongming Zhu

NASA Project Develops Next Generation Low-emissions Combustor Technologies................................................7975

Chi-Ming Lee, Clarence Chang, Stephen Kramner, John Herbon
High Bypass Ratio Jet Noise Reduction and Installation Effects Including Shielding Effectiveness
.................................................................................................................................................8365

Comparison of Second and Third Order Wind Tunnel Balance Calibration Models Using Monte Carlo to
Propagate Elemental Errors from Calibration to Installation........................................................................8287

Calibration and Data Analysis of the MC-130 Air Balance..................................................................................8241

Assessing Long Term Wind Tunnel Balance Performance and Uncertainty from Multiple Calibrations - Revisited.8160

Conceptual Design of a Six-Component Internal Balance Using Optical Fibre Sensors.................................8178

Comparison Study of Turbine Blade with Trailing-Edge Cutback Coolant Ejection Designs.................................8186

Investigation of the Effects of Lateral Cowl Length in an Inward Turning Scramjet Inlet......................................8194

Towards a Three Dimensional Parametric Mesher...............................................................................................8202

Three-Dimensional Combustion Diagnostics Based on Computed Tomography of Chemiluminescence............8210

Towards Quantitative Concentration Measurement of Acetylene in Rich Hydrocarbon Flames Using 1D
Raman-Rayleigh Scattering...................................................................................................................................8218

Towards an Updated Kinetics Model of CO₂* Chemiluminescence....................................................................8226

OH* Chemiluminescence in a Multipoint Combustion System: Steady State and Limit Cycle Behavior.................8234

Sensing Key Species During Fuel Oxidation in a Shock Tube Using Absorption Spectroscopy..........................8242

Temperature and Species Measurements of Combustion Produced by a 9-point Lean Direct Injector.................8250

Large-Eddy Simulation of a Reactive Shear Coaxial Injector Configuration.................................................................8258

LES of High-Frequency Combustion Instability in a Rocket Combustor ...............................................................8266

Control of Combustion Dynamics in a Swirl-stabilized Combustor with Nanosecond Repetitively Pulsed
Discharges..........................................................................................................................................................8274

Two-dimensional Model for Liquid-Propellant Transverse Combustion Instability................................................8282

Mechanical Disturbances Arising From Thermal Power Deposition in a Gas with Application to Supercritical
Liquid Rocket Engine Combustion Instability.........................................................................................................8290

Numerical Study on Vortex Driven Pressure Oscillation in a Solid Rocket Motor with Two Inhibitors.................8298

Energy Coupling in Repetitively Pulsed Nanosecond Dielectric Barrier Discharges in Plane-to-Plane Geometry....8306

Development of a Lumped Element Circuit Model for Approximation of Nanosecond Pulsed Dielectric Barrier
Discharges........................................................................................................................................................8314
Wing Profile Performance Variations Influenced by Manufacturing Tolerances.

Unsteady Aerodynamic Design on Unstructured Meshes with Sliding Interfaces

Low-Cost Robust Airfoil Optimization by Variable-Fidelity Models and Stochastic Expansions

CFD-Based Axisymmetric Aeroshell Shape Optimization in Hypersonic Entry Conditions

Eulerian and Lagrangian Methods for Coherent Structure Analysis in Both Computational and Experimental Image Analysis to Determine the Response of Passive Surface Hairs

A Novel Polymeric Sheet with Embedded Micro Optical Resonant Cavities for Wall Pressure Measurements

A MEMS Floating Element with Bump Shear Stress Sensor Array on a Chip

An Experimental Investigation on the Effects of Turbine Rotation Directions on the Wake Interference of Wind Turbines

Accuracy of State-of-the-Art Actuator-Line Modeling for Wind Turbine Wakes

Experimental Study of Turbine Hub Height Variation on Wind Farms

VOLUME 11

Downburst Effects on Wind Turbine Arrays

An Experimental Case Study of Complex Topographic and Atmospheric Influences on Wind Turbine Performance

An Experimental Study on the Performances of Wind Turbines over Complex Terrains

Localization of Acoustic Sources in Shock-Containing Jet Flows Using Phased Array Measurements

Modeling of Jet-by-Jet Diffraction

Effect of Nozzle-Exit Boundary Layer on Jet Noise

Effect of Scale on the Far-Field Pressure Skewness and Kurtosis of Heated Supersonic Jets

Integrated System Design Using Bayesian Belief Networks


GUI-based Geometry Deformation Tool for Modification of Aircraft Configurations

Development and Validation of Conceptual Design Framework for a Mid-Size Turbo-Prop Transport

Cooper-Harper Evaluation of Small UAS

Trim Analysis of a Moving-Mass Actuated Airplane in Steady Turn

Flight Performance Characteristics of a Tailless Folding Wing Morphing Aircraft

Stability of a Tailless Folding-Wing Morphing Aircraft in Static Configuration

MEMS Wall Shear Stress Sensor for Real Time Onboard Monitoring of Flow Separation Over a Wing Surface

A MEMS Floating Element with Bump Shear Stress Sensor Array on a Chip

A Novel Polymeric Sheet with Embedded Micro Optical Resonant Cavities for Wall Pressure Measurements

Image Analysis to Determine the Response of Passive Surface Hairs

Eulerian and Lagrangian Methods for Coherent Structure Analysis in Both Computational and Experimental Data

CFD-Based Axisymmetric Aeroshell Shape Optimization in Hypersonic Entry Conditions

Low-Cost Robust Airfoil Optimization by Variable-Fidelity Models and Stochastic Expansions

Unsteady Aerodynamic Design on Unstructured Meshes with Sliding Interfaces

Wing Profile Performance Variations Influenced by Manufacturing Tolerances
Design Optimization of Vortex Generators for a Junction Vortex of Wing-Body Configuration by Discrete Adjoint Approach ................................................................. 9259
Chung-Yang Kim

Analysis of the UH-60A Rotor Loads Using Wind Tunnel Data ................................................................................................................................. 9281
Ritu Marpu, Lakshmi Sankar, Thomas Norman, T. Alan Egolf, Stephen Makinen

Airloads Correlation of the UH-60A Rotor inside the 40- by 80-Foot Wind Tunnel ................................................................. 9305
I-Chung Chang, Thomas Norman, Ethan Romander

An Extension of the Time-Spectral Method to Overset Solvers ................................................................................................................................. 9328
Joshua Leffel, Scott Murman, Thomas Pallim

Quasi-periodic Time Spectral Method for Aeroelastic Flutter Analysis ................................................................................................................................. 9353
Nathan Mundis, Dimitri Mavriplis

Optimising Aspects of a BERP-like Rotor Using Frequency-Domain Methods ......................................................................................................................... 9368
Cathy Johnson, George Barakos

CFD Analysis of the RC-135 Rivet Joint Antenna Array ................................................................................................................................. 9401
John Staiger

Analysis of the Effects of Wall Interference on 0.4x0.8-Meter Transonic Wind Tunnel Airfoils Tests ................................................................................................................................. 9420
Junsok Yi, Young Ben, C. Gao, Juntao Xiong, Feng Liu, Shijian Luo

Aspects of Sting Interference for Transonic Store Release Wind Tunnel Testing ......................................................................................................................... 9435
Graham Doig, Guran Bogdan, Murray Snyder, Ben Rowe

Numerical Simulation of Massively Separated Flow over a Model of the Apollo Command Module ................................................................................................................................. 9448
Balasubramaniam Sasanapuri, Manish Kumar, Angela Lestari, Konstantin Kurbatski, Satikno Wirgso

Validation of DES for Capsule Aerodynamics using 05-CA Wind Tunnel Test Data ................................................................................................................................. 9457
D. Schwang, Grahame Candler

A Numerical and Experimental Study of an Airfoil in a Transonic Wind Tunnel ................................................................................................................................. 9503
Bruno Goffert, Marcos Ortega, Jo Falcao

Experimental Validations of a Low Boom Aircraft Design ................................................................................................................................. 9513
Todd Magee, Stephen Shaw, Spencer Fugel

Full Configuration Low Boom Model and Grids for 2014 Sonic Boom Prediction Workshop ................................................................................................................................. 9542
John Margenstern, Michael Buonanno, Frank Marconi

Near Field Pressure Measurements of Several Models in JAXA's 1m x 1m Supersonic Wind Tunnel ................................................................................................................................. 9553
Y. Makina, Masayoshi Noguchi

Summary of the 2008 NASA Fundamental Aeronautics Program Sonic Boom Prediction Workshop ................................................................................................................................. 9563
Michael Park, Michael Aftosmis, Richard Campbell, Melissa Carter, Susan Cliff, Linda Bangert

Introduction of 1st Low Boom Prediction Workshop ................................................................................................................................. 9590
Kenrick Waithie

Assessment of the Effect of Aircraft Technological Advancement on Aviation Environmental Impacts ................................................................................................................................. 9596
Kashal Moulichandani, Dantu Buyang Agoozimata, Daniel DeLaurentis, William Crossley

Aerodynamic Analysis of Helicopter Rotor Blades in Heavy Rain Condition ................................................................................................................................. 9609
Tung Wan, Ying-Lian Lin, Hsiang-Chun Kuan

CFD-Based Optimization of Electro-Thermal Wing Ice Protection Systems in De-Icing Mode ................................................................................................................................. 9620
Mahdi Pourbargian, Wagdi Habashi

Detection of Pitot-Static Icing at High Altitudes ................................................................................................................................. 9630
Philip Jarvinen

Rubber Bands and Pennies: An Introductory Aircraft Design Experience ................................................................................................................................. 9635
D. Brian Landrum

Multidisciplinary Team-based Design-Build-Test Projects with an Aero Premise ................................................................................................................................. 9645
Clifford Whitfield

Senior Capstone Design Project for Aerospace Specialization and Student-Faculty Research on Propulsion ................................................................................................................................. 9653
Viatcheslav Naoumov, Nidal Al Masoud, Alexander Haralambous, Adam Goldreich, Elaine Monsy

A Simulation Framework for Aerospace Design Education ................................................................................................................................. 9666
Mark Anderson

Development of an Unmanned Aircraft Systems (UAS) Option at the Graduate Level ................................................................................................................................. 9674
Andrew Arena, Giri Choudhary, Joseph Conner, Richard Gaeta, James Jacob, James Kidd

Development of an Aerospace Systems Engineering Graduate Program at University of Illinois at Urbana Champaign ................................................................................................................................. 9689
Steven D'Urso

Geometry Optimization in Three-Dimensional Unsteady Flow Problems using the Discrete Adjoint ................................................................................................................................. 9700
Karthik Mani, Dimitri Mavriplis

Numerical Evidence of Multiple Solutions for the Reynolds-Averaged Navier-Stokes Equations for High-Lift Configurations ................................................................................................................................. 9717
Dmitry Kamenshchik, John Bassolotti, Craig Hilmes, Forrester Johnson, Yenkat Venkatakrishnan, Laurence Wigton

Static and Dynamic Loads Modeling of an Aerodynamic Control Surface ................................................................................................................................. 9735
Mehdi Ghoreyshi, Adam Jirasek, Russell Cummings, Robert Tomaro, Kenneth Wurtler

One-Way Coupled Fluid Structure Simulations of Stores in Weapons Bays ................................................................................................................................. 9754
Srinivasan Arunagatesan, Manoj Bhuridwaj, Wilson Riley, Michael Ross

Comparison and Improvement of Wall Heat Transfer Prediction in Crossing-Shock-Wave/Turbulent-Boundary-Layer Interaction Conditions ................................................................................................................................. 9767
Andrea Salin, Yufeng Yao, Alexander Zhelovodov

Hypersonic Stability Analysis of a Flared Cone ................................................................................................................................. 9787
Travis Kocian, Eduardo Perez, Nicholas Olivier, Joseph Kuehl, Helen Reed
Theoretical Modeling of TS-dominated Transition Induced by Solid Particulates .......................................................... 9801
Alexander Fedorov

Acoustic Receptivity Measurements Using Modal Decomposition of a Modified Orr-Sommerfeld Equation ................................. 9815
Jason Monschke, Matthew Kuester, Edward White

Accurate Parabolic Navier-Stokes Solutions of the Supersonic Flow Around an Elliptic Cone ........................................ 9828
Pedro Paredez, Vassilios Theofilis

A Modular RANS Approach for Modeling Hypersonic Flow Transition on an Air-breathing Configuration ........................... 9839
Lianghua Xiao, Liang Wang, Song Fu, Zhixiang Xiao

VOLUME 12

Dynamics and Energy Extraction of a Surging and Plunging Airfoil at Low Reynolds Number ............................................... 9851
Jeason Choi, Tim Columbus, David Williams

Aeroelasticity Investigation of Generic SUAS-Membrane Wing Validation Study ............................................................... 9866
Hong Yang, Jonathan Dudley, James Davis

Oscillating Flexible Wings at Low Reynolds Numbers ........................................................................................................... 9885
David Cleaver, Zhi-Jin Wang, Ismet Gursul

Aspect Ratio Effects on the Leading-Edge Circulation and Forces of Rotating Flat-Plate Wings ........................................ 9905
Zakery Carr, Adam Devorsa, Matthew Ragnante

Flow Structure on a Rotating Wing: Effect of Wing Aspect Ratio and Shape ........................................................................ 9927
C.J. Ozen, Donald Rockwell

Experimental Studies of an Accelerating, Pitching, Flat-Plate at Low Reynolds Number ...................................................... 9944
Robbie Stevens, Charlie Pitt Ford, Holger Babinsky

Investigation of Cavity Flow Using Fast-Response Pressure Sensitive Paint ........................................................................... 9960
William Flaherty, Todd Reedy, Gregory Elliott, Joanna Austin, Ryan Schmit, Jim Crafton

Control of High Subsonic Cavity Flow Using Plasma Actuators .............................................................................................. 9975
Kevin Yagulis, James Gregory, Mo Samimi

Studies on Microjet Control Effectiveness in High-Temperature Supersonic Impinging Jets .................................................... 9991
Ted Worden, Pujja Upadhyay, Jonas Gustavsson, Farrukh Ali

Passively Compliant Membranes in Low Aspect Ratio Wings .............................................................................................. 10008
Manuel Arce, Lawrence Ukeiley, Zheng Zhang, James Hubbard, Peter Ifju

Force and Deformation Measurement on Low Aspect Ratio Membrane Airfoils ................................................................. 10022
Zheng Zhang, James Hubbard, Yskov Ahudarum, Lawrence Ukeiley, Peter Ifju, Nathan Martin, Andrew Wrist

A Non-equilibrium Dynamic Wall-model for LES of High Reynolds Number Airfoil Flow Near Stall Condition ................ 10039
Asada Kengo, Kezii

Analysis of Highly-Resolved Simulations of 2-D Humps Toward Improvement of Second-Moment Closures ...................... 10055
Elbert Jeysapal, Christopher Rumsey

Recallibration of the Shear Stress Transport Model to Improve Calculation of Shock Separated Flows ............................. 10069
Nicholas Georgiadis, Dennis Yoder

Realizable Unified RANS-LES and Dynamic LES Methods for Turbulent Flow Simulations .................................................. 10092

An Implicit Reconstructed Discontinuous Galerkin Method Based on Automatic Differentiation for the Navier-Stokes Equations on Tetrahedron Grids ........................................................................ 10105
Yudong Xia, Hong Luo, Robert Nourgaliev

Development of Discontinuous Galerkin Method for Detonation and Supersonic Combustion ........................................ 10128
Yu Lv, Matthias Ihme

A Hybridized Multiscale Discontinuous Galerkin Method for Compressible Flows ................................................................. 10140
Cuong Nguyen, Xevi Roca, David Moro, Jaime Peraire

Comparison of Methods for Implementing Well-Posed Boundary Conditions in Galerkin CFD Solvers ................................ 10153
Nicholas Moffitt, Charles O'Neill, Cody Pinkerman, Anthony Hassett, Andrew Arena

Comparison of SUPG and DG Finite-Element Techniques for the Compressible Navier-Stokes Equations on Anisotropic Unstructured Meshes ......................................................................................... 10199
Ryan Gashby, Nicholas Burgess, Kyle Anderson, Li Wang, Steven Allmaras, Dimitri Mavriplis

Visualisation of Blow-off Events of Two Interacting Turbulent Premixed Flames ............................................................... 10214
James Kariuki, Nicholas Worth, James Dawson, Epanamondas Mastorakos

Emission Formation of Liquid Fuel Combustion Under Humidified Conditions ................................................................. 10226
Sebastian Schimke, Sebastian Gils, Christian Paschereit

A Novel Flame Stabilization Method Using Standing Acoustic Fields ..................................................................................... 10236
Mitsuki Tanabe, Masanori Saito, Masato Katsutama, Hironori Yamada

HIFIRE Flight 2 - A Program Overview ............................................................................................................................ 10244
Kevin Jackson, Mark Gruber, Salvatore Buccellato

Measurements on NASA Langley Durable Combustor Rig by TDLAT: Preliminary Results ................................................. 10271
Evanston Rosa, Erik Ellison, Brian McGovern, James McDaniel, Glenn Dickin, Maxwell Deperto, Diego Caprotti, Richard Gaffney

Uncertainty Analysis of Velocity Measured by Diode-Laser Absorption Spectroscopy in a Scramjet Facility ........................... 10284
Fei Li, Xilong Yu, Weitao Cai, Lin Ma

Dual-Mode Scramjet Flameholding Operability Measurements ............................................................................................ 10292
James Donohue
Analysis of Multi-Segment Lunar Free Return Trajectories

Jingyang Li, Shengjing Gong, Hesi Basin, Shing-Yik Yim, Hengmiao Shui

Low-thrust Trajectory Design for Halo-to-halo Transfer between the Sun-Earth and Earth-Moon Systems

Peng Zhang, Junfeng Li, Yanmin Li, Jingyong Liu, Jingyang Li
Conceptual Study of a Small-Sized Mars Aerocapture Demonstrator ................................................................. 10773
Kazuhisa Fujita, Shinichiro Naria

Development and Testing of an Inflatable Artificial Gravity System ................................................................. 10789
Zach Barbee, Shea Februnbach, Jamey Jacob

Evaluation of Motion Capture Techniques in Microgravity .................................................................................. 10807
Alyssa Avery, Jamey Jacob

Preparation of a Frozen Regolith Simulant Bed for ISRU Component Testing in a Vacuum Chamber ......................... 10821
Julie Kleinhenn, Diane Linne

Facilities Development and Build Up for the Testing of ISRU Systems ................................................................. 10831
Dale Boucher, Sherry Schmidt

RESOLVE OVEN Field Demonstration Unit for Lunar Resource Extraction ........................................................... 10838
Aaron Paz, Lara Oryanchyn, Scott Jensen, Michael Reddington, Kris Lee, Gerald Sanders

Verification and Validation of DESTIN as the Primary Sample Acquisition Tool for the RESOLVE Project ............ 10851
Sherry Schmidt, Dale Boucher, Stephanie Fudge, Cindy Komareckha

Tangential Velocity Effects and Correlations for Blow-Off and Flashback in a Generic Swirl Burner and the Effect of a Hydrogen Containing Fuel ................................................................. 10856
Nicholas Syred, Anthony Giles, Jonathan Lewis, Agustín Valera-Medina, Philip Bowen, Anthony Griffiths

Experimental Investigation of Flame Extinction Limits of Canola and Soy Methyl Ester ........................................ 10871
Maria Grisanti, Ramkumar Parthasarathy, Subramanyam Gollahalli

Numerical Study of Upstream Radiative Heating in 1-D Detonations .................................................................. 10887
Pratibha Baghunandan, Kakottakuzhky Isaac

Simulation of a Single-Element Lean-Direct Injection Combustor Using a Polyhedral Mesh Derived from Hanging-Node Elements ........................................................................................................... 10898
Changwu You, Nan-Suey Liu

Combustion Characteristics of Petroleum and Biofuel Spray Flames in a Furnace ................................................. 10909
Cory Morton, Victor Tran, Ramkumar Parthasarathy, Subramanyam Gollahalli

Translational Temperature Distribution Measurements in High Enthalpy Flows by Laser-Induced Fluorescence ........ 10927
Hiroki Takayanagi, Kato Shun, Takeharu Sakai, Masahito Mizuno, Keisuke Fujii, Kazuhiro Fujita, Makoto Matsu, Yoshiki Yamaguchi

Experimental Study of Atomic Oxygen Catalytic Efficiency on TPS Surfaces using Microwave Discharged Plasma ......................................................................................................................... 10938
Shotaro Suzuki, Masahito Mizuno, Hiroki Takayanagi, Kazuhiro Fujita, Makoto Matsu, Yoshiki Yamaguchi

Experimental Study on the Ice Freezing Adhesive Characteristics of Metal Surfaces ............................................. 10947
Wei Dong, J. Ding, Zh. Zhou

Liquid Piston Compression with Droplet Heat Transfer ......................................................................................... 10958
Chao Qin, Eric Loth

Simulation of the High Cycle Fatigue Life Reduction Due to Internal Hydrogen Embrittlement Using a Commercial Finite Element Program ............................................................................................................. 10982
Wissam Bouaibila, Joerg Riccius, Matthias Bruchhausen, Burkhard Fischer

Atmospheric Boundary Layer Studies with Unified RANS-LES and Dynamic LES Methods .................................. 10996
Harish Gopalan, S. Heinz, Michael Steeolinger, Ehsan Foroushani

Estimation of Spatially/Temporally Resolved Wind Inflow from Limited Measurements ......................................... 11006
Raj Rati, Harish Gopalan, Jonathan Naughton

Correlation between Rotating LIDAR Measurements and Blade Effective Wind Speed ......................................... 11023
Eric Sinley, Lucy Pan

FENSAP-ICE Simulation of Icing on Wing Turbine Blades, Part 1: Performance Degradation .................................. 11038
Thomas Reid, Guido Baruzzi, Isik Ozer, David Switchonko, Wadgi Habashi

FENSAP-ICE Simulation of Icing on Wing Turbine Blades, Part 2: Ice Protection System Design ............................ 11056
Thomas Reid, Guido Baruzzi, Isik Ozer, David Switchonko, Wadgi Habashi

Disturbance Introduced Into A Laminar Boundary Layer by a NS-DBD Plasma Actuator ....................................... 11070
Georgge Corrals, Theodoros Michal, Ilya Popori, Leo Veldhuis, Mariu Kutsan, Steven Hulshoff

Lift and Drag Control of Circular Cylinder by Surface HF Plasma Actuator ............................................................. 11088
Valentin Bityurin, Sergey Boytsov, Anatoly Klumov, Pavel Kazansky, Ivan Moralev

Dielectric Barrier Discharge Control and Flow Acceleration Enhancement by Diode Surface .................................. 11096
Andrey Starikovskiy, Richard Miles

Design of a microNewton Thrust Stand for Low Pressure Characterization of DBD Actuators ............................... 11113
Jignesh Sont, Justin Zito, Subrat Roy

Simultaneous Investigation of Pressure Effects and Airflow Influence on DBD Plasma Actuators ............................. 11126
Jochen Kriegle, Kiria Barckmann, Jürgen Frey, Sven Grundmann, Cameron Trapea

Preliminary Results Concerning Nonlinear Acoustic Damping in a Forced Rijke Tube .............................................. 11135
Eric Jacob

Numerical Investigation of a Model Propeller Operating Under Off-design Conditions ........................................... 11142
Maron Mattar, Eirene Busch, Thorsten Lutz, Manuel Kessler, Ewald Kraemer

Validation of a Time-Domain Equivalent Source Method for Acoustic Scattering by an Oblate Spheroid .................. 11153
Baoqfeng Cheng, Kenneth Brentner, Philip Morris

Flapping Micro Air Vehicle: Wing Fabrication and Analysis .................................................................................. 11170
Jadric Davison, Todd Smith, Gregory Parker, P. Huang, Philip Beran, Mervat Elihendi

Design of a Biomimetic Unmanned Aircraft System ............................................................................................ 11182
Dillon Nelson, Frederic Keating, James Leonard, Jamey Jacob, Joshua Heffernen
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive Roll Compensation on Micro Air Vehicles with Perimeter Reinforced membrane Wings</td>
<td>11194</td>
</tr>
<tr>
<td>Basic Research for Flying Boat Type MAV of Low Aspect-ratio BWB</td>
<td>11206</td>
</tr>
<tr>
<td>Indoor Flight Test Facility Requirements for MAVs</td>
<td>11220</td>
</tr>
<tr>
<td>An Investigation into the use of Neighboring Optimal Control in the Solution of a Perching Problem</td>
<td>11232</td>
</tr>
<tr>
<td>Piezoelectric Morphing versus Servo-Actuated MAV Control Surfaces, Part II: Flight Testing</td>
<td>11242</td>
</tr>
<tr>
<td>Geometric Control of a Flapping Device in a Uniform Flow</td>
<td>11262</td>
</tr>
<tr>
<td>3D Attitude Estimation in Indoor Environments with a Complementary Filter for the Special Orthogonal Group SO(3)</td>
<td>11273</td>
</tr>
<tr>
<td>Influence of Cruise Flight Speed of Entomopter on Aerodynamics Loads</td>
<td>11284</td>
</tr>
<tr>
<td>Data Reduction from Time-resolved Tomographic PIV for Unsteady Pressure Evaluation</td>
<td>11297</td>
</tr>
<tr>
<td>Physics based Compressive Sensing Approach Applied to Airfoil Data Collection and Analysis</td>
<td>11309</td>
</tr>
<tr>
<td>Application of Proper Orthogonal Decomposition to Hyperspectral Tomographic Imaging of Unsteady Flows</td>
<td>11329</td>
</tr>
<tr>
<td>Application of MHz Frame Rate, High Dynamic Range PIV to a High-temperature, Shock-containing Jet</td>
<td>11337</td>
</tr>
<tr>
<td>A New Architecture for Burst-Mode Planar Imaging of Turbulent Flames</td>
<td>11358</td>
</tr>
<tr>
<td>Development of a High-Energy Pulse Burst Laser System for High-Speed Fluid Dynamics and Combustion Measurements</td>
<td>11365</td>
</tr>
<tr>
<td>Quantification and Accuracy of a CMOS-Based Raman Scattering Imaging System for High-Speed Measurements in Turbulent Flames</td>
<td>11375</td>
</tr>
<tr>
<td>Multi-Level Surrogate-Based Airfoil Shape Optimization</td>
<td>11387</td>
</tr>
<tr>
<td>Aerodynamic Rotor Blade Optimization at Eurocopter - A New Way of Industrial Rotor Blade Design</td>
<td>11396</td>
</tr>
<tr>
<td>Aerodynamic Optimization of Wings by Space Mapping</td>
<td>11410</td>
</tr>
<tr>
<td>Wingle Design for Sailplanes Using a Multi-Objective Evolutionary Algorithm</td>
<td>11424</td>
</tr>
<tr>
<td>Optimization of FX, DU and NACA Airfoils for Wind Turbine Blades Using a Multi-Objective Genetic Algorithm</td>
<td>11443</td>
</tr>
<tr>
<td>Overview of the Aeroelastic Prediction Workshop</td>
<td>11457</td>
</tr>
<tr>
<td>Lessons Learned in the Selection and Development of Test Cases for the Aeroelastic Prediction Workshop: Rectangular Supercritical Wing</td>
<td>11478</td>
</tr>
<tr>
<td>FUN3D Analyses in Support of the First Aeroelastic Prediction Workshop</td>
<td>11541</td>
</tr>
<tr>
<td>Results Using NSU3D for the First Aeroelastic Prediction Workshop</td>
<td>11565</td>
</tr>
<tr>
<td>Flow Simulations for the First Aeroelastic Prediction Workshop Using the EZNSS Code</td>
<td>11582</td>
</tr>
<tr>
<td>Analysis of Test Case Computations and Experiments for the Aeroelastic Prediction Workshop</td>
<td>11606</td>
</tr>
<tr>
<td>SID Modeling of Non-linear Characteristics of NACA 0012 Airfoil at Different Mach Numbers</td>
<td>11632</td>
</tr>
<tr>
<td>Reduced Order Modelling for Aeroelastic Aerofoil Response to a Gust</td>
<td>11644</td>
</tr>
<tr>
<td>Investigation of NACA 0012 Airfoil Periodic Flows in a Transonic Wind Tunnel</td>
<td>11660</td>
</tr>
<tr>
<td>Effect of Pivot Point on Aerodynamic Force and Vortical Structure of Pitching Flat Plate Wings</td>
<td>11682</td>
</tr>
<tr>
<td>A Numerical Study of Tandem Pitching Airfoils</td>
<td>11717</td>
</tr>
</tbody>
</table>

VOLUME 14
An Experimental Investigation on the Asymmetric Wake of an Oscillating Airfoil .............................................................. 11730
Hui Hu, Wei Ren, Hong Liu, James Wu

3D Flapping Aerodynamic Comparisons Of Corrugated Wing Vs. Flat Plate ................................................................. 11742
Ezzeddin Elarbi

Plunging Frequency-Amplitude Effects on Propulsion Performance of Flapping NACA 0012 Wing ........................................... 11757
Ezzeddin Elarbi

Robust and Scalable Overset Grid Assembly for Partitioned Unstructured Meshes ............................................................. 11772
Beatrice Roget, Jayanarayanan Sitaranam

Evaluation of Grid Modification Methods for On- and Off-Track Sonic Boom Analysis ..................................................... 11797
Sudeep Nayani, Richard Campbell

Development of Fluid-Structure Interaction Capability in DPLR .................................................................................... 11835
Michael Barnhardt

Strand Grid Solution Procedures for Sharp Corners ........................................................................................................... 11848
Dalon Work, Ryan Workman, Aaron Katz, Andrew Wissink, Osin Tong

Simulated Rotor Wake Interactions Resulting from Civil Tiltrotor Aircraft Operations Near Vertiport Terminals ............... 11869
Marcel Reic, Carlos Velez, Patricia Coronado

Aerodynamic Characteristics and Kinematic Analysis during Turnover of a Reusable Sounding Rocket ......................... 11894
Kazuto Kazuo, Satoshi Nonaka, Junya Aono, Eiji Shima

Effects of Duct Shape on a Ducted Propeller Performance .......................................................................................... 11907
Serdar Yilmaz, Duygu Erdem, Mehmet Karavagli

Reduction of Helicopter BVI Noise Using Synthetic Jets; A Numerical Study Using Large-eddy Simulation .................. 11918
Marcel Reic, Patricia Coronado, Carlos Velez

Rotorcraft Blade-vortex Street Interactions; Critical Aerodynamic Aspects ................................................................. 11933
Marcel Reic, Carlos Velez, Patricia Coronado

ISS Space Plasma Laboratory: An Orbital Solar and Heliospheric Physics Simulation Facility ...................................... 11961
Edgar Bering, Spiro Antiochos, Barbara Thompson, Mark Carter, Leonard Cassidy, Benjamin Longmier, Jared Squire, C. Richard Devore, John Sheehon, James McFadden, David Smith

Source Characterization for a Combined Effects Space Simulation Facility .............................................................. 11977
Carlos Malindano, Andrew Ketsdever, Taylor Lilly, Lauren Bann, Kan Xie, Casey Farnell, John Williams

Further Results from the U.S. Round-Robin Experiment on Plasma Expansion Speed ................................................. 11989
Boris Vayner, Dale Ferguson, Ryan Hoffmann, Adrian Wheelock, Justin Likar, John Prebarta, Dustin Crider, Todd Schneider, Jason Vaughn, Bao Hoang, Kenneth Steele, Sigrid Close, Ashish Goel, Mark Crofton, Jason Young, Michael Bodean, Negar

The Best GEO Daytime Spacecraft Charging Index ................................................................................................... 12014
Dale Ferguson, Steven Wimberly

Possible Decline in Solar Array Performance Due to Electrostatic Discharges in Orbit ......................................................... 12031
Boris Vayner, Joel Gulofaro

300V Direct Drive Vacuum Arc Thruster for Nano-satellite ........................................................................................... 12044
Masayoshi Nakamoto, Kazuhiro Toyoda, Shingo Fuchigami, Mengu Cho

On-Orbit Data Analysis of High Voltage Technology Demonstration Satellite HORYU-II .................................................. 12049
Shunsuke Iwata, Mengu Cho, Kazuhiro Toyoda, Tatsuya Yone, Hirokazu Marui, Minoru Isawa

Development Of Non-Optimum Factors For Launch Vehicle Tank Bulkhead Weight Estimation .................................. 12056
K. Chauncey Wu, Matthew Wallace, Jeffrey Cerro

Aerospace Analysis for a Non-Aerospace Archery Application .................................................................................... 12070
Eric Martin, Anne-Marie Behak

Hardware-in-the-Loop Technology Enabling Flexible Testing Processes ...................................................................... 12077
Andrew Himmler

The Hyperion 2.1 Green Aircraft Project .................................................................................................................. 12085
Jean Koster, Corrina Gibson, Gauravdeev Sain, Weston Willits, Yibin Sanmankanarayanan

Field Testing LIDAR-Based Feed-Forward Controls on the NREL Controls Advanced Research Turbine .................. 12116
Andrew Scholbrock, Paul Fleming, Lee Fingerh, Alan Wright, David Schlipf, Florian Haizmann, Fred Bolen

Computational Analysis of Compaction Wave Dissipation in Porous Solid Explosives .................................................. 12124
Prapat Thamanna Rao, Sanada Chaikrayaroth, Keith Gonthier

Modeling Composite Solid Propellant with Catalytic Additives .................................................................................... 12134
Corey Frazier, Andrew Demko, Eric Petersen

Laboratory-Scale Burning of Composite Solid Propellant for Studying Novel Nanoparticle Synthesis Methods ............. 12145
Tyler Allen, Andrew Demko, Mitch Johnson, Thomas Sammet, Eric Petersen, David Reid, Robert Draper, Sudipta Seal

Selection of Nanocomposite Reactive Materials for Using in Oxygen and Hydrogen Generators .................................. 12155
Marco Machado, Daniel Rodriguez, Evgeny Shafirovitch, Edward Drezin

Numerical Simulation on the Heat Source Surface of Spray Combustion for the Fuel of Li2SF6 ........................................... 12165
Chunliang Zhou, Bang-Yu Lin

Heat and Mass Transfer in Porous Media with Evaporating Effect in the Condenser of AMTEC .............................. 12173
Chunliang Zhou, Zhiguo Song

Numerical Simulation of the Thermal Performance of AMTEC .................................................................................... 12180
Chunliang Zhou, Zhiguo Song

The Stabilization of a Mach 10 Boundary Layer Using Regular Porous Coating ........................................................... 12192
Xiaowen Wang, Xiaolin Zhong
Oscillating Flowfield Waveriders Designed to Maximize Boundary Layer Stability: Preliminary 2D Concepts ................................................................. 1227
Patrick Bodt
Numerical Investigation of Porous Walls for a Mach 6.0 Boundary Layer Using an Immersed Interface Method .......................................................... 12239
Christoph Hader, Christoph Bremh, Hermann Fasel
Stability Analysis: An Experimental Study of Stationary Crossflow Instability for Swept Wing Boundary Layer .............................................................. 12259
Dong Li, Jue Wang, Meili Wang, Yuwei Li
Local and Bi-Global Stability Analysis of a Plasma Actuated Boundary Layer ......................................................................................................... 12267
Paul Riherd, Sabrina Roy
Force Coefficients of Low Reynolds Number Rotating Wings .......................................................................................................................... 12281
Kristy Schlueter, Anya Jones, Michael Ol, Kenneth Granlund
On the Influence of Pitching and Acceleration on Vortex Dynamics Around Low-Aspect-Ratio Rectangular Wing .............................................................. 12292
Ryan Jantzen, Kamihiko Taira, Kenneth Granlund, Michael Ol
Description of the Vortices and Vorticity around a Low-Aspect Ratio Flat Plate .............................................................................................................. 12304
Redha Wahidi, James Huhner
Vortex Dynamics and Performance of a Flexible Plunging Airfoil .......................................................................................................................... 12319
A Criterion for Vortex Separation on Unsteady Aerodynamic Profiles .................................................................................................................. 12340
David Rival, Jochen Kriegzeis, Pascal Schaub, Alexander Widmann, Cameron Tropea
A Lagrangian Perspective on Vortex Formation for Unsteady Flat Plates .................................................................................................................. 12351
Jochen Kriegzeis, Matthias Kinzel, David Rival
Lift on a Moving Flat Plate ............................................................................................................................................................................................ 12363
Xi Xia, Kamran Mohseni
Using Adjoint-based Approach to Study Flapping Wings ........................................................................................................................................ 12380
Min Yu, Mingjun Wei
Mechanisms of Deflection Angle Change in the Near and Far Vortex Wakes behind a Heaving Airfoil ................................................................. 12391
Zhenglu Wei, Z. Charlie Zheng
Investigation of the Wake Vortex Pattern of Rigid and Flexible Airfoils Undergoing Harmonic Pitch Oscillation ................................................ 12404
Bruno Montiir, Ahmed Naguib, Manoochehr Koochesfahani
Vortex Dynamics of a Finite-Aspect-Ratio Plunging Wing ............................................................................................................................. 12418
Azar Eslami Panah, James Akhala, James Buchholz
Evolution and Breakdown of a Leading Edge Vortex on a Rotating Wing ................................................................................................................ 12435
David Mayo, Anya Jones
Adaptive Simulations of Jet Injection in Crossflow ................................................................................................................................. 12452
Tua Nguyen, Simon Yu, Randy Chue
Fuel Jet Mixing Enhanced by Intermittent Injection ........................................................................................................................................ 12471
Holger Grosshans, Alexander Nygard, Laszlo Fuchs
Progress and Challenges in Sensitivity Computation of Chaotic Fluid Flow Simulations ......................................................................................... 12482
Qing Wang
Numerical Investigation of Flows with Three-Dimensional Separation .............................................................................................................. 12493
Andreas Gross, Hermann Fasel
Effect of Pulse Blowing on Flow over Control Surface ........................................................................................................................................ 12525
Yankai Wang, Qian Li, Ping Zhou, Dejian Zhao
Separated Flow Response to Single Pulse Actuation ........................................................................................................................................ 12532
Thomas Albrecht, Tom Weier, G. Gerbeth, David Williams, Bruno Montiir

VOLUME 15

Investigation of Pulsed Blowing Control Mechanism Using Wavelet Analysis and Acoustic Excitation ................................................................. 12545
Chiara Bernardini, Stuart Benton, Jen Peng Chen, Jeffrey Bars
Mechanism of Dynamic Stall Control on a Vertical Axis Wind Turbine .................................................................................................................. 12557
David Greenblatt, Amos Ben Harav, Hanns Mueller-Vahl
Suction Effects on the Transition and Reattachment of a Transitional Bubble ................................................................................................. 12573
Redha Wahidi, David Bridges
Control Mechanism of Plasma Actuator for Separated Flow around NACA0015 at Reynolds Number 63,000 - Separation Bubble Related Mechanisms........................................................................................................................................ 12589
Takesi Nonomura, Takanori Aono, Makoto Sato, Aki Yarden, Koichi Okada, Yoshitsuki Abe, Koza Fujii
Thick Airfoil Deep Dynamic Stall and its Control ........................................................................................................................................ 12617
Hanns Mueller-Vahl, Christoph Strangfeld, C. Nayer, Christian Paschereit, David Greenblatt
On the Accuracy and Efficiency of Several Discontinuous High-order Formulations .............................................................................................. 12632
Meilin Yu, Zhijian Wang
High-order Methods for Solutions of Three-dimensional Turbulent Flows ............................................................................................................. 12669
Li Wang, W Kyle Anderson, Jon Ervin, Sugar Kapadia
A High-Order Self-Adaptive Monolithic Solver for Viscous-Inviscid Interacting Flows .......................................................................................... 12686
David Moro, Cuong Nguyen, Mark Drela, Jaime Peraire
Propulsion Models Implemented in Finite Element CFD ........................................................................................................................................ 12704
Nicholas Moffitt, Cody Pinkerman, Andrew Arena
Corner Effects in Reflecting Oblique Shock-wave/Boundary-Layer Interactions ...................................................................................................... 12737
Holger Babinsky, Joseph Oorebeek, Troy Coltingham
Predictions of a Supersonic Turbulent Flow in a Square Duct ....................................................................................................... 12747
The Effect of Aspect Ratio on a Mach 2.75 Shock Boundary Layer Interaction Configuration .................................................. 12766
Daniel Gaalbraith, Mark Turner, Paul Orkwis, Samuel Weils
The Effect of Tunnel Size on Incident Shock Boundary Layer Interaction Experiments ......................................................... 12778
John Beach, Casimir Sachuta, Holger Babinsky
Recent Advances in Agglomerated Multigrid ....................................................................................................................... 12802
Hiroshi Nishikawa, Boris Diskin, James Thomas, Dana Hammond
A Fully-Coupled Approach to Simulate Three-Dimensional Flexible Flapping Wings ...................................................... 12844
Tao Yang, Mingjun Wei
Output Error Estimates and Mesh Refinement in Aerodynamic Shape Optimization .......................................................... 12856
Marian Nemec, Michael Aftosmis
An Adaptive Mesh Refinement Strategy with Conservative Space-Time Coupling for the Lattice-Boltzmann Method ........................................... 12874
Stephen Guezk, Xineng Gao, Todd Weisgraber, Berni Alder, Phillip Colella
Semi-Meshless Stencil Selection on Three-Dimensional Anisotropic Point Distributions with Parallel Implementation ...................................................................... 12885
David Kenneth, S. Timme, Juan Angulo, Kenneth Badcock
Inlet Guide Vanes Thermal Gradient Mitigation In the NASA Langley Research Center National Transonic Facility ........................................................................................................... 12903
Yenki Venkat, Roman Puryz, Owen Bisset, William Kilgore
Flow Field Measurements by PIV at High Reynolds Numbers ............................................................................................... 12915
Robert Konrath, J. Agocs, R. Geisler, D. Otter, L. Rosenboom, Th. Wolf, J. Quest
Enhancement of the Stereo Pattern Tracking Technique for Model Deformation assessment at ETW ...................................... 12923
Jennifer Mantik, H. Quas, J. Quest
Going for Experimental and Numerical Unsteady Wake Analyses Combined with Wall Interference Assessment by Using the NASA CRM-model in ETW .......................................................................................... 12938
Thorsten Lutz, Philipp Gansel, Jean-Luc Godard, Anton Gardubash, Robert Konrath, Jurgen Quest, S. Rivers
Fluid Mixing of Opposed Jet Flows in the Rectangular Duct ................................................................................................. 12953
Takahisa Nagao, Shinziuke Matsuno, A. Koshii Hayashi
Rayleigh Pressure Loss Analysis and Mitigation in Ultra-Compact Combustors .............................................................................. 12969
Tim Erdmann, David Blunck, Dale Shouse, Alejandro Briones, Craig Neuroth, Amy Lynch, Andrew Caswell, Daniel Richardson
Flowfield Effects on Distributed Combustion for Clean Gas Turbines ...................................................................................... 12982
Ahmed Khalil Huaan, Ashwani Gupta
Approximation of Agent Dynamics Using Reinforcement Learning .......................................................................................... 12992
Kenton Kirkpatrick, John Valasek
Application of Fuzzy Logic and GIS to Develop a Fire-prediction Algorithm for a Situational Awareness Based UAS for Wildland Fire-fighting (SIERRA) ............................................................................. 13005
Jutshi Agarwal, Manish Kumar, Kelly Cohen
Fuzzy Logic Inference for Pong (FLIP) ...................................................................................................................................... 13018
Brandon Cook, Sophia Mitchell, Kelly Cohen
Aircraft System Identification Using Artificial Neural Networks ................................................................................................. 13043
Kenton Kirkpatrick, James May, John Valasek
A Fuzzy Logic Based Image Processing Method for Automated Fire and Smoke Detection ..................................................... 13055
Sushil Garg, Balaji Sharma, Kelly Cohen, Manish Kumar
Nicholas Hanlon, Kelly Cohen, Manish Kumar
Fuzzy Logic Control of an Inverted Pendulum and a 2-DOF Helicopter .................................................................................. 13083
Alex Walker, Kelly Cohen
System Architecture Studies for the Energy Optimized Aircraft ............................................................................................... 13097
Suzanne Bergman, Matt French, Frederick Kuhn
Nonlinear Uncertainty Quantification, Sensitivity Analysis, and Uncertainty Propagation of a Dynamic Electrical Circuit ........................................................................................................................................... 13110
Austin Doty, John Doty, Jose Camberos, Kirk Yerkes
Evaluation of Equations of State for 1-D Modeling of the Thermally Choked Ram Accelerator .................................................. 13235
Tarek Bengherbia, Paschal Bauer, Yufeng Yao, Carl Knowlen, Adam Bruckner, Marc Giraud
Study on Detonation Wave Attenuation through Narrow Tube for Application to Explosion Safety and Detonation Engines .................................................................................................................................................. 13246
Radiation Measurements and Temperature Estimates of Unsteady Exhaust Plumes Exiting from a Turbine Driven by pulsed Detonation Combustion ................................................................................................................. 13259
Brent Rankin, Jay Gore, John Hoke, Frederick Schauer
On the Resolution Necessary to Capture Dynamics of Unsteady Detonation ............................................................................. 13272
Christopher Romick, Tariq Aslam, Joseph Powers
Ignition Envelope for Supersonic Combustion of Bulk Metals ................................................................................................. 13293
Anthony DePinto, Andrew Higgins
Multiple Polydisperse Spray Diffusion Flames; Influence of Droplet Size Distributions ................................................................. 13301
Liron Hamendnich, Jerrold Greenberg
Development of a New Dynamic Liquid Film Extension and Integration into a Spray Impingement Model ................................ 13315
Christian Rodrigues, Jorge Barata, andre Silva
Combustion of Bitumen-in-Water Drops: A Phenomenological Study ................................................................. 13326
Timothy Kennelly, Leo-Der Chen

Study on Droplet Nucleation Using Beryllium Injectors and Small Angle X-Ray Scattering (SAXS) Technique ................................................................. 13333
Kuo-Cheng Lin, Campbell Carter, Stephen Smith, Xiaobing Zuo

Simulation of Supercritical Ethylene Condensation in Beryllium Injectors .......................................................... 13351
Zachary Edwards, Jack Edwards, Kuo-Cheng Lin, Campbell Carter

Numerical Simulation of a Gas Turbine Combustor Using Nanosecond Pulsed Actuators ............................................. 13368
Chin-Cheng Wang, Subrata Roy

Temporal and Spatial Evolution of OH Concentration in a Lean Premixed Propane-Air Flame Assisted by Nanosecond Repetitively Pulsed Discharges .................................................................................................................. 13385
Da Xu, Deanna Lacoste, Christophe Lauts

Autoignition Behavior of Petroleum-Based and Hydroprocessed Renewable Jet Fuel Blends in a Rapid Compression Machine .................................................................................................................. 13391
Daniel Valco, Casey Allen, Tonghun Lee

Thermally-Nonequilibrium Kinetics of Plasma-Assisted Oxidation and Ignition below Self-Ignition Threshold ................................................................. 13400
Andrey Starikovskiy

Comprehensive Effectiveness and Efficiency Evaluation of Dielectric Barrier Discharge Plasma Actuators ................................................................. 13421
Jochen Krieges, Alexander Dachmann, Sven Grundmann, Cameron Tropea

Active Vortex Generation using Dielectric-Barrier Discharge Plasmas ................................................................................. 13432
Katrin Barckmann, Sven Grundmann, Cameron Tropea

VOLUME 16
In-Flight Transition Delay with DBD Plasma Actuators .................................................................................. 13446
Alexander Dachmann, Bernhard Simon, Philip Magin, Cameron Tropea, Sven Grundmann

Linear Stability Analysis of DBD Boundary-Layer Flow Control Experiments ................................................................. 13457
Alexander Dachmann, Cameron Tropea, Sven Grundmann

Dielectric Barrier Discharge Development at Low and Moderate Pressure Conditions .................................................. 13466
Andrey Starikovskiy, Sergey Panchesny

Experimental Investigation of Laser-Based Flow Modification Over a Low Speed Airfoil .................................................. 13480
Nathan Tichenor, Alfrun Bright, Kevin Kremeyer, Matthias Lenzner, Jeremy Yeak, Richard Wezien

Dynamics of Fragments of Cometary Meteors ................................................................. 13501
Chal Park

Study of Hybrid Dust Sample Collection System Toward Mars Aerosflyby Sample Collection Mission ................................................................. 13514
Toshiyuki Sasaki, Takashi Ozawa, Kazuhisa Fujita, Toshiyuki Hatakeyama, Makoto Tsubu, Kousuke Kurosawa, Takashi Mikouchi, Takeo Itai, Kyoko Okaedra

Spherical Capsule Heating in High Enthalpy Carbon Dioxide in LENS-XX Expansion Tunnel ................................................................. 13530
Matthew Maclean, Aaron Dufrere, Michael Holden

Computational Analysis and Characterization of the UTA 1.6 MW Arc-Heated Wind Tunnel Facility ................................................................. 13545
Cody Ground, Luca Maddalena, Valerio Vti

Initial Assessment of Mars Science Laboratory Heatshield Instrumentation and Flight Data .................................................. 13560
Deepak Bose, Michael Olson, Bernard Laub, Todd White, Jay Feldman, Jose Santos, Milad Malekz

Numerical Study on Anomalous Heating over Blunt-body in Free-Piston Shock Tunnel HIEST ................................................................. 13581
Tomosaki Ishihara, Yusuke Ogino, Naofumi Ohnishi, Keisuke Sawada, Hideyuki Tanno

Computation of Hypersonic Flow past a Blunt Body in an Inert Binary Gas Mixture in Rotational Non-equilibrium Using the Generalized Boltzmann Equation .................................................................................................................. 13593
Geng Qian, Bangguo Wang, Ramesh Agarwal

A Coupled CFD-CSD Method for Predicting HAWT Rotor Blade Performance ................................................................. 13612

A Solution-Based Stall Delay Model for Horizontal-Axis Wind Turbines ................................................................................. 13634
Joshua Dowler, Sven Schmitz

Implementation of the Actuator Cylinder Flow Model in the HAWC2 Code for Aeroelastic Simulations on Vertical Axis Wind Turbines .................................................................................................................. 13650
Helge Madsen, Torben Larsen, Luca Vita, Uwe Paulsen

Aerodynamics of an Ultralight Load-Aligned Rotor for Extreme-Scale Wind Turbines ................................................................. 13662
Adam Steele, Brian Ichter, Chao Qin, Eric Loth, Michael Selig, Patrick Moriarty

Rotational Augmentation on a 2.3 MW Rotor Blade with Thick Flatback Airfoil Cross Sections ................................................................. 13675
Scott Schreck, Lee Fingersh, Kate Siegel, Manjinder Singh, Paul Medina

Aerodynamic and Aeroacoustic Study of the Interaction between a 2D Wind Turbine Airfoil and a Cylinder Wake Using PIV and Farfield Microphones .................................................................................................................. 13684
Guannan Wang, Mark Glauser

Non-Selfmaintained Gas Discharge System Installation for Impact on Lean Flammable Gas Mixtures ................................................................. 13696
Dmitry Bychkov, Vladimir Bychkov, Sergey Denisov, Nikolai Arzelyan, Konstantin Koymachevskii

Plasma Flow from Electromagnetic Rail Accelerator Channels ................................................................................................. 13705
A. Erofeev, Boris Zhukov, Roman Karakin, Tatiana Lapushkina, Serguei Poniasev

Studying the Radio Frequency Energy Coupling to Atmospheric Plasma Jet for the Plasma-Assisted Combustion and Other Applications ................................................................. 13715
Stanislav Kolosenok, Alexander Karanov, Aleksander Savarovsky, Vladimir Soukhomlinov
Modeling of an Atmospheric Pressure Plasma Jet with Flow Effects .......................................................... 13721
Dong Breden, Laxminarayan Raja

Dynamics of a Laser-Induced Filament Supported and Controlled by a Direct Current Discharge .................. 13738
Albina Tropina, Mikhail Shneider, Richard Miles

Flame Propagation Enhancement of Ethylene by Addition of Ozone .......................................................... 13748
Matthew Pinchak, Timothy Ombrello, Campbell Carter, Ephraim Gutmark, Vissvamath Katta

Breakdown Characteristics of Nanosecond-Pulsed Plasma Discharges in Supercritical Carbon Dioxide and Supercritical Air ........................................................................................................ 13757
Andrew Lutz, Douglas Fletcher, Jason Meyers, Wyatt Owens, S. Smith

On Plasma Jets Applicability for Flow Control .............................................................................................. 13778
Vladimir Bychkov, Nikolai Ardelyan, Andrey Aleksandrov, Vladimir Chernikov, Konstantin Kosmachevskii, Aleksandr Kuranov, Aleksandr Savarovsky

Vortex Control by Combined Electric Discharge Plasma .............................................................................. 13791
Anatoly Klimov, A. Grigorenko, A. Efimov, L. Moralev, L. Polyakov, M. Sidorenko, B. Tolkanov, N. Estigneou, O. Ryabkov

Air Breakdown Characteristics at High Altitudes ......................................................................................... 13806
Vladimir Bychkov, Nikolai Ardelyan, Konstantin Kosmachevskii, Sergey Volkov, Aleksandr Kuranov, Aleksandr Savarovsky

SparkJet Efficiency ..................................................................................................................................... 13814
Mona Golbabaee-Asl, Doyle Knight, Kellie Anderson, Stephen Wilkinson

Gatchina Discharge Plasmoid Modeling ....................................................................................................... 13826
Vladimir Bychkov, Nadezhda Savenkova, Sergey Amelin

SCAMP: Superboom Caustic Analysis and Measurement Project Overview .................................................. 13833
Juliet Page, Kenneth Piotkin, Edward Haering, Domenic Magliere, Robert Cowart, Joseph Salamone, Kevin Elmuer, B. Welge, John Ladd

SCAMP: Experimental Design of a Sonic Boom Focus Flight Test ............................................................. 13842
Kenneth Piotkin, Domenic Magliere

SCAMP: Rapid Focused Sonic Boom Waypoint Flight Planning Methods, Execution, and Results ................. 13848
Edward Haering, Larry Clust, Kenneth Piotkin, Domenic Magliere, Michael Delaney, Jacob Brown

SCAMP: Focused Sonic Boom Experimental Execution and Measurement Data Acquisition ....................... 13869
Juliet Page, Christopher Hobbs, Edward Haering, Domenic Magliere, Rebecca Shape, Chris Hunting, Jim Giannakis, Scott Wiley, Franzeska Houtas

SCAMP: Application of PCBoom to Measured Sonic Boom Focus Analysis ................................................. 13882
Kenneth Piotkin

Fuel Cell Systems for Aircraft Application & Antares DLR-H2 All-Electric Flying Testbed ......................... 13902
Josef Kallo, Philipp Ratheke, Thomas Stephan, Oliver Thalau, Johannes Schirmer, Frieder Mayer, Heiko Teich

 Benefit Potential for a Cost Efficient Dual Fuel Propulsion BWB ........................................................... 13910
Ronald Kawai

Study of Pareto-Optimal Aircraft Technologies for Next-Decade Environmental Goals .............................. 13924
Hernando Jimenez, Christopher Acuff, Dimitri Mavris

Evaluation of the Tube-and-Wing Configuration Varieties for Near-Future Fuel Efficient Transonic Transports with the Advanced Aero Engines ........................................................................... 13943
Masaya Ohinizu, Shintyu Jeong, Shigeru Obayashi, Daizuike Sasaki, Kazuhiro Nakahashi, Takashi Misaka

Electric Motor Modeling for Conceptual Aircraft Design ........................................................................... 13953
Robert McDonnell

Design and Flight Testing of a Solar Powered Aircraft, a Student Challenge ................................................. 13962
Christopher Jounatet, David Lundstrom, Tomas Melin, Patrick Berry

The Future of Electric Aircraft ..................................................................................................................... 13973
Chrisy Roof, Musab Bari, Ami Oza, Bernd Chudoba

Parameterization and Geometric Optimization of Balloon Launched Sensorcraft for Atmospheric Research

Missions ....................................................................................................................................................... 13983
Chris Paulson, Andras Szobester

Conceptual Design and Analysis of an Unmanned Cargo Transport Tiltrotor Aircraft .................................. 13994
Sargun Ibrah, Cees Bi, R. Ladani

A UAV Design / Sizing Study from a System of Systems Perspective .......................................................... 14006
Michael Bociaga, William Crossley

A Wind Tunnel Investigation of Lepidopterae Flight in Cross Wind Conditions .......................................... 14020
Roberto Albertani, Matthew Goettl, Tyler Wilson

CFD Based Simulation of Elastic Aircraft in Maneuvering Flight ............................................................... 14034
Dong Guo, Min Xu, Shi-Lu Chen

Dynamic Modeling Accuracy Dependence on Errors in Sensor Measurements, Mass Properties, and Aircraft Geometry .................................................................................................................................... 14046
Jared Grauer, Eugene Morelli

Airdata Sensor Fault Detection and Isolation for Receiver Aircraft in Aerial Refueling .................................. 14063
Hakki Erhan Sevil, Atilla Dogan

Effect of Pre-existing Camber on Fluid–structure Interaction of Cicada Wings ................................................ 14075
Haoxiang Luo, Hu Dai, Jialei Song, James Doyle
<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of Stability and Control Estimation Methods from NATO STO Task Group AVT-201</td>
<td>14339</td>
</tr>
<tr>
<td>Aerodynamic Modeling for Real-Time Flight Dynamics Simulation</td>
<td>14376</td>
</tr>
<tr>
<td>Effects of the Orion Launch Abort Vehicle Plumes on Aerodynamics and Controllability</td>
<td>14387</td>
</tr>
<tr>
<td>Characterization of Aerodynamic Interactions with the Mars Science Laboratory Reaction Control System Using Computation and Experiment</td>
<td>14406</td>
</tr>
<tr>
<td>Determining the Stability and Control Characteristics of High-Performance Maneuvering Aircraft Using High-Resolution CFD Simulation with and without Moving Control Surfaces</td>
<td>14425</td>
</tr>
<tr>
<td>Flow Uniformity Calibration of AMELIA's Circulation Control Wings</td>
<td>14488</td>
</tr>
<tr>
<td>STOL Performance of Cal Poly's AMELIA</td>
<td>14513</td>
</tr>
<tr>
<td>Global Skin Friction Measurements on a Circulation Control Airliner in the NFAC</td>
<td>14535</td>
</tr>
<tr>
<td>AMELIA CESTOL Test: Acoustic Characteristics of Circulation Control Wing with Leading- and Trailing-Edge Slot Blowing</td>
<td>14545</td>
</tr>
<tr>
<td>Aerospace Structures Course Revisited</td>
<td>14558</td>
</tr>
<tr>
<td>Incorporation of the System Level Airworthiness Tool into Concurrent Engineering</td>
<td>14565</td>
</tr>
<tr>
<td>An Inexpensive Dynamic System for Teaching Measurement and Controls</td>
<td>14570</td>
</tr>
<tr>
<td>Numerical Studies of High-speed Cavity Flows Using LES, DDES and IDDES</td>
<td>14576</td>
</tr>
</tbody>
</table>

VOLUME 17
Evaluation of Turbulence Modeling Extensions for the Analysis of Hypersonic Shock Wave Boundary Layer Interactions
James On, Donald Konzakowski, Sanford Dash

LES Study of Shock Wave and Turbulent Boundary Layer Interaction
Justine Li, Nathan Grube, Stephan Priebe, Pino Martin

RANS Simulations of Flows with Shock Wave-Boundary Layer Interaction
Rafael Vieira, Joao Luiz Azvedo

On the Unsteady Shock Wave Interaction with a Splitter Plate: Inviscid Analysis
Nicole Mendoza, Rodney Bowersox

Flow Past a Rotating Finite Length Cylinder: Numerical and Experimental Study
Wei Zhang, Richard Benson, Valery Chernoray, Maxim Golubev

CFD Simulation of Transonic Flow under Small Disturbances
Hongbo Fan, Shaaban Abdallah

Influence of Thermodynamic Effect on Cavitation Suction Performance of Rocket Engine Inducer
Kaname Kawauchi, Naoki Tani, Nobuhiro Taniyoshi

High-order Accurate CFD Simulation of an Oscillating-Wing Wind Power Generator
Junfeng Wang, Chunlei Liang, Mark Miesch

Computational Analysis of Conical Forebody at High Angles of Attack with Transitional Model
Borui Zheng, Zhongyi Wang, Chao Gao, Hong Fang, Juntao Xiong, Feng Liu, Shijun Luo

A Reduced-order Model of the Mean Properties of a Turbulent Wall Boundary Layer at a Zero Pressure Gradient
Lei Xu, Zvi Rusak, Luciano Castillo

A New Local Formulation of the k-ω Transitional/Turbulence Model
Jeffrey Rodio, Hansam Hassan, Xiaodong Xiao

Free-Flight Investigation of Transition under Turbulent Conditions on a Laminar Wing Glove
Andreas Reeh, Michael Weismuller, Cameron Tropea

A Transition-Sensitive Hybrid RANS/LES Modeling Methodology for CFD Applications
Mohammad Alam, Keith Walters, David Thompson

DNS Study on Lambda Vortex and Vortex Ring Formation by Vortex Filaments in Flow Transition
Haokun Fu, Yonghua Yan, Chaosun Liu

DNS Study on the Origin of the Flow Randomization in Late Boundary Layer Transition
Lei Xu, Zvi Rusak, Ping Lu, Chaosun Liu

An Efficient Correction Procedure via Reconstruction for Simulation of Viscous Flow on Moving and Deforming Domain
Chunlei Liang, Koji Miyaji, Bin Zhang

Adjoint Based Error Estimation and hp-Adaptation for the High-Order CPR Method
Les Shi, Zhijian Wang

A Polynomial Adaptive LCP Scheme for Viscous Compressible Flows
Jean-Sebastien Cagnone, Brian Vermeire, Sivakamakran Nadarajah

ILES Using the Correction Procedure via Reconstruction Scheme
Brian Vermeire, Jean-Sebastien Cagnone, Sivakamakran Nadarajah

P-multigrid Discontinuous Galerkin Method for Compressible Turbulent Flows
Antonio Ghidoni, David Pasquale, Stefano Rebay, Alessandro Colombo, Francesco Bassi

Development of a Projection-Based Method for the Numerical Calculation of Compressible Reactive Flows
Gilles Reichling, Berthold Noll, Manfred Jäger

Optimization of Bezier Curves for High Speed Leading Edge Geometries
Patrick Rodi

Numerical Prediction of Test Flow Conditions for Low Density High Enthalpy Flow in an Expansion Tube Facility
Takanori Akahori, Yasunori Nagata, Yusuke Takahashi, Katsuhiro Yamada, Katsumi Hirooka, Takashi Abe

Analysis of a Decoupled Implicit Method for Aerothermodynamics and Reacting Flows
Graham Candler, Pramod Sainath, Ioannis Nomis, Ioannis Nopelis

Analysis of Self-Excited Combustion Instability using Decomposition Techniques
Chong Huang, Matthew Harvatzinski, William Anderson, Venkateswaran Sankaran

Simulation of Near Nozzle Flow Structure of an Effervescent Atomizer
Jehanzeb Masud, Kashif Mehmood

Effect of Inclination and Compound Angle on Turbulent Quantities Following a Single Cylindrical Jet in Crossflow
Justin Hodges, Gregg Natsui, Mark Rickllick, Jayanta Kapat

Vortex Breakdown in Swirling Flows in Diverging or Contracting Pipes
Zvi Rusak, Nicholas Bourgourd, Shichao Wang

The Optimum Wavelength of Spanwise Segmented Plasma Actuator Forcing of a Circular Cylinder Wake
Samik Bhattacharya, James Gregory

Mixing Layer Excitation by Dielectric Barrier Discharge Plasma Actuators
Richard Ely, Jesse Little

Active Control of Supersonic Base Flows with Electric Arc Plasma Actuators
Bradley Deblieuw, Gregory Elliott, J. Craig Dutton

Flow Control for Turret Aero-Optics Applications
Bajjan Yaksinovic, Ari Glezer, Santanu Gordev, Eric Jumper, William Brown

Effectiveness of Flow Control Over a Submerged Hemispherical Flat-Window Turret
Philip Morgan, Miguel Visbal
Design and Calibration of a Six Degree-of-Freedom Thrust Sensor for a Lab-Scale Hybrid Rocket

Norbert Ulbrich, Robert Gisler

A Baseline Load Schedule for the Manual Calibration of a Force Balance

Norbert Ulbrich, Robert Gisler

Hidde Connections between Regression Models of Strain-Gage Balance Calibration Data

Norbert Ulbrich

A Design of Experiments Approach Applied to Wind Tunnel Balance Calibration at Arnold Engineering Development Complex

Carrie Beinholtz, David Yoder, Drew Landman, Paul Jaibert, Doug Garrard

Acceleration Compensation for Force Measurements in Hypersonic Shock Tunnel

Debosh Joshi, Pravin Vakhassery, Frank Lu

VOLUME 18

Implementation of a Wall Interference Correction Method at the National Full-Scale Aerodynamics Complex

Lei Yang, Patrick Goulding, Norbert Ulbrich

A Fundamental Study on Aircraft Model by Wake Measurements in Low-Speed Wind Tunnels

Masashi Kishitani, Yutaka Yamaguchi, Yoshihiro Kitagawa, Tatsuki Hidenshuto, Date Hisaaki, Yoshihito Takita

Evaluation of Free-Stream Turbulence Intensity in the Mars Wind Tunnel Under Low Reynolds Number Conditions

Daiju Numata, Takakuni Tsuji, Kenta Kawai, Akihisa Arai

Mathematical Modeling of Wind-Speed Transients in Wind Tunnels

Mark Rennie, Peter Suitcliffe, Alexander Vorobiev, Alan Cain

Force Measurements on a NACA 0012 Wingtip at Mach 0.75

Michael Werling, Jernej Gutierrez, Eric Braun, Frank Lu

An Experimental Study of Detonation Diffraction and Shock Initiation

Christopher Stevens, Paul King, Fred Schauer, John Hoke

Analysis of a Single H2-air Pulse Detonation in a Supersonic Combustor

Faure Malo-Molina, Emily Dreyer

Plasma-Assisted Ignition and Deflagration-to-Detonation Transition

Andrey Starikovskiy, Nickolay Aleksandrov, Aleksandr Baktin

Nozzle Guide Vane Integration into Rotating Detonation Engine

Nick DeBarmore, Paul King, Fred Schauer, John Hoke

Numerical Study of Obstacles in Rotating Detonation Engines

Nicholas Ernest, Kelly Cohen, Corey Schumacher

Collaborative Tasking of UAVs Using a Genetic Fuzzy Approach

Emergent Behavior of Multi-Vehicle Formations Using Extremum Seeking

Marcin Brodecki, Kamesh Subbarao, Q. P. Chu

Adaptive Output Feedback Spacecraft Formation Flying Via Observer Based Feedback Linearization

Keun Lee, Sahajendra Singh

Autonomous Air Traffic Control Dialog Management System to Enable Unmanned Aircraft in the National Airspace System

San Ganwardana, Juan Alonso

Experimental Validation of the Allocation of UAVs under Communication Restrictions

Chelsea Sabo, Kelly Cohen, Tim Arnett, Manish Kumar, Derek Kingston

Formation Flight Control System for In-Flight Sweet Spot Estimation

Marcin Brodecki, Kamesh Subbarao, Q. P. Chu

Trade Space Exploration Enabled by a Non-Domination Level Coordinate System on the Pareto Frontier

Matthew Daskilewicz, Brian German

Comparison of Different Uses of Metamodels for Robust Design Optimization

Johan Persson, Johan Olvander

A General Purpose Discrete Adjoint Formulation for Inviscid Two-Dimensional Fluid Dynamic Optimization

Andrea Damone, Giovanni Caramia

Leveraging Dynamical System Theory to Incorporate Design Constraints in Multidisciplinary Design

Bradley Steinfield, Robert Braun

Managing Gradient Inaccuracies while Enhancing Optimal Shape Design Methods

Trent Lukaczynski, Francisco Pulacian, Juan Alonso

Comparison of Reduced- and Full-space Algorithms for PDE-constrained Optimization

Jason Hicken, Juan Alonso

Medium Pressure Emissions of a Multipoint Low NOx Combustion System

Rodrigo Villalva, Brian Dolan, David Munday, Ephraim Guzman, Gregory Zink, Spencer Pack, Jerry Goeke

Numerical-Experimental Research of Ultra Compact Combustors Containing Film and Effusion Cooling

Alejandro Brones, Hugh Thornburg, Bali Sekar, Craig Neubert, Dale Stone

Effect of Centrifugal Forces on Flame Stability in an Ultra-Compact Combustor

Viswanath Katta, David Blunck, Mel Roquemore

Direct Numerical Simulation of Exhaust Gas Recirculation Effect on Autoignition of an HCCI Stratified Turbulent Flow Field for DME/Air Mixture at High Pressure: NO Effect

Hossam El-Ararg, Yiguang Ju
Temperature Plasma .............................................................................................................................................................................15622

Nano-second Discharge Ignition of Lean C$_2$H$_2$-Containing Mixtures .................................................................................................................................15651
Ilya Kosarev, Alexander Pashkomyov, Svetlana Kindyshetsa, Nikolay Aleksandrov, Andrey Starikovskiy

Effects of $N(2)$ and NO in Plasma-assisted Oxidation and Ignition Below Auto-ignition Threshold ...................................................... 15658
Liang Wu, Jamie Lane, Michael Stichler, Nicholas Cermansky, David Miller, Alexander Fridman

Fast Gas Heating Initiated by Pulsed Nanosecond Discharge in Atmospheric Pressure Air ................................................................. 15666
Nikolay Popov

Time-resolved Electric Field Measurements in Nano-second Surface Dielectric Discharge. Comparison of Different Polarities. Ignition of Combustible Mixtures by Surface Discharge in a Rapid Compression Machine ........................................... 15686
Sergey Stapanyan, Guillaume Vanhove, Svetlana Starikovskaya, M. Boumehdi

Ignition of Hydrocarbon-Air Mixtures by Non-Equilibrium Plasma at High Pressures ........................................................................... 15703
Alekandr Rakitin, Andrey Nikiforov, Andrey Starikovskiy

Investigation of Nonequilibrium Radiation for Mars Entry ......................................................................................................................... 15720
Aaron Brandis, Christopher Johnston, Brett Cruden, Dinush Prabhu

Uncertainties in Heating Predictions of Segmental-Conical Space Vehicle Resulting From Data on Chemical and Physical Kinetics ................................................................................................................................. 15756
Sergey Sazhikov, Mikhail Shvalov, Alexandr Beloshitskii, Anatoly Djadkin

Emission Measurements from High Enthalpy Flow on a Cylinder in the LENS-XX Hypervelocity Expansion Tunnel .............................................................................................................................................................................15799
Ronald Parker, Matthew McLean, Aaron Dufrene, Mathew Lackner

Simulation of Shock Tube Radiation Measurements with a Collisional-Radiative Model ........................................................................ 15820
Adrien Lemal, Carolyn Jacobs, Marie-Yvonne Perrin, Christophe Laux, Elisabeth Raynaud, Philippe Tran

Field Test Results from the Sandia SMART Rotor ..................................................................................................................................................15829
Jonathan Berg, Matthew Barone, Brian Resor

Probabilistic Analysis of Offshore Wind Turbine Monopiles ......................................................................................................................... 15839
Wyssan Carwell, Sanjay-Arwaade, Don Degroen, Matthew Lackner

Manufacturing Defect Effects on Bend-Twist Coupled Wind Turbine Blades ......................................................................................................................... 15848
Michael McWilliam, Curran Crawford

Composite Lay-up Optimization for Horizontal Axis Wind Turbine Blades ......................................................................................................................... 15859
Michael McWilliam, Curran Crawford

SCAMP: Application of Nonlinear Progressive-wave Equation to Sonic Boom Transition Focus ......................................................................................15872
Andrew Piacsek, Kenneth Plotkin

SCAMP: Supersonic Passenger Transport Transonic Acceleration Flight Profiles with Considerations of Focused Sonic Boom .............................................................................................................................................................................15881

Time-Domain Simulation of Long-Range Sound Propagation in an Atmosphere with Temperature Gradient ............................................. 15898
G. Ke, Z. Charlie Zheng

Small-Scale Thrust Augmentation Analysis of Cold Flow Ejector/ Diffuser Assembly ..................................................................................15909
Charles Wisniewski, William Heiser

Fault-tolerant and Resilient Electrification for the More Electric Engine ..................................................................................................... 15921
Hiroshi Oyori, Masaya Wakiya, Hirofumi Isoda, Toshio Ono, Noriko Morikawa

High Energy Density Propulsion System Design and Testing for Small Unmanned Systems ..................................................................... 15932
Thomas Hays, Andrew Arena

Integrated Power Management System for the More Electric Aircraft ............................................................................................................ 15973
Hitoshi Oyori, Noriko Morikawa

Low Velocity Difference Thermal Shear Layer Mixing Rate Measurements ..................................................................................................15979
Robert Bush, Harry Calver, Nicholas Georgiadis, Dave Westebein

Simulating Effects of High Angle of Attack on Turbopfan Engine Performance ..................................................................................................... 15989
Yuan Liu, Russell Claus, Jonathan Litt, Ten-Huei Guo

Numerical Prediction of Convective and Radiative Heating of Scramjet Combustion Chamber with Hydrocarbon Fuels .........................................................................................................................................................................................16002
Joseph Shang, Sergey Sazhikov

Computational and Experimental Investigation of Ice Accretion on the Surface of Rotorcraft Air Intake Anti-Icing System .........................................................................................................................................................................................16018
Goook Bin Ahn, Ki Young Jung, Rho Shin Myong, Hoon Bum Shin, Wadgul Habashi

Experimental Study on Aerodynamic Characteristics of Clustered Linear Aerospike Nozzles ...........................................................................16027
Kohei Kawamura, Goro Masaay, Hideki Takahashi, Sadatake Tomioka, Noboru Sakuranaka, Takeo Tomita

Thrust Vectoring of a Laser-ablated Plasma Using Permanent Magnets and Various Materials ...................................................................... 16037
Aaron Rubin, Sohail Zaidi, Richard Miles

Variable Fidelity Methods and Surrogate Modeling of Critical Loads on X-31 Aircraft ...................................................................................... 16058
Mengmeng Zhang, Maximilian Tomac, Cong Wang, Arthur Rizzi
Antibody-antigen Binding in a Flowthrough Microfluidic Device .......................................................... 16559
Shamsen Adams, Cong Zhang, Harvey Zambrano, Terry Conlisk

Controlling the Electroosmotic Flow in Nanochannels: Effect of Divalent Counter-ions ......................... 16571
Harvey Zambrano, Terry Conlisk

Three-Dimensional Transitory Control of Flow Separation over a 2-D Airfoil ........................................ 16583
George Tak Woo, Ari Glezer

Feedback Control of Flow Separation on NACA0024 Airfoil Under Periodic Wall Oscillation by Means of DBD Plasma Actuator and FBG Sensor ................................................................. 16601
Takuya Segawa, Timothy J. Jones, Yen-Kai Kuo, Tutshiho Masea, Satoshi Ogata, Shinya Takeshita

High-Fidelity Simulations of NS-DBD-based Control of a Stalled NACA0015 Airfoil ............................... 16613
Datta Gaitonde, Kelsey Shuler, Majid Sahin, Bryan Glaz, Surya Dinavahi

Lift Enhancement of a Pitching Airfoil in Dynamic Stall by DBD Plasma Actuators ............................ 16629
Kazunori Mitsu, Shigeyoshi Watanabe, Takashi Atohe, Hiroyski Kato, Motofumi Tanaka, Uchiwa Tatsuro

Identification of Aircraft by their Unique Turbulent Wake Signature: Progress with Experimental Validation ........................................ 16641
Aaron Alman, Sidaard Ganasekar

The Turbulent Wake of a Submarine Model in Pitch and Yaw ............................................................ 16660
Kumud Ajmani, Hukam Mongia, Phil Lee

Spatio-Temporal Characteristics of Scalar Mixing in Turbulent Gas-Phase Jets ...................................... 16676
Jeffrey Spencer, Sunil James, Marcus Herrmann

Planar Imaging Investigation of Supersonic Hydroximer Mixtures .................................................. 16688
Colin Heye, Christopher Lietz, Jaime Martinez, Venkatramanan Raman, David Blunck

Numerical Simulations of the Near-field Flows Past Cylinders in Tandem Arrangements ....................... 16704
Francisco Hernandez-Perez, Clinton Groth, Omer Gulder

First, Second, and Third Order Finite-Volume Schemes for Diffusion ............................................... 16720
Hiroaki Nishihara

Using Miniapplications in a Mantovo Framework for Optimizing Sandia's SPARC CFD Code on Multi-Core, Many-Core, and GPU-Accelerated Compute Platforms .................................................. 16737
Daniel Barnette, Richard Barrett, Simon Hammond, Jagan Jayaraj, James Laros

High Resolution Central Scheme with Dominant Wall Dissipation for Cell Centered Unstructured Meshes ............................................................................................................................. 16750
Aleksandar Jemcov, Joseph Maruszewski

Pressure Correction Solver Based on Preconditioned Numeric Flux for Incompressible and Compressible Flows .................................................................................................................. 16764
Aleksandar Jemcov, Joseph Maruszewski, Dipankar Choudhury, Davor Cokljat

Design and Verification Methodology of Boundary Conditions for Finite Volume Schemes ................... 16779
David Folkner, Aaron Katz, Venke Sankaran

Experimental Characterization of Hypersonic Nozzle Boundary Layers and Free-Stream Noise Levels .. 16799
Guillaume Grosat, Sebastien Parris, Khalil Benzaki, Patrick Rambaud

A Flap-Based Gust Generation System for Hair Sensor Investigations ............................................. 16815
Jacob Weierman, Mason Morris, Jeff Callicoat, Andy Arena, Rick Gaeta, Jamey Jacob, Jacob Weierman

Trajectory Reconstruction and Uncertainty Analysis using Mars Science Laboratory Pre-Flight Scale Model Aeroballistic Testing ........................................................................................................ 16830
Rafael Lugo, Robert Tolson, Mark Schoenenberger

Improved Prediction Method for the Design of High-Resolution Total Pressure Distortion Screens .......... 16850
William Schneck, Anthony Ferrar, Justin Bailey, Kevin Hoopes, Walter O'Brien

Engine and Propeller Testing for Small to Mid-Size UAV's ................................................................ 16869
Robert Wightman, Mason Marreis, Jeff Collicutt, Andy Arena, Rick Gueta, Jamey Jacob, Jacob Weierman

Effects of Freestream Flow Quality on Boundary Layer Transition in the National Transonic Facility .... 16883
F. Owen, A. Owen

Transonic Buffeting Investigation using Unsteady Pressure-Sensitive Paint in a Large Wind Tunnel .......... 16898
Marie-Claire Merienne, Yves Le Sant, Frederic Lebrun, Bruno Deleglise, Dominique Sonnet

The Effect of Pressure Gradient and a Non-adiabatic Surface on Boundary Layer Transition Investigated by Means of TSP ........................................................................................................ 16914
Nasim Shahbazian, Clinton Groth, Omer Gulder

Comparative Study of Algebraic and Transported FSD Models for LES of Premixed Flames in Flamelet and Thin Reaction Zones Regimes ........................................................................... 16938

LES of a Hydrogen-Enriched Lean Turbulent Premixed Flame .............................................................. 16951
Francisco Hernandez-Perez, Clinton Groth, Omer Gulder

Large Eddy Simulation Analysis of Flow Field Inside a High-g Combustor ............................................. 16963
Colin Heye, Christopher Lietz, Jaime Martinez, Venkatramanan Raman, David Blunck

Spray Model Evaluations for a Reverse Flow Combustor ...................................................................... 16974
Jeffrey Spencer, Sunil James, Marcus Herrmann

Investigation of the Acoustic Boundary Conditions Used for the Entropy Wave Generator Test Case ........ 16991
Jean-Michel Lourier, Andreas Huber, Berthold Noll, Manfred Aigner

Kumud Ajmani, Hakum Mongia, Phil Lee

Kumud Ajmani, Hakum Mongia, Phil Lee

Lest We Forget: Preserving the History of Aerospace and Astronautics at the USAF Academy .......... 17039
Robert Wettemann
Silent Flight: The Exciting Life of "Nellie" Zabel Willhite .............................................................................................................................. 17044
D. Brian Landrum, Keisuke Fushida, Shuijirou Sawai, Yasuhiro Morii

Making Aerospace History Meaningful for a New Generation: Lockheed Martin's Centennial Campaign ............................................................. 17052
Matthew Kramler

Design and Flight Test of a Morphing UAV Flight Control System .............................................................................................................. 17055
Troy Probst, Brian David, Kevin Kochersberger, Oguz Ohanian

VOLUME 20

A Reactionary Obstacle Avoidance Algorithm for Autonomous Vehicles ........................................................................................................ 17069
Gizem Yucel, Ilbay Yavrucuk

A Fuzzy Logic-Based Controller for Helicopter Autorotation .......................................................................................................................... 17082
Zachary Sunberg, Jonathan Rogers

Autonomous Precision Landing System with Avoidance System using Single Camera for Small Landers .................................................. 17105
Satoru Kanazawa, Seisuke Fukuda, Shuijirou Sawai, Yasuhiro Morii

Global Optimization of Path-Constrained Optimal Control Problems via Semidefinite Programming Relaxations ................................... 17112
Nobuhiro Yokoyama

Flush Air Data Sensing for Soaring-Capable UAVs ............................................................................................................................... 17122
John Quindlen, Jack Langelaan

Precision Route Optimization using Fuzzy Intelligence (PROFIT) .................................................................................................................. 17139
Sophia Mitchell, Kelly Cohen, Manish Kumar

Trajectory Optimization of a Battery-Powered Competition Aircraft ....................................................................................................... 17147
Kevin Reynolds

Global Optimization Under Uncertainty for Tractor-Trailer Base Flaps ....................................................................................................... 17162
Jacob Freeman, Christopher Roy

In Flight Validated Flexible-Multi-Body Structural Dynamics Model of a Bioinspired Ornithopter ........................................................................ 17187
Cornelia Altenbuchner, James Hubbard, Amy Wissa

Simplifying CAD to CAE Interoperability for Performing High-Fidelity Iterative Design ........................................................................ 17203
Mihai Pruna, Ali Merchant

A Novel Framework for Design Optimization of Unsteady Problems ......................................................................................................... 17217
Vincee Ahuja, Hadasatuh Lapin, Chandra Kannepalli

Support Vector Regression-based Multidisciplinary Design Optimization in Aircraft Conceptual Design .................................................. 17231
Keshi Zhang, Zhonghua Han

Improved Performance of Large Data Visualization using Sub-Zone Load-On-Demand ............................................................................ 17244
Jacob Frey, Craig MacKay

Visualization and Analysis of Vortex Features in Helicopter Rotor Wakes ...................................................................................................... 17260
David Kao, Jasim Ahmad, Terry Holz, Brian Allan

"Flow Visualization" Juxtaposed With "Visualization of Flow": Synergistic Opportunities Between Two Communities (Invited) .......................................................................................................................... 17275
Tiago Etienne, Hoa Nguyen, Robert Kirby, Claudio Silva

Laminar Flame Speeds of Hydrocarbons with Helium Dilution at Elevated Pressures and Temperatures .................................................. 17288
Drew Plichta, Eric Petersen, Sinead Burke, Henry Curran

Supercritical Combustion of General Fluids in Laminar Counterflows ........................................................................................................ 17295
Xingjian Wang, Hongfa Huo, Vigor Yang

Laminar Flame Speed Measurements of Methyl Octanoate, n-Nonane, and Methylocyclohexane .............................................................. 17311
Brandon Rotaru, Michael Kreciji, Andrew Vissotski, Eric Petersen

Weakly Stretched Methane-Air Laminar Flame Speeds and the Non-Linear Extrapolation to Zero Stretch .................................................. 17318
Timothy Ombrello, Campbell Carter, Matthew Pinchak, Ephraim Gutmark, Viswanath Katra

Modeling of Steady High-Pressure Laminar Premixed Flames of N-Heptane and Iso-Octane ......................................................................... 17326
Kenneth Harstad, Josette Bellan

An Experimental Study of H2/O2/CO2 Premixed Cellular Tubular Flames .................................................................................................... 17347
Carl Hall, Robert Pitz

Heat Release and OH* Radiation in Laminar Non-Premixed Hydrogen-Oxygen Flames .................................................................................... 17358
Thomas Fiala, Thomas Sattelmayer

Detonation Initiation and Shock-Flame Interaction in Hydrogen-Air Mixtures ............................................................................................. 17365
Brian Taylor, Ryan House, David Kessler, Violin Gomez, Elaine Oran

Purely Gasdynamic Multidimensional Indirect Detonation Initiation Using Localized Acoustic Timescale Power Deposition ......................... 17378
Jonathan Beugele, David Kassoy, Oleg Vasilyev, A. Vezolainen

Experimental Study of Sustained Shock Initiated Detonation in a Multiple Pulse Detonation-Crossover System ........................................... 17393
Robert Driscoll, Andrew St. George, David Munday, Ephraim Gutmark

Ignition Design For a Rotating Detonation Engine ............................................................................................................................. 17404
Stephen Miller, Paul King, Frederick Schauer, John Hoke

Divergence and Mixing in a Rotating Detonation Engine ........................................................................................................................... 17415
Craig Nordeen, Douglas Schwcr, Fred Schauer, John Hoke, Thomas Barber, Baki Cetegen

Thermal Management for a Modular Rotating Detonation Engine ............................................................................................................. 17429
Scott Thiersenkauf, Paul King, Fred Schauer, John Hoke

Numerical Analysis of Spinning Detonation Dependency on Initial Pressure Using AUSMDV Scheme ..................................................... 17437
Tsuyoshi Nagao, Makoto Asahara, A. Koichi Hayashi, Nobuyuki Tsutou, Etsuuke Tamada
On Reducing Feedback Pressure in Rotating Detonation Engines ................................................................. 17448
Douglas Schwer, Kaitlin Kalivasanath

Response of Premixed, Swirling Flames to Helical Flow Disturbances .......................................................... 17463
Vishal Acharyya, Tim Lieuwen

Time Varying, Ensemble Averaged Turbulent Flame Speed in Harmonically Forced, Turbulent Premixed Flames .......................................................... 17476
Dong-Hyuk Shin, Tim Lieuwen

Method to Measure Flame Index in a Partially-Premixed Gas Turbine Combustor .............................................. 17490
David Rosenberg, Patton Allison, James Driscoll

Spark Ignition of Single Bluff-body Premixed Flames and Annular Combustors .............................................. 17504
Essam Khalil

Application of the Cross Wavelet Transform and Wavelet Coherence to OH-PLIF in Bluff Body Stabilized Flames .......................................................... 17516
Harish Subramani, Terrence Meyer, Naibo Jiang, Andrew Caswell, Sukesh Roy, James Gord

Measurement of Turbulent Flame Propagation Rates of Methane Using a New Facility .................................... 17524
Sankaranarayanan Ravi, Anish Baclis, Eric Petersen

Nautilus: A Tool For Modeling Fluid Plasmas ...................................................................................................... 17531
John Loverich, Sean C. D. Zhou, Kris Beckwith, Madhusudhan Kundrapu, Mike Loh, Sudhakar Mahalingam, Peter Stoltz, Ammar Hakim

Dynamic Contraction of the Positive Column of a Self-Sustained Glow Discharge in Nitrogen/Air Flow .......................................................... 17561
Mikhail Schneider, Mikhail Mokrov, Gennady Milikh

Modeling and Simulation of Weakly Ionized Plasmas Using Nautilus .......................................................... 17575
Madhusudhan Kundrapu, John Loverich, Kris Beckwith, Peter Stoltz, Michael Keidar, Tai Sen Zhuang, Alexey Shashurin

Mixing Actuation by Unstable Filamentary Discharge ...................................................................................... 17586
Essam Khalil

Evaluation of Dielectric Barrier Discharge Configurations for Biological Decontamination .................................. 17596
Kedar Pai, Jamey Jacob

Investigation of Water Dissociation by Nanosecond Repetitively Pulsed Discharges in Superheated Steam at Atmospheric Pressure .......................................................... 17611
Florent Sainct, Deanna Lacoste, Mike Kirkpatrick, Emmanuel Odi, Christophe Laux

Mirrors in Dawn Dusk Orbit for Low-Cost Terrestrial Solar Electric Power in the Evening ................................ 17621
Lewis Fraas, Arthur Palosse, Billy Derber

Effect of Air Curtain on Flow Regimes and Heat Transfer Characteristics in a Refrigerated Cold Room ............... 17632
Essam Khalil, Gamal Elhariry, Ahmed Adeel

Some Fundamentals of Explosions ..................................................................................................................... 17643
David Lilley

Effect of Fire Locations on the Performance of Impulse Ventilation System in an Underground Car Park ............... 17664
Essam Khalil, Mahmoud Fouad, Shady Ali

Dispersion and Possible Ignition of Flammable Material .................................................................................. 17673
David Lilley

ICT for Going Forward to Green Era .................................................................................................................. 17686
Essam Khalil

Experimental Investigation of Gasification of Biomass Using Carbon Dioxide .................................................... 17693
Ryoichi Amano, Mohamed Ibrahim, Akira Gupta

Efficient Energy Utilization in Green Built Environment: Concepts & Standards ............................................. 17698
Essam Khalil

Importance Sampling Uncertainty Quantification for DSMC Modeling of a Hypersonic Shock Interaction Flow .......................................................... 17707
Jonathan Burt, Eugeny Titov, Eswar Josyula

Classical Trajectory Calculation Direct Simulation Monte Carlo: GPU Acceleration and Three Body Collisions 17729
Paul Norman, Thomas Schwartzentruber

DSMC Simulation of Vibrational Excitation and Reaction for Molecular Nitrogen in Shock Tube Flows ................. 17745
Zhong Li, Tong Zhu, Deborah Levin

A Nonequilibrium-Direction-Dependent Rotational Energy Model for use in Continuum and Stochastic Molecular Simulation ...................................................................................... 17765
Chonglin Zhang, Paolo Valentinii, Thomas Schwartzentruber

Assessment of an All-Particle Hybrid Method for Hypersonic Rarefied Flow .................................................... 17788
Eunji Jun, Iain Boyd

A Parallel Implementation Strategy for Multi-Level Cartesian Grid Based DSMC Codes ..................................... 17813
Ioannis Nompelis, Thomas Schwartzentruber

Satellite Drag Uncertainties Associated With Atmospheric Parameter Variations at Low Earth Orbits ................. 17829
Essam Khalil

An Analysis of an Implicit Vortex Method for Wind Turbine Wake Modelling .................................................... 17848
Stephen Lawton, Curran Crawford

A Free-vortex Wake Diffusion Model for Wind Turbines in Steady and Turbulent Atmospheric Inflow ................. 17858
Christopher Gundling, Jayanarayanan Sitararaman, Harish Gopalan, Beatrice Rogers

A Comparison Between Wind Turbine Aerodynamics Model Output When Using a Generic Versus the Actual Turbine Characterization as Input .................................................................................. 17885
Matthew Churchfield, Jasper Laurens, Alex Loeven, Sang Lee, Patrick Muriarty

Coupled Mesoscale Microscale Model for Wind Resource Estimation and Turbine Aerodynamics Using an Overset Grid Approach ...................................................................................... 17903
Jayanarayanan Sitararaman, Harish Gopalan, Christopher Gundling, Jeffrey Mirocha, Wayne Miller
Actuator Line Aerodynamics Model with Spectral Elements .......................................................... 17926
Yulia Pest, Paul Fischer, Guenter Conzalmann, Veerabhadra Kotamarthi
Computational Analysis of Shrouded Wind Turbine Configurations ............................................... 17933
Aniket Aranake, Vinod Lakshminarayan, Karthik Duraisamy
Experimental Performance Evaluation of a Turbine Driven by Pulsed Detonations ........................... 17950
Kurt Rouser, Paul King, Frederick Schauer, Rolf Søndergaard, John Hoke

Author Index