28th AIAA Aerodynamic Measurement Technology, Ground Testing, and Flight Testing Conference 2012

New Orleans, Louisiana, USA
25-28 June 2012

Volume 2 of 2

ISBN: 978-1-62276-212-5

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571

Some format issues inherent in the e-media version may also appear in this print version.

The contents of this work are copyrighted and additional reproduction in whole or in part are expressly prohibited without the prior written permission of the Publisher or copyright holder. The resale of the entire proceeding as received from CURRAN is permitted.

For reprint permission, please contact AIAA's Business Manager, Technical Papers. Contact by phone at 703-264-7500; fax at 703-264-7551 or by mail at 1801 Alexander Bell Drive, Reston, VA 20191, USA.

TABLE OF CONTENTS

VOLUME 1

Combined VUV Absorption and Laser Absorption Spectroscopy for Atomic Oxygen Detection 1
Makoto Matsui, Akira Kuwahara, Yoshiki Yamagiwa

High-Repetition-Rate H_2O Absorption Spectroscopy Measurements in Bluff Body Stabilized Flames 8
Andrew Caswell, Stanislav Kostka, Sukesh Roy, Jean Whitney, Scott Sanders, Amy Lynch, James Gord

Laser Induced Fluorescence Combined with Laser Absorption Spectroscopy for Optically Thick Plasma Diagnostics 13
Tsuyoshi Kaneko, Satoshi Nomura, Kimiya Komurasaki, Hiroyuki Koizumi

TDL Absorption Sensor for In Situ Determination of Combustion Progress in Scramjet Ground Testing 20
Ian Schultz, Christopher Goldenstein, Jay Jeffries, Ronald Hanson, Robert Rockwell, Christopher Goyne

Applications of Statistically Defensible Test and Evaluation Methods to Aircraft Performance Flight Testing 26
Reagan Woolf

A Method of Standardizing Takeoff Performance Data Using Modeling and Simulation 41
Reagan Woolf, Kenneth Orleans

Design of Experiments Using Response Surface Methods to Optimize Simulated Reentry Trajectories 53
Timothy Jorris, Kenneth Bull, Ryan Carr, Jacob Downey

Using Statistical Power to Improve Turbine Engine Test Planning 67
Rylan Cox, Stephen Arnold

Hypersonic Ground Testing Combustion Air Heater Ignition Optimization via Design of Experiments 74
Dusty Vaughn, Glenn Garrard, Drew Landman

Experimental Study of an Optical Fibre-based Pressure Sensor for Boundary Layer Transition Detection 82
Maxime Forte, Alain Seraudie, Daniel Arnal, Stephanie Molin, Olivier Vaudel, Pascale Nouchi

Deployment of a Pressure Sensitive Paint System for Measuring Global Surface Pressures on Rotorcraft Blades in Simulated Forward Flight 87
Neal Watkins, Bradley Leighty, William Lipford, Oliver Wong, Kyle Goodman, Jim Crafton, Robert Forlines, Larry Goss, James Gregory, Thomas Juliano

Unsteady Pressure-Sensitive Paint Measurements on an Articulated Model Helicopter in Forward Flight 101
Kevin Disotell, Thomas Juliano, Di Peng, James Gregory, Jim Crafton, Narayanan Komerath

Unsteady PSP Measurement of Transonic Unsteady Flow Field around a Rocket Fairing Model 120
Kazuyuki Nakakita, Yoshiki Takama, Kentaro Imagawa, Hiroyuki Kato

Reduction of Temperature Effect in Pressure-Sensitive Paint Measurements by Model Materials and Coatings 133
Yasuhiro Egami, Kouki Fujii, Toshiki Takagi, Yu Matsuda, Hiroki Yamaguchi, Tomohide Niimi

Development of Temperature-Cancelled Motion-Capturing PSP System and Its Application to a Hypersonic Wind Tunnel 143
Taika Okabe, Takeshi Miyazaki, Hirotaka Sakaue

Flight Test Results of Efficient Maneuver Development for a GPS-Based Pitot-Static Calibration Method Using Output-Error Optimization 154
Garrett Milne, Borja Martos

Static V_{MCA} Demonstrations: Safety and Data Implications 172
Darren McDonald, Kyle Gardner

In-Flight Drag Measurements on Manikins 178
Uwe Solies, Rodney Allison, Michael Leigh

Airfield Performance Evaluation of an Advanced Propeller on the C-130H 189
Kevin Halpin, Lance Bays, James Armor, Kevin Wagahoff

Response Surface Modeling Tolerance and Inference Error Risk Specifications: Proposed Industry Standards 203
Richard Deloach

Wind Tunnel Testing of a Counter Rotating Open Fan Powered Aircraft 213
Peter Aschwanden, Juerg Mueller, Brian Smith, Richard Northall, Robert Griffiths

Force and Moment Measurements on a Free-Flying Capsule Model in a High-Enthalpy Shock Tunnel 225
Stuart Laurence, Jan Martinez Schramm, Klaus Hannemann

Acoustic Forcing and Control of Reflected Waves in the Klebanoff-Saric Wind Tunnel 234
Matthew Kuester, Edward White

Computational Modeling of a Slotted Wall Test Section 249
Alexander Krynytzky, Meredith Fleming, David Sommerfield, Pei Li

Using CFD to Calculate Support Interference Effects 263
Aurelia Cartieri, Sylvain Mouton
Fiber-Coupled High-Speed OH-PLIF Imaging in Turbulent Flames 277
Paul Hsu, Waruna Kulatilaka, Naibo Jiang, Stanislav Kostka, Sukesh Roy, Anil Patnaik, James Gord
Multi-Photon Fluorescence Imaging of Flame Species Using Femtosecond Excitation 282
Waruna Kulatilaka, Sukesh Roy, James Gord, Viswanath Katta
High-Data-Rate One-Dimensional Thermometry Using Femtosecond CARS 288
James Gord, Waruna Kulatilaka, Hans Stauffer, Sukesh Roy
Application of Optical Measurement Techniques in Combustion Test-Cell Environments 292
Amy Lynch, Stanislav Kostka, Andrew Caswell, Craig Neuroth, Dale Shouse, James Gord
Quantitative Radar REMPI Measurement of Methyl Radical in 1-D McKenna Flame 299
Yue Wu, Zhili Zhang, Timothy Ombrello, Viswanath Katta
Hypersonic Boundary Layer Measurements with Variable Blowing Rates Using Molecular Tagging Velocimetry 315
Brett Bathel, Paul Danehy, Craig Johansen, Stephen Jones, Christopher Goyne
OH PLIF Visualization of the UVa Supersonic Combustion Experiment: Configuration A 334
Craig Johansen, Colin McRae, Paul Danehy, Emanuela Gallo, Luca Cantu, Robert Rockwell, Christopher Goyne, J. McDani
Improvement of the Measurement Range of the Micro-pillar Shear-stress Sensor MPS^3 349
Bernardo Nottebrock, Michael Klaas, Wolfgang Schröeder
Real-Time Measurement of Skin Friction Using Calibrated Multi-Element Hotfilm Arrays 360
Robert Long, Edward White
Convective Heat Flux Measurement Validation and Qualification 368
Brian Earp, Joseph Schetz, Reece Neel
Development of Digital Image Projection Techniques to Quantify Surface Film/Rivulet Flows 379
Bin Wang, Song Zhang, Hui Hu, William Lohry
Issues and Solutions to Midwave Staring FLIR Performance Measurement over Background 397
Sergio Fontanez, Ryan Buatala, Dean Hatfield
Trajectory Analysis Program for Determining Range Safety Considerations for a Reusable Launch Vehicle Using Multiple-Phase Pseudospectral Optimization 412
Ryan Carr, Timothy Jorris, Jacob Downey
Initial Testing and Development of an Organic Remote Pilot Aircraft Capability at the USAF Test Pilot School 432
Timothy Bronder, Jason Lee, David Heinz, Nicholas Helms, Marco Mangini, Mark Keeble
Digital Video Laboratory in a T&E World 452
Otto Martinez, Alexander Paxton
Novel Use of On-Board Data Recorder System on Existing Weapon Systems 467
Rocky Haynes, Danny Carrillo
Characterizing Routing with CoTS Radio-to-Router Information in an Airborne Network 474
Bow-Nan Cheng, Randy Charland, Paul Christensen, Andrea Coyle, Leonid Veytser, James Wheeler
Measurement Techniques for Shock Movement Capture on a NACA 0012 in Unsteady Compressible Flow 486
Christopher Jensen, Kyle Gompertz, Di Peng, James Gregory, Jeffrey Bons

VOLUME 2

An Approach for Estimating LDA Spatial Filtering Effects on Velocity Measurements 508
Sara Toutiaei, Harish Gopalan, Jonathan Naughton, Philippe Lavoie
An Experimental Investigation on the Spray Flows Exhausted from a Counter-swirling Air-blast Nozzle 517
Daniel Dvorak, Spencer Peck, Hui Hu
Ultra-high-speed Digital In-line Holography System Applied to Particle-laden Supersonic Underexpanded Jet Flows 539
Kristian Ingvorsen, Nicolas Buchmann, Julio Soria
Lessons Learned in Combined Developmental and Operational Test: Ten Years of F-15 Testing by the OFP CTF 549
David Wright, Richard Sumner
Overview of the C-12J External Stores Flight Test Program 557
Joshua Schneider, Reid Larson, Thomas Hill
Un-tethered Test Capability: Improving Airborne Test Efficiency 563
Bethany Ward
A Family of Low Cost Personal Computer Based Data Acquisition Systems for Flight Test 570
John Muratore

Subminiature Flight Safety System (SFSS), Application of Total Systems Engineering Approach to Reduce Product Development Cost and Risk 582
Steve Musteric, Joshua Langston
Joint Mission Environment Test Capability (JMETC), the solution for Air Force Distributed Test and Evaluation Infrastructure Requirements 597
Chip Ferguson, David Brown
DDS-Suite - A Dynamic Data Acquisition, Processing, and Analysis System for Wind Tunnel Testing 607
Nathan Burnside
Adapting Egress Tests to the Modern Test and Evaluation Process 615
George Ayers, Michelle Zeisset, James Daniel, Timothy Gros
Multidisciplinary Design Optimization with Vdot Using MEARS 622
Joseph Herdy, Damian Yanez
Status of AEDC Transonic, Supersonic, and Hypersonic Wind Tunnel Improvement Programs 632
Edward Mickle, Christopher Abbott, Richard Mead, Frank Wonder, William Brooks
The Redstone Responsive Systems Solutions Initiative 655
Roger Herdy, Marty Kress
Check-Standard Testing Across Multiple Transonic Wind Tunnels with the Modern Design of Experiments 665
Richard Deloach
Hypersonic PIV in a Ludwieg Tube Wind Tunnel at Mach 5.9 690
Marcus Casper, Peter Scholz, Jan Windte, Rolf Radespiel, Sven Scharnowski, Christian Kähler, Soren Stephan
Experimental Investigation of the Flow Field Topology for Several Cargo Drop Configurations 703
Eric W. M. Roosenboom, Andreas Schroeder, Reinhard Geisler, Janos Agocs
Measurement of Vibrational Nonequilibrium in a Supersonic Freestream Using Dual-Pump CARS 715
Andrew Cutler, Gaetano Magnotti, Luca Cantu, Emanuela Gallo, Paul Danehy, Robert Baurle, Robert Rockwell, Christopher Goyne, James McDaniel
Time Resolved Filtered Rayleigh Scattering for Temperature and Density Measurements 728
Isaac Yeaton, Pietro Maisto, Kevin Lowe
Curved Boundary Layer Rake Measurement in the Trisonic Gasdynamic Facility 744
Ryan Schmit
Transition Detection and Skin Friction Measurements on Rotating Propeller Blades 760
Erich Schuelein, Henning Rosemann, Sven Schaber
Supercritical Cold Flow Facility, Experiment Design and Modeling for the Study of Fluidic Mixing 785
Robert Bernstein, Nils Sedano, Raymond Walsh, Patrick Sgarlata
A 2-D Inertial Particle Separator Research Facility 807
Dominic Barone, Eric Loth, Philip Snyder
Experimental and Numerical Evaluation of Hydrogen Fueled Dual Mode Scramjet Engine 819
William Engblom, Gaurav Bellamkonda, Jonathan Osborne
A General Simulation of an Air Ejector Diffuser System 834
Derick Daniel
Space Shuttle Solid Rocket Motor Plume Pressure and Heat Rate Measurements 853
Wulf Von Eckroth, Leah Struchen, Thomas Trovillion, Rafael Perez, Shaun Nerolich, Chris Parlier
Investigation on the Performance of Second Throat Supersonic Exhaust Diffuser for Starting Higher Area Ratio Nozzles 876
R. Ashokkumar, S. Sankaran, T. Sundararajan, K. Srinivasan
Probe Capture for Quantitative Flow Visualization in Large Scale Wind Tunnels 888
Andreas Mueller, Andrin Landolt, T. K. Rösgen
High-Reynolds Number Active Blowing Semi-Span Force Measurement System Development 896
Keith Lynn, Ray Rhew, Gregory Jones, William Milholen, Michael Acheson, Scott Goodliff
Jet Exit Rig Six Component Force Balance 927
Raymond Castner, John Wolter, Mark Woike, Dennis Booth, David King
Detection of Bi-Directionality in Strain-Gage Balance Calibration Data 936
Norbert Ulbrich
Determination of Aerodynamic Coefficients from Shock Tunnel Free Flight Trajectories 949
Pierre Wey, Julio Srulijes, Myriam Bastide, Bastien Martinez, Patrick Gnemmi
Performance Evaluation of Pressure Transducers for Water Impacts 958
Gregory Vassilakos, David Stegall, Sean Treadway
Evaluation of Regression Models of Balance Calibration Data Using an Empirical Criterion 975
Norbert Ulbrich, Thomas Volden
Characterizing the Aerodynamic Influence of F-16 Stores on Limit Cycle Oscillations Using Aero-Structure Simulation 994
Jason Lechniak, Keerti Bhamidipati, Crystal Pasiliao
Author Index