

Inlets, Nozzles, and Propulsion Systems Integration

Papers Presented at the AIAA Aviation Forum 2023

San Diego, California, USA
12-16 June 2023

ISBN: 978-1-7138-7860-5

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 34922 Uwytkug'Xcmg{'Ftkxg.'Uwky'422, Reston, VA 20191, USA.

TABLE OF CONTENTS

AERODYNAMICS OF COMPLEX INLET AND NOZZLE CONFIGURATIONS

Angle of Attack Effects on Open Fan Propulsion Systems at Take-Off Conditions.....	1
<i>Arne W. Stuermer</i>	
CFD Modeling of Turbofan Intake Aerodynamics at Crosswind Conditions.....	13
<i>Arne W. Stuermer, Reinhard Geisler</i>	
Deep-Learning for Flow-Field Prediction of 3D Non-Axisymmetric Aero-Engine Nacelles	26
<i>Fernando Tejero , David G. Macmanus, Jesús Matesanz García, Luca Boscagli, Josep Hueso-Rebassa, Christopher Sheaf</i>	
Modal Analysis of Serpentine Diffuser Distortion	40
<i>Spencer L. Stahl, Datta V. Gaitonde, Russell W. Powers, John T. Spyropoulos</i>	
Aerodynamics of a Compact Nacelle at Take-Off Conditions.....	65
<i>Avery E. Swarthout, David G. Macmanus, Fernando Tejero , Jesús Matesanz García, Ioannis Goulos, Luca Boscagli, Christopher Sheaf</i>	

AERODYNAMICS OF INLET AND EXHAUST SYSTEMS

Computational Assessment of Non-Axisymmetric Separate-Jet Exhausts on Test Rig Configurations.....	79
<i>Josep Hueso-Rebassa, David G. Macmanus, Ioannis Goulos</i>	
Experimental Characterization of Flow Distortion in a Semi-Embedded Engine Intake for Boundary Layer Ingestion Application.....	95
<i>Nicolas Rembaut, Olivier Atinault, Vincent Brion</i>	
Effect of Incoming Boundary Layer Thickness on the Flow Characteristics of a Supersonic Air Intake.....	113
<i>Robert D. Smith, Nikhil Khobragade, Unnikrishnan Sasidharan, Rajan Kumar</i>	

PERFORMANCE AND ASSESSMENT OF UNIQUE INLETS, NOZZLES, AND PROPULSION SYSTEMS

Thrust-Drag and Power Balance Accounting Methods for a Boundary Layer Ingesting Propulsion Configuration.....	126
<i>David K. Hall, Matthew Ibasitas</i>	
Brayton Cycle Analysis of the Effect of Wake Ingestion on Aircraft Range	147
<i>Paul M. Bevilaqua</i>	
Coupled Propulsive and Aerodynamic Analysis of an Installed Ultra-High Bypass Ratio Powerplant at High-Speed and High-Lift Conditions.....	157
<i>Jesús Matesanz García, David G. Macmanus, Fernando Tejero, Ioannis Goulos, Josep Hueso-Rebassa, Avery E. Swarthout, Robert Christie</i>	
Design Considerations of Non-Axisymmetric Exhausts for Large Civil Aero-Engines.....	179
<i>Josep Hueso-Rebassa, David G. Macmanus, Ioannis Goulos, Fernando Tejero</i>	

Powered Low-Speed Experimental Aerodynamic Investigation of an Over-Wing Mounted Nacelle Configuration.....	199
<i>Vinicius T. Silva, Anders Lundbladh, Carlos Xisto, Petter Miltén, Isak Jonsson</i>	
Advanced Parametric Lobe Mixer Concepts for Internally Mixed Nozzles.....	215
<i>William V. Banks</i>	

TOPICS IN INLETS, NOZZLES, AND PROPULSION SYSTEM INTEGRATION

Evaluation of a Subsonic Fluidic Thrust Vectoring Concept - Part I: Numerical Investigation of the Steady and Transient Behaviour	235
<i>Nils Schwagerus, Jonas Remiger, Marcel Stößel, Dragan Kozulovic, Michael Krummenauer</i>	
Evaluation of a Subsonic Fluidic Thrust Vectoring Concept - Part II: Impact on Propulsion System and Mission Performance	251
<i>Jonas Remiger, Nils Schwagerus, Marcel Stößel, Dragan Kozulovic, Michael Krummenauer</i>	
Influence of the Engine Exhaust on the Wing Pressure Distribution, Computed with an Integrated Simulation of Airframe and Running Engine	263
<i>Jan Mueller, Kazuhisa Chiba, Yoshinori Oba</i>	
Traversing Nozzle Probe in Small Gas Turbine Engines.....	278
<i>Kaitlyn Brendlinger, Mason Stocke, Jordan Taylor, Nicholas Grannan, Mark Fernelius</i>	
Numerical Optimization of High Convolved Serpentine Air Inlet Duct Using Response Surface Methodology	288
<i>Omer Faruk Yahsi, Mehmet H. Yilmaz, Erkan Gunaydinoglu, Yusuf Ozyoruk</i>	

HIGH-SPEED INLETS, ISOLATORS, AND NOZZLES I

Computational Study of an Internal Osculating Waverider Intake	314
<i>Andrew J. Shuck, Mark E. Noftz, Joseph S. Jewell, Jonathan Poggie, Andrew Bustard, Thomas J. Juliano, Nicholas J. Bisek</i>	
Experimental Investigations of the Hypersonic Streamtraced Performance Inlet at Sub-Design Mach Number and Varying Angles of Attack.....	327
<i>Matthew J. Schram, William Stramecky, Venkateswaran Narayanaswamy</i>	
Surface Pressure Comparison of an Internal Osculating Waverider Inlet Under Noisy and Quiet Flow.....	351
<i>Mark E. Noftz, Andrew J. Shuck, Joseph S. Jewell, Jonathan Poggie, Andrew Bustard, Thomas J. Juliano, Nicholas J. Bisek</i>	
Fast Pressure-Sensitive Paint Measurements of an Internal Osculating Waverider Inlet Under Quiet and Noisy Flow	364
<i>Andrew Bustard, Mitsugu Hasegawa, Hirotaka Sakaue, Thomas J. Juliano, Mark E. Noftz, Andrew J. Shuck, Joseph S. Jewell, Jonathan Poggie, Nicholas J. Bisek</i>	

HIGH-SPEED INLETS, ISOLATORS, AND NOZZLES II

Flow Separation Measurements in Regions of SBLI Using Wall Shear Sensors	390
<i>Nicholas J. Molinaro, Daniel Simmons, Ryan J. Meritt</i>	

Supersonic External-Compression Inlets for Mach 1.4 to 2.0	398
<i>John W. Slater</i>	
Design and Analysis of a Jet Stretcher for High-Altitude Supersonic Free Jet Testing	418
<i>Brian Heberling, May-Fun Liou, Heath H. Reising</i>	

DESIGN AND ANALYSIS OF INLET AND EXHAUST SYSTEMS

Selection of a Scale Resolving Simulation Technique for Flow Field Analysis of a High-Speed Air Intake	431
<i>Bilal Mufti, Tauha Irfan, Zakria Toor, Jehanzeb Masud</i>	
Parametric Study on the Thrust Vectoring of a Supersonic Jet Manipulated by Fluidic Injection.....	440
<i>Anwesh Yadav, Vignesh R, Arun Kumar Perumal</i>	
Design Optimization of a Novel Boundary Layer Diverter for Semi-Submerged Inlets	448
<i>Umut Can Kucuk, Ismail Hakki Tuncer</i>	
Effect of Small Step on Aerodynamic Performance in the Transonic Inlet	463
<i>Enbo Ju, Feng Ye, Xuanshi Meng, Xiaoguang Ma, Tong Chen</i>	

HIGH-SPEED INLETS, ISOLATORS, AND NOZZLES III

Effects of Non-Uniform Inflow to Side- And Central- Spillage Bump Inlets	477
<i>Zonghan Yu, Huihui Huang, Ya Yuan</i>	
A Geometrical-Irregular Boundary Layer Suction Method for Hypersonic Flow Distortion Suppression	487
<i>Yuedi Lei, Guoping Huang, Xuayang Yan, Ruilin Wang, Zonghan Yu</i>	
Comprehensive Assessments of Hypersonic Inlet Restart Using Active Jet.....	497
<i>Yichao Jin, Wei Yao</i>	
Multi-Objective Optimization of Arbitrary Supersonic Intake Based on Axiomatic Design Theory Using Kriging/MOGA.....	507
<i>Jatinder Pal Singh Sandhu, Megha Bhardwaj, Anurag Sharma, N Ananthkrishnan, Ik-Soo Park</i>	
Diagnostic Investigation of Fluid Flow Characteristics of Aerospike Nozzles During Streamtube Compression and Shock Wave Generation at Various Pressure Ratios	529
<i>Shubhangi Sundaria, Amritansh Kumar Bhagat, Md Saquib Reza, Vr Sanal Kumar</i>	
Experimental Investigation of Surface Roughness on the Flowfield and Aero-Acoustics of Converging Nozzles	562
<i>Mingtai Chen, Hunter Power, Emma Stults, Anil Mohan, Ruksana Baby</i>	

Author Index