Contents

Part I Airplane Aerodynamics

Influence of Meshing on Flow Simulation in the Wing-Body Junction of Transport Aircraft ........................................... 3 Philipp Peter Gansel, Patriz Dürr, Markus Baumann, Thorsten Lutz and Ewald Krämer

Numerical Approach Aspects for the Investigation of the Longitudinal Static Stability of a Transport Aircraft with Circulation Control ........ 13 Dennis Keller

Numerical Investigation of the Influence of Shock Control Bumps on the Buffet Characteristics of a Transonic Airfoil ................. 23 Steffen Bogdanski, Klemens Nübler, Thorsten Lutz and Ewald Krämer

Numerical Investigation of the Flutter Behaviour of a Laminar Supercritical Airfoil ................................................... 33 A. C. L. M. van Rooij and W. Wegner

Part II Optimization

Aero-Elastic Multipoint Optimization Using the Coupled Adjoint Approach ................................................................. 45 Mohammad Abu-Zurayk and Joël Brezillon

Efficient Global Optimization of a Natural Laminar Airfoil Based on Surrogate Modeling .................................................. 53 Chunna Li, Joël Brezillon and Stefan Görtz

Efficient Quantification of Aerodynamic Uncertainty due to Random Geometry Perturbations ........................................ 65 Dishi Liu and Stefan Görtz
Fluid-Dynamic Optimization of the Cabin Air Outlet
Do728-KLA with Adjoint Sensitivity Analysis ............................. 75
Anne Lincke, Gerrit Lauenroth, Thomas Rung and Claus Wagner

Part III Turbulence Research and Turbulence Modeling

Geometrical Features of Streamlines and Streamline Segments in Turbulent Flows ........................................ 85
Philip Schaefer, Markus Gampert, Fabian Hennig and Norbert Peters

Numerical Investigation of the Combined Effects of Gravity and Turbulence on the Motion of Small and Heavy Particles .... 93
Christoph Siewert, Rudie Kunnen, Matthias Meinke and Wolfgang Schröder

On “Adaptive Wall-Functions” for LES of Flow and Heat Transfer ......................................................... 103
G. John-Puthenveettill and S. Jakirlić

The Influence of the Diffusion Model on the Separation Sensitivity of Differential Reynolds Stress Models ............................. 113
Bernhard Eisfeld

DNS and LES of Turbulent Mixed Convection in the Minimal Flow Unit ......................................................... 123
Christian Kath and Claus Wagner

Turbulence Resolving Simulations of the Flow About a Tandem Cylinder and a Rudimentary Landing Gear .................. 133
Dieter Schwamborn, Axel Probst, Roland Kessler, Mariafrancesca Valentino and Keith Weinman

Superstructures in a Turbulent Boundary Layer Under the Influence of an Adverse Pressure Gradient Investigated by Large-Scale PIV . . . 143
D. Schanz, T. Knopp, A. Schröder, M. Dumitra and C. J. Kähler

Part IV Laminar Flow Control and Transition

Impact of Forward-Facing Steps on Laminar-Turbulent Transition in Subsonic Flows ................................. 155
Christopher Edelmann and Ulrich Rist
Interaction of a Cylindrical Roughness Element and a Two-Dimensional TS-Wave
Benjamin Plogmann, Werner Würz and Ewald Krämer

Effects of a Discrete Medium-Sized Roughness in a Laminar Swept-Wing Boundary Layer
Holger B. E. Kurz and Markus J. Kloker

Wing Design Based on a Tapered Wing Natural Laminar Flow Airfoil Catalogue
Judith Frfr. von Geyr, Fedime von Knoblauch zu Hatzbach, Arne Seitz, Thomas Streit and Georg Wichmann

Experimental and Numerical Investigations of the Laminar Airfoil NLF9
René-Daniel Cécora and Henning Rosemann

Reconstruction of a Disturbance Flow Field from Wall Measurements of Tollmien-Schlichting Waves
Arne Seitz

Flight Measurements Under Turbulent Atmospheric Conditions
Andreas Reeh, Michael Weismüller and Cameron Tropea

Part V Rotorcraft Aerodynamics

Numerical Investigation of the Influence of the Model Installation on Rotor Blade Airfoil Measurements
K. Richter, A. D. Gardner and S. H. Park

Flow Simulation of a Five: Bladed Rotor Head
Moritz Grawunder, Roman Reß, Victor Stein, Christian Breitsamter and Nikolaus A. Adams

Blade Shape Design: Trim Acceleration for Fluid-Structure Coupled Simulations of an Isolated Rotor in Forward Flight
Martin Hollands, Manuel Keßler and Ewald Krämer

Numerical Investigations of a Back-Flow Flap for Dynamic Stall Control
K. Kaufmann, A. D. Gardner and K. Richter
Adaptation of the Dynamic Rotor Blade Modelling in CAMRAD for Fluid-Structure Coupling Within a Blade Design Process ........ 263
Christian Stanger, Martin Hollands, Manuel Keßler and Ewald Krämer

Part VI Convective Flows

Flight Testing of Alternative Ventilation Systems for Aircraft Cabins ........................................ 275
J. Bosbach, A. Heider, T. Dehne, M. Markwart, I. Gores and P. Bendfeldt

Large-scale Coherent Structures in Turbulent Mixed Convective Air Flow ........................................ 285
Andreas Westhoff, Johannes Bosbach and Claus Wagner

Numerical Simulation of the Air Flow and Thermal Comfort in Aircraft Cabins ........................................ 293
Mikhail Konstantinov, Waldemar Lautenschlager, Andrei Shishkin and Claus Wagner

Highly-Resolved Numerical Simulations of High Rayleigh and Reynolds Number Indoor Ventilation in a Generic Room .... 303
Olga Shishkina and Claus Wagner

Influence of the Geometry on Rayleigh-Bénard Convection .......... 313
Sebastian Wagner, Olga Shishkina and Claus Wagner

Part VII Aerodynamics and Aeroacoustics of Ground Vehicles

An Experimental and Numerical Investigation of the Near Wake Field of a Tractor-Trailer Configuration .............. 325
Johannes Haff, Joachim Tschech, Hugues Richard, Sigfried Loose and Claus Wagner

Experimental Study of the Pressure Rise due to Tunnel Entry of a High-Speed Train .................................. 335
Daniela Heine and Klaus Ehrenfried

Aerodynamic Loads Induced by Passing Trains on Track Side Objects ........................................ 343
Sabrina Rutschmann, Klaus Ehrenfried and Andreas Dillmann
Flow-Induced Airborne and Structure-Borne Noise at a Simplified Car Model

Stefan Müller, Stefan Becker, Christoph Gabriel, Reinhard Lerch and Frank Ullrich

Part VIII Aeroelasticity and Structural Dynamics

Prediction of Transonic Flutter Behavior of a Supercritical Airfoil Using Reduced Order Methods

Nagaraj K. Banavara and Diliana Dimitrov

Partitioned Fluid-Structure Interaction on Solution-Adaptive Hierarchical Cartesian Grids

Gonzalo Brito Gadeschi, Matthias Meinke and Wolfgang Schröder

An Assessment of the Influence of Fuselage Deformations on the Numerical Prediction of High-Lift Performance

Stefan Keye

Combined Time-Resolved PIV and Structure Deformation Measurements for Aeroelastic Investigations

Hauke Ehlers, Reinhard Geisler, Sebastian Gesemann and Andreas Schröder

Part IX Numerical Simulation

CTAU, A Cartesian Grid Method for Accurate Simulation of Compressible Flows with Convected Vortices

Philip Kelleners and Frank Spiering

Coupling of Flow Solvers with Variable Accuracy of Spatial Discretization

Frank Spiering and Philip Kelleners

Overlapping Grids in the DLR THETA Code

Roland Kessler and Johannes Löwe

Detached Eddy Simulation Using the Discontinuous Galerkin Method

Michael Wurst, Manuel Keßler and Ewald Krämer

Application of Point and Line Implicit Preconditioning Techniques to Unsteady Flow Simulations

Dian Li and Stefan Langer
Validation of a Time-Domain TAU-Flight Dynamics Coupling
Based on Store Release Scenarios .................................................. 455
Lars Reimer, Ralf Heinrich and Rosemarie Meuer

Implementation of Flow Through Porous Media into a Compressible
Flow Solver ......................................................................................... 465
Michael Mößner and Rolf Radespiel

Evaluation of Hybrid RANS/LES Methods for Computing
Flow over a Prolate Spheroid ............................................................. 475
Sunil Lakshmipathy

RANS-based Aerodynamic Drag and Pitching Moment Predictions
for the Common Research Model ....................................................... 485
Olaf Brodersen and Simone Crippa

Aerodynamic Effects of Tip Tanks on a Swept Wing
Wind-Tunnel Model ............................................................................. 495
Claus-Philipp Hühne, Peter Scholz and Rolf Radespiel

Simulation of Interaction of Aircraft and Gust Using
the TAU-Code ..................................................................................... 503
Ralf Heinrich

Numerical Investigation of the Magnus Effect of a Generic
Projectile at Mach 3 up to 90° Angle of Attack .................................. 513
Daniel Klatt, Robert Hruschka and Friedrich Leopold

Part X  Experimental Simulation and Test Techniques

Large Scale Tomographic Particle Image Velocimetry
of Turbulent Rayleigh-Bénard Convection ........................................ 525
Daniel Schiepel, Johannes Bosbach and Claus Wagner

Pressure Measurement on Rotating Propeller Blades by Means
of the Pressure-Sensitive Paint Lifetime Method ............................... 535
C. Klein, U. Henne, W. E. Sachs, S. Hock, N. Falk, V. Ondrus,
U. Beifuss and S. Schaber

Optical In-Flight Wing Deformation Measurements with the Image
Pattern Correlation Technique .......................................................... 545
Ralf Meyer, Tania Kirmse and Fritz Boden
Development of a Rotating Camera for In-flight Measurements of Aircraft Propeller Deformation by Means of IPCT
Fritz Boden and Boleslaw Stasicki

Impact of Forced High Frequency Airfoil Oscillations on the Shock Motion at Transonic Buffet Flows
Antje Feldhusen, Axel Hartmann, Michael Klaas and Wolfgang Schröder

Total Pressure Measurements Behind an Axial Ventilator Using a Kiel Probe Array
Till Heinemann, Claus Bakeberg, Hermann Lienhart and Stefan Becker

Experimental Study on Wave Drag Reduction at Slender Bodies by a Self-aligning Aerospike
Oliver Wysocki, Erich Schülein and Christian Schnepf

Part XI Aeroacoustics

Aeroacoustic and Aerodynamic Importance of Unequal Rotor Rotation Speeds of a CROR

Computational Aeroacoustics of a Counter-Rotating Open Rotor at Different Angles of Attack
Eirene Rebecca Busch, Manuel Keßler and Ewald Krämer

Assessment of Front Rotor Trailing Edge Blowing for the Reduction of Open Rotor Interaction Noise
A. Stuermer, R. A. D. Akkermans and J. W. Delfs

 Examination of the Influence of Flow Speed on the Coherence Lengths in Turbulent Boundary Layers at High Subsonic Mach Numbers
Stefan Haxter, Klaus Ehrenfried and Stefan Kröber

Sound Generation by Low Mach Number Flow Through Pipes with Diaphragm Orifices
Frank Obermeier, Mikhail Konstantinov, Andrei Shishkin and Claus Wagner

A Separated Flow Model for Semi-Empirical Prediction of Trailing Edge Noise
Chan Yong Schuele and Karl-Stéphane Rossignol
Part XII     Biofluid Mechanics

Computational Analysis of a Three-dimensional Flapping Wing . . . .  651
Nadine Buchmann, Rolf Radespiel and Ralf Heinrich

Combined Flow and Shape Measurements of the Flapping
Flight of Freely Flying Barn Owls . . . . . . . . . . . . . . . . . . . . .  661
Thomas Doster, Thomas Wolf and Robert Konrath

Numerical Investigation of the Aerodynamic Forces Induced
by the Flow around Free Flying Fruit Fly . . . . . . . . . . . . . . . . .  671
Andrei Shishkin and Claus Wagner

Author Index . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .  681
New Results in Numerical and Experimental Fluid Mechanics IX
Contributions to the 18th STAB/DGLR Symposium, Stuttgart, Germany, 2012
2014, XVI, 683 p. 427 illus., 105 illus. in color., Hardcover
ISBN: 978-3-319-03157-6