

American Helicopter Society International

AHS Specialists Conference on Aerodynamics 2008

January 23-25, 2008
San Francisco, California, USA

Volume 1 of 2

Printed from e-media with permission by:

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

ISBN: 978-1-60560-104-5

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

ISBN: 978-1-60560-104-5

Copyright (2008) by the American Helicopter Society International
All rights reserved.

For permission requests, please contact the American Helicopter Society International
at the address below.

American Helicopter Society International
217 N. Washington Street
Alexandria, Va. 22314 - 2538

American Helicopter Society International

AHS Specialists Conference
on Aerodynamics
2008

TABLE OF CONTENTS

VOLUME 1

Requirements for Next Generation Comprehensive Analysis of Rotorcraft	1
<i>W. Johnson, A. Datta</i>	
Rotorcraft Aeromechanics–Getting Through the Dip	9
<i>J. G. Leishman</i>	
Sliding Mesh Algorithm for CFD Analysis of Helicopter Rotor-Fuselage Aerodynamics	34
<i>R. Steijl, G. Barakos</i>	
Predicting Blade Vortex Interaction, Airloads and Acoustics using the Vorticity Transport Model	48
<i>M. E. Kelly, K. Duraisamy, R. E. Brown</i>	
Force Production Mechanisms of Flapping-Wing MAV	67
<i>B. L. Bush, J. D. Baeder</i>	
Computational Studies of the Effects of Gurney Flaps on Autorotative Performance of Rotors in Descent Flight	90
<i>B. Y. Min, L. N. Sankar, C. Tongchitpakdee, Y. H. Yu</i>	
Investigation of AH-64 Tail Rotor Balancing Issues	102
<i>M. C. Newkirk, D. L. Kunz</i>	
An Enhanced Method for Floquet Modal Identification	109
<i>H. Saberi, H. Xin, M. Khoshlahjeh</i>	
Development of an Aeroelastic Stability Boundary for a Rotor in Autorotation	119
<i>J. Trchalík, E. A. Gillies, D. G. Thomson</i>	
CFD/CSD Coupled Trim Solution for the Dual-Rotor CH-47 Helicopter Including Fuselage Modeling	132
<i>M. Bhagwat, A. Dimanlig, H. A. Saberi, E. T. Meadowcroft, B. Panda, R. Strawn</i>	
Rotorcraft Methodology for Unstructured CFD-CSD Coupling	140
<i>J. N. Abras, M. J. Smith</i>	
Initial Development of a Methodology for Quantitative Load Prediction Over the Aircraft Flight Envelope	154
<i>S. M. Makinen, E. Reed, T. A. Egolf, N. Rajmohan, L. Sankar</i>	
Coupled Thrust and Vorticity Dynamics during VRS	170
<i>O. Sava, R. B. Greenrich, F. X. Caradonna</i>	
Comprehensive Analysis, Prediction, and Validation of UH-60A Blade Loads in Unsteady Maneuvering Flight	182
<i>A. Abhishek, A. Datta, I. Chopra</i>	

An Integrated Analysis Code with CFD/Rotor Dynamics Coupling Developed in JAXA	205
<i>Y. Tanabe, S. Saito</i>	
An Examination of Engine Effects on Helicopter Aeromechanics	211
<i>D. M. O'Brien Jr., M. E. Calvert, S. L. Butler</i>	
SEA Interior Noise Validation for Rotorcraft	221
<i>D. J. Butts</i>	
Suppressing In-Plane, Low Frequency Helicopter Harmonic Noise with Active Controls	229
<i>B. W. Sim</i>	
Understanding Far Field Near-In-Plane High Speed Harmonic Helicopter Rotor Noise in Hover: Governing Parameters and Active Acoustic Control Possibilities	248
<i>G. Gopalan, F. H. Schmitz</i>	
Preliminary Study on Time-Spectral and Adjoint-Based Design Optimization of Helicopter Rotors	271
<i>S. Choi, K. H. Lee, J. J. Alonso, A. Datta</i>	
Theoretical Optimum Rotor Performance in Hover and Climb	290
<i>D. A. Peters, C. Garcia-Duffy</i>	
Computational Fluid Dynamics Analysis of a Coaxial Rotor Using Overset Grids	298
<i>G. Ruzicka, R. C. Strawn</i>	
Using CFD to Understand and Evaluate Tail Rotor Blade Designs	317
<i>A. Brocklehurst, R. Steijl, G. Barakos</i>	
The Challenges Faced in the Development of Active Inceptor Systems	338
<i>S. Barnard, A. Taylor</i>	
Simulation Development in Support of Investigation of Handling Qualities Specification Requirements for Maritime Rotorcraft	352
<i>C. He, J. Goericke, D. Lee, J. Zhao</i>	
NRC's Superslide as a Mission Task Element for ADS-33 (Maritime)	362
<i>D. G. Mitchell, T. K. Nicoll, A. W. Gubbels, S. Carignan, K. Ellis</i>	
Daughtership Release Flight Dynamics of the Aerial Surveyor Hybrid Autonomous Aircraft	372
<i>W. M. DeBusk</i>	
Integration of a Large Radome with an Unmanned Rotorcraft	383
<i>P. Ziegenbein, R. Narducci, E. Mychalowycz, J. Firko</i>	

VOLUME 2

The Path to Turboprop Competitive Rotorcraft: Aerodynamic Challenges	394
<i>J. D. Sinsay</i>	
Creation & Validation of a Generic Rotorcraft Performance Analysis Tool (RPAT)	407
<i>J. Kolaczynski, S. Hefter</i>	
Influence of Dynamic Stall and Dynamic Wake Effects on Helicopter Trim and Rotor Loads	421
<i>V. Laxman, C. Venkatesan, P. R. Dwivedi</i>	
Predicting Helicopter External Loads during Maneuvering Flight	455
<i>K. Strobe, M. Spires, B. Gassaway, R. Kacvinsky</i>	

Vibration and Noise Reduction of Helicopter Rotors Using an Active / Passive Approach	463
<i>B. Glaz, P. P. Friedmann, L. Liu</i>	
Active Trim Tab for Rotor Track and Balance.....	481
<i>A. Lengyel, M. van Schoor, L. Centolanza</i>	
Dynamics of A Ducted Rotor in Forward Flight.....	495
<i>J. Zhang, E. Smith, J. Horn</i>	
Turbulence Modeling Treatment for Rotorcraft Wakes.....	504
<i>M. Potsdam, T. Pulliam</i>	
Influence of Lift Offset on Rotorcraft Performance	518
<i>W. Johnson</i>	
Performance Analysis of Trailing-Edge Flaps in Helicopter Primary Control	549
<i>J. Falls, A. Datta, I. Chopra</i>	
Coupling of a Geometrically Exact Rotor Blade Analysis with Unsteady Aerodynamics and Dynamic Inflow	577
<i>H. G. Lee, S. R. Viswamurthy, S. J. Shin</i>	
Assessment of Predictive Capability of Aeromechanics Methods.....	583
<i>W. G. Bousman, T. Norman</i>	
High Resolution Computational Investigation of Trimmed Coaxial Rotor Aerodynamics in Hover	605
<i>V. K. Lakshminarayan, J. D. Baeder</i>	
Airfoil Design and Testing for High-Lift Rotorcraft Applications	629
<i>P. B. Martin, M. Rhee, M. D. Maughmer, D. M. Somers</i>	
A State-Space Free-Vortexhybrid Wake Model for Helicopter Rotors.....	662
<i>B. J. Wasileski, D. A. peters</i>	
The Prediction and Validation of Hover Performance and Detailed Blade Loads	672
<i>S. Schmitz, J. J. Chattot, M. Bhagwat, M. A. Moulton, F. X. Caradonna</i>	
Calculation of JVX Proprotor Performance and Comparisons with Hover and High-Speed Test Data	691
<i>C. W. Acree Jr.</i>	
Pareto Frontier Method for Multi-Disciplinary Optimization of Helicopter Rotors.....	703
<i>K. Collins, J. Bain, L. Sankar, T. A. Egolf, R. D. Janakiram</i>	
Interactional Aerodynamics and Acoustics of a Propeller-Augmented Compound Coaxial Helicopter.....	722
<i>H. W. Kim, A. R. Kenyon, K. Duraisamy, R. E. Brown</i>	
Comparison of Approximate Time Domain Aerodynamics for Flapped Air foils with CFD Based Results with Applications.....	744
<i>L. Liu, P. P. Friedmann, A. K. Padthe</i>	
Numerical Investigation of Laminar/Turbulent Transition Effects on the Dynamic Stall of an Oscillating Airfoil	761
<i>M. Costes, V. Gleize, A. Le Pape, F. Richez</i>	
Author Index	