

37th European Rotorcraft Forum 2011

(ERF 2011)

**Vergiate and Gallarate, Italy
13-15 September 2011**

Volume 1 of 2

ISBN: 978-1-61839-626-6

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.

Copyright© (2011) by AgustaWestland
All rights reserved.

Printed by Curran Associates, Inc. (2012)

For permission requests, please contact AgustaWestland
at the address below.

AgustaWestland
Via Giovanni Agusta, 520
Cascina Costa di Samarate (VA)
21017 Italy

Phone: 39 033 122 9111
Fax: 39 033 122 9046

ERF2011@agustawestland.com

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

VOLUME 1

074 - A Neural Network Approach to Predicting the Horizontal Air Velocity Component of the AS 355 F2 in Low Airspeed Regime	1
<i>J. Figueira, D. De Andrade, R. Vieira Cruz</i>	
075 - Ground Level Measurements of Thermoacoustic Transfer Function of a Brownout Cloud	10
<i>J. Tritschler, R. Celi</i>	
079 - BOSS2: Single Primary Flight Display Page from Cruise to Hover/Landing in Brownout	19
<i>Z. Szoboszlai, G. Neiswander</i>	
082 - Rotor Wake Modelling in Ground Effect Conditions	29
<i>A. Filippone, R. Bakker, P. Basset, B. Rodriguez, R. Green, B. Kutz, F. Bensing, A. Visingardi</i>	
083 - Sound Quality Analysis and Synthesis of Rotorcraft Flyover Noise Using a Source Transfer-Receiver Approach	41
<i>D. Sabbatini, K. Janssens, H. Van Der Auweraer, F. Cenedese</i>	
084 - Radioaltimeter in the Function of Anticollision System	51
<i>D. Draxler, J. Labun, M. Sotak, P. Kurdel</i>	
088 - Weather Safety Through Online Weather Briefing	56
<i>J. Block</i>	
089 - Stability Analysis of Helicopter Rotors in Forward Flight Via Statespace Aeroelastic Modeling and Correlation with Experimental Results	64
<i>D. Muro, M. Gennaretti</i>	
090 - Flight Task Performance with High and Low Gain Night Vision Goggles	72
<i>G. Craig, S. Carignan, M. Brulotte</i>	
091 - Comparative Assessment of Two CFD Solvers on the Aerodynamic Performance Prediction of Helicopter Components	78
<i>E. Gasparella, R. Ponza, E. Benini</i>	
093 - Development of a Framework for Optimising Aspects of Helicopter Aerodynamics	88
<i>C. Johnson, G. Barakos</i>	
094 - Modeling Operations on Suppression of Forest Fires on a Helicopter Training Simulator	108
<i>A. Sviridenko, D. Kurulyuk, N. Nez</i>	
096 - Scale Model Tests of a Centre-line Tiltrotor: Conversion Between Rotary and Fixed Wing Modes	118
<i>B. Burrage</i>	
097 - Harmonic Balance Solutions for Realistic Rotor Configurations	126
<i>M. Woodgate, G. Barakos</i>	
098 - Aeroelastic CFD Computations for Rotor Flows	143
<i>F. Dehaeze, G. Barakos</i>	
099 - Towards Consistent Hybrid Overset Mesh Methods for Rotorcraft CFD	163
<i>M. Jarkowski, M. Woodgate, J. Rokicki, G. Barakos</i>	
100 - A Periodicity Correction for Microscopic- PIV Rotor Tip Vortex Measurements	178
<i>M. Bhagwat, M. Ramasamy</i>	
101 - UH-60M Fly-by-Wire Flight Control System Electromagnetic Environmental Effects Qualification Testing	N/A
<i>L. Salway</i>	
105 - Safety Hazards in Nighttime Offshore Helicopter Operations	190
<i>F. Nascimento, A. Majumdar, W. Ochieng, S. Jarvis</i>	
106 - European Helicopter Safety Team (EHST): Mapping Safety Issues with Technological	200
<i>J. Stevens, J. Vreeken, M. Masson</i>	
107 - Helicopter Trim Calculation for Calculating Performance Characteristics Taking Into Account Mutual Influence of Fuselage, Main and Tail Rotors	208
<i>S. Mikhailov, A. Kusuymov, E. Nikolaev, N. Shilova, M. Antoshkina</i>	
108 - Classification of Pilot Requirements Used for Takeoff Planning	213
<i>S. Greiser, J. Wolfram, M. Gestwa</i>	
109 - Aero-Elastic Modeling of Helicopter Composite Blade in Unsteady Incompressible Flow	230
<i>T. Farsadi, J. Javanshir</i>	
111 - Multiple Input Describing Function for Non-linear Analysis of Ground and Air Resonance	241
<i>V. Muscarello, G. Quaranta</i>	

112 - An Investigation of Aeroelastic Rotorcraft-Pilot Interaction	251
<i>P. Masarati, G. Quaranta, M. Gennaretti, J. Serafini</i>	
116 - Present and Future Trends in Aircraft and Rotorcraft Pilot Couplingsa Retrospective Survey of Recent Research Activities within the European Project ARISTOTEL	266
<i>M. Pavel, P. Masarati, H. Smaili, J. Malecki, M. Gennaretti, A. Ionita, B. Dang Vu, M. Jump, M. Jones, L. Zaicek</i>	
117 - Fully Coupled Structural – Unsteady Aerodynamics Modelling for Aeroelastic Response of Rotorcraft	285
<i>G. Bernardini, J. Serafini, M. Colella, M. Gennaretti</i>	
118 - Design of a Dynamically Scaled Rotor System and Verification of the Blade Properties	293
<i>D.-H. Kim, S.-H. Kim</i>	
119 - a New Smart Approach to Helicopter TAWS	301
<i>M. Mampel, T. Munsterer, P. Kramper, M. Kress, M. Wegner</i>	
120 - Aerodynamic and Aeroacoustic Characteristics of JAXA Real-size Quiet Rotor Blade	307
<i>S. Saito, Y. Tanabe, N. Kobiki, H. Sugawara, N. Sasaki, H. Fujita</i>	
121 - Fuselage Drag Reduction Studies Using a Coupled Lattice-Boltzmann and Navier-Stokes Methodology	325
<i>J. Kim, B.-Y. Min, L. Sankar, N. Yeshala</i>	
122 - MyCopter: Enabling Technologies for Personal Air Transport Systems	336
<i>M. Jump, P. Perfect, G. Padfield, M. White</i>	
125 - Simulation of Helicopter Dynamics with External Suspended Loads	348
<i>P. Marguerettaz, G. Guglieri</i>	
130 - Flight Loop Development for Training Simulation by Industry Last Progress	360
<i>R. Emmanuelle, A. Christine, G. Philippe</i>	
131 - New Fatigue and Damage Tolerance Evaluation Rules - Are We Fit for Them?	370
<i>S. Emmerling</i>	
132 - Application of Continuation and Bifurcation Methods for Aeroelastic Rotor Blade Stability	380
<i>D. Rezgui, M. Jones, M. Lowenberg, C. Monteggia</i>	
133 - The Starflex®: Flying All Over the World and Always in Evolution	390
<i>J. Besson, Y. Marino</i>	
134 - Measurements of the Turbulent Flow Environment on the Ground Below a Hovering Rotor	398
<i>J. Rauleder, J. Leishman</i>	
135 - Geometric Optimisation of a Gurney Flap Hinge-less Deployment System for a Helicopter Model Blade	409
<i>A. Paternoster, R. Loendersloot, A. De Boer, R. Akkerman</i>	
136 - The Development of an Innovative Composite Tail Boom	415
<i>A. Engleder, S. Gorlich, D. Strobel</i>	
137 - Electromagnet Driving Force for Active Gurney Flap: Finite Element Modelling and Preliminary Experimental Validation	421
<i>G. Diodati, M. Ciminello, A. Concilio</i>	
138 - Stability and Response of Two Bladed Gimballed Rotors with Coning Hinges	428
<i>G. Avanzini, G. De Matteis, A. Torasso</i>	
139 - Second Generation Virtual Sensor for Helicopter Gross Weight Prediction	438
<i>M. Morales, D. Haas, B. Fuller</i>	
140 - A Demonstration and Primer of Modern Handling Qualities Characteristics Using a Highly Augmented WiFi Controlled Rotorcraft	447
<i>J. McKay, G. Wiggins, W. Lewis</i>	
143 - Helicopter Emergency Medical Service (HEMS) from a Rooftop in Amsterdam: A Simulation Perspective	457
<i>H. Haverdings</i>	
144 - System Architecture for New Avionics on Eurocopter Fleet Based on IMA Supporting Civil and Military Missions	476
<i>E. Guillanton, S. Germanetti</i>	
145 - An Experimental Set Up for the Study of the Retreating Blade Dynamic Stall	484
<i>A. Zanotti, F. Auteri, G. Campanardi, G. Gibertini</i>	
146 - Investigation of Dynamic Stall Control by Deployable Vortex Generator using URANS Computations and Time-Resolved PIV Analysis	494
<i>G. Joubert, A. Le Pape, B. Heine, S. Huberson</i>	
147 - Improved Performance Prediction for Bo105 Model Rotor in Cruise Using CFD/CSD Analysis	505
<i>J. Lim</i>	
148 - CFD Adaptive Mesh Refinement for Rotorcraft Wake Simulations	523
<i>M. Potsdam, A. Wissink, S. Kamkar, B. Jayaraman</i>	

149 - Free Mesh Morphing Optimisation applied of Composite Stiffened Panels under Stability and Strength Constraints	547
<i>G. Quaranta, L. Lanzi, M. Sirna</i>	
150 - An Effective Tool for the Automated Generation of Aerofoil Characteristics Tables for Rotorcraft Analysis and Design	556
<i>N. Anh Vu, J. Lee, S. Kim</i>	
151 - Experimental Investigation of Dynamic Stall Performance for the EDI-M109 and EDI-M112 Airfoils	567
<i>A. Gardner, K. Richter, H. Ma, A. Altmikus, A. Klein, C.-H. Rohardt</i>	
153 - Anomaly Detection and Diagnosis Applied to AS332 Helicopter Using Eurohums Vibration Data	578
<i>H. Morel, F. Viniacourt, F. Hoffman</i>	
154 - Performance Analysis of a Lightweight Helicopter Featuring a Two Bladed Gimballed Rotor	586
<i>G. Avanzini, G. De Matteis, F. Lucertini, A. Torasso</i>	

VOLUME 2

155 - Helicopter Main Rotor - Tail Rotor Interactional Aerodynamics and Related Effects on the On-Ground Noise Footprint	596
<i>S. Melone, A. D'Andrea</i>	
156 - Analysis of Main Rotor Noise Reduction Due to Novel Planform Design - The Blue Edge™ Blade	612
<i>M. Gervais, V. Garetton</i>	
157 - On an Integrated Software Tool in Support of Certification and Formulation of Operational Procedures for Rotorcraft Vehicles	621
<i>C. Bottasso, F. Luraghi, G. Maisano</i>	
158 - Helicopter Engine Intake Barrier Filter Design	630
<i>N. Bojdo, A. Filippone</i>	
159 - Structural Analysis of a Bearingless Rotor System using an Improved Flexible Multi-body Model	640
<i>T. Chun, S. Shin</i>	
161 - Transitory Separation Control on a ROBIN Fuselage using Pulsed Actuation	646
<i>G. Woo, A. Glezer, T. Crittenden</i>	
162 - Statistical Methods for Helicopter Preliminary Design and Sizing	656
<i>M. Lier</i>	
163 - Proof of Concept for a Predictive Ship Helicopter Operational Limitation Analysis Tool Lieutenant	666
<i>A. Hoencamp, M. White, P. Perfect</i>	
164 - Low Level Flight Solutions for Civilian Missions	677
<i>F. Francois-Xavier, G. Marianne, P. Richard</i>	
165 - Computational Investigation of Hub Drag Deconstruction from Model to Full Scale	684
<i>Rajiv Shenoy, M. Holmes, M. Smith, N. Komerath</i>	
166 - Drag Analysis for an Economic Helicopter	694
<i>S. Schneider, S. Mores, M. Edelmann, A. D'Alascio, D. Schimke</i>	
168 - Computational Assessment of Flow Breakdown in Closed Section Model Rotor Tests	708
<i>M. Biava, A. Thomopoulos, L. Vigevano</i>	
169 - New Diagnostic Techniques for Advanced Rotorcraft Monitoring System	718
<i>D. Podoryash, D. Tinyakov, A. Mironov, P. Doronkin, A. Priklonsky</i>	
170 - A Kriging-Based Trim Algorithm for Rotor Aeroelasticity	728
<i>N. Reveles, M. Smith, A. Zaki, O. Bauchau</i>	
171 - Numerical Investigation of Three-Dimensional Effects During Dynamic Stall	738
<i>M. Costes, F. Richez, A. Le Pape, R. Gaveriaux</i>	
172 - Pilot Sensitivity to Flight Model Dynamics in Rotorcraft Simulation	752
<i>E. Timson, P. Perfect, M. White, G. Padfield</i>	
173 - A Rating Scale for Subjective Assessment of Simulator Fidelity	766
<i>P. Perfect, R. Erdos, A. Berryman</i>	
174 - Optimised Rotor Head Design for an Economic Helicopter	778
<i>T. Kneisch, R. Krauss, A. D'Alascio, D. Schimke</i>	
176 - ALLFlight - Helicopter Flight Trials Under DVE Conditions with an AI-130 mmW Radar System	790
<i>T. Luken, N. Peinecke, S. Schmerwitz, H.-U. Dohler</i>	

177 - An Integrated Environment for Helicopter Aeroservoelastic Analysis	799
<i>P. Masarati, V. Muscarello, G. Quaranta</i>	
178 - Whirl Flutter Analysis of a Wind Tunnel Model Using Multidisciplinary Simulation and Multibody Dynamics	811
<i>A. Rezaeian</i>	
180 - Experiments and Theoretical Study of a Flexible Rotor in Extreme Ground Effect	816
<i>M. Gilad, I. Chopra, O. Rand</i>	
182 - Computational Investigation of Dynamics of Controlled Landing of the Helicopter Equipped with Skid Landing Gear	826
<i>S. Alimov, A. Girfanov, S. Mikhailov, D. Nedelko</i>	
183 - A New Appreciation of Prescribed Wake Models for CFD Analysis in View of Aeroacoustic Applications	841
<i>Y. Murakami, Y. Tanabe, S. Saito, H. Sugawara</i>	
187 - Numerical comparison of dynamic stall for 2D airfoils and an airfoil model in the DNW-TWG	851
<i>A. Klein, K. Richter, A. Gardner, A. Altmikus, T. Lutz, E. Kramer</i>	
188 - Stability and Controllability Analysis for Ornicopter – A New Tailless Helicopter	860
<i>J. Wan, M. Pavel, D. Yilmaz</i>	
189 - Comfort Methodology and Comfort Indicators Applied on Helicopter Noise - Comfort Methodology and Comfort - Indicators Applied on Helicopter Noise	870
<i>F. Marrot, J. Caillet, G. Roulois, P. Crozat</i>	
191 - Aerodynamic Optimization of the ERICA Tilt-Rotor Intake and Exhaust System	879
<i>A. Garavello, E. Benini, R. Ponza, A. Scandroglio, A. Saporiti</i>	
192 - Aeroelastic Modeling of the Hub and Blade Rotor System of the NICETRIP Tilt-rotor Aircraft Using Mecano Fem Multibody Solver	896
<i>F. Cugnon, A. Eberhard</i>	
193 - Development and Application of a Physics-Based Computational Tool to simulate Helicopter Brownout	903
<i>A. D'Andrea</i>	
194 - Multiobjective-Multipoint Rotor Blade Optimization in Forward Flight Conditions Using Surrogate-Assisted Memetic Algorithms	917
<i>A. Massaro, A. D'Andrea, E. Benini</i>	
196 - Continuous-time Predictorbased Subspace Identification for Helicopter Dynamics	930
<i>M. Bergamasco, M. Lovera</i>	
197 - Environmental Optimization of Rotorcraft Approach Trajectories	938
<i>S. Hartjes, H. Visser, M. Pavel</i>	
198 - Failure Mode Estimation at Highly Loaded Thick Composite Lugs Representing Rotary Wing Uas Blade Root	945
<i>G. Tursun, B. Maradit, E. Taskinoglu</i>	
199 - Measuring Biodynamic Feedthrough in Helicopters	958
<i>J. Venrooij, D. Yilmaz, M. Pavel, G. Quaranta, M. Jump, M. Mulder</i>	
200 - Trade Study: Influence of Different Blade Shape Designs on Forward Flight and Hovering Performance of an Isolated Rotor	968
<i>M. Hollands, M. Keßler, A. Altmikus, E. Kramer</i>	
201 - Comfort Methodology and Indicators Applied on Helicopter Vibrations	978
<i>L.-F. Chaillou, J. Guillon, B. Enenkl, A.-C. Desplanques</i>	
202 - Helicopter Safety – A Contradiction in Terms?	988
<i>B. van der Meer, D. Yilmaz, J. Stoop, M. Pavel</i>	
204 - Assessing the Suitability of Ship Designs for Helicopter Operations Using Offline and Piloted Flight Simulation	998
<i>C. Kaaria, J. Forrest, I. Owen</i>	
205 - Application of PIO Prediction Criteria to Rotorcraft	1007
<i>V. Mariano, G. Guglieri, A. Ragazzi, A. Westland</i>	
206 - Clean Sky – The Green RotorCraft Integrated Technology Demonstrator: State of Play Three Years After Kick-Off	1024
<i>A. Antifora, F. Toulmay</i>	
207 - The C.R.E.A.T.I.O.N. Project for Rotorcraft Concepts Evaluation: The First Steps	1035
<i>P.-M. Basset, A. Tremolet, F. Cuzieux, C. Schulte, D. Tristrant, T. Lefebvre, G. Reboul, M. Costes, F. Richez, S. Burguburu, D. Petot, B. Paluch</i>	
208 - A Hybrid Modelling Technique for the Energy Absorption Capabilities of a Crashworthy Helicopter Structure	1048
<i>B. Cacchione, A. Airoidi, P. Astori</i>	

209 - Capability of Helicopter CFD Simulations Trimmed to Free Flight Condition to Predict Flight Test Data	1058
<i>M. Embacher, M. Keßler, M. Dietz, E. Kramer</i>	
210 - Evaluation of the Coupling Potential in Closed-Cell Laminated Composites for Rotorcraft Applications.....	1070
<i>S. Muder, R. Haynes, E. Armanios</i>	
212 - Additional Benefits of Active Twist Blades	1076
<i>J. Riemenschneider, M. Pohl, M. Schulz, S. Opitz, T. Hoffmann, F. Hoffmann</i>	
214 - Computation of Transition to Turbulence on Rotor Blades	1087
<i>G. Depommier, D. Alfano, D. Leusink, G. Leymary</i>	
215 - The Role of Transition Modeling in CFD Predictions of Static and Dynamic Stall.....	1097
<i>M. Moulton, T.-C. WongMarilyn, J. Smith, A. Le Pape, J.-C. Le Balleur</i>	
218 - Fast Free Wake: A Possible Approach to Real-Time Rotor Wake Simulation	1109
<i>F. Palo, R. Bianco Mengotti, F. Scorcelletti, L. Vigevano</i>	
221 - The MBS Modelling of Structural Blade Offsets and its Impact on the Eigenbehaviour of Elastic Helicopter Rotors.....	1122
<i>S. Waitz</i>	
223 - Loosely-Coupled Multibody Dynamics/CFD Analysis for Rotorcraft in Descending Flight.....	1142
<i>J.-S. Park, J.-H. Sa, Y.-H. You, S. Jung, S.-H. Park</i>	
224 - Performance Evaluation for Active Tab installed in Mach Scaled Model Blade	1154
<i>K. Noboru</i>	
225 - Material Characterization and Failure Predictions for Composites	1164
<i>A. Makeev, Y. Nikishkov</i>	
226 - Climatic Reconstruction of Elastic Characteristics of a Helicopter Hingeless Composite Rotor	1171
<i>S. Mikhailov, E. Nikolaev, N. Shilova, M. Antoshkina</i>	
227 - Power Harvesting Applied in a Helicopter Lag Damper.....	1176
<i>P. de Jong, R. Loedersloot, A. de Boer, P. van der Hoogt</i>	
228 - Tiltrotor UAV Development: Ground and Flight Tests	1184
<i>S. Choi, S. Hwang, O. Ahn, Y. Kang, S. Koo, Jai. Kim</i>	
229 - Limit Margin Prediction For Helicopters Using Long Term Learning Adaptive Neural Networks.....	1187
<i>I. Yavrucuk, G. Gursoy</i>	
Author Index	