

## Aerodynamics 1

*Paper # 1 – 8:00 – 8:30 a.m.*

**An Assessment of the Long-Age Unsteady Rotor Hub Wake Physics for Empennage Analysis (434)**  
David Reich, (Presenter); Sven Schmitz, The Pennsylvania State University; Rajiv Shenoy; Marilyn Smith, Georgia Institute of Technology

*Paper # 2 – 8:30 – 9:00 a.m.*

**Helicopter Fuselage Active Flow Control in the Presence of a Rotor (335)**  
Preston Martin, US Army AMRDEC (Presenter)

*Paper # 3 – 9:00-9:30 a.m.*

**Boundary Layer Transition Measurements on Hovering Helicopter Rotors by Infrared Thermography (141)**  
Kai Richter, (Presenter); Erich Schülein, German Aerospace Center (DLR)

**Refreshment Break – 9:30 – 10:00**

*Paper # 4 – 10:00 – 10:30 a.m.*

**Investigation of the Plume-like Three-Dimensionality of Rotor-Induced Dust Fields (112)**  
Anish Sydney, (Presenter); J. Gordon Leishman, University of Maryland College Park

*Paper # 5 – 10:30 – 11:00 a.m.*

**Numerical examination of a model rotor in brownout conditions (343)**  
Benjamin Kutz, University of Stuttgart (Presenter); Tobias Günther, University of Magdeburg; Andreas Rumpf, University of Stuttgart; Alexander Kuhn, Konrad-Zuse-Zentrum für Informationstechnik (ZIB)

*Paper # 6 – 11:00 – 11:30 a.m.*

**Stability and turbulence characteristics of tip vortices from a coaxial rotor in hover (350)**  
Swathi Mula, (Presenter); Christopher Cameron; Charles Tinney; Jayant Sirohi, The University of Texas at Austin

*Paper # 7 – 11:30 - 12:00 noon*

**EXPERIMENTAL INVESTIGATION ON A 1/4 SCALED MODEL OF AN HIGH-PERFORMANCE TILTWING AIRCRAFT IN HOVER (161)**  
Giovanni Droandi, Politecnico di Milano (Presenter)

*Paper # 8 – 12:00 – 12:30 p.m.*

**Predictions of JVX Rotor Performance in Hover and Airplane Mode Using High-Fidelity Unstructured Grid CFD Solver (54)**  
Chunhua Sheng, The University of Toledo (Presenter)

## Dynamics 1

*Paper # 1 – 8:00 – 8:30 a.m.*

**Blue Pulse™: Active Rotor Control at Eurocopter - New EC145 demonstrator & flight test results - (87)**  
Antoine Rabourdin, (Presenter); Oliver Dieterich; Peter Konstanzer; Jean-Baptiste Maurice, Eurocopter Germany

*Paper # 2 – 8:30 – 9:00 a.m.*

**Ground and Flight Testing of a Hub Mounted Vibration Suppression System (370)**  
Joseph Andrews, (Presenter); William Welsh, Sikorsky Aircraft Corporation; Russ Altieri, Lord Corporation; James Diottavio, US Army Aviation Development Directorate – Aviation Applied Technology Directorate

*Paper # 3 – 9:00 – 9:30 a.m.*

**Adaptive Pitch Link Device for Helicopter Rotor Vibration Control: How it Works (248)**  
Fred Nitzsche, Carleton University (Presenter)

**Refreshment Break – 9:30 – 10:00**

*Paper # 4 – 10:00 -10:30 a.m.*

**Wind Tunnel Test Results for a 0.2 Scale V-22 Stiff Inplane 4-Bladed Tiltrotor Aeroelastic Model (74)**  
Jeff Newman, (Presenter); Tom Parham; Casey Johnson; David Popelka, Bell Helicopter Textron, Inc.

*Paper # 5 – 10:30 – 11:00 a.m.*

**Blade Property Measurement and Its Assessment on Air/Structural Loads of HART II Rotor (157)**  
Sung Jung (Presenter); Young-Hyun You; Manoj Kumar Dhadwal; Brandon Hagerty, NASA Ames Research Center; Johannes Riemenschneider; Ralf Keimer, DLR (German Aerospace Center)

*Paper # 6 – 11:00 – 11:30 a.m.*

**DYNAMICS FEM CORRELATION USING STRUCTURAL OPTIMIZATION TOOLS (204)**  
Sebastien Laurier Chapleau (Presenter); Martin Couture, Bell Helicopter Textron Canada Ltd; Mike Seifert, Bell Helicopter Textron Inc.

*Paper # 7 – 11:30 – 12 noon*

**Performance Characteristics of Symmetrized In-Flight Tracking Control (79)**  
Frank A. King; Alexander Steinwandel (Presenter); Walter Fichter, University of Stuttgart

*Paper # 8 – 12:00 – 12:30 p.m.*

**Control loads reduction through control system architecture optimization – application to a conventional rotor on a compound helicopter (34)**  
Manuel PARIS, Eurocopter (Presenter)

## Handling Qualities 1

*Paper # 1 – 8:00 – 8:30 a.m.*

**Simulation Testing of Advanced Response Types for Ship-Based Rotorcraft (308)**  
Gregory Soneson (Presenter); Joseph Horn, Pennsylvania State University

*Paper # 2 – 8:30 – 9:00 a.m.*

**A Portable Display for Evaluating Handling Qualities in Shipboard Hover (333)**  
Sean Roark, US Navy (NAVAIR) (Presenter); Dave Mitchell, Mitchell Aerospace Research; Gino Molinaro, US Navy (NAVAIR)

*Paper # 3 – 9:00 – 9:30 a.m.*

**Design and Piloted Simulation of Active External Load Stabilization Control Laws for the H-6 Adaptive Vehicle Management System (AVMS) Testbed (382)**  
Byron Patterson, The Boeing Company (Presenter); Christina Ivler, Aeroflightdynamics Directorate (AMRDEC), U.S. Army RDECOM; Pamela Hayes, The Boeing Company

**Refreshment Break – 9:30 – 10:00**

*Paper # 4 – 10:00 – 10:30 a.m.*

**Piloted Simulation Evaluation of a Robust Feedback Controller for Helicopters Handling Externally Slung Loads (405)**  
James Rigsby, Sikorsky Aircraft Corporation (Presenter); Joseph F. Horn, Penn State University

*Paper # 5 – 10:30 – 11:00 a.m.*

**Use of Redundant Controls to Enhance Transient Response and Handling Qualities of Compound Rotorcraft (426)**  
Adam Thorsen, (Presenter); Joe Horn; Gurbuz Taha Ozdemir, Penn State

*Paper # 6 – 11:00-11:30 a.m.*

**Helicopter Flight Test Exploration of Active Side-Stick Throw and Force Gradient (366)**  
Marc Alexander, (Presenter); Stephan Carignan, National Research Council of Canada

*Paper # 7 – 11:30 – 12 noon*

**Effect of Contrast and Spatial Frequency on Aggressiveness and Confidence in an Idealized Lateral Reposition Maneuver (172)**  
Daniel Brown (Presenter); Roberto Celi, University of Maryland - College Park

## Manufacturing Technology and Processing 1

*Paper # 1 – 8:00 – 8:30 a.m.*

**Evaluation of Laminate Quality for Out of Autoclave Manufacturing for a Complex Shaped Crew Door (9)**  
Erin Quinlan, Bell Helicopter Textron Canada (Presenter); Stella Hughes; James Kratz; Adam Smith; Timotei Centea, McGill University; Stéphane Héroux, Delastek; Leyla Farhang, University of British Columbia; et al.

*Paper # 2 – 8:30 – 9:00 a.m.*

**Thermoplastic Rotorcraft Driveshafts Provide Weight Reduction with Improved Survivability (93)**  
John Michasiow (Presenter); Zachary August, Automated Dynamics

*Paper # 3 – 9:00 – 9:30 a.m.*

**STUDY OF PROCESSING CONDITIONS ON THE FORMING OF RIBBED FEATURES USING RANDOMLY-ORIENTED STRANDS THERMOPLASTIC COMPOSITES (144)**  
Dominic LeBlanc, (Presenter); Benoit Landry; Gilles-Phillipe Picher-Martel; Arthur Levy; Pascal Hubert, McGill University ; Erin Quinlan , Bell Helicopter Textron Canada, et al.

**Refreshment Break – 9:30 – 10:00**

*Paper # 4 – 10:00 – 10:30 a.m.*

**Advanced Multi Axis Trim and Drill Cell for Low Volume, Multiple part configuration in a JIT Environment. (164)**  
Andrew Laird, Bell Helicopter Textron Canada (Presenter)

*Paper # 5 – 10:30 – 11:00 a.m.*

**Conduction Heating for Adhesive Bonding of Rotorcraft Primary Structure (203)**  
Drazen Djokic (Presenter); Simon Hind, National Research Council of Canada; Joseph Verdino, Bell Helicopter Textron Canada; Ali Yousefpour, National Research Council of Canada

*Paper # 6 – 11:00 – 11:30 a.m.*

**Development of Thermoplastic Composite Cones for Helicopter Tail Boom Application (237)**  
Farjad Shadmehri (Presenter); Jeff Simpson, Concordia University; Erin Quinlan, Bell Helicopter Textron Canada Limited; Xiao Cai, Concordia University; Pascal Hubert, McGill University; Suong Van Hoa, Concordia University; Mehdi Hojj, et al.

*Paper # 7 – 11:30 – 12 noon*

**Manufacturing of Composite Helicopter Tailboom Using Automated Fiber Placement (238)**  
Jihua Chen (Presenter); Marc-Andre Oceau; Steven Roy, National Research Council Canada; Pierre Beaulieu, Bell Helicopter Textron Canada Ltd.; Ali Yousefpour, National Research Council Canada

## Operations 1

*Paper # 1 – 8:00 – 8:30 a.m.*

**Evaluation of NEPTEC Obscurant Penetrating Autosynchronous Lidar in Degraded Visual Environments (Helicopter Flight Tests): Part II – Lidar view through capability (259)**  
Gilles Roy (Presenter); Simon Roy, DRDC Valcartier; Xiaoying Cao, Lidar Consultant

*Paper # 2 – 8:30 – 9:00 a.m.*

**Tactics, Techniques, and Procedures to Extend Component Remaining Useful Life based on Aircraft Maneuvers (181)**

Kevin Conrad (Presenter); Alan Love; Brian Tucker; Juan Marin; Dustin Doubet, Bell Helicopter

*Paper # 3 – 9:00 – 9:30 a.m.*

**Predictions of Rotor and Rotor/Airframe Configurations on Brownout Clouds Produced during Simulated Landing Maneuvers (60)**  
Bharath Govindarajan (Presenter); J. Gordon Leishman, University of Maryland, College Park

**Refreshment Break – 9:30 – 10:00**

*Paper # 4 – 10:00 – 10:30 a.m.*

**Adaptive Distributed Aviation Asset Optimization for Operational Effectiveness (Phase II) (380)**  
Charles Shepard (Presenter); John Merrihew; Norm Geddes; Steve Toney, VELOXITI, Inc.; Raymond Higgins, Army Aviation Development Directorate - Applied Aviation Technology Directorate (ADD-AATD)

*Paper # 5 – 10:30 – 11:00 a.m.*

**Conducting Helicopter Operations in Northern Labrador and the Arctic (139)**

Geoff Goodyear, Universal Helicopters Newfoundland and Labrador LP (Presenter)

*Paper # 6 – 11:00 – 11:30 a.m.*

**V-22 and the Future of Carrier Onboard Delivery (COD): Improving the Way the Navy Re-Supplies Its Carriers and Maritime Forces (256)**  
Ken Karika (Presenter); John Barber, Bell Helicopter Textron Inc.

*Paper # 7 – 11:30 a.m. - 12 noon*

**COMBAT TEMPERED AIRCRAFT SURVIVABILITY RATING (187)**  
Jordan Kaye, Sikorsky (Presenter); Mark Robeson, Aviation Applied Technology Directorate

## Product Support Systems Technology

*Paper # 1 – 8:00 – 8:30 a.m.*

**Engine Corrosion and Corrosion Prevention (180)**  
Robert Pobjoy, Pratt & Whitney Canada (Presenter)

*Paper # 2 – 8:30 – 9:00 a.m.*

**Direct Maintenance Cost After-Market positioning: a strategy based approach (189)**  
Pierre Carpentier, Pratt and Whitney Canada (Presenter)

*Paper # 3 – 9:00 – 9:30 a.m.*

**Analysis of Health and Usage Monitoring System (HUMS) Users' Perspective towards Mission Benefits Using Regression Analysis (226)**

Tanzina Zaman (Presenter); Abdel Bayoumi, University of South Carolina

**Refreshment Break – 9:30 – 10:00**

*Paper # 4 10:00 10:30 a.m.*

**Portable Peening Capabilities in Maintenance, Repair, and Overhaul Environments using Ultrasonic Shot Peening (307)**

Kelly McClurg (Presenter); Randy Buckner, Avion Solutions, Inc.; Olivier Brier, Frederic Chateau, SONATS

*Paper # 5 – 10:30 – 11:00 a.m.*

**Methods and Techniques for Analysis of Field Data for Commercial Rotorcraft Components (355)**

Richard Muñiz, (Presenter); Mike Neus, Bell Helicopter Textron, Inc.

*Paper # 6 – 11:00 – 11:30 a.m.*

**Dependence of Vibration Characteristics on Grease Service Levels in an AH-64D Intermediate Gearbox (388)**

Travis Edwards (Presenter); Andrew Patterson; Abdel Bayoumi, University of South Carolina

*Paper # 7 – 11:30 a.m – 12 noon*

**CAMEO\_Readiness Integration Center (396)**

Jose Camacho; Duane Ronan, Bell Helicopter (Presenter)

## Test & Evaluation 1

*Paper # 1 – 8:00 – 8:30 a.m.*

**Analysis and Testing of the Bell Model 525 Helicopter Flight Control System (132)**  
Thomas Archer; Christos Bais, Bell Helicopter (Presenter)

*Paper # 2 – 8:30 – 9:00 a.m.*

**Category A Testing of the Bell 412EPI Helicopter Equipped with the PT6T-9 Engine and Bell Basix-Pro(TM) Integrated Avionics System (142)**  
John Schillings, Bell Helicopter (Presenter)

*Paper # 3 – 9:00 – 9:30 a.m.*

**Three-dimensional reconstruction of blade tip vortices of a BO 105 using a multi-camera BOS system (274)**  
Andre Bauknecht, (Presenter); Benjamin Ewers; Christian C. Wolf, German Aerospace Center (DLR); Friedrich Leopold, French-German Research Institute of Saint Louis; Markus Raffel, German Aerospace Center

**Refreshment Break – 9:30 – 10:00**

*Paper # 4 – 10:00 – 10:30 a.m.*

**Flight Testing of an In-Flight Tuning System on a CH-53G Helicopter (279)**  
Uwe T. P. Arnold (Presenter); Daniel Fuerst, ZF Luftfahrttechnik GmbH

*Paper # 5 – 10:30 – 11:00 a.m.*

**Hover Testing of a Helicopter Rotor Blade Chord Extension System (354)**  
Farhan Gandhi, Rensselaer Polytechnic Institute (Presenter); Eric Hayden, US Naval Air Systems Command

*Paper # 6 – 11:00 – 11:30 a.m.*

**Unsteady boundary layer transition measurements by differential infrared thermography (358)**  
Christoph Merz (Presenter); Kai Richter; Sina Rafati; Markus Raffel, German Aerospace Center (DLR)

*Paper # 7 – 11:30 a.m. – 12 noon*

**Helicopter Flight Test Evaluation of NEPTEC Obscurant Penetrating Autosynchronous LiDAR in Degraded Visual Environments (365)**  
Marc Alexander (Presenter); Stephan Carignan, National Research Council of Canada; Gilles Roy; Simon Roy, Defence Research and Development Canada – Valcartier

## Wind Energy 1

*Paper # 1 – 8:00 – 8:30 a.m.*

**SOLUTION OF GLAUERT'S CONTRACTION/EXPANSION EQUATIONS FOR WIND TURBINES AND POWERED ROTORS WITH SWIRL (70)**

Andrew Howard, Rensselaer Polytechnic Institute; Ramin Modarres (Presenter); David Peters; Benjamin Rahming, Washington University in St. Louis

*Paper # 2 – 8:30 a.m. – 9:00 a.m.*

**Gurney Flap Control Authority on a Pitching Wind Turbine Airfoil (433)**  
Pourya Nikoueeeyan; John Strike; Andrew Magstadt; Michael Hind; Jonathan Naughton, University of Wyoming (Presenter)

*Paper # 3 – 9:00 – 9:30 a.m.*

**Analysis of Vertical Axis Wind Turbine Aerodynamics by Using a Multi-Fidelity Approach (296)**  
Yi Han, University of Wyoming; Jayanarayanan Sitaraman, University of Wyoming (Presenter); Yong Dan, Northwest University (China)

**Refreshment Break – 9:30 – 10:00**

*Paper # 4 – 10:00 – 10:30 a.m.*

**Numerical Investigations of Upwind and Downwind NREL 5MW Reference Wind Turbines (317)**  
Qiuying Zhao; Jacob Ickes, Chunhua Sheng (Presenter); Abdollah Afjeh, The University of Toledo

*Paper # 5 – 10:30 – 11:00 a.m.*

**Turbulence Transport Phenomena in the Wakes of Wind Turbines (208)**  
Pankaj Jha; Jessica Bashoum, The Pennsylvania State University; Earl Duque, Intelligent Light; Sven Schmitz, The Pennsylvania State University (Presenter)

*Paper # 6 – 11:00 – 11:30 a.m.*

**Application of rFlow3D code to performance prediction and the wake structure investigation of wind turbines (321)**

Harutaka Oe (Presenter); Makoto Yamamoto, Tokyo University of Science; Yasutada Tanabe; Masahiko Sugiura; Takashi Aoyama, Japan Aerospace Exploration Agency

*Paper # 7 – 11:30 a.m. – 12 noon*

**UNDERSTANDING THE WIND TURBINE WAKE BREAKDOWN MECHANISM WITH CFD (329)**  
Marina Carrion; Mark Woodgate; Rene Steijl; George Barakos, University of Liverpool (Presenter)

## Acoustics I

*Paper # 1 – 8:00 – 8:30 a.m.*

### ACOUSTIC ASSESSMENT OF 3 METER RADIUS ROTOR WITH WHIRL TOWER TEST AND ANALYSIS (278)

arda yucekayali (Presenter); Erdem AYAN, TAI

*Paper # 2 – 8:30 – 9:00 a.m.*

### Numerical and Experimental Studies of BVI Noise Control Using Active Flaps Through Feedback Based on Pressure Signals on Blade (325)

Yasutada Tanabe (Presenter); Masahiko Sugiura; Noboru Kobiki; Takashi Aoyama, JAXA; Hideaki Sugawara, Ryoju Systems Inc.

*Paper # 3 – 9:00 – 9:30 a.m.*

### Quantification of Rotor Surface Roughness due to Ice Accretion via Broadband Noise Measurement (374)

Baofeng Cheng (Presenter); Kenneth Brentner; Yiqiang Han; Jose Palacios; Philip Morris, The Pennsylvania State University

### Refreshment Break – 9:30 – 10:15

*Paper # 4 – 10:14 – 10:45 a.m.*

### A New Finite-Difference Method for General Long-Range Rotorcraft Acoustics: Initial Comparisons with Intermediate-Range Data (258)

John Steinhoff (Presenter); Subhashini Chitta; Andrew Wilson, Wave CPC Inc; Ben Sim; Frank Caradonna, U.S. Army Aviation Development Directorate; Lakshmi Sankar, Georgia Tech

*Paper # 5 – 10:45 – 11:15 a.m.*

### Optimization Analyses for Aerodynamic and Noise Characteristics of Helicopter Scissors Tail Rotor (158)

Zheng Zhu; Qijun Zhao, Nanjing University of Aeronautics and Astronautics Nanjing, (Presenter)

*Paper # 6 – 11:15 – 11:45 a.m.*

### Understanding In-Plane Noise and Loading for Active Noise Control (436)

Tianxiao Yang (Presenter); Kenneth Brentner; Ethan Corle; Sven Schmitz, Penn State University

*Paper # 7 – 11:45 a.m. – 12:15 p.m.*

### ACTIVE CONTROL OF TRANSMISSION NOISE IN A BELL 407 HELICOPTER (30)

Yann Pasco, Université de Sherbrooke (Presenter); Alain Berry, Université de Sherbrooke; Anant Grewal, CNRC; Sébastien Laurier Chappleau, BELL Helicopter Textron

## Joint Aerodynamics / Dynamics

*Paper # 1 – 8:00 – 8:30 a.m.*

### Rotor Structural Loads Analysis Using Coupled Computational FluidDynamics/Computational Structural Dynamics (207)

Hyeonsoo Yeo, US Army Aeroflightdynamics Directorate (Presenter)

*Paper # 2 – 8:30 – 9:00 a.m.*

### Effects of Structural Properties on Rotor Airloads Prediction Based on CFD/CSD Coupling Method (210)

Junyi Wang, Nanjing University of Aeronautics and Astronautics; Qijun Zhao, Nanjing University of Aeronautics and Astronautics (Presenter)

*Paper # 3 – 9:00 – 9:30 a.m.*

### A Novel Parallel Algorithm for Rotor Dynamics Simulation (32)

Seundo Heo, Georgia Institute of Technology (Presenter); Olivier Bauchau, University of Michigan-Shanghai Jiao Tong University Joint Institute

### Refreshment Break – 9:30 – 10:15

*Paper # 4 – 10:15 – 10:45 a.m.*

### Converged Velocity Field for Rotors by a Blended Potential Flow Method (10)

Jianzhe Huang, Washington University; David Peters, Washington University (Presenter); Morgan Nowak, Georgia Tech; JVR Prasad, Georgia Tech

*Paper # 5 – 10:45 – 11:15 a.m.*

### An Assessment of RCAS Performance and Loads Prediction for Conventional and Advanced Rotor Configurations (314)

Rohit Jain, US Army; Hyeonsoo Yeo, US Army (Presenter); Mahendra Bhagwat, US Army; Jimmy Ho, Science and Technology Corporation

*Paper # 6 – 11:15 – 11:45 a.m.*

### Optimal Design of Compound Helicopters Using Higher Harmonic Control (361)

Eli Giovanetti, Duke University (Presenter); Kenneth Hall, Duke University

*Paper # 7 – 11:45 a.m. – 12:14 p.m.*

### A Higher-Order Free-Wake Method for a Helicopter Rotor in Forward Flight Using Distributed Vorticity Elements (381)

Tenzin Choephel, Pennsylvania State University (Presenter)

## Crew Stations & Human Factors

*Paper # 1 – 8:00 – 8:30 a.m.*

### Eliminating Avoidable Helicopter Seating-Related Injuries to IMPROVE COMBAT READINESS AND MISSION EFFECTIVENESS (288)

Richard Healing, R Cubed Consulting LLC (Presenter)

*Paper # 2 – 8:30 – 9:00 a.m.*

### Display Symbolology for Rotorcraft Air Racing (406)

Karen Feigh, Georgia Institute of Technology (Presenter); Romain Lamour, Thales Avionics

*Paper # 3 – 9:00 a.m. – 9:30 a.m.*

### Select Human Machine Interface Properties for Cockpit Touchscreen Displays (228)

Tim Robinson, Esterline Control and Communication Systems (Presenter); Mickey Jacobson, Esterline Control and Communication Systems; Greg Grabski, Esterline Control and Communication Systems; Steve Humphrey, Esterline Control and Communication Systems

### Refreshment Break – 9:30 – 10:15

*Paper # 4 – 10:15 – 10:45 a.m.*

### A Strategy for Mitigating Degraded Visual Environments for Rotorcraft (295)

Larry Trick, NAVAIR; Timothy Gowen, NAVAIR (Presenter)

*Paper # 5 – 10:45 – 11:15 a.m.*

### A Simple Short-Term Solution to Helicopter Spatial Disorientation Including Operations in Degraded Visual Environments (319)

Braden McGrath, Engineering Acoustics Inc.; Joe McKay, AED AMRDEC; John Ramiccio, USAARL; Angus Rupert, USAARL (Presenter)

*Paper # 6 – 11:15 – 11:45 a.m.*

### Terrain and Obstacle Avoidance Displays for Low-Level Helicopter Operations in Degraded Visual Environments (411)

Allon Kahana, Univ. of Haifa (Presenter); Barbara Sweet, NASA; Zoltan Szoboszlai, US Army; Michal Rottem Hovev, Israeli Air Force

*Paper # 7 – 11:45 a.m. – 12:15 p.m.*

### 3D-LZ 2013 Flight Test: Landing an EH-60L Helicopter in a Brownout Degraded Visual Environment (286)

Zoltan Szoboszlai, US Army; Brian Fujizawa, US Army (Presenter); Carl Ott, US Army; James Savage, US Air Force; Shawn Goodrich, US Air Force; Richard McKinley, US Air Force; H. N. Buck Burns, H.N. Burns Engineering

## Handling Qualities 2

*Paper # 1 – 8:00 – 8:30 a.m.*

### A Process for the Subjective and Objective Evaluation of PIO Tendencies (73)

Michael Jones, University of Liverpool; Michael Jump, University of Liverpool (Presenter)

*Paper # 2 – 8:30 – 9:00 a.m.*

### Effect of Control System Augmentation on Handling Qualities and Task Performance in Good and Degraded Visual Environments (98)

Colin Theodore (Presenter); Carlos Malpica, NASA; Ben Lawrence, San Jose State Foundation; Christopher Blanken; Mark Tischler, US Army Aeroflightdynamics Directorate; James Lindsey, Monterey Technologies

*Paper # 3 – 9:00 – 9:30 a.m.*

### Investigation of Personal Aerial Vehicle Handling Qualities Requirements for Harsh Environmental Conditions (109)

Philip Perfect, University of Liverpool (Presenter); Michael Jump, University of Liverpool; Mark White, University of Liverpool

### Refreshment Break – 9:30 – 10:15

*Paper # 4 – 10:15 – 10:45 a.m.*

### UH-60 Modernized Control Laws for Improved Hover/Low-Speed Handling Qualities in the Degraded Visual Environment (154)

Brian Fujizawa, US Army Aviation Development Directorate - AFDD (Presenter); Mark Tischler, US Army Aviation Development Directorate - AFDD; Carl Ott, US Army Aviation Development Directorate - AFDD

*Paper # 5 – 10:45 – 11:15 a.m.*

### Investigation of Novel Concepts for Control of a Personal Air Vehicle (332)

Michael Jones, University of Liverpool; Philip Perfect, University of Liverpool; Michael Jump, University of Liverpool (Presenter); Mark White, University of Liverpool

*Paper # 6 – 11:15 – 11:45 a.m.*

### Handling-Qualities Based System Identification and Flight Control of an Unmanned Helicopter (26)

Guanlin Wang, China Aerospace Scienc and Technology Corporation; Yonghong Xiang, China Aerospace Scienc and Technology Corporation (Presenter); Hongli Chen, China Aerospace Scienc and Technology Corporation; Song Han, China Aerospace Scienc and Technology

*Paper # 7 – 11:45 a.m. – 12:15 p.m.*

### Development of Tau-Based Landing Profiles for Personal Aerial Vehicle Applications (404)

linghai lu, University of Liverpool (Presenter); Michael Jump, University of Liverpool; Perfect Philip, University of Liverpool; Mark White, University of Liverpool

## Session B – Wednesday Morning, May 21 – 8:00 a.m. – 12:15 p.m.

### HUMS-CBM 1

*Paper # 1 – 8:00 – 8:30 a.m.*

#### **A New Spectral Average Based Bearing Fault Diagnostic Approach (254)**

Brandon Van Hecke, University of Illinois-Chicago; David He, University of Illinois-Chicago (Presenter); Yongzhi Qu, University of Illinois-Chicago; Eric Bechhoefer, 2Green Power Monitoring Systems, LLC

*Paper # 2 – 8:30 – 9:00 a.m.*

#### **MH60 Accessory Module Bearing Fault Detection (312)**

Jason Hines, NAVAIR (Presenter)

*Paper # 3 – 9:00 – 9:30 a.m.*

#### **A Novel Gear Condition Monitoring Method Based on Transient Impulse Response (283)**

Yan Chen, United Technologies Research Center (Presenter); Zaffir Chaudhry, United Technologies Research Center; Paula Dempsey, NASA Glenn Research Center

**Refreshment Break – 9:30 – 10:15**

*Paper # 4 – 10:15 – 10:45 a.m.*

#### **Condition Monitoring of Helicopter Drivetrain Components Using Bispectral Analysis (137)**

Mohammed Hassan, University of South Carolina; Alex Cao, University of South Carolina (Presenter); Abdel Bayoumi, University of South Carolina

*Paper # 5 – 10:45 – 11:15 a.m.*

#### **Enhanced Rotorcraft Drive System Diagnostics (169)**

Jeremy Sheldon, Impact Technologies, A Sikorsky Innovations Company (Presenter); David Kasper, Sikorsky Aircraft Corporation; Mark Davis, Sikorsky Aircraft Corporation; Jason Fetty, Army AATD

*Paper # 6 – 11:15 – 11:45 a.m.*

#### **Non-Metallic Debris Monitor For A Helicopter Transmission (344)**

Andrea Chavez, Bell Helicopter Textron Inc. (Presenter); Jason Fetty, Aviation Development Directorate - Aviation Applied Technology Directorate; Joseph Gerardi, Innovative Dynamics, Inc.

*Paper # 7 – 11:45 a.m. – 12:15 p.m.*

#### **Seeded-Fault Spin-Testing of an Active Rotor Electromechanical Actuator and Mechanism (251)**

Claude Matalanis, United Technologies Research Center (Presenter); Andrzej Kuczek, United Technologies Research Center; Ulf Jonsson, United Technologies Research Center; Brian Wake, United Technologies Research Center; Paul Brewer, UTC Aerospace Systems

### Modeling & Simulation 1

*Paper # 1 – 8:00 – 8:30 a.m.*

#### **Physics-Based Modeling of Viscous Ground Effect for Rotorcraft Applications (85)**

Jinggen Zhao, Advanced Rotorcraft Technology, Inc. (Presenter); Chengjian He, Advanced Rotorcraft Technology, Inc.

*Paper # 2 – 8:30 – 9:00 a.m.*

#### **Real-Time Simulation of Coaxial Rotor Configurations with Combined Finite State Dynamic Wake and VPM (315)**

Jinggen Zhao, Advanced Rotorcraft Technology, Inc. (Presenter); Chengjian He, Advanced Rotorcraft Technology, Inc.

*Paper # 3 – 9:00 – 9:30 a.m.*

#### **Real-Time Simulation of Rotorcraft Downwash in Proximity of Complex Obstacles using Grid-Based Approaches (211)**

Ludwig Friedmann, Technische Universität München (Presenter); Phillip Ohmer, Technische Universität München; Manfred Hajek, Technische Universität München

**Refreshment Break – 9:30 – 10:15**

*Paper # 4 – 10:15 – 10:45 a.m.*

#### **Development of a Finite State Model for a Coaxial Rotor in Forward Flight (413)**

Morgan Nowak, Georgia Tech (Presenter); J. V. R. Prasad, Georgia Tech; David Peters, Washington University

*Paper # 5 – 10:45 – 11:15 a.m.*

#### **Semi-Empirical Physics-Based Modeling of Fuselage-Rotor and Fuselage-Wake Interferences for Comprehensive Codes (29)**

Berend G. van der Wall, German Aerospace Center (DLR) (Presenter); André Bauknecht, German Aerospace Center (DLR); Sung N. Jung, Konkuk University; Young H. You, Konkuk University

*Paper # 6 – 11:15 – 11:45 a.m.*

#### **A Performance Analysis of Compound Helicopter Configurations (129)**

Kevin Ferguson, University of Glasgow (Presenter); Douglas Thomson, University of Glasgow

*Paper # 7 – 11:45 am – 12:15 p.m.*

#### **A Novel, High Fidelity 6-DoF Simulation Model for Tethered Load Dynamics (105)**

Daniel Prosser, Georgia Institute of Technology (Presenter); Marilyn Smith, Georgia Institute of Technology

### Structures & Materials 1

*Paper # 1 – 8:00 – 8:30 a.m.*

#### **"Fatigue-Free Platforms": Vision for Future Army Rotorcraft (421)**

Dy Le, US Army (Presenter); Volker Weiss, US Army; Jaret Riddick, US Army

*Paper # 2 – 8:30 – 9:00 a.m.*

#### **In Search of Rotorcraft Airframe Fatigue Assessment Methodology (20)**

Suresh Moon, Engility (Presenter); Nam Phan, NAVAIR

*Paper # 3 – 9:00 – 9:30 a.m.*

#### **A Damage Tolerance and Fatigue Evaluation Approach for Composite Rotorcraft Airframe Structures (65)**

Alexander Engleder, AIRBUS Helicopters Deutschland (Presenter)

**Refreshment Break – 9:30 – 10:15**

*Paper # 4 – 10:15 – 10:45 a.m.*

#### **Structures Perspective for Strength and Fatigue Prognosis in Composites (435)**

Guillaume Seon, University of Texas at Arlington (Presenter); Yuri Nikishkov, University of Texas at Arlington; Andrew Makeev, University of Texas at Arlington

*Paper # 5 – 10:45 – 11:15 a.m.*

#### **Investigation of Probabilistic Failure Predictions with Progressive Damage in Composites (250)**

Robert Haynes, US Army Research Laboratory (Presenter); Chi-yu Shiao, US Army Research Laboratory

*Paper # 6 – 11:15 – 11:45 a.m.*

#### **AFP Monocoque Composite Tailboom Full Scale Fatigue Testing (80)**

Alain Colle, Bell Helicopter (Presenter)

*Paper # 7 – 11:45 a.m. – 12:15 p.m.*

#### **Structural Health Sensing of Damage Precursors using Magnetostrictive Particles Embedded in Composite Structures (261)**

Asha Hall, U.S. Army Research Laboratory (Presenter); Mulugeta Haile, U.S. Army Research Laboratory; Robert Haynes, U.S. Army Research Laboratory; Michael Coatney, U.S. Army Research Laboratory; Jin Hyeong Yoo, U.S. Army Research Laboratory

*Paper # 8 – 12:15 – 12:45 a.m.*

#### **On Repair Limit Extension for Rotorcraft Composite Structures: General Approach and Demonstration (152)**

Mark Gurvich, United Technologies Research Center (Presenter); Xuemei Wang, United Technologies Research Center; JinKyu Choi, Sikorsky Aircraft Corporation; Michael Urban, Sikorsky Aircraft Corporation

### Unmanned VTOL Aircraft & Rotorcraft 1

*Paper # 1 – 8:00 – 8:30 a.m.*

#### **Benchmarking of UAV Guidance Systems in Nap of the Earth (NOE) Flight (143)**

Dmitry Bershadsky, Georgia Institute of Technology (Presenter); Eric Johnson, Georgia Institute of Technology

*Paper # 2 – 8:30 a.m. – 9:00 a.m.*

#### **Safe Path Planning with Localization Uncertainty for Urban Operation of VTOL UAV (82)**

Yoko Watanabe, ONERA (Presenter); Sylvain Dessus, ONERA; Patrick Fabiani, ONERA

*Paper # 3 – 9:00 a.m. – 9:30 a.m.*

#### **Learning and Adaptation for Autonomous Guidance in Unknown Environments (305)**

Abhishek Verma, University of Minnesota; Berenice Mettler, University of Minnesota (Presenter)

**Refreshment Break – 9:30 – 10:15**

*Paper # 4 – 10:15 – 10:45 a.m.*

#### **Evaluation of a Planner Ensemble on the Obstacle Field Navigation Benchmark (400)**

Sanjiban Choudhury, Carnegie Mellon University; Sankalp Arora, Carnegie Mellon University; Sebastian Scherer, Carnegie Mellon University (Presenter)

*Paper # 5 – 10:45 a.m. – 11:15 a.m.*

#### **Sikorsky MATRIX™ Autonomous Mission Manager (392)**

Igor Cherepinsky, Sikorsky Aircraft Corporation (Presenter); Harshad Sane, Sikorsky Aircraft Corporation; Chris Stathis, Sikorsky Aircraft Corporation; Thomas Frewen, United Technologies Research Center; Jason Derenick, United Technologies Research Center

*Paper # 6 – 11:15 – 11:45 a.m.*

#### **A Principled Approach to Enable Safe and High Performance Maneuvers for Autonomous Rotorcraft (444)**

Sankalp Arora, Carnegie Mellon University; Sanjiban Choudhury, Carnegie Mellon University; Sebastian Scherer, Carnegie Mellon University (Presenter)

*Paper # 7 – 11:45 a.m. – 12:15 p.m.*

#### **Scaling Effects in Guidance Systems Benchmarking: the Agility Scale Ratio (372)**

Berenice Mettler, University of Minnesota (Presenter); Abhishek Verma, University of Minnesota

## Session C – Wednesday Afternoon, May 21 – 1:45 p.m. – 6:00 p.m.

### Acoustics 2/Operations 2

#### Operations 2

*Paper # 1 – 1:45. – 2:15 p.m.*

#### **On The Role of Cable Curvature in Rotorcraft-based Tow Operations for Submerged Loads (425)**

Ananth Sridharan, University of Maryland, College Park (Presenter); Roberto Celi, University of Maryland, College Park

*Paper # 2 – 2:15 – 2:45 p.m.*

#### **Hydrodynamic Characterization of a Sonar Body for Rotorcraft-based Towing (437)**

Jaye Falls, United States Naval Academy (Presenter)

*Paper # 3 – 2:45 – 3:15 p.m.*

#### **Lessons Learned from NH90 NFH Helicopter-Ship Qualification Testing across the Complete Dutch Fleet (277)**

Alrik Hoencamp, Royal Netherlands Navy (Presenter)

**Refreshment Break -- 3:15 – 4:00**

#### Acoustics 2

*Paper # 1 – 4:00 – 4:30 p.m.*

#### **Quasi-Steady Analysis of a Bell 430 During Transient Roll-Right and Pitch-Up Maneuvers (68)**

James Stephenson, University of Texas at Austin (Presenter); Charles Tinney, University of Texas at Austin

*Paper # 2 – 4:30 – 5:00 p.m.*

#### **Development and testing of optimized Instrument Flight Rules (IFR) noise abatement procedures on EC155 (201)**

Frédéric Guntzer, Eurocopter (Presenter); Vincent Gareton, Eurocopter; Marc Gervais, Eurocopter; Philippe Rollet, Eurocopter

*Paper # 3 – 5:00 – 5:30 p.m.*

#### **Segment-wise Measurement of Helicopter Approach Noise with a Reduced Microphone Setup (31)**

Willem Frederic Jurrien Olsman, German Aerospace Center (DLR); Bianca Isabella Gursky, German Aerospace Center (DLR) (Presenter)

*Paper # 4 – 5:30 -6:00 p.m.*

#### **Helicopter Noise Abatement Arrival Trajectories (90)**

Sander Hartjes, Delft University of Technology (Presenter); Hendrikus Visser, Delft University of Technology; Marilena Pavel, Delft University of Technology

### Avionics & Systems 1

*Paper # 1 – 1:45 – 2:15 p.m.*

#### **Joint Common Architecture Recommendations (242)**

Thomas DuBois, Boeing (Presenter); Fernando Dones, Boeing; William Kinahan, Sikorsky Aircraft Company

*Paper # 2 – 2:15 – 2:45 p.m.*

#### **Methodology for Equivalent Level of Safety Certification of US Army Rotorcraft in Required Navigational Performance in Area Navigation Controlled Airspace (45)**

Charles SanFilippo, US Army; Jonathan Lance, Camber Corp.; Graham Emore, US Army; Mark Gulley, SURVICE Engineering Corp (Presenter)

*Paper # 3 – 2:45 – 3:15 p.m.*

#### **Honeywell Synthetic Vision Avionics Backbone (SVAB) Program (431)**

Howard Wiebold, Honeywell (Presenter)

**Refreshment Break -- 3:15 – 4:00**

*Paper # 4 – 4:00 – 4:30 p.m.*

#### **Computing Industry Applications to Rotorcraft Avionics (118)**

Andrew Augenstein, Boeing (Presenter); Mark Hansen, Boeing

*Paper # 5 – 4:30 – 5:00 p.m.*

#### **Active Parallel Actuation Subsystem, An Alternative Approach to Tactile Cueing Without Fly By Wire (33)**

Joe Irwin, The Boeing Company; Adam Taylor, BAE Systems (Presenter)

*Paper # 6 – 5:00 – 5:30 p.m.*

#### **Apache Mission Processor Software Architecture: Future Airborne Capability Environment Considerations (100)**

Ronald Koontz, The Boeing Company (Presenter); Dale Johnson, US Army

*Paper # 7 – 5:30 – 6:00 p.m.*

#### **A redundant aircraft attitude system based on fuzzy logic data fusion of the miniaturized inertial sensors (225)**

Teodor Lucian Grigorie, University of Craiova; Ruxandra Mihaela Botez, Ecole de Technologie Supérieure (Presenter)

*Paper # 8 – 6:00 – 6:30 p.m.*

#### **Geometric Control of Helicopters with Sling Loads (428)**

Gerardo De La Torre, Georgia Institute of Technology (Presenter); Eric Johnson, Georgia Institute of Technology

### Crash Safety

*Paper # 1 – 1:45 – 2:15 p.m.*

#### **An investigation into the effects of body-borne equipment on occupant injury under vertical impact with seat 'bottom-out' (55)**

Daniel Aggromito, Monash University (Presenter); Rodney Thomson, Cooperative Research Centre for Advanced Composite Structures; Bernard Chen, Monash University; Wenyi Yan, Monash University; John Wang, Defence Science and Technology Organisation

*Paper # 2 – 2:15 – 2:45 p.m.*

#### **Simulation and experimental characterization of crashworthy composite helicopter subfloor impacts on varied surfaces (41)**

Thomas Billac, The University of Auckland; Matthew David, German Aerospace Center (DLR) (Presenter)

*Paper # 3 – 2:45 – 3:15 p.m.*

#### **Reusable Energy Absorbing Lab (REAL) Seat (133)**

Michael Knott, NAVAIR (Presenter); Brandon Hall, NAVAIR

**Refreshment Break -- 3:15 – 4:00**

*Paper # 4 – 4:00 – 4:30 p.m.*

#### **IMPACT TESTS AND SIMULATIONS OF CRASHWORTHY COMPOSITE STRUCTURES USING VARIABLE LOAD CONCEPT (215)**

Tiansong Hou, The University of New South Wales; Matthew David, German Aerospace Center (DLR) (Presenter); Gangadhara. B Prusty, The University of New South Wales; Garth Pearce, The University of New South Wales; Don Kelly, The University of New South Wa

*Paper # 5 – 4:30 – 5:00 p.m.*

#### **Development of Smart Seat Energy Absorbers for Enhanced Rotorcraft Crash Safety (227)**

Muthuvel Murugan, U.S. Army Research Laboratory (Presenter); JinHyeong Yoo, U.S. Army Research Laboratory; Gregory Hiemenz, Techno-Sciences, Inc.

*Paper # 6 – 5:00 – 5:30 p.m.*

#### **Comparison of Mobile Aircrew Restraint Strategies in a Full-Scale CH-46 Airframe Crash Test (340)**

Lindley Bark, NAWC-AD PAX RIVER (Presenter)

*Paper # 7 – 5:50 – 6:00 p.m.*

#### **Performance of CH-46 Pilot seats in NASA Full Scale Crash Test (356)**

Alex Harris, BAE Systems (Presenter); Lindley Bark, Naval Air Warfare Center – Aircraft Division

*Paper # 8 – 6:00 – 6:30 p.m.*

#### **Predicted Performance of an Optimized Energy-Absorbing Crashworthy Seat During Idealized and Actual Crash Pulses (397)**

Marvin Richards, BAE Systems (Presenter); Edwin Sieveka, NAVAIR

### Dynamics 2

*Paper # 1 – 1:45 – 2:15 p.m.*

#### **Generalized Timoshenko and Vlasov Theories for the Oblique Cross-Sectional Analysis of Rotor Blades (53)**

Anurag Rajagopal, Georgia Institute of Technology (Presenter); Dewey Hodges, Georgia Institute of Technology

*Paper # 2 – 2:15 – 2:45 p.m.*

#### **Advanced beam modeling applied to articulated rotor – Implementation in HOST aeromechanic simulation tool (69)**

Yan Skladanek, EUROCOPTER (Presenter); Laurent Boucherie, EUROCOPTER; Bernard Benoit, EUROCOPTER; Paul Cranga, EUROCOPTER

*Paper # 3 – 2:45 – 3:15 p.m.*

#### **Time Domain Modeling of Nonlinear Viscoelastic Beams (148)**

hao kang, US Army Research Lab (Presenter); Bryan Glaz, US Army Research Lab; Matthew Floros, US Army Research Lab

**Refreshment Break -- 3:15 – 4:00**

*Paper # 4 – 4:00 – 4:30 p.m.*

#### **Gain-Scheduled Higher Harmonic Control for Full Flight Envelope Vibration Reduction (76)**

Frank Fan, Massachusetts Institute of Technology (Presenter); Steven Hall, Massachusetts Institute of Technology

*Paper # 5 – 4:30 – 5:00 p.m.*

#### **H2 Periodic Control on Active Twist Rotor for Vibration Reduction (196)**

Claudio Brillante, Politecnico di Milano (Presenter); Marco Morandini, Politecnico di Milano; Paolo Mantegazza, Politecnico di Milano

*Paper # 6 – 5:00 – 5:30 p.m.*

#### **Parametric Study of Helicopter Vibration and Noise Reduction with On-Blade Control Devices (218)**

Peretz Friedman, University of Michigan; Miang Chia, University of Michigan (Presenter); Ashwani Padthe, University of Michigan

*Paper # 7 – 5:30 – 6:00 p.m.*

#### **Robust anti-windup design for active trailing edge flaps in active rotor applications (347)**

Rafael Morales, University of Leicester (Presenter); Matthew Turner, University of Leicester

## HUMS-CBM 2

*Paper # 1 – 1:45 – 2:15 p.m.*

**Vertical Lift Aircraft Rotor and Blade Mechanical and Dynamic Fault Detection in the field through the use of Revolution to Revolution Blade Track Data Analysis (249)**  
GILBERT MESEC, SWANGATE INTERNATIONAL (Presenter)

*Paper # 2 – 2:15 – 2:45 p.m.*

**Rotor Track and Balance Improvements (5)**  
Eric Bechhoefer, Green Power Monitoring Systems (Presenter); Austin Fang, Cornell University; Epharim Garcia, Cornell University

*Paper # 3 – 2:45 – 3:15 p.m.*

**CH146 HUMS Program Financial Benefits Analysis (64)**  
Alexandre Heroux-Therault, Bell Helicopter (Presenter)

**Refreshment Break -- 3:15 – 4:00**

*Paper # 4 – 4:00 – 4:30 p.m.*

**Propulsion System Diagnostic and Reasoning Technology Development (216)**

Brian LeFevre, Impact Technologies, a Sikorsky Innovations Company (Presenter); Jason Friel, Sikorsky Aircraft; Greg Kacprzyński, Impact Technologies, a Sikorsky Innovations Company; Nicholas Mackos, Impact Technologies, a Sikorsky Innovations Company; Is

*Paper # 5 – 4:30 – 5:00 p.m.*

**Hydraulic System Internal and External Leakage Diagnostics (214)**  
Matthew Smith, Sikorsky Aircraft (Presenter); Jared Kloda, Sikorsky Aircraft; Jason Friel, Sikorsky Aircraft

*Paper # 6 – 5:00 – 5:30 p.m.*

**Wire Harness Diagnostics (342)**  
Mike Mastrianni, Sikorsky Aircraft (Presenter); Brian Drost, Sikorsky Aircraft

*Paper # 7 – 5:30 – 6:00 p.m.*

**HUMS & CBM in the Civil Helicopter Market (280)**  
Falk Hoffmann, Eurocopter Deutschland GmbH (Presenter)

## Modeling & Simulation 2

*Paper # 1 – 1:45 – 2:15 p.m.*

**Subjective and Objective Metrics for the Evaluation of Motion Cueing Fidelity for a Roll-Lateral Reposition Maneuver (239)**

Moritz Wiskemann, MPI for Biological Cybernetics; Frank Drop, MPI for Biological Cybernetics (Presenter); Daan Pool, TU Delft; Rene van Paassen, TU Delft; Max Mulder, TU Delft; Heinrich Bülthoff, MPI for Biological Cybernetics

*Paper # 2 – 2:15 – 3:45 p.m.*

**Quantifying the Effects of Motion Cueing Settings on Perceived Simulation Fidelity (300)**

Scott Reardon, NASA (Presenter); Steven Beard, NASA; Emily Lewis, Science Applications International Corporation; Bimal Aponso, NASA

*Paper # 3 – 2:45 – 3:15 p.m.*

**Assessing the Fidelity of a Research Simulator (271)**

Sylvain Manso, DSTO (Presenter)

**Refreshment Break -- 3:15 – 4:00**

*Paper # 4 – 4:00 p.m. – 4:30 p.m.*

**Effects of Simulator Platform Characteristics and Flight Tasks on Adverse Rotorcraft Pilot Coupling Prediction (339)**

linghai lu, University of Liverpool (Presenter); Michael Jump, University of Liverpool; Michael Jones, University of Liverpool; Deniz Yilmaz, Technical University of Delft; Marilena Pavel, Technical University of Delft

*Paper # 5 – 4:30 – 5:00 p.m.*

**Simulation of Coupled Helicopter-Slung Load-Pilot Dynamics (46)**

Kobi Enciu, Technion (Presenter); Aviv Rosen, Technion - Israel Institute of Technology

*Paper # 6 – 5:00 – 5:30 p.m.*

**Applying ADS-33 Based Requirements to High-Precision Tasks on the Bell 525 Relentless Commercial Helicopter (37)**

Sung Kim, Bell Helicopter Textron (Presenter); Mike Bothwell, Bell Helicopter Textron

*Paper # 7 – 5:30 – 6:00 p.m.*

**FREQUENCY DOMAIN SYSTEM IDENTIFICATION OF A LIGHT HELICOPTER IN HOVER (240)**

Stefano Geluardi, Max Planck Institute for Biological Cybernetics (Presenter); Frank Nieuwenhuizen, Max Planck Institute for Biological Cybernetics; Lorenzo Pollini, Facoltà di Ingegneria, Università di Pisa; Heinrich Bülthoff, Max Planck Institute for Biological Cybernetics

## Systems Engineering Tools/Processes

*Paper # 1 – 1:45 – 2:15 p.m.*

**Risk Management and Technology Considerations in Rotorcraft Product Development (452)**

Theodora Saunders, Sikorsky Aircraft (Presenter); Macide Dunica, Sikorsky Aircraft

*Paper # 2 – 2:15 – 2:45 p.m.*

**Managing Certification for Software & AEH on Military Programs (384)**

Susan Lenahan, The Boeing Company (Presenter)

*Paper # 2 2:45 – 3:15 p.m.*

**System Geometrical management (66)**

Jean-loup Gatti, EUROCOPTER (Presenter); François Martinel, Eurocopter

**Refreshment Break -- 3:15 – 4:00**

*Paper # 4 – 4:00 – 4:30 p.m.*

**AN ALTERNATIVE APPROACH FOR SYSTEM ARCHITECTURE DESIGN (71)**

Germanetti Serge, Eurocopter; Erwan Guillanton, Eurocopter (Presenter)

*Paper # 5 4:30 – 5:00 p.m.*

**Transitioning to MBSE in a Large Systems Engineering Organization that Develops Complex Mission System for Helicopters (149)**

Stephen Felter, Lockheed Martin (Presenter)

*Paper # 6 – 5:00 – 5:30 p.m.*

**A Dynamic View for Exercising Functions for Integrated Product and Process Development (430)**

Daniel Schrage, Georgia Tech (Presenter)

*Paper # 7 – 5:30 – 6:00 p.m.*

**Rotor Wireless Gateway (341)**

Sanjay Bajekal, UTRC (Presenter); Brian Bouquillon, Sikorsky Aircraft Corporation

*Paper # 8 – 6:00 – 6:30 p.m.*

**Beyond Technology Readiness Assessment: System Assessment in Rotorcraft (453)**

Theodora Saunders, Sikorsky Aircraft (Presenter); Nick Pezzente, Sikorsky Aircraft; Macide Dunica, Sikorsky Aircraft; Grace Cotnoir, Sikorsky Aircraft

## Test & Evaluation 2

*Paper # 1 – 1:45 – 2:15 p.m.*

**First NICETRIP Powered Wind Tunnel Tests Successfully Completed in DNW-LLF (11)**

Alessandro Stabellini, Agusta; Alberto Verna, Agusta; Joost Hakkaart, National Aerospace Laboratory - NLR (Presenter); Anton Bruin de, National Aerospace Laboratory - NLR; Juergen Langer, DLR; Oliver Schneider, DLR; Michael Przybilla, DLR; Iwan Philipsen

*Paper # 2 – 2:15 – 2:45 p.m.*

**ICING WIND TUNNEL TEST OF A FULL SCALE HEATED TAIL ROTOR MODEL (104)**

Jason Wright, Bell Helicopter (Presenter); Roger Aubert, Bell Helicopter

*Paper # 3 – 2:45 – 3:15 p.m.*

**Rotor Ice Testing of a Centrifugally Powered Pneumatic Deicing System for Helicopter Rotor Blades (113)**  
Jose Palacios, Penn State (Presenter)

**Refreshment Break -- 3:15 – 4:00**

*Paper # 4 – 4:00 – 4:30 p.m.*

**Twist Effects On Rotor Performance, Loads And Vibrations (115)**

Edward Brouwers, The Boeing Company (Presenter); Thomas Zientek, The Boeing Company; Louis Centolanza, US Army Aviation Development Directorate (ADD)

*Paper # 5 – 4:30 – 5:00 p.m.*

**Performance and Flowfield Measurements to Understand the Aerodynamics of a Micro-Air-Vehicle Scale Helicopter Rotor (243)**

Moble Benedict, University of Maryland College Park (Presenter); Justin Winslow, University of Maryland; Zohaib Hasnain, University of Maryland; Inderjit Chopra, University of Maryland

*Paper # 6 – 5:00 p.m. – 5:30 p.m.*

**Experimental Demonstration of Tailboom Vibration Reduction Using Fluidic Flexible Matrix Composite Tubes (266)**

Kentaro Miura, Pennsylvania State University (Presenter); Matthew Krott, Pennsylvania State University; Edward Smith, Pennsylvania State University; Christopher Rahn, Pennsylvania State University; Peter Romano, Bell Helicopter

*Paper # 7 – 5:30 – 6:00 p.m.*

**Performance and Vibratory Hub Loads of a Mach-Scale Coaxial Rotor in Hover (367)**

Christopher Cameron, University of Texas Austin (Presenter); Anand Karpatne, University of Texas Austin; Jayant Sirohi, University of Texas Austin

## Advanced Vertical Flight 1

*Paper # 1 – 8:00 – 8:30 a.m.*

**Stability of Rotorcraft for Interplanetary Space Flight (67)**  
S. Chad Gibbs, Duke University (Presenter); Jerry E. Warren, NASA Langley Research Center; W. Keats Wilkie, NASA Langley Research Center; Earl H. Dowell, Duke University

*Paper # 2 – 8:30 – 9:00 a.m.*

**Continuous Trailing-Edge Flaps for Primary Flight Control of a Helicopter Main Rotor (91)**  
Robert Thornburgh, U.S. Army Research Laboratory; Andrew Kreshock, U.S. Army Research Laboratory; Matthew Wilbur, U.S. Army Research Laboratory (Presenter); Martin Sekula, NASA Langley Research Center; Jinwei Shen, University of Alabama

*Paper # 3 – 9:00 – 9:30 a.m.*

**CFD Calculations on the Unsteady Aerodynamic Force of Tilt-rotor in Conversion Mode (273)**  
Li Peng, National Key Laboratory of Rotorcraft Aeromechanics, Nanjing University of Aeronautics and Astronautics Nanjing; Zhao Qi-Jun, National Key Laboratory of Rotorcraft Aeromechanics, Nanjing University of Aeronautics and Astronautics Nanjing (Present)

**Refreshment Break -- 9:30 – 10:15**

*Paper # 4 – 10:15 – 10:45 a.m.*

**Modeling and Control System Design of a Large Scale Multicopter VTOL Aircraft (285)**  
Rustom Jehangir, Advanced Tactics Inc. (Presenter)

*Paper # 5 – 10:45 – 11:15 a.m.*

**Development of Control Strategies and Flight Testing of a Twin-Cyclocopter in Forward Flight (303)**  
Elena Shrestha, University of Maryland (Presenter); Moble Benedict, University of Maryland; Vikram Hrishikeshavan, University of Maryland; Inderjit Chopra, University of Maryland

*Paper # 6 – 11:15 – 11:45 a.m.*

**Cyclogyro Thrust Vectoring for Anti-Torque and Control of Helicopter (336)**  
Louis Gagnon, Politecnico di Milano (Presenter); Marco Morandini, Politecnico di Milano; Giuseppe Quaranta, Politecnico di Milano; Pierangelo Masarati, Politecnico di Milano

*Paper # 7 – 11:45 a.m. – 12:15 p.m.*

**Reversible Airfoil for Stopped Rotors in High Speed Flight (348)**  
Robert Niemiec, Rensselaer Polytechnic Institute (Presenter); Farhan Gandhi, Rensselaer Polytechnic Institute

## Aerodynamics 2

*Paper # 1 -- 8:00 – 8:30 a.m.*

**AERODYNAMIC SHAPE OPTIMIZATION OF A HELICOPTER MAIN ROTOR HUB BEANIE USING ADVANCED MULTI-OBJECTIVE EVOLUTIONARY ALGORITHMS (77)**  
Lorenzo Dal Mas, University of Padua (Presenter); Rita Ponzia, HIT09 srl; Ernesto Benini, University of Padua

*Paper # 2 – 8:30 – 9:00 a.m.*

**Advanced CFD based optimization methods applied to the industrial design process of airframe components at Eurocopter (125)**  
Qinyin Zhang, Eurocopter Germany (Presenter); Andrea Garavello, Eurocopter Germany; Alessandro D'Alascio, Eurocopter Germany; Dieter Schimke, Eurocopter Germany

*Paper # 3 – 9:00 – 9:30 a.m.*

**Time-depedent adjoint-based aerodynamic shape optimization applied to helicopter rotors (416)**  
Dimitri Mavriplis, University of Wyoming (Presenter); Karthik Mani, University of Wyoming

**Refreshment Break -- 9:30 – 10:15**

*Paper # 4 – 10:15 – 10:45 a.m.*

**A Computational Framework for Helicopter Fuselage Drag Reduction Using Vortex Generators (224)**  
Jean-Christophe BONIFACE, ONERA (Presenter)

*Paper # 5 – 10:45 – 11:15 a.m.*

**UH-60A Rotor Tip Vortex Prediction and Comparison to Full-Scale Wind Tunnel Measurements (290)**  
Buvana Jayaraman, Science and Technology Corp. (Presenter); Mark Potsdam, US Army

*Paper # 6 – 11:15 – 11:45 a.m.*

**Blade Displacement Predictions for the Full-Scale UH-60A Airloads Rotor (293)**  
Robert Biedron, NASA Langley Research Center (Presenter); Elizabeth Lee-Rausch, NASA Langley Research Center

*Paper # 7 11:45 a.m. – 12:15 p.m.*

**Blade Surface Roughness and Boundary Layer Transition Effects on Rotorcraft Performance and Flight Envelope Limits (429)**  
Shivaji Medida, University of Maryland (Presenter); Ananth Sridharan, University of Maryland; James Baeder, University of Maryland; Roberto Celi, University of Maryland

*Paper # 8 12:15 – 12:45 p.m.*

**ASSESSMENT OF ICE ACCRETION EFFECTS ON ROTOR DYNAMICS VIA MULTI-BODY AND CFD APPROACHES (255)**  
Daniel Kelly, McGill University (Presenter); Roberto Alicino, Politecnico di Milano; Habibollah Fouladi, McGill University; Wagdi Habashi, McGill University; Giuseppe Quaranta, Politecnico di Milano; Pierangelo Masarati, Politecnico di Milano; Marco Fossa

## Aircraft Design 1

*Paper # 1 – 8:00 – 8:30 a.m.*

**Framework for Assessing Performance Impact of Rotor Performance Technology Integration (3)**  
Michael Avera, American Society for Engineering Education (Presenter); Rajneesh Singh, U.S. Army Research Lab

*Paper # 2 – 8:30 – 9:00 a.m.*

**Design and fabrication elements of unmanned rotorcraft ILX-27 (84)**  
Pawel Gula, Institute of Aviation (Presenter)

*Paper # 3 – 9:00 – 9:30 a.m.*

**Exploration of Novel Powerplant Architectures for Hybrid Electric Helicopters (198)**  
Inderjit Chopra, University of Maryland; VT Nagaraj, University of Maryland (Presenter)

**Refreshment Break -- 9:30 – 10:15**

*Paper # 4 – 10:15 – 10:45 a.m.*

**Design and Development of the Atlas HPH (232)**  
Todd Reichert, AeroVelo Inc. (Presenter); Cameron Robertson, AeroVelo Inc.

*Paper #5 – 10:45 – 11:15 a.m.*

**An Evaluation of Three Technologies for Rotating/Non-Rotating Data Transfer (252)**  
Claude Matalanis, United Technologies Research Center (Presenter); Nicholas Soldner, United Technologies Research Center; Sanjay Bajekal, United Technologies Research Center; Ulf Jonsson, United Technologies Research Center; Vijay Lakamraju, United Techno

*Paper # 6 – 11:15 – 11:45 a.m.*

**Development of a Hydroformable Skid Landing Gear for Bell Helicopter's Model 407 (281)**  
Xavier Elie-Dit-Cosaque, Université Laval (Presenter); Augustin Gakwaya, Université Laval; Michel Guillot, Université Laval; Simon Bernier, Bell Helicopter Textron Canada Limited

## Awards Presentations/ Manufacturing Technology and Processing 2

*Award Paper # 1 -- 8:00 – 8:30 a.m.*

**Cheeseman Award: Adverse Rotorcraft-Pilot Couplings – Modelling and Prediction of Rigid Body RPC**  
Marilena Pavel and Deniz Yilmaz, Delft University of Technology; Binh Dang Vu, ONERA; Michael Jump, Linghai Lu and Michael Jones, University of Liverpool

*Award Paper # 2 – 8:30 – 9:00 a.m.*

**Student Design Competition Graduate Winner: Helix**  
University of Maryland

*Paper # 3 – 9:00 – 9:30 a.m.*

**Student Design Competition Undergraduate Winner: Griffin**  
The Pennsylvania State University

**Refreshment Break -- 9:30 – 10:15**

**Manufacturing Technology and Processing 2**

*Paper # 1 – 10:15 – 10:45 a.m.*

**Compression Molding of Composite Tailboom Frames (318)**  
Steven Roy, National Research Council Canada (Presenter); Felix Bednar, Bell Helicopter Textron Canada Limited; Pierre Beaulieu, Bell Helicopter Textron Canada Ltd.; Ali Yousefpour, National Research Council Canada

*Paper # 2 – 10:45 – 11:15 a.m.*

**UTILIZING SELECTIVE LASER SINTERING FOR PRODUCTION FABRICATION OF PECULIAR SUPPORT EQUIPMENT (81)**  
Dominic Przano, Bell Helicopter Textron Inc (Presenter)

*Paper # 3 – 11:15 – 11:45 a.m.*

**Improving the predictions of distortions throughout the manufacturing process of mechanical parts for a "one shot" industrialization (123)**  
Jean-bertrand DE LOOZE, EUROCOPTER (Presenter); TIFFANY CAULA, EUROCOPTER; NOLWENN HIMBERT, EUROCOPTER

*Paper # 4 – 11:45 a.m. – 12:15 p.m.*

**Providing a Systems Approach for Digital Manufacturing and Design Innovation (438)**  
Daniel Schrage, Georgia Tech (Presenter)

## History

*Paper # 1 – 8:00 – 8:30 a.m.*

**Glenn Hammond Curtiss, the Aerial Experiment Association and the John Newton Williams Helicopter of 1908 (56)**

Paul Fardink, U.S. ARMY (Retired) (Presenter)

*Paper # 2 – 8:30 – 9:00 a.m.*

**Faith of our Father – Igor Sikorsky's Eternal Legacy (235)**

Robert Beggs, American Helicopter Museum & Education Center (Presenter); Igor Sikorsky, Jr, Sikorsky

*Paper # 3 – 9:00 – 9:30 a.m.*

**50 Years After The Bo46 Foirst Flight - Could We Do Better Today? (324)**

Manfred Hajek, Technische Universitaet Muenchen (TUM) (Presenter)

**Refreshment Break -- 9:30 – 10:15**

*Paper # 4 10:15 – 10:45 a.m.*

**The Model 107-II Helicopter: 50 Years of Tandem-Rotor Excellence (390)**

Robert Roedts, Columbia Helicopters (Presenter)

*Paper # 5 – 10:45 – 11:15 a.m.*

**Wing Commander Kenneth H. Wallis: The Triumphs, Tragedy and Enigma of an Extraordinary Life in Autogyro Aviation (2)**

BRUCE CHARNOV, HOFSTRA UNIVERSITY (Presenter)

*Paper # 6 – 11:15 – 11:45 a.m.*

**An Interview with Colonel Floyd Harold "Hal" Kushner, M.D., F.A.C.S U.S. ARMY Flight Surgeon and Vietnam Prisoner of War (49)**

Paul Fardink, U.S. ARMY (Retired) (Presenter)

*Paper # 7 – 11:45 a.m. – 12:15 p.m.*

**A HISTORICAL INVESTIGATION OF THE MISSION REQUIREMENTS AND ENABLING TECHNOLOGIES INFLUENCING THE DEVELOPMENT OF UNMANNED ROTARY-WING AIRCRAFT (399)**

Scott Bruce, UASX; Jason Pereira, Avericon, LLC (Presenter)

## Modeling & Simulation 3

*Paper # 1 – 8:00 – 8:30 a.m.*

**Investigation of Ship Airwakes Using a Hybrid Computational Methodology (415)**

Eliot Quon, Georgia Institute of Technology (Presenter); Marilyn Smith, Georgia Institute of Technology; Glen Whitehouse, Continuum Dynamics Inc.

*Paper # 2 – 8:30 – 9:00 a.m.*

**The Effect of Ship Size on the Flying Qualities of Maritime Helicopters (111)**

Ieuan Owen, The University of Lincoln; Paul Scott, The University of Liverpool (Presenter); Mark White, The University of Liverpool

*Paper # 3 – 9:00 – 9:30 a.m.*

**Helicopter Downwash Effects on Ship Airwake: Predictions, Modeling from a Database, and Simulation (408)**

Kyle Schau, Florida Atlantic University; Gopal Gaonkar, Florida Atlantic University (Presenter)

**Refreshment Break -- 9:30 – 10:15**

*Paper # 4 – 10:15 – 10:45 a.m.*

**Integrated Methods to Model and Update Rotorcraft Simulations with Experimental Data (43)**

Jared Cooper, Barron Associates, Inc. (Presenter)

*Paper # 5 – 10:45 – 11:15 a.m.*

**Modeling the Airwake in Helicopter Ship Landing Operations from a Control Perspective (205)**

Tri Ngo, Virginia Tech; Cornel Sultan, Virginia Tech (Presenter)

*Paper # 6 – 11:15 – 11:45 a.m.*

**SIMULATION METHODS USED IN THE DEVELOP OF THE QUIESCENT PERIOD PREDICTION SYSTEMS FOR THE ROYAL NAVY (28)**

Bernard Ferrier, Hoffman Engineering Corp (Presenter); John Duncan, MoD; Defence Equipment & Support; Maritime Combat Systems; Michael Belmont, University of Exeter; Jamie Duncan, MoD; Defence Equipment & Support; Maritime Combat SystemsD

*Paper # 7 – 11:45 a.m. – 12:15 p.m.*

**Spacial Modelling and Simulation of On-deck Helicopter Securing and Manoeuvring (97)**

Michael Leveille, Carleton University (Presenter); Robert Langlois, Carleton University

## Propulsion 1

*Paper # 1 – 8:00 – 8:30 a.m.*

**Development of a Neural-Network (NNET) Based Engine Model (15)**

Fahri Ersel Olcer, Aselsan Inc., MGE0 Div. (Presenter)

*Paper # 2 – 8:30 – 9:00 p.m.*

**ASSESSMENT AND CALIBRATION OF SEMI-EMPIRICAL MODELS FOR PREDICTING POLLUTANT EMISSIONS OF THE ERICA TILTROTOR TURBOSHAFT ENGINE (23)**

Lorenzo Dal Mas, University of Padua (Presenter); Ernesto Benini, University of Padua; Rita Ponza, HIT09 srl

*Paper # 3 – 9:00 – 9:30 a.m.*

**Design space exploration and identification of optimum advanced powerplant configurations for various rotorcraft operations (102)**

Fakhre Ali, Cranfield University (Presenter); Tzanidakis Konstantinos, Cranfield University; Ioannis Goulos, Cranfield University; Pachidis Vassilios, Cranfield University; Roberto d'Ippolito, Noeissolutions

**Refreshment Break -- 9:30 – 10:15**

*Paper # 4 – 10:15 – 10:45 a.m.*

**Vehicle-Level Optimization of Rotorcraft Propulsion Systems (138)**

Osgar Ohanian, AVID LLC (Presenter); Paul Gelhausen, AVID LLC; Adam Entsminger, AVID LLC; Chris Dunn, AVID LLC; Christian Sonnenburg, AVID LLC

*Paper # 5 – 10:45 – 11:15 a.m.*

**Enabling Sustainable Engine Design: LCA and Eco Design Strategies (170)**

Scott Hendershot, Pratt & Whitney Canada Corp. (Presenter)

*Paper # 6 – 11:15 – 11:45 a.m.*

**Variable Speed Power Turbine Preliminary Design Optimization for Rotorcraft Applications (330)**

Gianluigi Misté, University of Padova (Presenter); Alvise Pellegrini, Hit09 S.r.l.; Ernesto Benini, University of Padova

*Paper # 7 – 11:45 a.m. -12:15 p.m.*

**CFD Modelling of Gas Turbine Combustor Post-Shutdown: Heat Soak-Back Phenomenon (151)**

Mohamed-Ali Ghazlani, Universite Laval (Presenter); Alain de Champlain, Universite Laval; Bernard Paquet, Universite Laval; Smail Kalla, Universite Laval; Nigel Davenport, Pratt & Whitney Canada

## Structures & Materials 2

*Paper # 1 – 8:00 – 8:30 a.m.*

**A Design of Experiments (DOE) Approach in Evaluating the Effect of Bond-Line Thickness and Temperature on the Fatigue Strength of Bonded Joints (244)**

Blake Bergeson, The Boeing Company (Presenter); Antonio Llanos, The Boeing Company; Christopher Gatley, The Boeing Company

*Paper # 2 – 8:30 a.m. – 9:00 a.m.*

**PHASE GRADIENT APPROACH FOR DETAILED DAMAGE LOCALIZATION IN COMPOSITE ROTORCRAFT COMPONENTS (383)**

Aaron Darnton, Georgia Institute of Technology (Presenter); Massimo Ruzzene, Georgia Institute of Technology

*Paper # 3 – 9:00 – 9:30 a.m.*

**Analysis of Impact Behavior of Thick Rotorcraft Composite Components: Approach and Implementation (153)**

Mark Gurvich, United Technologies Research Center (Presenter); Prabhakar Rao, United Technologies Research Center; Patrick Clavette, United Technologies Research Center; Brian Bouquillon, Sikorsky Aircraft Corporation; Mark Davis, Sikorsky Aircraft Corp

**Refreshment Break -- 9:30 – 10:15**

*Paper # 4 – 10:15 – 10:45 a.m.*

**Design, Development, and Qualification of Computationally Designed Alloys (117)**

Jeff Grabowski, QuesTek Innovations LLC (Presenter); Jason Sebastian, Ph.D., QuesTek Innovations LLC; Kerem Taskin, QuesTek Innovations LLC; Clay Houser, QuesTek Innovations LLC

*Paper # 5 – 10:45 – 11:15 a.m.*

**Airframe Active Vibration-Based Damage Detection and Localization (349)**

Justin Long, The Pennsylvania State University (Presenter); Stephen Conlon, Applied Research Laboratory

*Paper # 6 – 11:15 – 11:45 a.m.*

**EVALUATION OF ROTOR STRUCTURAL CHARACTERISTICS BASED ON WHIRL TOWER TESTS (357)**

Gokhan TURSUN, TAITURKISH AEROSPACE INDUSTRIES, INC. (Presenter); Betul Pelin ERGUL, TAITURKISH AEROSPACE INDUSTRIES, INC.; Ilyas TOPRAK, TAITURKISH AEROSPACE INDUSTRIES, INC.

*Paper # 7 – 11:45 a.m. – 12:15 p.m.*

**Design Considerations For a Chordwise Implementation of PAM Actuators for TEF Actuation (337)**

Robert Vocke III, University of Maryland (Presenter); Curt Kothera, InnoVital Systems, Inc.; Norman Wereley, University of Maryland



## Advanced Vertical Flight 2

*Paper # 1 – 1:30 – 2:00 p.m.*

### **Aerodynamic Performance Modeling of Ducted Fans and Shrouded Propellers for Preliminary Design (103)**

Conor Stahlhut, Boeing (Presenter)

*Paper # 2 – 2:00 – 2:30 p.m.*

### **Design, Rapid Prototyping and Testing of a Ducted Fan Micro-Quadcopter (120)**

Chin Gian Hooi, Embry-Riddle Aeronautical University (Presenter)

*Paper # 3 – 2:30 – 3:00 p.m.*

### **Investigation of Aerodynamic Interactions in Ducted Rotor Systems (407)**

Rajneesh Singh, U.S. Army Research Lab (Presenter); Michael Avera, U.S. Army Research Lab

*Paper # 4 – 3:00 – 3:30 p.m.*

### **Multi Fidelity Analysis and Design of Ducted Rotors (323)**

Anand Pratap Singh, Univ of Michigan (Presenter); Karthik Duraisamy, Univ of Michigan

### **Refreshment Break – 3:30 – 4:00**

*Paper # 5 – 4:00 – 4:30 p.m.*

### **HELIOS Simulation of a Ducted Fan in Cruise Flight Mode (334)**

Hormoz Tadghighi, Boeing Company (Presenter)

*Paper # 6 – 4:30 – 5:00 p.m.*

### **Experimental Study of the Environmental Flow-field of Two Impinging Model Scale Jets (394)**

Leighton Myers, The Pennsylvania State University (Presenter); Nicholas Rudenko, The Pennsylvania State University; Dennis McLaughlin, The Pennsylvania State University

*Paper # 7 – 5:00 – 5:30 p.m.*

### **Technology Identification for a High Performance Fan-in-Wing VTOL Aircraft (412)**

Michael Avera, U.S. Army Research Laboratory (Presenter); Hao Kang, U.S. Army Research Laboratory; Rajneesh Singh, U.S. Army Research Laboratory; Matthew Floros, U.S. Army Research Laboratory

## Aerodynamics 3

*Paper # 1 – 1:30 – 2:00 p.m.*

### **Investigation of three-dimensional dynamic stall on an airfoil using fast response pressure sensitive paint (160)**

Anthony Gardner, DLR (Presenter); Christian Klein, DLR; Werner Sachs, DLR; Ulrich Henne, DLR; Holger Mai, DLR; Kai Richter, DLR

*Paper # 2 – 2:00 – 2:30 p.m.*

### **Velocity field measurements on a rotating blade through dynamic stall (229)**

Vrishank Raghav, Georgia Institute of Technology; Narayanan Komerath, Georgia Institute of Technology (Presenter)

*Paper # 3 – 2:30 – 3:00 p.m.*

### **Combustion-Powered Actuation for Dynamic Stall Suppression – Simulations and Low-Mach Experiments (253)**

Claude Matalanis, United Technologies Research Center; Byung-Young Min, United Technologies Research Center (Presenter); Patrick Bowles, United Technologies Research Center; Brian Wake, United Technologies Research Center; Tom Crittenden, Georgia Institut

*Paper # 4 – 3:00 – 3:30 p.m.*

### **Compressible Dynamic Stall of a SSC-A09 Airfoil Subjected to Coupled Pitch and Freestream Mach Oscillations (424)**

Kyle Gompertz, The Ohio State University; James Gregory, The Ohio State University (Presenter); Jeffrey Bons, The Ohio State University

### **Refreshment Break – 3:30 – 4:00**

*Paper # 5 – 4:00 – 4:30 p.m.*

### **Numerical investigation of three-dimensional dynamic stall on an oscillating finite wing (126)**

Kurt Kaufmann, German Aerospace Center (DLR) (Presenter); Michel Costes, ONERA - The French Aerospace Lab; François Richez, ONERA - The French Aerospace Lab; Anthony Donald Gardner, German aerospace center (DLR); Arnaud Le Pape, ONERA - The French Aerospace

*Paper # 6 – 4:30 – 5:00 p.m.*

### **Unsteady Blade Shape Optimization for Rotorcraft (167)**

vineet ahuja, combustion research and flow technology, inc. (Presenter); Chandrashekar Kannepalli, combustion research and flow technology, inc.; Andrea Zambon, combustion research and flow technology, inc.; Mark Potsdam, US Army Aviation Development D

*Paper # 7 – 5:00 – 5:30 p.m.*

### **Aerodynamic Shape Optimization for Alleviating Dynamic Stall Characteristics of Helicopter Rotor Airfoil (156)**

Qing Wang, Nanjing University of Aeronautics and Astronautics; Qijun Zhao, Nanjing University of Aeronautics and Astronautics (Presenter); Qi Wu, Nanjing University of Aeronautics and Astronautics

## Aircraft Design 2

*Paper # 1 – 1:30 – 2:00 p.m.*

### **PIEZOELECTRIC DE-ICING SYSTEMS FOR ROTORCRAFT (13)**

Eric Villeneuve, AMIL (Presenter); Derek Harvey, Bell Helicopter Textron Canada Limited; David Zimcik, IAR/NRCC; Jean Perron, AMIL/LIMA; Roger Aubert, Bell Helicopter Textron Inc

*Paper # 2 – 2:00 – 2:30 p.m.*

### **Contribution to the study and design of an electrothermal de-icing/anti-icing system for aircraft during flight (165)**

Mohammed Boussetoua, Université du Québec à Chicoutimi (Presenter); Mohand Ouhrouche, Université du Québec à Chicoutimi (UQAC); Perron Jean, Université du Québec à Chicoutimi (UQAC)

*Paper # 3 – 2:30 – 3:00 p.m.*

### **Integrated Optimization Analyses on Aerodynamic/Stealth Characteristics of Helicopter Rotor Based on Surrogate Model (155)**

Xiang-wen Jiang, Nanjing University of Aeronautics and Astronautics; Qijun Zhao, Nanjing University of Aeronautics and Astronautics (Presenter); Guo-qing Zhao, Nanjing University of Aeronautics and Astronautics; Peng Li, Nanjing University of Aeronautics

*Paper # 4 – 3:00 – 3:30 p.m.*

### **Design Trends for a Coaxial Compound Helicopter Configuration using Two Optimization Algorithms (440)**

Sean Hersey, University of Maryland (Presenter); Roberto Celi, University of Maryland; Ananth Sridharan, University of Maryland; Omri Rand, Israel Institute of Technology; Vladimir Khromov, Israel Institute of Technology

### **Refreshment Break – 3:30 – 4:00**

*Paper # 5 – 4:00 – 4:30 p.m.*

### **Several Nominal Distances for Gaussian Process Metamodels in the Presence of Categorical Alternatives (264)**

Jose Valenzuela-del Rio, Georgia Institute of Technology (Presenter); Dimitri Mavris, Georgia Institute of Technology

*Paper # 6 – 4:30 – 5:00 p.m.*

### **A Physics-Based Approach to Trim Optimization of an Articulated Slowed Rotor in High-Speed Flight (362)**

Jean-Paul Reddinger, Rensselaer Polytechnic Institute (Presenter); Farhan Gandhi, Rensselaer Polytechnic Institute

*Paper # 7 – 5:00 – 5:30 p.m.*

### **Robust control for a helicopter using guardian map and genetic algorithm (432)**

Georges Ghazi, LARCASE (ETS) (Presenter)

## Dynamics 3/Wind

### Energy 2

#### Dynamics 3

*Paper # 1 – 1:30 – 2:00 p.m.*

### **Integrated Aeromechanics with Three-Dimensional Solid-Multibody Structures (190)**

Anubhav Datta, STC / US Army AFDD (Presenter); Wayne Johnson, NASA Ames Research Center

*Paper # 2 – 2:00 – 2:30 p.m.*

### **Three-Dimensional CAD-Based Structural Modeling for Next Generation Rotor Dynamic Analysis (178)**

William Staruk (Presenter); Inderjit Chopra, University of Maryland; Anubhav Datta, U. S. Army Aeroflightdynamics Directorate

*Paper # 3 – 2:30 – 3:00 p.m.*

### **Ground Resonance and Whirl Stability Analysis Using CAMRAD (359)**

Li Liu (Presenter); Vaidyanathan Anand; Keith Hair; Friedrich Straub, The Boeing Company

*Paper # 4 – 3:00 – 3:30 p.m.*

### **Investigation of RCAS-CAMRAD II UH60 Structural Dynamics Model Correlation (150)**

Benjamin Silbaugh, American Society for Engineering Education (Presenter); Hao Kang; Matthew Floros; Rajneesh Singh, US Army Research Lab

### **Refreshment Break – 3:30 – 4:00**

#### Wind Energy 2

*Paper # 1 – 4:00 – 4:30 p.m.*

### **Design Space Exploration of Gyrocopter-Type Airborne Wind Turbines (236)**

David Rancourt (Presenter); François Bolduc Teasdale; Etienne Demers Bouchard; Michael J. Anderson; Dimitri N. Mavris, Georgia Institute of Technology

*Paper # 2 – 4:30 – 5:00 p.m.*

### **GENETIC ALGORITHM BASED AERODYNAMIC SHAPE OPTIMIZATION TOOL FOR WIND TURBINE BLADES AND ITS IMPLEMENTATION TO HELICOPTERS (386)**

Ozge Polat (Presenter); Nilay Sezer Uzol, Turkish Aerospace Industries; Ismail Hakkı Tuncer, Middle East Technical University

*Paper # 3 – 5:00 – 5:30 p.m.*

### **The Application of Helicopter Health and Usage Monitoring Techniques within the Wind Turbine Industry (284)**

Peter Morrish (Presenter); Carole Murray, Helitune Ltd.; Nick Lieven; Matthew Asher, University of Bristol; Michael Mulroy; Chong Ng, National Renewable Energy Centre

*Paper # 4 – 5:30 – 6:00 p.m.*

### **Structural Health and Prognostic Management: Operating Strategies and Design Recommendations for Mitigating Local Damage Effects in Offshore Turbine Blades (304)**

Phillip Richards, Georgia Institute of Technology (Presenter); Todd Griffith, Sandia National Laboratories; Dewey Hodges, Georgia Institute of Technology

## HUMS-CBM 3

*Paper # 1 – 1:30 – 2:00 p.m.*

### **Airframe Structural Integrity Management: A UH-60 Application and Demonstration (184)**

Andrew Brookhart, Sikorsky Aircraft Corporation (Presenter); Preston Bates, Sikorsky Aircraft Corporation; Nathaniel Bordick, U.S. Army Aviation Development Directorate - AATD

*Paper # 2 – 2:00 – 2:30 p.m.*

### **Improved fatigue damage and load time signal estimation for dynamic helicopter components using computational techniques (368)**

Catherine Cheung, National Research Council Canada (Presenter); Bruno Rocha, National Research Council Canada; Julio Valdes, National Research Council Canada; Mark Kotwicz-Herniczek, National Research Council Canada; Anton Stefani, National Research Council

*Paper # 3 – 2:30 – 3:00 p.m.*

### **Applications of Virtual Monitoring of Loads to Engineering Decision Making (182)**

Raymond Beale, Sikorsky Aircraft (Presenter); Mark Davis, Sikorsky Aircraft; Brian Morris, Sikorsky Aircraft; Kenneth Kadezabek, Sikorsky Aircraft; Jeffery Schaff, Sikorsky Aircraft

*Paper # 4 – 3:00 – 3:30 p.m.*

### **Extension of HUMS Data for Estimating Flight Severity for Helicopter Airframe Structures (398)**

Gregory Wood, MERC (Mercer Engineering Research Center) (Presenter)

**Refreshment Break – 3:30 – 4:00**

*Paper # 5 – 4:00 – 4:30 p.m.*

### **V-22 Dynamic Components Fatigue Design Usage Spectrum vs. Fleet History (287)**

Stacey Kelly, Bell Helicopter, Textron (Presenter)

*Paper # 6 – 4:30 – 5:00 p.m.*

### **System Design and Evaluation of RFID-scalable components supporting RF recharging of UHF semi-passive tags for Rotorcraft Parts Life Tracking applications (14)**

Mike Augustin, Benz Airborne Systems (Presenter); Charles Sanzone, Benz Airborne Systems; Bud Coleman, Benz Airborne Systems; Nam Phan, Navy; Daniel Liebschultz, Navy

*Paper # 7 – 5:00 – 5:30 p.m.*

### **Method to Allocate Vehicle Health Management Analytics to Subsystems for Maintenance Credit (245)**

Kevin Conrad, Bell Helicopter (Presenter); Jonathan Oliver, Bell Helicopter

## Propulsion 2

*Paper # 1 – 1:30 – 2:00 p.m.*

### **A Complete System Model for Gearbox Loss-of-Lubrication (27)**

Sean McIntyre, The Pennsylvania State University (Presenter); Qingtao Yu, The Pennsylvania State University; Robert Kunz, The Pennsylvania State University; Liming Chang, The Pennsylvania State University; Robert Bill, The Pennsylvania State University

*Paper # 2 – 2:00 – 2:30 p.m.*

### **Nanolubricant Oil Additives and Its Application in Condition-Based Maintenance of the Intermediate Gearbox of AH-64 Helicopter (72)**

Kareem Gouda, University of South Carolina (Presenter); Abdel Bayoumi, University of South Carolina; Joshua Tarbutton, University of South Carolina; Steve Marcous, University of South Carolina; Mohsen Nikkhoo, University of South Carolina

*Paper # 3 – 2:30 – 3:00 p.m.*

### **Advanced Approaches to Helicopter Engine System Dynamics (147)**

Eric Ho, Pratt & Whitney Canada (Presenter)

*Paper # 4 – 3:00 – 3:30 p.m.*

### **Collaboration of Gleason T900 Teeth Contact Analysis (TCA) parameters (175)**

Biqiang Xu, Sikorsky Aircraft (Presenter)

**Refreshment Break – 3:30 – 4:00**

*Paper # 5 – 4:00 – 4:30 p.m.*

### **Predicting Transmission System Reliability Using Physics-Based Computational Simulation (257)**

Robert Tryon, VEXTEC Corporation (Presenter); Animesh Dey, VEXTEC Corporation; Ganapathi Krishnan, VEXTEC Corporation

*Paper # 6 – 4:30 – 5:00 p.m.*

### **Rotor Resonance Disturbance Rejection Controller (306)**

Reza Pedrami, Pratt & Whitney Canada Corp. (Presenter)

*Paper # 7 – 5:00 – 5:30 p.m.*

### **Predictive models for the thermo-fluid state of geared systems (311)**

MIAD YAZDANI, UNITED TECHNOLOGIES RESEARCH CENTER (Presenter); MARIOS SOTERIOU, UNITED TECHNOLOGIES RESEARCH CENTER; ZAFFIR Chaudhry, UNITED TECHNOLOGIES RESEARCH CENTER; FANPING SUN, UNITED TECHNOLOGIES RESEARCH CENTER; JOE LIU, United Technologies Research Center

*Paper # 8 – 5:30 – 6:00 p.m.*

### **Improving Wear and Fretting Characteristics with Fiber Reinforced Aluminum Liners (360)**

Dwayne Owen, Bell Helicopter (Presenter)

## Test & Evaluation 3

*Paper # 1 – 1:30 – 2:00 p.m.*

### **Comparative Bench Test Assessment of Medium Authority On-blade Actuation Technologies (38)**

Troy Schank, Bell Helicopter (Presenter); Joe Szeffi, Invercon LLC; Curt Kothera, InnoVital Systems, Inc.

*Paper # 2 – 2:00 – 2:30 p.m.*

### **OH-58 Block II Control Law Upgrades to Support the AAS Demonstrator (62)**

Shyhyng Shue, Bell Helicopter (Presenter); Eric Carlson, Bell Helicopter; John Schillings, Bell Helicopter; Mike Bothwell, Bell Helicopter

*Paper # 3 – 2:30 – 3:00 p.m.*

### **-scale Experimental Validation of Dynamic, Centrifugally Powered, Pneumatic Actuators for Active Rotor Blade Surfaces (83)**

Joseph Szeffi, Invercon LLC (Presenter); Brian Cormier, Kaman Aerospace Corporation; Luke Ionno, Kaman Aerospace Corporation

*Paper # 4 – 3:00 – 3:30 p.m.*

### **CFD-CSD Analysis Validation by PIV Experiments for Avian-based Rigid and Flexible Wings for MAV Applications (402)**

David Mayo, The University of Maryland (Presenter); James Lankford, University of Maryland College Park; Moble Benedict, University of Maryland College Park; Inderjit Chopra, University of Maryland College Park

**Refreshment Break – 3:30 – 4:00**

*Paper # 5 – 4:00 – 4:30 p.m.*

### **Securing a safe firing envelope for the qualification of a gun installation on a helicopter (378)**

Natalie Munninghoff, National Aerospace Laboratory (NLR) (Presenter); Jasper van der Vorst, National Aerospace Laboratory (NLR); Koen Zeilstra, National Aerospace Laboratory (NLR)

*Paper # 6 – 4:30 – 5:00 p.m.*

### **Testing-based approach to determining the divergence speed of slung loads (427)**

Alexander Forbes, Georgia Institute of Technology; Sorin Pirau, Georgia Institute of Technology; Brandon Liberi, Georgia Institute of Technology; Vrishank Raghav, Georgia Institute of Technology; Narayanan Komerath, Georgia Institute of Technology (Present)

## Unmanned VTOL Aircraft & Rotorcraft 2

*Paper # 1 – 1:30 – 2:00 p.m.*

### **Sikorsky Autonomous Research Aircraft (47)**

Igor Cherepinsky, Sikorsky Aircraft Corporation (Presenter); Harshad Sane, Sikorsky Aircraft Corporation; Joshua Leland, Sikorsky Aircraft Corporation; Michael Connor, Sikorsky Aircraft Corporation; Vincent Goodson, Sikorsky Aircraft Corporation; Chris St

*Paper # 2 – 2:00 – 2:30 p.m.*

### **Collaborative Search and Pursuit for Autonomous Helicopters (363)**

John Mooney, Georgia Institute of Technology (Presenter); Eric Johnson, Georgia Institute of Technology

*Paper # 3 – 2:30 – 3:00 p.m.*

### **Optimization of MQ-8 (Fire Scout) UAV Launch and Recovery Performance (36)**

Bernard Ferrier, Hoffman Engineering Corp; Ajay Sehgal, Wyle Laboratories, Inc. (Presenter); Robert Ernst, Naval Air Systems Command (NAVAIR)

*Paper # 4 – 3:00 – 3:30 p.m.*

### **A Real Time Expert Control System for Helicopter Autorotation (40)**

Zachary Sunberg, Texas A&M University; Nate Miller, Texas A&M University; Jonathan Rogers, Georgia Institute of Technology (Presenter)

**Refreshment Break – 3:30 – 4:00**

*Paper # 5 – 4:00 – 4:30 p.m.*

### **Motion feedback improves performance in teleoperating UAVs (247)**

Johannes Lächele, Max Planck Institute for Biological Cybernetics (Presenter); Joost Venrooij, Max Planck Institute for Biological Cybernetics; Paolo Pretto, Max Planck Institute for Biological Cybernetics; Heinrich H. Bühlhoff, Max Planck Institute for B

*Paper # 6 – 4:30 – 5:00 p.m.*

### **Stability, Control, and Simulation of a Dual Lift System Using Autonomous RMAX Helicopters (309)**

Marcos Berrios, Army Aviation Development Directorate (Presenter); Mark Tischler, Army Aviation Development Directorate; Luigi Cicolani, San Jose State Research Foundation; J. David Powell, Stanford University

*Paper # 7 – 5:00 – 5:30 p.m.*

### **Application of a Fault Tolerant Integrated Navigation Architecture on an Unmanned Helicopter (241)**

Sinan Pakkan, ASELSAN (Presenter); Fahri Ersel Ölçer, ASELSAN; Bülent Emre Platin, Middle East Technical University; Volkan Nalbantoğlu, ASELSAN