Acoustics

Acoustics I
Technical Session A: Tues. May 19, 2020 - 8:00 AM to 12:00 PM

8:00 AM - 8:30 AM
Medium-Sized Helicopter Noise Abatement Flight Test (Paper 200)

8:30 AM - 9:00 AM
Development of Generic Noise Abatement Guidance for Helicopters (Paper 89)

9:00 AM - 9:30 AM
A Perceptual Evaluation of the Efficacy of Sound Exposure Level in the Rating of Annoyance to Helicopter Noise (Paper 105)
Matthew Boucher,* Andrew Christian, Siddhartha Krishnamurthy, Stephen Rizzi, NASA Langley Research Ctr.;

10:00 AM - 10:30 AM
Experimental Acoustic Characterization of Anti-Phase Asymmetric Rotors (Paper 24)
Raja Akif Raja Zahirudin,* Jose Palacios, Sihong Yan, Pennsylvania State University; Nhan Nguyen, NASA Ames Research Center; Juntao Xiong, Stinger Ghaffarian Technologies Inc;

10:30 AM - 11:00 AM
Experimental and Computational Investigation of Stacked Rotor Acoustics in Hover (Paper 166)
George Jacobellis,* Rajneesh Singh, U.S. Army CCDC Army Research Laboratory; Chloe Johnson, Jayant Sirohi, University of Texas at Austin;

11:00 AM - 11:30 AM
Aeroacoustic Analysis of a Side-by-Side Hybrid VTOL Aircraft (Paper 141)
Zhongqi Jia,* Seongkyu Lee, University of California, Davis;

11:30 AM - 12:00 PM
Aerodynamic And Acoustic Design Of The Joby Aviation eVTOL Propeller (Paper 305)
Jeremy Bain,* Alex Stoll, Gregor Veble Mikic, Joby Aviation;

Acoustics II
Technical Session D: Thurs. May, 21, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Coaxial Rotor Broadband Noise Prediction in Hover (Paper 198)
Seongkyu Lee,* Inbal Shlesinger, University of California, Davis;

8:30 AM - 9:00 AM
Modeling Multirotor Aeroacoustic Interactions Through the Vortex Particle Method (Paper 91)
Eduardo Alvarez,* Tyler Critchfield, Andrew Ning, Brigham Young University;

9:00 AM - 9:30 AM
Computational Prediction of Broadband Noise from a Representative Small Unmanned Aerial System Rotor (Paper 152)
Christopher Thurman,* James Baeder, University of Maryland; Nikolas Zawodny, NASA Langley Research Ctr.;

10:15 AM - 10:45 AM
A Comparison of Multicopter Noise Characteristics with Increasing Number of Rotors (Paper 318)
10:45 AM - 11:15 AM
Findings in Aero-Acoustic Simulations for Optimizations (Paper 195)
Brendan Smith,* Farhan Gandhi, Robert Niemiec, Rensselaer Polytechnic Institute;

11:15 AM - 11:45 AM
CFD and Aeroacoustic Analysis of Wingtip-Mounted Propellers (Paper 218)
Gunther Wilke,* German Aerospace Center (DLR);

11:45 AM - 12:15 PM
Computation and Extraction of Boundary Layer Parameters from Numerical Simulations for Use in Rotor Acoustics Models (Paper 189)
Dilhara Jayasundara,* James Baeder, Yong Su Jung, University of Maryland; Jan-Arun Faust, University of Munich;

11:45 AM - 12:15 PM
Computation and Extraction of Boundary Layer Parameters from Numerical Simulations for Use in Rotor Acoustics Models (Paper 189)
Alexander Costenoble,* James Baeder, University of Maryland; John Hrynuk, Rajneesh Singh, US Army;
Advanced Vertical Flight

Advanced Vertical Flight I
Technical Session A: Tues. May 19, 2020 - 8:00 AM to 12:00 PM

8:00 AM - 8:30 AM
Duct-Winged Inertial Bicopter: Theory, Design and Testing (Paper 60)
Gary Gress,* Simon Li, University of Calgary;

8:30 AM - 9:00 AM
Numerical Study of Distributed Variable Geometry Ducted Fans for eVTOLs (Paper 180)
Francis Marois,* Mathieu Picard, David Rancourt, University of Sherbrooke;

9:00 AM - 9:30 AM
Transition Performance Of Tilt Propeller Aircraft (Paper 363)
Alex Stoll,* Joby Aviation;

10:00 AM - 10:30 AM
Modeling of Proprotor/Wing/Flap Interaction for Advanced Vertical Lift Aircraft (Paper 270)
Todd Quackenbush,* Continuum Dynamics, Inc.; Christine Solomon, Daniel Wachspress, Michael Yu, Continuum Dynamics Inc.;

10:30 AM - 11:00 AM
Comparing CFD Predictions of the Multirotor Test Bed with Experimental Results (Paper 357)
Sarah Conley,* Carl Russell, NASA Ames Research Center;

11:00 AM - 11:30 AM
Hunter Denton,* Moble Benedict, Texas A&M University; Hao Kang, US Army Research Lab; Vikram Hrishikeshavan, University of Maryland;

11:30 AM - 12:00 PM
Helicopter Rotor Morphing for Performance Improvement in Reverse Flow Conditions (Paper 110)
Matthew DiPalma,* Etana Ferede, Farhan Gandhi, Richard Healy, Rensselaer Polytechnic Institute; Daniel Camp, US Army Aviation Applied Technology Directorate; Zaffir Chaudhry, United Technologies Research Center;

Advanced Vertical Flight II
Technical Session C: Wed. May 20, 2020 - 1:45 PM to 6:00 PM

1:45 PM - 2:15 PM
Flight Dynamics and Control of a Robotic Boomerang (Paper 254)
Prashant Singh, Abhishek Abhishek,* Mangal Kothari, Indian Institute of Technology Kanpur;

2:15 PM - 2:45 PM
Aerodynamic Investigation of Non-Planar Wing Configurations for Quadrotor Based Tail-Sitters (Paper 157)
Derek Safieh,* Inderjit Chopra, Vikram Hrishikeshavan, University of Maryland;

2:45 PM - 3:15 PM
Post-Failure Control Reconfiguration for a Lift-Offset Coaxial Helicopter (Paper 172)
Michael McKay,* Farhan Gandhi, Praneet Vayalali, Rensselaer Polytechnic Institute;

4:00 PM - 4:30 PM
Performance and Handling Qualities Assessment of Large Variable-RPM Multi-Rotor Aircraft for Urban Air Mobility (Paper 126)
Matthew Bahr,* Farhan Gandhi, Michael McKay, Robert Niemiec, Rensselaer Polytechnic Institute;
Passenger Ride Quality Metrics for Urban Air Mobility Vehicle Concepts (Paper 369)
Lee Kohlman,* Bernard Adelstein, Carlos Malpica, Christopher Silva, NASA Ames Research Center;
Aerodynamics I
Technical Session A: Tues. May 19, 2020 - 8:00 AM to 12:00 PM

8:00 AM - 8:30 AM
A Review of Numerical Breakdown of Vortex Wake for High-Fidelity Rotor-in-Hover Computations (Paper 316)
Nathan Harharan,* Jennifer Abras, HPCMP CREATE; Robert Narducci, The Boeing Co.;

8:30 AM - 9:00 AM
Numerical Investigation of Secondary Vortex Structures in a Rotor Wake (Paper 341)
Andrew Bodling,* Science and Technology Corporation; Mark Potsdam, U.S. Army Combat Capabilities Development Command;

9:00 AM - 9:30 AM
Rotating Wing Dynamic Stall: State of the Art and Future Directions (Paper 311)
Marilyn Smith,* Georgia Institute of Technology;

10:00 AM - 10:30 AM
Validation and analysis of aero-elastic simulations of the UH-60A rotor from pre to post-stall flight conditions (Paper 256)
Francois Richez,* ONERA The French Aerospace Lab; Marilyn Smith, Georgia Institute of Technology; Rohit Jain, U.S. Army Aviation Development Directorate;

Aerodynamics II
Technical Session C: Wed. May 20, 2020 - 1:45 PM to 6:00 PM

1:45 PM - 2:15 PM
Investigations of Ship Airwakes Using Concurrent CFD Computations and PIV Experiments (Paper 202)
David Farish,* Sven Schmitz, Regis Thedin, Pennsylvania State University; Gordan Leishman, Dhuree Seth, Embry-Riddle Aeronautical University;

2:15 PM - 2:45 PM
Experimental Investigation of Blade-tip Vortex Instabilities of a Rotor with Cyclic Pitch (Paper 227)
Johannes N. Braukmann,* Andreas Goerttler, Markus Raffel, C. Christian Wolf, German Aerospace Center (DLR);

2:45 PM - 3:15 PM
Frequency Analysis of a Rotor in Time-Varying Ground Effect (Paper 314)
Joseph Milluzzo,* Ondrej Juhasz, US Naval Academy; John K Tritschler, US Naval Test Pilot;

4:00 PM - 4:30 PM
Single Rotor Wake Measurements in Hover with Dynamic Pitch Excitation using Time-Resolved PIV (Paper 354)
Patrick Mortimer,* Jayant Sirohi, University of Texas at Austin; Stephan Platzer, Juergen Rauleder, Institute of Helicopter Technology Technical University of Munich;

4:30 PM - 5:00 PM
Numerical and Experimental Aerodynamic Investigation of a Micro-UAV for Flying on Mars (Paper 389)
Herve Bezard,* ONERA;

5:00 PM - 5:30 PM
Numerical Investigation of Unsteady Boundary Layer Transition on a Dynamically Pitching Rotor (Paper 77)
Jared Carnes,* James Coder, University of Tennessee;

5:30 PM - 6:00 PM
AW609 Tiltrotor Aerodynamics predictions: correlation between CFD and Wind Tunnel with Flight Test Data Validation (Paper 260)
Carlo Cassinelli,* Leonardo Helicopters;
Aerodynamics II
Technical Session B: Wed. May 20, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Investigation of the Interactional Aerodynamics of the XV-15 Tiltrotor Aircraft (Paper 134)
Steven Tran,* STC; Joon Lim, CCDC AvMC;

8:30 AM - 9:00 AM
Aerodynamic Analysis of Rotor/Propeller Wakes Interactions on High Speed Compound Helicopter (Paper 169)
Ronan Boisard,* ONERA; Joon W. Lim, U.S. Army;

9:00 AM - 9:30 AM
Multi-Fidelity Computational Analysis of NASA’s Quadcopter Air Taxi Concept (Paper 199)
Patricia Ventura Diaz,* Jasm Ahmad, Wayne Johnson, Seokkwan Yoon, NASA Ames Research Center;

10:15 AM - 10:45 AM
Comparison of Computational and Experimental Hub Drag Breakdown for A Scaled-Coaxial Counter-Rotating Hub (Paper 281)
Phurwat Anusonti-Inthra,* Army Research Laboratory;

10:45 AM - 11:15 AM
Aerodynamic Interactions on Airbus Helicopters’ Compound Helicopter RACER in Hover (Paper 265)
Felix Frey,* Manuel KeLer, Ewald KrMer, Jakob Thiemeier, Constantin Hrle, Institute of Aerodynamics and Gas Dynamics, University of Stuttgart;

11:15 AM - 11:45 AM
A Computational Investigation of Multi-Rotor Interactional Aerodynamics with Hub Lateral and Longitudinal Canting (Paper 323)
Richard Healy,* Farhan Gandhi, Rensselaer Polytechnic Institute; Michael Duffy, Mihir Mistry, The Boeing Co.;

11:45 AM - 12:15 PM
Towards Full-Scale Fuselage Drag Reduction Computations using Fluidic Oscillators (Paper 50)
Nicholson Koukpaizan,* Ari Glezer, Curtis Peterson, Marilyn Smith, Georgia Institute of Technology;

Aerodynamics IV
Technical Session D: Thurs. May, 21, 2020 - 8:00 AM to 12:15 PM

10:15 AM - 10:45 AM
Numerical and Experimental Investigation into the Aerodynamic Benefits of Rotorcraft Formation Flight (Paper 106)
Mark Voskuijl,* Jan De Vries, Netherlands Defence Academy; Ramon Duivenvoorden, Delft University of Technology; Lars Moree, Royal Netherlands Air Force;

10:45 AM - 11:15 AM
Reconsidering the Aerodynamic Theory and Practical Application of Rotorcraft Maneuverability (Paper 197)
John Tritschler,* Jim McCue, John O’Connor, US Naval Test Pilot School; Ondrej Juhasz, US Naval Academy;

11:15 AM - 11:45 AM
Investigation of Coaxial Rotor Blade Crossover Aerodynamic Interactions using a Vortex Particle Method (Paper 370)
Kalki Sharma,* Kenneth Brentner, Penn State; Phurwat Anusonti-Inthra, Army Research Laboratory; Ethan Corle, ORAU;

11:45 AM - 12:15 PM
Reduced-Order Modeling and Analysis of Unsteady Rotor Hub Flows (Paper 179)
Tristan Wall,* James Coder, University of Tennessee in Knoxville;
Aircraft Design

Aircraft Design I
Technical Session B: Wed. May 20, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
More / All Electric Vertical Take-Off and Landing (VTOL) Vehicle Sensitivities to Propulsion and Power Performance (Paper 68)
Christopher Snyder,* NASA John H. Glenn Research Center;

8:30 AM - 9:00 AM
VTOL Aerodynamic Configurations Analysis for Urban Air Mobility (Paper 83)
Maxim Myasnikov,* Sergey Esaulov, Igor Ilyin, Mil Moscow Helicopter Plant;

9:00 AM - 9:30 AM
Evaluation of Sizing Strategies for eVTOL UAV Configurations (Paper 242)
Bharath Govindarajan, Indian Institute of Technology Madras; Ananth Sridharan,* Airbus A3;

10:15 AM - 10:45 AM
Multirotor Configuration Trades Informed by Handling Qualities for Urban Air Mobility Application (Paper 219)
Shannah Withrow,* Carlos Malpica, NASA Ames Research Center;

10:45 AM - 11:15 AM
Demonstration of Prop-Rotor System Development for 52kg MTOW Quad-Tilt Prop UAV (Paper 88)
Deog-Kwan Kim,* Seong-Wook Choi, Danbi Hong, Hee Jung Kang, Youngjun Kee, Taijoo Kim, Myeong-Gyu Lee, Seong-Yong Wie, Chul Yong Yun, Korea Aerospace Research Institute;

11:15 AM - 11:45 AM
UAS Design for Maneuverability with HYDRA and OpenVSP (Paper 313)
Michael Avera,* Christopher Cameron, US Army CCDC Army Research Lab;

11:45 AM - 12:15 PM
Configuration Design and Initial Sizing Study on Twin-fuselage VTOL UAV (Paper 326)
Hayoung Shi,* Jinseok Jeong, Beomsoo Kang, Pusan National University;

12:15 PM - 12:45 PM
Optimal Design of Rotor Blade for a Winged Compound Helicopter at High Advance Ratio (Paper 223)
Yasutada Tanabe,* Hideaki Sugawara, Masahiko Sugiuura, Japan Aerospace Exploration Agency; Takekawa Kuniyuki, Ryoyu Systems Co., Ltd.;

Aircraft Design II
Technical Session C: Wed. May 20, 2020 - 1:45 PM to 6:00 PM

1:45 PM - 2:15 PM
Mission Oriented Multi-Prop Analysis using Statistical Design Trends (Paper 151)
Omri Rand,* Vladimir Khromov, Technion - IIT;

2:15 PM - 2:45 PM
Conceptual Design of the VTOL Platforms with Dissimilar Rotors andWings (Paper 269)
Nathan Beals,* U.S. Army Research Laboratory; Bharath Govindrajan, Indian Institute of Technology Madras; Rajneesh Singh, U S Army Research Laboratory;

2:45 PM - 3:15 PM
Progress Toward a New Conceptual Assessment Tool for Aircraft Cost (Paper 374)
Robert Scott,* J. Michael Vegh, US Army;
4:00 PM - 4:30 PM  
**Machine Learning based Aerodynamic Optimization for Rotor Blades** (Paper 348)  
Daniel Martinez,* Science and Technology Corporation;

4:30 PM - 5:00 PM  
**Active and Passive Camber Morphing for Helicopter Rotors towards Performance Improvements in Hover and Vertical Flight** (Paper 38)  
Kushagra Vidyarthi,* Roeland De Breuker, Marilena Pavel, Yasir Zahoor, Delft University of Technology; Mark Voskuijl, Netherlands Defence Academy;

5:00 PM - 5:30 PM  
**Helicopter Short Line Underslung Payload Transportation: Exploration of Magneto-Rheological Actuators as a Means to Control Payload Motio** (Paper 342)  
Etienne Perron,* Universite de Sherbrooke; Jean-Sbastien Plante, Exonetik; Marc Alexander, National Research Council of Canada; David Rancourt, Universit de Sherbrooke;

5:30 PM - 6:00 PM  
**The Innovative Blade Attachment for the new H145 Bearingless Main Rotor** (Paper 255)  
Stefan Emmerling,* Gerald Kuntze-Fechner,* Airbus Helicopters;

6:00 PM - 6:30 PM  
**Bell 505 JRX, 200 Aircraft Delivered and Counting!** (Paper 115)  
Patrick Paquin,* Yann Lavallee,* Bell;

**Aircraft Design III**  
Technical Session E: Thurs. May, 21, 2020 - 1:30 PM to 5:30 PM

1:30 PM - 2:00 PM  
**Investigation of BERP-Shape Tip Design on an Apache Rotor Blade** (Paper 209)  
Ronny Widjaja,* Defence Science and Technology; Rohit Jain, Joon Lim, Mark Potsdam, US Army Combat Capability Development Command;
Avionics and Systems

Technical Session E: Thurs. May, 21, 2020 - 1:30 PM to 5:30 PM

1:30 PM - 2:00 PM
Integration and Test of a Degraded Visual Environment System on H145 (Paper 392)
Tim Waanders,* Airbus Helicopters;

2:00 PM - 2:30 PM
A Systems Design Approach to Fuel Measurement for Hybrid Aircraft (Paper 28)
Mark Connors,* Liquid Measurement Systems;

2:30 PM - 3:00 PM
It's Time for Army Aviation to Move to a Development Assurance Approach for Including Open Integrated Modular Avionics (Paper 52)
Daniel Schrage,* Georgia Institute of Technology;

3:30 PM - 4:00 PM
Stability Augmentation System for a Coaxial Ultralight Helicopter (Paper 9)
Tobias Richter,* Walter Fichter, Benjamin Rothaupt, University of Stuttgart; Benedikt Grebing, edm aerotec GmbH;

4:00 PM - 4:30 PM
Using Deep Learning based Computer Vision in Helicopter Cockpits for Cognitive Decision Aiding (Paper 131)
Vinay Huddar,* Nitesh Teja Mudapaka,* Collins Aerospace;

4:30 PM - 5:00 PM
Enhanced Scanning Agility of a 3D Lidar Operating in DVE using a Double Pair of Risley Prisms (Paper 286)
Gilles Roy,* Defence Research Development Canada Valcartier; Robert Bernier, Les instruments optiques du Saint-Laurent inc.; Xiaoying Cao, Lidar Consultant; Justin Matheson, NTC;

5:00 PM - 5:30 PM
Future Vertical Lift Digital Backbone, Navigating Technology and Implementation Details (Paper 165)
Harold Tiedeman, Branden Sletteland,* Max Taylor, Collins Aerospace;

5:30 PM - 6:00 PM
Architecture And Application Of Hypervisor In FACE Environment With Safety Assurance (Paper 21)
Jason Myren, Mitch Groen,* Collins Avionics;
Crash Safety

Technical Session C: Wed. May 20, 2020 - 1:45 PM to 6:00 PM

1:45 PM - 2:15 PM
Crash-Protective Performance of the NextGen MH-60S Gunner Seat (Paper 149)
Eric Anderson,* Lindley Bark, NAWCAD;

2:15 PM - 2:45 PM
Crashworthiness of a Lift plus Cruise eVTOL Vehicle Design within Dynamic Loading Environments (Paper 201)
Jacob Putnam,* Justin Littell, NASA Langley Research Ctr.;

2:45 PM - 3:15 PM
Qualification of Rotorcraft Seats by Modeling and Simulation as Applied to the MH-60S NextGen Gunner Seat (Paper 266)
Aamir Jafri,* Lindley Bark,* NAVAIR;

4:00 PM - 4:30 PM
Development and Validation of a SPH Bird Model (Paper 382)
Maurizio Tirelli, Riccardo Bay, Fabrizio Turconi,* Leonardo Helicopters; Ryan Miller, Jim Waterman,* Agusta Westland Philadelphia Corporation; Marco Anghileri, Politecnico di Milano;

4:30 PM - 5:00 PM
A Technical Overview of Next Generation Gunner Seat Features (Paper 385)
Lindley Bark, Martin Lawson,* NAWCAD;

5:00 PM - 5:30 PM
NextGen MH-60S Gunner Seat - Aircrew Endurance Requirements Drive a Paradigm Shift in Crashworthy Seating Design and Qualification (Paper 352)
Bethany L. Shivers,* Lindley Bark, Meredith Fielder, Matthew Pontarelli, NAWCAD;

5:30 PM - 6:00 PM
Chronic Injury Mitigation - The Next Frontier in Crash-Protective Seating (Paper 215)
Lindley Bark,* NAWCAD; Fillip Behrman, NAVAIR PMA202; LT Hadley Sulpizio, Training Air Wing FIVE (TW5);
Crew Stations and Human Factors

Crew Stations I
Technical Session D: Thurs. May, 21, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Flight Simulation Assessment of Autorotation Algorithms and Cues (Paper 252)
Mushfiqul Alam,* Michael Jump, University of Liverpool; Brian Eberle, Jonathan Rogers, Georgia Institute of Technology;

8:30 AM - 9:00 AM
3D Conformal Pilot Cueing for Rotorcraft Shipboard Landings (Paper 217)
Robert Walters,* Karen Feigh, Joe McCandless, Georgia Institute of Technology;

9:00 AM - 9:30 AM
Using Augmented Reality to Reduce Workload in Offshore Environments (Paper 261)
Malte-Jürgen Maibach,* Michael Jones, Christian Walko, German Aerospace Center (DLR);

10:15 AM - 10:45 AM
Virtual Cockpit Instruments Displayed on Head Worn Displays for Helicopter Offshore Operations (Paper 249)
Lars Ebrecht, Johannes Ernst,* Sven Schmerwitz, German Aerospace Center (DLR);

10:45 AM - 11:15 AM
An Evaluation of Pilot Electroencephalographic Activity during a Helicopter Tracking Task (Paper 327)
Andrew Law,* Kris Ellis, Sion Jennings, National Research Council Canada;

11:15 AM - 11:45 AM
Pupillometric Workload Measurement in the 360 Degree Integrated Cueing Environment (ICE) (Paper 275)
Amanda Hayes,* Christopher Aura, Kathryn Feltman, US Army Aeromedical Research Laboratory;

11:45 AM - 12:15 PM
Identifying Operator Workload State through Psychophysiological Metrics in Rotary-wing Simulated Flight (Paper 325)
Kathryn Feltman,* Kyle Bernhardt, Amanda Kelley, U.S. Army Aeromedical Research Laboratory;

12:15 PM - 12:45 PM
A Tool for Pilot’s Performance and Engagement Assessment in Helicopter Flight Simulator (Paper 339)
Antoni Kopyt,* Przemysław Bibik, Paulina Tomaszewska, Warsaw University of Technology;

Crew Stations II
Technical Session E: Thurs. May, 21, 2020 - 1:30 PM to 5:30 PM

1:30 PM - 2:00 PM
Development of an Improved Gunner Seat Restraint (Paper 289)
Roger Podob,* US Navy; Charlie Van Druff, Soteria Mechatronics;

2:00 PM - 2:30 PM
Anthropometric Accommodation and Ergonomics in the MH-60S NextGen Gunners Seat (Paper 386)
Lori Basham,* Justin Blankenship, Andrew Koch, Naval Air Warfare Center Aircraft Division;

2:30 PM - 3:00 PM
The Art of Helicopter EICAS Design (Paper 59)
Erik Oltheten,* Bell;

3:30 PM - 4:00 PM
Influence of Optical and Gravito-Inertial Cues on Distance Perception During Manual and Supervisory Control (Paper 233)
Martine Godfroy-Cooper,* SJSU/NASA/ADD; Francois Denquin, Jean-Christophe Sarrazin, ICNA/DTIS/ONERA; Edward Bachelder,
4:00 PM - 4:30 PM
**Multisensory Cues for Addressing Spatial Orientation** (Paper 383)
Bruce Mortimer, Engineering Acoustics Inc.; Angus Rupert,* USAARL;

4:30 PM - 5:00 PM
**Assessment of a Multimodal Cueing Set for Maintaining Aviators' Situational Awareness in a Degraded Visual Environment** (Paper 334)
Kathryn Feltman,* Aaron McAtee, U.S. Army Aeromedical Research Laboratory; Gina Hartnett, Army Combat Capabilities Development Command; Martine Godfroy-Cooper, Joel Miller, San Jose State Research Foundation;

5:00 PM - 5:30 PM
**Multisensory Cueing to Resolve Helicopter Drift Detection in DVE** (Paper 229)
Angus Rupert,* USAARL; Bruce Mortimer, Engineering Acoustics Inc.; Chris Brill, USAF; Braden McGrath, University of Canberra;
Dynamics

Dynamics I
Technical Session A: Tues. May 19, 2020 - 8:00 AM to 12:00 PM

8:00 AM - 8:30 AM
From Helicopter Vibrations to Passenger Perceptions: A Closer Look on Standards (Paper 46)
S Leyman, Zkurt, W Fichter, T Rath, University of Stuttgart; O Dieterich, M Priems, Airbus Helicopters; H B Lthoff, S Nooij, Max Planck Society;

8:30 AM - 9:00 AM
Validation of Enhanced Rotorcraft Aeromechanical Simulations: Flow Field, Unsteady Loads, and Vibration (Paper 79)
R Modarres, P Lorber, B-Y Min, J Zhao, Sikorsky, a Lockheed Martin Co.;

9:00 AM - 9:30 AM
Time-Parallel Scalable Solution of Periodic Rotor Dynamics for 3D Structures (Paper 231)
M Patil, A Datta, University of Maryland;

10:00 AM - 10:30 AM
Sensitivity Study of Helicopter Vibrations with Elastic Fuselage Coupling and Dynamic Empennage Loads from Free Wake Analysis (Paper 253)
W Rex, M Hajek, M Rinker, Technical University of Munich;

10:30 AM - 11:00 AM
Comparisons of Fully Coupled Aeroelastic Fuselage Simulations to UH-60A Airloads Program Data (Paper 298)
N Reveses, E Blades, T Pierce, ATA Engineering; H Yeo, US Army Combat Capabilities Development Command Aviation & Missile Center;

11:00 AM - 11:30 AM
Tiltrotor Conversion Maneuver Analysis with RCAS (Paper 130)
H Yeo, U.S. Army Aviation Development Directorate Aviation; H Saberi, Advanced Rotorcraft Technology;

11:30 AM - 12:00 PM
Navier-Stokes Simulation of 5-bladed Rotor in Maneuver using Quasi-static CFD/CSD Approach (Paper 139)
S Jung, S Hong, K Kim, S Park, Konkuk University; J Lee, Korea Aerospace Industries;

Dynamics II
Technical Session B: Wed. May 20, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Aeroelastic Stability of Coaxial Rotors in Hover and Forward Flight (Paper 75)
P Singh, P Friedmann, University of Michigan;

8:30 AM - 9:00 AM
Pretest Flutter Predictions of the Upcoming Aeroelastic Tiltrotor Wind Tunnel Test (Paper 93)
A Kreshock, H Kang, R Thornburgh, H Yeo, U. S. Army Combat Capabilities Command; J Baggett, J Shen, University of Alabama;

9:00 AM - 9:30 AM
AeroServoElastic Test Campaign of the AW609 Civil Tilt-Rotor (Paper 336)
M Favale, N Donini, C Liliu, G Tovo, A Trezzini, Leonardo Helicopters; A Haidar, Agusta Westland Philadelphia Corporation;

10:15 AM - 10:45 AM
Scalable Mesh Partitioning and Spatial Domain Decomposition for Large-Scale 3D Finite Element-Multibody Structures
10:45 AM - 11:15 AM
An Evaluation of Finite-State Dynamic Inflow for Usage in Design (Paper 205)
Jimmy Ho,* Science and Technology Corporation; Hyeonsoo Yeo, U.S. Army Combat Capabilities Development Command Aviation & Missile Center;

11:15 AM - 11:45 AM
Wind Tunnel Test on a slowed Mach-Scaled Hingeless Rotor with Lift Compounding (Paper 204)
Shashank Maurya,* Inderjit Chopra, Xing Wang, University of Maryland;

11:45 AM - 12:15 PM
Modal Elastic Component Enhancements for RCAS (Paper 178)
Matthew Hasbun, Ryan Blumenstein,* Hossein Saberi, Advanced Rotorcraft Technology;

12:15 PM - 12:45 PM
Optimal Rotor Phasing for Multicopter Vibratory Load Minimization (Paper 294)
Nicholas Kopyt,* Farhan Gandhi, Robert Niemiec, Rensselaer Polytechnic Institute;
Electric Vertical Takeoff and Landing (eVTOL)

eVTOL I
Technical Session B: Wed. May 20, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Investigation of Near Ground Effects in Hover Flight for the Multi-Rotor aircraft Volocopter-2X (Paper 263)
Sebastian Miesner,* Manuel Keler, Ewald Mer, IAG, University of Stuttgart; Ulrich Ferlein, Volocopter GmbH;

8:30 AM - 9:00 AM
A CFD Based Method to Model Aerodynamic Interactions in Complex eVTOL Configurations for Realtime and Medium Fidelity Simulations (Paper 343)
Gregor Veble Miki?,* Jeremy Bain, JoeBen Bevirt, Alex Stoll, Joby Aviation;

9:00 AM - 9:30 AM
Wind Tunnel Testing and Analysis of a Rigid, Variable Speed Rotor for eVTOL Applications (Paper 333)
William Staruk,* Evan Bonny, Lauren Butt, Cody Gray, Garrett Hennig, Diego Represa, Richard Toner, Aurora Flight Sciences, Inc.;

10:15 AM - 10:45 AM
Use of a High Energy-Dense Li Anode Cell for an eVTOL Application (Paper 147)
Robert Hess,* Joshua Stewart, BAE Systems; Jeff Britt, Mark Niedzwiecki, Sion Power;

10:45 AM - 11:15 AM
Experimental Investigation of a Refined 4-hp UMD-ARL Engine-Generator Powertrain (Paper 346)
Brent Mills,* Anubhav Datta, University of Maryland;

11:15 AM - 11:45 AM
Electric Propulsion Component Sizing for Optimal Aircraft Configuration (Paper 388)
Michael Ricci,* LaunchPoint Technologies;

eVTOL II
Technical Session C: Wed. May 20, 2020 - 1:45 PM to 6:00 PM

1:45 PM - 2:15 PM
Developing Sustainable Urban Air Mobility Infrastructure that is Efficient, Safe and Regulatory Compliant (Paper 194)
Rex Alexander,* Five-Alpha LLC; Jonathan Daniels, Praxis Aerospace Concepts International, Inc.; Nick Lappos, Sikorsky, a Lockheed Martin Co.;

2:15 PM - 2:45 PM
Working Group on eVTOL Noise Assessment (Paper 109)
David Josephson,* Josephson Engineering, Inc.;

2:45 PM - 3:15 PM
Development Of eVTOL Aircraft For Urban Air Mobility At Joby Aviation (Paper 163)
Alex Stoll,* JoeBen Bevirt, Mir Jalali, Joby Aviation;

4:00 PM - 4:30 PM
The Integral Approach to Define the Ecosystem for the Autonomous Aerial Taxi Service in Dubai (Paper 185)
Denis Heckmann, Maximilian Fischer, Alexander Nase, FEV Consulting; Ruba Fayez Abdelal, Khaled Al Awadhi,* Amair Saleem, Roads and Transport Authority Dubai;

4:30 PM - 5:00 PM
The Influence of the Wiring Harness on the System Performance of eVTOL Aircraft on the Example of Common Reference Models (Paper 63)
Sebastian Oberschwendtner,* Technical University Munich;
5:00 PM - 5:30 PM
Parametric Life Cycle Economic Study and Co-optimization of Supply and Demand for Urban Air Mobility (UAM) (Paper 284)
Nate Sirirojvisuth,* PRICE Systems LLC; Simon Briceno, Cedric Y. Justin, Georgia institute of technolog;
Handling Qualities

Handling Qualities I
Technical Session B: Wed. May 20, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
A Study of the Effect of Thrust/Collective Control Inceptor on Tilt-Rotor Handling Qualities (Paper 70)
Federico Barra,* Giorgio Guglieri, Politecnico di Torino; Pierluigi Capone,* ZHAW Zurich University of Applied Sciences;

8:30 AM - 9:00 AM
Quantitative Assessment of Proposed High-Speed Break Turn MTE (Paper 324)
James Bumbaugh,* David Doughty, Michael Mosher, Matthew Rhinehart, John Tritschler, NAVAIR;

9:00 AM - 9:30 AM
Exploring Pilot Workload Using Inceptor Time Histories (Paper 66)
Ryan Paul,* Matthew Rhinehart, NAVAIR;

10:15 AM - 10:45 AM
Estimating Handling Qualities Ratings from Flight Data: A Psychophysical Perspective (Paper 72)
Edward Bachelder,* Martine Godfroy-Cooper, San Jose State University Research Foundation; Bimal Aponso, NASA Ames Research Center; Jeffrey Lusardi, U.S. Army Aviation Development Directorate;

10:45 AM - 11:15 AM
Identifying Pilot-Induced Oscillation Tendencies in Advanced Fly-by-Wire Rotorcraft (Paper 225)

11:15 AM - 11:45 AM
Development and Flight Validation of Proposed Unmanned Aerial System Handling Qualities Requirements (Paper 244)
Christina Ivler,* Declan Kerwin, Joel Otomize, Danielle Parmer, Mark B. Tischler, Kevin Truong, University of Portland; Norma Gowans, USRA;

11:45 AM - 12:15 PM
Explicit Uncertainty Quantification for Probabilistic Handling Qualities Assessment (Paper 98)
Umberto Saetti,* Jonathan Rogers, Georgia Institute of Technology;

Handling Qualities II
Technical Session C: Wed. May 20, 2020 - 1:45 PM to 6:00 PM

1:45 PM - 2:15 PM
Development and Assessment of Flightlead Cue for Real-time Guidance and Pilot Workload Reduction in Rotorcraft Shipboard Recovery (Paper 241)
Vinodhini Comandur, J. V. R. Prasad,* Robert Walters, Georgia Institute of Technology;

2:15 PM - 2:45 PM
US-German Joint In-flight and Simulator Evaluation of Collective Tactile Cueing for Torque Limit Avoidance; Shaker vs. Soft Stop (Paper 271)
Mario Moliday,* User, DLR; Jeff Lusardi,* CCDC AvMc Aviation Development Directorate;

2:45 PM - 3:15 PM
Bell V-280 System Identification: Application of JIO Methodology for Flight Test Data Analysis (Paper 174)
Caitlin Berrigan,* Paul Ruckel, Bell; Mark Lopez,* CCDC AvMC Aviation Development Directorate; J.V.R. Prasad, Georgia Institute of Technology;

4:00 PM - 4:30 PM
System Identification and Handling Qualities Predictions of an eVTOL Urban Air Mobility Aircraft Using Modern Flight Control Methods (Paper 7)
Robert Niemiec,* Farhan Gandhi, Rensselaer Polytechnic Institute; Mark Lopez, Mark Tischler, U.S. Army Combat Capabilities Development Command Aviation and Missile Center;

4:30 PM - 5:00 PM
Design and Evaluation of Control Laws for the CH-53E Low Speed Precision Control System (Paper 95)

5:00 PM - 5:30 PM
CH-53K Control Laws: Improved Safety and Performance in the Degraded Visual Environment (Paper 132)
David Engel,* NAVAIR; Alex Fanberg, Steven Spoldi, * Sikorsky, a Lockheed Martin Co.;

5:30 PM - 6:00 PM
Flight Investigation of Blended Command in Low Speed Maneuvering (Paper 319)
Geoffrey Jeram,* U.S. Army; Ondrej Juhasz, U.S. Naval Academy;

Handling Qualities III
Technical Session E: Thurs. May, 21, 2020 - 1:30 PM to 5:30 PM

1:30 PM - 2:00 PM
Outer-Loop Flight Control Design and Simulation Handling Qualities Assessment for Coaxial-Compound and Tiltrotor Aircraft (Paper 158)
Tom Berger,* Mark Tischler, US Army Aviation Development Directorate; Joseph Horn, The Pennsylvania State University;

2:00 PM - 2:30 PM
Fault Tolerant Adaptive Control with Control Allocation as Applied to a Compound Rotorcraft (Paper 211)
Jeffrey Lewis,* Pennsylvania State University; Venkatakrishnan Iyer, Eric Johnson, Pennsylvania State University;

2:30 PM - 3:00 PM
Real-Time Nonlinear Model Predictive Control of a Helicopter in Autorotation (Paper 193)
Brian Eberle,* Jonathan Rogers, Georgia Institute of Technology;

3:30 PM - 4:00 PM
Nonlinear Dynamic Inversion Control for Urban Air Mobility Aircraft with Distributed Electric Propulsion (Paper 212)
Jean-Pierre Theron,* Joseph Horn, Pennsylvania State University; Daniel Wachspress, Continuum Dynamics, Inc.;

4:00 PM - 4:30 PM
Flight Dynamics and Control of an eVTOL Concept with a Propeller-Driven Rotor (Paper 17)
Umberto Saetti,* Georgia Institute of Technology; Jacob Enciu, Joseph F. Horn, Pennsylvania State University;

4:30 PM - 5:00 PM
Disturbance Rejection and Handling Qualities of Fixed-Pitch, Variable-RPM Quadcopters with Increasing Rotor Diameter (Paper 303)
Ariel Walter,* Farhan Gandhi, Michael McKay, Robert Niemiec, Rensselaer Polytechnic Institute; Christina Ivler, University of Portland;

5:00 PM - 5:30 PM
Trade-off between Maneuver Performance and Component Load Limiting (Paper 268)
Chams Eddine Mballo,* Georgia Institute of Technology;

5:30 PM - 6:00 PM
Flight Mechanics of the RACER Compound HC (Paper 155)
Remy HUOT,* Paul Eglin, Airbus Helicopters;
History

Technical Session D: Thurs. May, 21, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
The Aircraft, the Rotorcraft and the Life of Walter Rieseler 1890-1937 (Paper 119)
Berend G. Van Der Wall,* German Aerospace Center (DLR);

8:30 AM - 9:00 AM
The Life and Mysterious Death of Harold F. Pitcairn: Was it Suicide? (Paper 5)
Bruce Charnov,* Hofstra University;

9:00 AM - 9:30 AM
A Design Worthy of Success: Bernard Sznycer, Selma Gottlieb and the Intercity SG-VI (Paper 278)
Renald Fortier,* Canada Aviation and Space Museum;

10:15 AM - 10:45 AM
Perseverance: Some Reflections on 55 Years of the Canadian Sea King (Paper 20)
John Orr,* Independent Researcher;

10:45 AM - 11:15 AM
Applicable Lessons Learned from AHIP/OH-58D Development for the Army’s Future Attack and Reconnaissance Open
Systems Aircraft (Paper 240)
Daniel Schrage,* Georgia Institute of Technology;

11:15 AM - 11:45 AM
Linear Time-Periodic Systems in Rotorcraft - A Historical Perspective (Paper 124)
Umberto Saetti,* Georgia Institute of Technology; Marco Lovera, Politecnico di Milano;

11:45 AM - 12:15 PM
Attack Helicopter Generations (Paper 18)
Michael Leong,* The Boeing Co.;
Manufacturing Technology and Processing

Manufacturing and Technology
Technical Session D: Thurs. May, 21, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Bell 505 Automation at Final Assembly - Project Octopus (Paper 54)
Dric Roche,* S Bastien Giroux,* Bell;

8:30 AM - 9:00 AM
XV-15 Tilt Rotor Research Aircraft (TRRA) Photogrammetry and Metrology Measurement (Paper 161)
Haley Cummings,* Belen Bowman, Shirley Burek, Michelle Dominguez, Christopher Silva, Eduardo Solis, NASA Ames Research Center;

9:00 AM - 9:30 AM
Utilizing Casting Technologies on Legacy Parts (Paper 164)
Heather Woodworth,* Andrew Featheringham,* Jeff Kinlan, Sikorsky, a Lockheed Martin Co.;

10:15 AM - 10:45 AM
Reducing Risk in 3D Printed Composite Tooling (Paper 320)
Eric Dunn,* Sikorsky, a Lockheed Martin Co.;

10:45 AM - 11:15 AM
Practical Solutions for Embedding Fiber Optics in Composites (Paper 372)
Nathaniel Dew,* Sikorsky, a Lockheed Martin Co.;

11:15 AM - 11:45 AM
A Computational Framework for Design and Reliability of Additive Manufacturing Parts (Paper 279)
Behrooz Jalalahmadi,* Jason Rios, Sentient Science;

11:45 AM - 12:15 PM
T55 Gas Turbine Engine Bleed Band Actuator Housing Re-Design (Paper 331)
Wesley Cass,* U.S.Army;
Modeling and Simulation

Modeling and Simulation I
Technical Session A: Tues. May 19, 2020 - 8:00 AM to 12:00 PM

8:00 AM - 8:30 AM
Comparison of Different Approaches for Modeling Vortex – Rotor Wake Interference on Rotor Trim (Paper 56)
Berend G. Van Der Wall,* German Aerospace Center (DLR);

8:30 AM - 9:00 AM
Performance of Gradient-Boosted Trees for Prediction of Coaxial Inflow Models with XGBoost (Paper 122)
Cory Seidel,* Ethan Center, David Peters, Washington University in St. Louis;

9:00 AM - 9:30 AM
Enhancement and Validation of VPM-Derived State-Space Inflow Models for Multi-Rotor Simulation (Paper 123)
Chengjian He, Chongseok Chang, Matthew Gladfelter,* Advanced Rotorcraft Technology; Mark Lopez, Mark Tischler, US ARMY CCDC AvMC; Ondrej Juhasz, US Navy Academy;

10:00 AM - 10:30 AM
Free Wake Identified Inflow Models for a Generic Coaxial Rotorcraft Configuration (Paper 145)
Jeffrey Keller,* Robert McKillip, Daniel Wachspess, Continuum Dynamics, Inc.; Mark Lopez, Mark Tischler, Aviation Development Directorate, CCDC, AvMC; Ondrej Juhasz, US Naval Academy;

10:30 AM - 11:00 AM
Inflow Based Flight Dynamics Modeling Improvements for the Sikorsky X2 Technology Demonstrator (Paper 148)
Ondrej Juhasz,* US Naval Academy; Hong Xin,* Sikorsky, a Lockheed Martin Co.; Mark Tischler, US Army CCDC AvMC;

11:00 AM - 11:30 AM
Understanding the Effect of Rotor-to-Rotor Interference on CH-47 Helicopter Dynamics (Paper 216)
Feyyaz Guner,* J. V. R. Prasad, Georgia Institute of Technology; David G. Miller, The Boeing Co.;

11:30 AM - 12:00 PM
Bell 412 Modeling and Model Fidelity Assessment for Level-D Training Simulators (Paper 230)
Vincent Myrand-Lapierre,* Michel Nadeau-Beaulieu, CAE; Mark B. Tischler, ADD, CCDC Aviation & Missile Center; Marilena D. Pavel, Olaf Strossma, Delft University of Technology; Bill Gubbels, NRC, Flight Research Laboratory; Mark White, The University of Liverpool;

12:00 PM - 12:30 PM
High-Fidelity Coupled CFD-CSD Based Aeroelastic Modeling of Cycloidal Rotor (Paper 312)
ATANU HALDER,* Texas A&M University, College Station; Vinod Lakshminarayan, Science and Technology Corporation; Moble Benedict, Texas A&M University;

Modeling and Simulation II
Technical Session B: Wed. May 20, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Performance of Recent Large-angle Extensions to Classical Simulator Washout Algorithms (Paper 349)
Robert Langlois, John Hayes, Rishad Irani, Mikayla Micomonaco,* Carleton University;

8:30 AM - 9:00 AM
eVTOL Accretion Modeling for Supporting Algorithmic Icing Detection (Paper 288)
Robert McKillip,* Andrew Kaufman, Todd Quackenbush, Continuum Dynamics Inc.; Eric Kreeger, NASA Glenn Research Center;

9:00 AM - 9:30 AM
Multidisciplinary Trim Analysis Using Improved Optimization, Image Analysis, and Machine Learning Algorithms (Paper 13)
Modeling and Simulation III

Technical Session E: Thurs. May, 21, 2020 - 1:30 PM to 5:30 PM

1:30 PM - 2:00 PM
System Identification of a Coaxial Ultralight Helicopter (Paper 125)
Tobias Richter, Walter Fichter, Benjamin Rothaupt,* University of Stuttgart; Benedikt Grebing, edm aerotec GmbH;

2:00 PM - 2:30 PM
Linear Model Identification for Rotorcraft Using Adaptive Learning (Paper 322)
Gonenc Gursoy,* Zeynep Ilkay Nasir, Aerotim Engineering LLC; Ilkay Yavrucuk, Middle East Technical University (METU);

2:30 PM - 3:00 PM
Guidelines for System Identification of Vehicles with Highly Correlated Inputs (Paper 210)
Aaron Wagner,* San Jose State University; Mark Lopez, Mark Tischler, CCDC Aviation & Missile Center;

3:30 PM - 4:00 PM
Methodology Correlation for Coaxial Rotor and Blade Load Prediction (Paper 102)
Jinggen Zhao,* Sikorsky, A Lockheed Martin Co.;

4:00 PM - 4:30 PM
Visual Augmentation for Personal Air Vehicles During Flight Control System Degradation (Paper 3)
Tim Mehling,* Manfred Hajek, Omkar Halbe, Matthias Heller, TUM Technical University of Munich; Milan Vrdoljak, University of Zagreb;

4:30 PM - 5:00 PM
A Virtual Reality Approach to Piloted Flight Simulation (Paper 379)
Matteo Daniele, Pierangelo Masarati,* Giuseppe Quaranta, Andrea Zanoni, Politecnico di Milano;

5:00 PM - 5:30 PM
UAV Dynamic System Modeling and Visualization using Modelica and FMI (Paper 138)
Meaghan Podlaski,* Hao Chang, Hamed Nademi, Luigi Vanfretti, Rensselaer Polytechnic Institute;
Operations

Technical Session D: Thurs. May 21, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Dynamic Performance Investigation for Tilt-rotor Aircraft (Paper 150)
David Anderson, Douglas Thomson, Ye Yuan,* University of Glasgow;

8:30 AM - 9:00 AM
Dragonfly : Defining Environments for Rotorcraft Flight on Titan (Paper 81)
Ralph Lorenz,* Applied Physics Laboratory;

9:00 AM - 9:30 AM
A Concept of Operations for Advanced Manufacturing of Small Unmanned Aircraft Systems for Marine Squads (Paper 129)
John Gerdes,* Nathan Beals, Eric Holder, James Humann, CCDC ARL;

10:15 AM - 10:45 AM
Blockchain Applications for Rotorcraft Component Tracking (Paper 236)
Taavi Taijala, Raj Bharadwaj, * Honeywell; John Moffatt, US Army, AvMC ADD-E;

10:45 AM - 11:15 AM
Preliminary Insights on Small eVTOL Design Trends from Surrogate Modeling for Operations Research (Paper 350)
Product Support Systems Technology

Product Support
Technical Session E: Thurs. May, 21, 2020 - 1:30 PM to 5:30 PM

3:30 PM - 4:00 PM
Leveraging Additive Manufacturing for Low-Volume, Out of Production Spare Parts (Paper 42)
Thomas Reilly,* Bell;

4:00 PM - 4:30 PM
U.S. Army Rotary-wing Airframe Defect Trending, Modeling, and Analysis (Paper 96)
Jared Peltier,* Prasant Chhotu, US Army Combat Capabilities Development Command Aviation & Missile Center;

4:30 PM - 5:00 PM
Additive Manufacturing Implementation in Rotorcraft Sustainment (Paper 80)
William Harris,* Sikorsky, a Lockheed Martin Co.;

5:00 PM - 5:30 PM
Holistic Life Management of Damage Tolerant Airframes (Paper 64)
Darryl Toni,* Avinash Sarlashkar, Sikorsky, a Lockheed Martin Co.;
Propulsion

Propulsion I
Technical Session A: Tues. May 19, 2020 - 8:00 AM to 12:00 PM

8:00 AM - 8:30 AM
An Empirical Inlet Pressure Recovery Model for Engine Inlet Barrier Filters for Rotorcraft Applications (Paper 27)
Man Zhang, Man Zhang, Mark Beeman, Mark Beeman, US Army, CCDC, Aviation and Missile Center;

8:30 AM - 9:00 AM
Experimental Results of Transient Variable Speed Rotor Performance for Small UAS Propulsion Scalability (Paper 53)
Kendy Edmonds, Kendy Edmonds, Virginia Polytechnic & State University; D Blake Stringer, D Blake Stringer, Kent State University; Mark Valco, Mark Valco, Vehicle Technology Directorate, Army Research Laboratory;

9:00 AM - 9:30 AM
A Prediction Model of Transient Variable Speed Rotor Performance for Small UAS Propulsion Scalability (Paper 55)
D Blake Stringer, D Blake Stringer, Kent State University; Mark Valco, Mark Valco, Vehicle Technology Directorate, Army Research Laboratory; Kendy Edmonds, Kendy Edmonds, Virginia Polytechnic & State University;

10:00 AM - 10:30 AM
Recent Developments of the Arrayed Controlled Turn-less Structures (ACTS) Motor (Paper 78)
Oved Zucker, Oved Zucker, Polarix Corporation;

10:30 AM - 11:00 AM
Comparison of Variator Technologies for Variable Rotor Speed Drivetrains for Rotorcraft (Paper 246)
Hanns Amri, Hanns Amri, Florian Donner, Florian Donner, Felix Huber, Felix Huber, Michael Weigand, Michael Weigand, Vienna University of Technology;

11:00 AM - 11:30 AM
Sizing and Optimization of Group 1 UAS Electric Powertrains (Paper 362)
Farid Saemi, Farid Saemi, Mobile Benedict, Mobile Benedict, Texas A&M University; Nathan Beals, Nathan Beals, Army Research Laboratory;

Propulsion II
Technical Session B: Wed. May 20, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Computational Thermal Analysis and Testing to Improve Loss of Lubrication Performance of Helicopter Transmissions (Paper 62)
Kenta Ogasawara, Hidenori Arisawa, Hironori Hashimoto, Akira Hayasaka, Yuji Shinoda, Hiroki Yamamoto, Kawasaki Heavy Industries, Ltd.;

8:30 AM - 9:00 AM
Contact Pattern Development of the CH-53K MGB with Split-Path Gear-train (Paper 101)
Shulin He, Yryiy Gmiyra, Chris Pierce, Sikorsky, a Lockheed Martin Co.; Leslie Leigh, NAVAIRSYS COM HQ;

9:00 AM - 9:30 AM
Deflection Analysis of a Hybrid Spur Gear Drivetrain (Paper 116)
Sean Gauntt, Robert Campbell, Sean McIntyre, Pennsylvania State University;

10:15 AM - 10:45 AM
Modeling and Design of a Wet Clutch/Offset Compound Gear Transmission for Dual-Speed Rotorcraft Applications (Paper 222)
Hans DeSmidt, Xiaowen Su, University of Tennessee; Robert Bill, Edward Smith, Penn State University;
10:45 AM - 11:15 AM
High-Temperature Composite Materials for Hybrid Aerospace Gears (Paper 307)
Matthew Waller,* Kevin Koudela, Sean McIntyre, Penn State;

11:15 AM - 11:45 AM
Low-Order Prediction of Mineral Dust Sticking Probability in Turboshaft Engines (Paper 251)
Matthew Ellis,* Nicholas Bojdo, Antonio Filippone, Merren Jones, Alison Pawley, University of Manchester;

11:45 AM - 12:15 PM
Performance Deterioration of Rotorcraft Engines fitted with Particle Separators (Paper 187)
Nicholas Bojdo,* Wesley Appleton, Matthew Ellis, Antonio Filippone, University of Manchester;

Propulsion III
Technical Session D: Thurs. May, 21, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Challenges of Integrating a Torque Measurement System for the GE T408 Engine into a CH-47D Chinook (Paper 171)
Daniel Kakaley,* Lord Corporation; Kenneth Durbin, ADD; Gregory Lane, AED; Robert Kyff, GE Aviation; Kevin Ignatuk, The Boeing Co.;

8:30 AM - 9:00 AM
Embedded Sensing for Gas Turbine Engine Component Health Monitoring (Paper 283)
Muthuvel Murugan,* Anindya Ghoshal, Michael Walock, FCDD-RLV-P; Roger Caesley, Robert Knapp, Epsilon Optics Ltd.;

9:00 AM - 9:30 AM
Green House Gas (GHG) Initiative for the Rotorcraft Industry (Paper 367)
Albertus Tjandra,* Michel Dion, Bell; Vincent Routhieau, Airbus Helicopters; Pierre-Marie Basset, Arnaud Le Pape, ONERA; Claude B RATE, Safran Helicopter Engines;
Safety

Safety
Technical Session A: Tues. May 19, 2020 - 8:00 AM to 12:00 PM

8:00 AM - 8:30 AM
Restoring Practical Single Engine IFR to the Marketplace (Paper 58)
Erik Oltheten,* Bell;

8:30 AM - 9:00 AM
Explainable AI: Rotorcraft Attitude Prediction (Paper 97)
Hikmat Khan,* Nidhal Bouaynaya, Ghulam Rasool, Rowan University; Charles Johnson, Federal Aviation Administration;

9:00 AM - 9:30 AM
Status and Way Forward on Rotorcraft Lightning Protection (Paper 121)
Tagliana Bernard, Meyer Marc,* Zehar Sonia,* Airbus Helicopters;

10:00 AM - 10:30 AM
Artificial Intelligence for Helicopter Safety: Head-Pose Detection in the Cockpit (Paper 306)
Ghulam Rasool, Nidhal Bouaynaya, Éric Feuerstein,* Ramachandran Ravi, Rowan University; Charles C. Johnson, Federal Aviation Administration;

10:30 AM - 11:00 AM
Appropriate Calculation of Risk per Flight Hour for Rotorcraft Safety Risk Management (Paper 332)
John Hewitt,* Loan (Joan) Pham,* Sikorsky, a Lockheed Martin Co.;

11:00 AM - 11:30 AM
Hazard Analysis and Failure Modes and Effects Analysis for NASA Revolutionary Vertical Lift Technology (RVLT) Concept Vehicles (Paper 353)
Patrick Darmstadt,* The Boeing Co.;

11:30 AM - 12:00 PM
Retrospective Analysis of Australia’s Defence Aviation Safety Framework (Paper 391)
Arvind Sinha,* Australian Department of Defence; James Hood, RMIT University;
Structures and Materials

Structures and Materials I
Technical Session C: Wed. May 20, 2020 - 1:45 PM to 6:00 PM

1:45 PM - 2:15 PM
Structural Assessment of Additively Manufactured Flight Control Components (Paper 100)
Jan Kasprzak,* Ryan Achterberg, Prashant Patel, Nam Phan, NAVAIR;

2:15 PM - 2:45 PM
Gear Rim Failure Prediction Based on Fracture Mechanics (Paper 103)
Biqiang Xu,* Sikorsky, a Lockheed Martin Co.;

2:45 PM - 3:15 PM
Structural Integrity Challenges for Future Rotorcraft Programs (Paper 99)
Robert Benton,* US Army;

4:00 PM - 4:30 PM
Determining TH-1H Tailboom Loads from Measured Strain Gage Data (Paper 133)
Ken Taylor,* Dennis Garza, Eric Winslette, Mercer Engineering Research Center;

4:30 PM - 5:00 PM
Development of a Rotorcraft Structural Integrity Program Master Plan for Future Vertical Lift (Paper 309)
Lisa Chiu,* Dennis McCarthy, The Boeing Co.; Matthias Krastel, Sikorsky, a Lockheed Martin Co.; Derrell Lorthridge, U.S. Army Combat Capabilities Development Command ADD;

5:00 PM - 5:30 PM
Investigation of Fatigue and Flaw Tolerance Performance of 18CrNiMo7-6 Case Hardening Steel (Paper 214)
Yal?N Zt, Ufuk Akcihan,* Fazl? Fatih Melemez, Onur Zayd?N, Turkish Aerospace;

Structures and Materials II
Technical Session E: Thurs. May, 21, 2020 - 1:30 PM to 5:30 PM

1:30 PM - 2:00 PM
Reliability-Driven Analysis, Design and Characterization of Rotorcraft Structures: Decision-Making Framework (Paper 310)
Mark Gurvich,* United Technologies Research Center;

2:00 PM - 2:30 PM
Advanced Materials Technology to Improve Compressive Strength of High-Modulus Carbon Fiber-Reinforced Composites (Paper 355)
Andrew Makeev, Sarvenaz Ghaffari,* Guillaume Seon, University of Texas Arlington;

2:30 PM - 3:00 PM
Uncertainty Quantification of the ONERA 7A Rotor using Comprehensive Analysis (Paper 338)
Manas Khurana, Science and Technology Corporation; Itham Salah El Din,* ONERA; Hyeonsoo Yeo, US Army Combat Capabilities Development Command;

3:30 PM - 4:00 PM
Fatigue Life Improvement in Hierarchically Organized Nanocomposites for Application in Vertical Lift Rotorcrafts (Paper 368)
Mithil Kamble,* Nikhil Koratkar, Aniruddha S Lakhnot, Caitain Picu, Rensselaer Polytechnic Institute;

4:00 PM - 4:30 PM
Low AOB Component Loads Derivation to Implement MH-60R HUMS (Paper 65)
Suresh Moon,* Technical Data Analysis, Inc.; Daniel Liebschutz, NAVAIR;
System Engineering Tools/Processes

Systems Engineering
Technical Session D: Thurs. May, 21, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
Engineering Challenges to Reinvent the Sky (Paper 84)
Roberto Licata,* Dassault Systèmes;

8:30 AM - 9:00 AM
Integration of VTOL Air-taxis into an Existing Infrastructure with the use of the Model-Based System Engineering (MBSE) Concept SMArDT (Paper 182)
Nicolas J.Ckel,* Philipp Orth, Robert Schaller, FEV Europe GmbH; Maximilian Fischer, FEV Consulting GmbH; Jakob Andert, Christian Granrath, Institute for Combustion Engines, RWTH Aachen;

9:00 AM - 9:30 AM
A Systems Engineering Approach for Enabling Research and Development in the Vertical Lift Autonomy Flight Sciences Domain (Paper 364)
Marc Alexander,* National Research Council of Canada;

10:15 AM - 10:45 AM
Is Architecture Measurable Towards Creating, Managing, and Measuring Architecture and Resulting Product Line Implementations (Paper 104)
Gordon Hunt,* Skayl; Scott Wigginton,* CCDC AvMC; Paul Jonas, FirePoint; Ronald Towns, RWT Consulting;

10:45 AM - 11:15 AM
Advances in Property Model Methodology (PMM) (Paper 190)
Louis Fabre,* Christian Gaurel, Pascal Pandolfi, Pascal Paper, Thomas Razafimahefa, Airbus Helicopters; Patrice Micouin, MICOUIN CONSULTING;

11:15 AM - 11:45 AM
Model-Based Systems Engineering and a Modular Open System Approach using DevSecOps with Agile Software Methods (Paper 188)
Thomas DuBois, Christopher Goebel,* Robert Matthews,* L3Harris; John Stough,* JHNA, Inc.; David Linden,* Leidos, Inc.; David Walsh,* SigmaTech;
Test and Evaluation

Test and Evaluation I
Technical Session D: Thurs. May, 21, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
GPS-Based Airspeed Calibration for Rotorcraft: Generalized Application for All Flight Regimes (Paper 69)
Denis Hamel,* Carson Allgood, Alexander Kolarich,* Airbus Helicopters;

8:30 AM - 9:00 AM
Cold Weather Testing of the Bell 525 Relentless (Paper 57)
Bradley Regnier,* Albert Brand, Joshua O’Neil, Hans Runge, John Schillings, Brandon Thomas, Bell;

9:00 AM - 9:30 AM
Helicopter Flight Test Evaluation of an Actively Stabilized External Slung Load (Paper 361)
Marc Alexander,* National Research Council of Canada;

10:15 AM - 10:45 AM
MH-60 Full Scale Test Rig Loads Development and Analysis (Paper 203)
Robert McGinty,* Jeffery Brenna, MERC; John Vine, DST Group; Dan Liebschutz, NAVAIR; Philip Conジェル, SAIC;

10:45 AM - 11:15 AM
Development & Testing of a Rotorcraft Engine Nose Gearbox Lubrication System (Paper 366)
Todd Harder,* The Boeing Co.;

11:15 AM - 11:45 AM
Hardware-in-the-Loop Dynamic Wind Tunnel Investigation of Slung Loads Dynamics with Application to Active Cargo Hook Stabilization of an M119 Howitzer (Paper 114)
Aviv Rosen, Tel Aviv University; Joseph Horn,* Pennsylvania State University;

Test and Evaluation II
Technical Session E: Thurs. May, 21, 2020 - 1:30 PM to 5:30 PM

1:30 PM - 2:00 PM
Experimental and Numerical Investigation of Interaction Between Rotor and Wing at High Advance Ratio (Paper 87)
Yasutada Tanabe,* Noboru Kobiki, Hideaki Sugawara, Japan Aerospace Exploration Agency; Hirotaka Hayashi, Wataru Kobayashi, Ryosuke Satou, SUBARU Corporation;

2:00 PM - 2:30 PM
The Multirotor Test Bed - A New NASA Test Capability for Advanced VTOL Rotorcraft Configurations (Paper 356)
Carl Russell,* Sarah Conley, NASA Ames Research Center;

2:30 PM - 3:00 PM
Digital Twin Approach for Structural Property Evaluation of Next Generation Active Twist Blades (Paper 167)
Sung Jung, Jun Ahn, Sehoon Chang, Hyun Hwang,* Konkuk University; Steffen Kalow, Ralf Keimer, German Aerospace Center (DLR);

3:30 PM - 4:00 PM
Experimental Measurement of Sectional Stiffness Properties of Composite Rotor Blades (Paper 173)
Tyler Sinotte,* Olivier Bauchau, University of Maryland;

3:00 PM - 4:30 PM
Scaled-Model Testing of Coaxial Rotor Hub Flows (Paper 272)
Charles Tierney,* Sven Schmitz, Pennsylvania State University; Nicholas Jaffa, David Reich, Applied Research Laboratory;

4:30 PM - 5:00 PM
Wind-Tunnel Testing a Small Isolated Folding Propeller: Test Setup, Results and Surrogate Performance Modelling (Paper 377)

5:00 PM - 5:30 PM
Design of a Lean Avionics Rig for Efficient System Integration Testing and Human Factors (Paper 296)
Nicolas Callejo Goena,* Pasquale Chiella,* Giovanni Di Meo,* Kopter Group AG;
Unmanned VTOL Aircraft and Rotorcraft

Unmanned VTOL I
Technical Session A: Tues. May 19, 2020 - 8:00 AM to 12:00 PM

8:00 AM - 8:30 AM
Manned Unmanned Teaming - TEAMX (Paper 143)
THOMASSEY Lionel,* AIRBUS Helicopters;

8:30 AM - 9:00 AM
Manned-Unmanned Teaming Challenges in the Maritime Environment (Paper 29)
Jacquelyn Banas,* Andreas Cords, Tim Mehling, Tobias Paul, ESG;

9:00 AM - 9:30 AM
The use of the AWHero RUAV in Order to Provide Enhanced Situational Awareness in a Maritime Environment: A Real Case (Paper 287)
Marco Cicalè,* Leonardo Helicopters;

10:00 AM - 10:30 AM
Atmospheric Sampling in Urban Areas and Complex Terrain using UAS Swarms (Paper 162)
Jared Cooper,* David Neal, Barron Associates, Inc.; Stephan De Wekker, University of Virginia;

10:30 AM - 11:00 AM
Rotor Fault Detection and Identification for a Hexacopter Based on Control and State Signals via Statistical Learning Methods (Paper 301)
Airin Dutta,* Farhan Gandhi, Fotis Kopsaftopoulos, Michael McKay, Rensselaer Polytechnic Institute;

11:00 AM - 11:30 AM
A Machine-learning Approach to Time-optimal Trajectory Generation for UAV’s (Paper 321)
Di Zhao, Runyu Lai, Sandipan Mishra,* Rensselaer Polytechnic Institute;

11:30 AM - 12:00 PM
Imitation Learning and Vision-Based Autonomous VTOL UAV Landing Without GPS or Tracking Landing Spot (Paper 196)
Bochan Lee,* Mobile Benedict, Dilip Kalathil, Keerat Singh, Texas A&M University;

12:00 PM - 12:30 PM
Vision-based Autonomous Guidance Approach for a Nano Unmanned Rotorcraft Towards Indoor Flight Environment (Paper 238)
Gualin Wang,* Dehui Li, Panpan Xu, Beijing Intelligent Dynamics Rotorcraft Company;

Unmanned VTOL II
Technical Session B: Wed. May 20, 2020 - 8:00 AM to 12:15 PM

8:00 AM - 8:30 AM
John Preston,* US Army CCDC AvMC;

8:30 AM - 9:00 AM
Development of Automatic Controllers and Piloting Aid Functions for Enhancement of UAV/OPV Autorotation Management (Paper 146)
Christian Brackbill,* David Quinn, US Army, Army Futures Command; Laurent Binet, ONERA;

9:00 AM - 9:30 AM
A Contract Based Approach to Collision Avoidance for UAVs (Paper 156)
10:15 AM - 10:45 AM
Prediction on Nonlinear Flight Dynamics of a Quad-rotor UAV with Rotor Aerodynamic Analysis under Gust (Paper 235)
Sun Hoo Park,* Sihun Lee, SangJoon Shin, JeongUk Yoo, Seoul National University; Youngmin Park, Korea Aerospace Research Institute;

10:45 AM - 11:15 AM
Experimental Investigation and Fundamental Understanding of Propeller and Wing Interactions for VTOL Unmanned Aerial Vehicle (Paper 220)
M. Rama Krishna,* Abhishek Abhishek,* Debopam Das, Indian Institute of Technology Kanpur;

11:15 AM - 11:45 AM
Optimal Trajectory Generation for a Quadrotor Biplane Tailsitter (Paper 221)
Kristoff McIntosh,* Sandipan Mishra, Di Zhao, Rensselaer Polytechnic Institute; Jean Paul Reddinger, CCDC Army Research Laboratory;

11:45 AM - 12:15 PM
Flight Test Determination of Multi-Rotor UAV Trim Conditions (Paper 267)
Ryan Thorpe,* James Gregory, Matthew McCrink, Achal Singhal,* The Ohio State University;

Unmanned VTOL III
Technical Session C: Wed. May 20, 2020 - 1:45 PM to 6:00 PM

1:45 PM - 2:15 PM
Urban Transportation Network Architecture (Paper 31)
Maryam Naleini,* Bell;

2:15 PM - 2:45 PM
Fuel Cell Application for Small eVTOL UAVs (Paper 181)
Thomas Seren,* Mirko Hornung, Technical University of Munich;

2:45 PM - 3:15 PM
Endurance Optimization of a Tandem Helicopter with Variable Speed Rotors and a Reciprocating Engine (Paper 144)
Mathieu Bouchard,* David Rancourt, Université de Sherbrooke; David Laflamme, Enrick Laflamme, Laflamme Aéro Inc.;

4:00 PM - 4:30 PM
Coupled Pitch-Lag Hinge for High Inertia Electric Rotors (Paper 329)
Jean-Paul Reddinger,* CCDC Army Research Laboratory;