



# **Vertical Flight Society 75<sup>th</sup> Annual Forum & Technology Display**



**May 13–16, 2019**

**Pennsylvania Convention Center**

# **Technical Sessions**

**Special Session schedules listed on the back cover**

Technical Session A: Monday, May 13 - Afternoon, 1:30 p.m. - 5:30 p.m.					
	Aerodynamics I Room 108B Session Chair: <b>Dr. Juergen Rauleder</b> Technical Univ. of Munich	Acoustics I: Room 105B Session Chair: <b>Dr. Doug Boyd</b> NASA Langley	Adv. Vertical Flight I Room 103C Session Chair: <b>Carl Russell</b> NASA Ames Research Ctr.	Manufact. Tech. I: Room 104A Session Chair: <b>Heather Woodworth</b> Sikorsky, Lockheed Co.	HUMS I: Room 107B Session Chairs: <b>Catherine Cheung, NRC</b> <b>Chris Lyman, US Army ADD</b>
1:30 - 2:00 Paper #1	<b>Comparison of Rotor - Fuselage Flow Fields and Unsteady Tail Interactions between Two CFD Codes and Experiment</b> (22) Peter Lorber*, Byung-Young Min, Jinggen Zhao, Sikorsky, Lockheed Martin Co.	<b>Dynamic Replanning of Low Noise Rotorcraft Operations</b> (70) Eric Greenwood*, NASA Langley Research Ctr.	<b>Preliminary Design of a Highly Efficient VTOL System Based on Tethered Fixed-Wing Aircraft</b> (23) John Bass*, University of Sherbrooke; et. al.	<b>Army Aviation Additive Repair/Manufacture (AR/M) Qualification</b> (142) Wesley Cass*, US Army	<b>Enabling Technology for Sustainment of Navy Aircraft Structures</b> (32) Roberto Semidey*, Mark Glucksman-Glaser, Nam Phan, US Naval Air Systems Command
2:00 - 2:30 Paper #2	<b>Aerodynamic Interactions on Airbus Helicopters' Compound Helicopter RACER in Cruise Flight</b> (302) Felix Frey*, Jakob Thiemeier, Constantin Ohre, Manuel Kessler, Ewald Kramer, University of Stuttgart	<b>Aeroacoustic Analysis of UAV-Scale Cycloidal Rotor: An Experimental and Computational Approach</b> (268) Adam Kellen, Atanu Halder*, Moble Benedict, Texas A&M University	<b>Experimental Validation of Vertical Lifting Capabilities of Circling Tethered Fixed Wing UAVs</b> (112) Bruno Chapdelaine*; Guillaume Ledoux; David Rancourt, University of Sherbrooke	<b>Additive Manufacturing of Titanium Alloys by Cold Spraying onto Al7075</b> (365) Jaroslaw Sienicki*, PZL Mielec, a Sikorsky Co.; Wojciech Zorawski, Kielce University	<b>CH146 Structural Usage Monitoring</b> (33) Adem Turkdogan*, Marc Ouellet, Simon Bernier, Bell
2:30 - 3:00 Paper #3	<b>CFD Calculations of the XV-15 Tiltrotor During Transition</b> (115) Steven Tran*, STC Corp.; G. Bowen-Davies, Kitty Hawk Corp.; Joon Lim, Gerardo Nunez, Andrew Wissink, US Army	<b>Auralization of Unsteady Rotor Noise using a Solution to the Ffowcs Williams-Hawkings Equation</b> (48) Siddhartha Krishnamurthy*, Stephen Rizzi, NASA; Brian Tuttle, Analytical Mechanics Associates, Inc.	<b>Numerical Investigation of the Flight Dynamics of a Robotic Boomerang</b> (286) Prashant Singh, Abhishek Abhishek*, Indian Institute of Technology Kanpur	<b>Additive Manufacturing (AM) of a Rotorcraft Gearbox Housing Independent Research &amp; Development (IRAD) Project</b> (220) Gerald Cross*, Robert Filler, Boeing Co.	<b>Evaluating Analysis Methods for Legacy HUMS Data</b> (334) Anthony Edmonds*, Aaron Muise, Rowena Glasgow, IMP Aerospace and Defence
<b>Refreshment Break: 3:00 to 3:30</b>					
3:30 - 4:00 Paper #4	<b>Simulation of Rotor-Empennage Interactional Aerodynamics in Comparison to Experimental Data</b> (221) Markus Rinker*, G. Uhl, M. Hajek, S. Platzer, Technical Univ. Munich; Tobias Ries, Martin Embacher, Airbus Helicopters	<b>PowerFLOW Simulations of Helicopters in Blade-Vortex Interaction Conditions</b> (185) Gianluca Romani*, Damiano Casalino, Dassault Systems	<b>Controlling a Highly Gyroscopic VTOL MAV</b> (405) Lee Whitchee*, Manan Gandhi, Evangelos Theodorou, Georgia Tech.; Eric Johnson, Penn State University	<b>In-Process Defect Monitoring &amp; Correction in Additive Manufacturing of Aluminum Alloys</b> (81) Behrooz Jalalahmadi*, J. Liu, J. Rios, Sentient; J. Slotwinski, C. Peitsch, A. Goldberg, T. Montalbano, John Hopkins Univ.	<b>Real Time Rotor Component Load Limiting via Model Predictive Control</b> (200) Chams Eddine Mballo*, Georgia Tech.
4:00 - 4:30 Paper #5	<b>Fundamental Investigation of Proprotor and Wing Interactions in Tiltrotor Aircraft</b> (137) Joon Lim*, US Army ADD	<b>In Situ Development and Application of Fly Neighborly Noise Abatement Procedures for Helicopters</b> (195) Juliet Page*, Amanda Rapoza, Volpe; Eric Jacobs, EBDEA Acoustics LLC	<b>CFD Validation of Small Quadrotor Performance using CREATE™ AV Helios</b> (212) Austin Thai*, Sheryl Grace, Boston University; Rohit Jain, US Army Combat Capability Dev. Command	<b>Innolot: International Manufacturing Technology Development in Poland</b> (165) William Harris*, Sikorsky, Lockheed Martin Co.	<b>Low Computational, Nonlinear Component Trend Analysis</b> (192) Eric Bechhoefer*, GPMS Inc
4:30 - 5:00 Paper #6	<b>Computational Analysis of Rotor-Blown-Wing for eVTOL Applications</b> (373) Matthew Misiorowski*, Farhan Gandhi, Rensselaer Polytechnic Institute; Phuriwat Anusonti-Inthra, US Army Research Lab	<b>Prediction of Rotorcraft Broadband Trailing-Edge Noise and Parameter Sensitivity Study</b> (121) Sicheng Li*, Seongkyu Lee, University of California Davis	<b>Flight Dynamics Identification, Maneuverability, and Gust Tolerance of a Robotic Hummingbird in Hover</b> (254) David Coleman*, Moble Benedict, Texas A&M Univ.	<b>Selecting Parts for Additive Manufacturing in Aerospace Sector: Multi-criteria Analysis</b> (362) Aleksander Bana's*, Radoslaw Wojtuszewski*, PZL Mielec, a Sikorsky Co.; Michał Olejarczyk*, Wrocław University of Science	<b>Dynamic Time Warping to Quantify Structural Maneuver Variability</b> (133) Jeffrey Monaco, Jason Hull*, Spire Innovations, LLC; Roberto Semidey, Mark Glucksman-Glaser, US Naval Air Systems Command
5:00 - 5:30 Paper #7	<b>High-Fidelity Computational Analysis of Ducted and Coaxial Rotors for Urban Air Mobility</b> (139) Seokkwan Yoon, Patricia Ventura Diaz*, Rafael Caracuel Rubio, NASA Ames Research Ctr.	<b>Identification and Prediction of Broadband Noise for a Small Quadcopter</b> (153) Nicole Pettingill*, Nikolas Zawodny, NASA Langley Research Ctr.	<b>Development of a Gun-Launched Rotary-Wing Micro Air Vehicle</b> (246) Hunter Denton*, Moble Benedict, Texas A&M Univ.; Vikram Hrishikeshavan, Univ. of Maryland; Hao Kang, US Army Research Lab	<b>Design and Numerical Analysis of Shaped Connection Made of CFRP</b> (282) Waldemar Login*, Andrzej Dylewski, Polskie Zakłady Lotnicze	<b>Interacting Multiple Model Algorithms for Rotorcraft Regime Recognition</b> (79) Dakota Musso*, Jonathan Rogers, Georgia Tech.
5:30- 6:00 Paper #8					<b>Novel Diagnostic Metrics for Regime Recognition Verification and Validation</b> (95) Jonathan Warner, Jonathan Rogers*, Georgia Tech.

Main author is listed first, \* denotes presenter.

<b>Technical Session A: Monday, May 13 - Afternoon, 1:30 p.m. - 5:30 p.m.</b>				
	<b>Product Support: Room 102AB</b>	<b>Propulsion I: Room 103A</b>	<b>Systems Eng: Room 304</b>	<b>Test &amp; Eval. I: Room 103B</b>
	Session Chair <b>Jinkyu Choi</b> Pratt & Whitney	Session Chair: <b>Bruce Jensen</b> Sikorsky, Lockheed Martin Co.	Session Chair: <b>Serge Germanetti</b> Airbus	Session Chair: <b>Joost Hakkaart</b> NLR
1:30 - 2:00 Paper #1	<b>Updating US Army Aviation Critical Item Management for 21st Century</b> (8) Myung Rhee, Christopher Gray*, US Army AMRDEC	<b>Parametric Instability of Planetary Gear Transmission with Elastic Ring Gear due to Discrete Boundary Strut Parameter Variation</b> (4) Peng Guan*, Hans DeSmidt, Univ. of Tennessee	<b>Vertical Lift Aircraft Design through the Georgia Tech Integrated Product &amp; Process Development Approach For Over the Past 30 Years</b> (381) Daniel Schrage*, Srujal Patel, Georgia Tech.	<b>Design and Conduct of a Flight Test to Investigate Hover In-Ground-Effect Performance over Sloped Terrain</b> (99) John Holder*, KBRWyle; John Tritschler*, US Naval Test Pilot School
2:00 - 2:30 Paper #2	<b>Providing Engineering Support for Deployed Aircraft in Southwest-Asia</b> (47) Ronald Brychta, Bryan Steiner, Nicholas Schroeder*, Andrew Mason-Leister, FCDD-AMA-M	<b>Turboshaft Engine Altitude Testing for Army Qualification</b> (235) George Bobula*, IronMountain Solutions; Richard Wayne, Charles Watwood, US Army	<b>Geometrical Management Leading to Merge System Engineering &amp; APQP</b> (135) Jean-loup Gatti*, Airbus Helicopters	<b>Performance Measurements on Rotors Hovering above Moving Surfaces</b> (290) Aaron Martinez*, Joseph Milluzzo, Scott Drayton, Scott Davids, US Naval Academy
2:30 - 3:00 Paper #3	<b>Post Lightning Strike Inspection</b> (107) Travis Massa*, US Army Combat Capabilities Development Command Aviation & Missile Ctr.	<b>Pericyclic Transmission Prototype: Detailed Component Design, Analysis, &amp; Fabrication</b> (132) Tanmay Mathur*, Edward Smith, Robert Bill, Penn State Univ.; Mark Stevens, NASA Glenn Research Ctr.	<b>Intelligent Black Box Verification, Validation, and Accreditation for Rotorcraft Performance Modeling</b> (445) William McCandless*, US Army Futures Command; Ian Dettwiller, US Army Corps of Engineers	<b>Experimental Evaluation of Ice Accretion on Coaxial-Rotor Vehicles</b> (30) Sihong Yan*, Jose Palacios, Shawn Scroger, Penn State Univ.
<b>Refreshment Break: 3:00 to 3:30</b>				
3:30 - 4:00 Paper #4	<b>A Modular Open System Approach for the US Army's Improved Turbine Engine</b> (62) Casey Carter, PeopleTec Inc; Daniel Suggs, Ranger Defense; Danielle Dutcher*, Scott Rosengren, Matthew Sipe, Ben Plummer, US Army	<b>Dynamic Interactions in an Electromechanical Main Gearbox of a High-Speed Coaxial Compound Helicopter</b> (170) Youn Park, Andreas Schlaich*, Romax Technology	<b>Taking a Systems Engineering Approach to Address Sustainability</b> (344) Xiaomei Yu*, Sikorsky, a Lockheed Martin Co.	<b>A Research on the Icing Flight Test and Computational Simulation for the Design of Ice Protection System for KUH</b> (222) Jik Soo Kim, Nameun Park*, Sang Gi Lee, Cheol Hun Woo*, Hyung Sik Kim, Yoo Sang Hwang, KAI
4:00 - 4:30 Paper #5	<b>Re-strategizing Army MQ-1C System Sustainment Support Post-Production &amp; Deployment Phase</b> (425) Victoria Gomez Ramos*, Prasant Chhotu, US Army	<b>Dynamic Testing of a High-Specific-Torque Concentric Magnetic Gear</b> (105) Justin Scheidler*, Zachary Cameron, Thomas Tallerico, NASA Glenn Research Ctr.	<b>Use of Machine Learning to Define Optimum HUMS Acquisition Strategy</b> (151) Pierre Bonamour*, Gianni Naccarato, F. Champavier, A. Mechouche, N. Daouayry, Lucas Macchi, Airbus	<b>Bell V-280 Valor: JMR TD Flight Test Update - Year 2</b> (418) Paul Wilson*, Ryan Ehinger, Matt McMenemy, Bell
4:30 - 5:00 Paper #6	<b>RFID Solution for Tracking Components Life for Rotor Head Assembly</b> (355) Maciej Zawodniok, Sohel Patel, Missouri S&T; Kishan Goel, Nam Phan, US Navy; Nagaraja Iyyer*, Tech. Data Analysis	<b>Effect of Maneuvering and Gust Loads on the Two-Speed Shift Dynamics of a Helicopter Equipped with a Dual Clutch Transmission</b> (303) Xiaowen Su, Hans DeSmidt*, University of Tennessee; Edward Smith, Robert Bill, Penn State Univ.	<b>Automating Criteria Evaluation in Safety-Critical Avionic Systems</b> (252) Ramandeep Singh, Analise Giobbi*, Triumph Integrated Systems	<b>High-Speed Wind Tunnel Tests of a Full-Scale Proprotor on the Tiltrotor Test Rig</b> (117) Alex Sheikman, Cecil Acree*, Thomas Norman, NASA Ames Research Ctr.
5:00 - 5:30 Paper #7	<b>HELIWISE: Tool for Helicopter Advanced HUMS Data Analysis</b> (388) Valerio Prece*, Leonardo Helicopters		<b>An Analysis and Classification Process towards the Qualification of Autonomous Systems in Army Aviation</b> (123) Robert Copeland*, US Army AMRDEC	<b>The Maryland Tiltrotor Rig (MTR): Baseline Gimballed Hub</b> (122) Frederick Tsai*, Anubhav Datta, James Sutherland-Foggio, Univ. of Maryland; Dave Privett, Calspan
5:30 - 6:00 Paper #8				<b>Scaled Model Testing of Rotor Hub Root-End Airfoil Shapes</b> (406) Charles Tierney*, Jeff Harris, David Reich, Nicholas Jaffa, Sven Schmitz, Penn State Univ.

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Technical Session B: Wednesday, May 15 - Morning, 8:00 a.m. - 12:15 p.m.					
	<b>Aerodynamics II: Room 108B</b>	<b>Acoustics II: Room 105B</b>	<b>Aircraft Design I: Room 103A</b>	<b>Avionics &amp; Systems: Room 304</b>	<b>Dynamics I: Room 103B</b>
	Session Chair <b>Dr. Rohit Jain</b> US Army ADD	Session Chair: <b>Dr. Doug Boyd</b> NASA Langley	Session Chair <b>Michael Avera</b> US Army Research Lab	Session Chair <b>Joseph Franiak</b> Northrop Grumman	<b>Test &amp; Eval. II</b> Session Chairs: <b>Ramin Modarres, Sikorsky, Lockheed Martin Co. Joost Hakkaart, NLR</b>
08:00 - 08:30 Paper #1	<b>Full Configuration CFD Analysis of the S-97 RAIDER™</b> (266) Patrick Bowles, Margaret Battisti, Byung-Young Min*, Brian Wake, Nick Tuozzo, Peter Lorber, Claude Matalanis, Sikorsky, Lockheed Martin Co.	<b>Validation of Helicopter Noise Prediction System with Flight Data (28)</b> Mrunali Botre*, Kenneth Brentner, Joseph Horn, Penn State Univ.; Daniel A. Wachspress, Continuum Dynamics	<b>CFD Based Aerodynamic Design of Helicopter Tail Boom for Hover and Sideward Flight Performance Enhancement (249)</b> Alper Ezertas*, Baris Can, Yuksel Ortakaya, Osman Gungor, Turkish Aerospace	<b>Potential Army Repurposing of Digital Radio Frequency Memory (DRFM) Products for the Electronic Warfare, Tactical Environment (15)</b> Brenda Menees*, US Army AED	<b>Numerical Analysis of RPM effect on Dynamic Stall Phenomena on Helicopter Rotor at High Thrust Forward Flight (51)</b> Camille Castells*, Francois Richez, Michel Costes, ONERA
08:30 - 09:00 Paper #2	<b>Airframe Drag Computation and Validation of an AH-64 (158)</b> Hormoz Tadghighi*, Boeing Co.	<b>Aeroacoustic Modeling of an eVTOL Slowed Rotor Winged Compound Aircraft (408)</b> Todd Quackenbush*, Daniel Wachspress, Continuum Dynamics; Kenneth Brentner, Penn State Univ.; Luigi Ricci-Moretto, Dinesh Barwey, Robert Lewis, Piasecki Aircraft	<b>Development and Validation of the Rensselaer Multicopter Analysis Code (RMAC): a Physics-Based Comprehensive Modeling Tool (367)</b> Robert Niemiec*, Farhan Gandhi, RPI	<b>ARINC 661 Third Party Toolkit User Experience (56)</b> Jacob Weaver*, Joel Lam*, Rockwell Collins	<b>Dynamic Stall Modeling using Viscous Vortex Particle Method for Coaxial Rotors (154)</b> Puneet Singh*, Peretz Friedmann, University of Michigan
09:00 - 09:30 Paper #3	<b>Experimental Investigation of Rotor Slipstream Oscillations in the Ground Effect (202)</b> Pawel Ruchala*, Adam Dziubinski, Wit Stryczniewicz, Malgorzata Wojtas, Kazimierz Szumanski, Institute of Aviation	<b>Performance and Acoustics of Small Rotors with Non-Uniform Blade Spacing (350)</b> Matthew Floros*, US Army Research Lab	<b>Development of the Mars Helicopter Rotor System (382)</b> Benjamin T. Pipenberg*, Jeremy D. Tyler, Sara A. Langberg, Matthew T. Keennon, AeroVironment Inc.	<b>Adv. Tech., Lightweight, Multifunctional Micro-avionics for Manned &amp; Unmanned Ref. Enhance Op. Capability of Future Vertical Lift Platforms (129)</b> V. Michael Contarino, RaNae Contarino, R Cubed Engineering LLC; Richard Healing*, Air Safety Engineering LLC	<b>Compound Helicopter X3 in High-Speed Flight: Correlation of Simulation and Flight Test (234)</b> Constantin Ohrle*, Jakob Thiemeier, Felix Frey, Manuel Keßler, Ewald Kramer, Univ. of Stuttgart; Martin Embacher, Paul Eglin, Paul Cragga, Airbus Helicopters
<b>Refreshment Break: 9:30 - 10:15</b>					
10:15 - 10:45 Paper #4	<b>Integration of Finite State Dynamic Wake Model for Rotor Interference with Comprehensive Rotorcraft Analysis (63)</b> Jeewoong Kim*, Chengjian He, Hossein Saberi, Adv. Rotorcraft Tech.; David Peters, Washington University	<b>Effect of Pitch Attitude on the Performance and Acoustics of a Lift-Offset Coaxial Rotor Based on High-Fidelity CFD/CSD Simulations (119)</b> Zhongqi Jia*, Seongkyu Lee, Univ. of California Davis; Kalki Sharma, Kenneth Brentner, Penn State Univ.	<b>Linearly Variable Chord-Extension Morphing for Helicopter Rotor Blades (203)</b> Rohin Majeti*, Berend van der Wall, Christoph Balzarek, DLR	<b>Affordable Integrated Antennas on Helicopters (226)</b> Herve Dutruc*, Francois-Xavier Filias, Airbus Helicopters	<b>Advanced AH-64 Compound Wind Tunnel Testing Overview (240)</b> Edward Brouwers*, Richard Deresz, Boeing Co.; Michael Fillman, AeroVironment Inc.
10:45 - 11:15 Paper #5	<b>Extraction of Dynamic Inflow Models for Coaxial and Tandem Rotors from CFD Simulations (171)</b> Po-Wei Chen*, Lakshmi Sankar, JVR Prasad, Georgia Tech.; Natasha Schatzman, NASA Ames Rrsch. Ctr.; Ganesh Rajagopalan, Iowa State Univ.	<b>Regarding the Perceptual Significance and Characterization of Broadband Components of Helicopter Source Noise (83)</b> Andrew Christian*, Jarrett Caston, Eric Greenwood, NASA Langley Research Ctr.	<b>VTOL Concepts for Unmanned Payload Delivery Applications (127)</b> Michael Avera*, US Army Research Lab	<b>A Hollistic Approach to Open Systems Architecture for Army Aviation (446)</b> John Stough*, Alan Hammond, Chris Kellow, JHNA; Leslie Hyatt, US Army PEO Aviation; Tom DuBois, Consultant	<b>Experimental Assessment of an Airfoil Optimized to Delay the Onset of Dynamic Stall (347)</b> Pourya Nikoueeyan*, Tanner Harms, Jonathan Naughton, University of Wyoming; Vineet Ahuja, Combustion Research & Flow Tech. Inc.
11:15 - 11:45 Paper #6	<b>Inflow System Identification for Coaxial-Pusher Rotorcraft in Cruising Flight (419)</b> Sean Hersey*, Roberto Celi, Univ. of Maryland; Ondrej Juhasz, Mark Tischler, US Army ADD	<b>Acoustic Testing of the Tiltrotor Test Rig in the National Full-Scale Aerodynamics Complex 40 by 80-Foot Wind Tunnel (104)</b> Natasha Schatzman*, Carlos Malpica, NASA	<b>Design of Servo-Flap Helicopter Rotor Blades with Forward Swept Wingtips (241)</b> Fu-Shang (John) Wei*, CCSU; David Peters, Washington University		<b>Investigation of 3-D Strains on Highly-Twisted Swept Tip Composite Rotor Blades (279)</b> Cheng Chi*, Anubhav Datta, Inderjit Chopra, Univ. of Maryland
11:45 - 12:15 Paper #7	<b>Iterative Blade Element Momentum Theory for a Coaxial Rotor (176)</b> Seongkyu Lee*, Maxime Dassonville, Univ. of California Davis	<b>On the Use of CFD for Improvement of Low-Fidelity Blade-Vortex Interaction Prediction Code (44)</b> Gabriel Reboul*, Fabrice Falissard, ONERA			
12:15 - 12:45 Paper #8		<b>Expanding Helicopter Noise Simulation Scope, based on High-Fidelity CFD (223)</b> Manuel Keßler*, University of Stuttgart			

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<b>Technical Session B: Wednesday, May 15 - Morning, 8:00 a.m. - 12:15 p.m.</b>				
	<b>History: Room 104AB</b> Session Chair: <b>Erasmus Pinero</b> <b>Bell</b>	<b>Modeling &amp; Sim. I: Room 102AB</b> <i>NATO Model Fidelity Improvement &amp; Assess.</i> Session Chair: <b>Dr. Mike Jones, DLR</b>	<b>Propulsion II: Room 103C</b> Session Chair: <b>Bruce Jensen</b> <b>Sikorsky, Lockheed Martin Co.</b>	<b>Struct. &amp; Materials I: Room 107B</b> Session Chair: <b>Kit Fry US Army</b> <b>AED</b>
08:00 - 08:30 Paper #1	<b>Ludwig, Rudolf and Emil Rub: Forgotten German Aeronautical and Rotating-Wing Pioneers</b> (3) Berend G. van der Wall*, DLR	<b>Rotorcraft Modeling Renovation for Improved Fidelity</b> (292) Neil Cameron*, Mark White, Gareth Padfield, Univ. of Liverpool; Linghai Lu*, Dheeraj Agarwal, Liverpool Univ.; Arthur Gubbels, NRC	<b>High Temperature Thin-Film Sensor Technologies for Adv. Propulsion Materials</b> (26) Yong Wong*, Mike McFarland, Santosh Sahoo, Acree Tech.; Kang Lee, NASA Glenn; Anindya Ghoshal, US Army Research Lab	<b>Structures Technology for Component Damage and Failure Prediction</b> (402) Yuriy Nikishkov*, Gennadiy Nikishkov, Guillaume Seon, Andrew Makeev, Brian Shonkwiler, Univ. of Texas Arlington
08:30 - 09:00 Paper #2	<b>The Lost Treasures of Maitland Bleecker: His Helicopter and Other Innovations</b> (42) Paul Fardink*, US Army (Ret.)	<b>Bell 412 System Identification: Comparing Methods and Tools</b> (219) Susanne Seher-Weiß*, Steffen Greiser, Johannes Wartmann, DLR; Arthur Gubbels, Joseph Ricciardi, Kenneth Hui, NRC; Vincent Myrand-Lapierre, CAE	<b>Fundamental Studies of a Variable-Voltage Hybrid-Electric Powertrain</b> (325) Brent Mills*, Anubhav Datta, Univ. of Maryland	<b>Influence of Cycle Counting methods on Fatigue Life Estimation of Critical Rotorcraft Components</b> (413) Aarohi Shah*, Massimo Ruzzene, Julian J. Rimoli, Georgia Tech.
09:00 - 09:30 Paper #3	<b>Frank Piasecki's First Production Helicopter, the HRP-1 Rescuer</b> (52) Tommy Thomason*, Hanlon Services Inc.	<b>Tandem Rotor Inflow Modeling and its Effect on Vehicle Dynamics</b> (215) Feyyaz Guner*, J. V. R Prasad, Georgia Tech. David G. Miller, Boeing Co.; Chengjian He, Advanced Rotorcraft Tech.	<b>Lichten Runner-up Paper: Semi-Empirical Modeling of Group 1 UAS Electric Powertrains</b> (311) Farid Saemi*, Moble Benefict, Texas A&M Univ., Nathan Beals, US Army Research Lab	<b>Load Confluence Algorithm Applied to a Combined Rotor/Fuselage Loads Model w/ Extended Application to Structural Fatigue Life Tracking</b> (113) Chance McCall*, Tech. Data Analysis; O. Bauchau, V. Sonnevill, UMD; C. deMontfort, B. Harper, Warner Robbins; R. McGinty, Mercér, Y. Bazilevs, Brown Univ.
<b>Refreshment Break: 9:30 to 10:15</b>				
10:15 - 10:45 Paper #4	<b>Catastrophe at Farnborough: How the Death of John W. C. "Pee Wee" Judge on 11 Sept. 1970 SBAC Air Show in a Wallis WA-117 Autogyro Changed British Popular Rft. History</b> (5) Bruce Charnov*, Hofstra University	<b>Enhancement of an Engineering Simulation Model to Improve the Correlation with Flight Test Data in Climb/Descent and Autorotation</b> (194) Hong Xin*, Chi Zhang, Joseph Driscoll, Sikorsky, Lockheed Martin Co.	<b>Design &amp; Development of Main Rotor Gearbox for the Sikorsky Boeing SB&gt;1 DEFIANT JMR Technology Demonstrator Aircraft</b> (208) Scott Bouwer*, Eric Kaiser, Boeing Co.	<b>RSIP - A New Standard Practice for U.S. Army Rotorcraft Structural Integrity Programs</b> (201) Michael Kiser*, US Army AED
10:45 - 11:15 Paper #5	<b>Setting the Record Straight on Failures and Successes in Army Aviation Development Programs over the Past Forty-Five Years</b> (273) Daniel Schrage*, Georgia Tech.	<b>VPM-Derived State Space Inflow Model for Multi-Rotor Air Vehicle Modeling and Simulation</b> (49) Chengjian He*, Matthew Gladfelter, C. Chang, Adv. Rotorcraft Tech, Inc.; Mark Tischler, Ondrej Juhasz, US Army ADD	<b>Fundamental Studies of Lithium Sulfur Batteries for Electric Aviation</b> (341) Emily Fislser*, Anubhav Datta, Univ. of Maryland	<b>On the Integration of Structural Loads Analysis with Structural Flight Testing for Improved Fatigue Methodologies</b> (125) Robert Benton*, US Army AED
11:15 - 11:45 Paper #6	<b>Helicopters and Counterinsurgency: A Delicate Pairing</b> (116) Robert Kodosky*, West Chester University	<b>Linearized Inflow and Interference Models from High Fidelity Free Wake Analysis for Modern Rotorcraft Configurations</b> (322) Jeffrey Keller*, R. McKillip, D. Wachspress, Continuum Dynamics; M. Tischler, O. Juhasz, US Army ADD	<b>Gearbox Planetary Bearing Cage Failure Analysis</b> (416) Joshua Fitzgerald*, Bryan Allison, Tom Lunz, Matthew Misiaszek, SKF Aeroengine	<b>An Alternative Probabilistic Approach for Reliability Assessment of Rotorcraft Structures</b> (327) Mark Gurvich*, Thomas Frewen, Bob LaBarre, United Technologies Research Ctr.
11:45 - 12:15 Paper #7	<b>History Question and Answer Period from Audience</b>		<b>Design Optimziation of a Hybrid Spur Gear</b> (138) Sean Gauntt*, Robert Campbell, Sean McIntyre, Penn State Univ.	<b>Machine Learning based Digital Twin Simulation and Prediction of Structural Component's Fatigue Life</b> (380) Xiang Ren*, Alireza Sadeghirad, D. C. Pham, Jim Lua, Global Engineering & Materials

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**Technical Session C: Wednesday, May 15 - Afternoon, 1:45 p.m. - 6:00 p.m.**

	<b>Aerodynamics III: Room 108B</b> Session Chair: <b>Dr. Juergen Rauleder</b> Technical Univ. Munich	<b>Aircraft Design II: Room 103A</b> Advanced Vertical Flight II Session Chairs: <b>Michael Straus,</b> <b>Sikorsky, Lockheed Martin Co.</b> <b>Andrew Kreshock, US ARL</b>	<b>Dynamics II: Room 103B</b> Session Chair: <b>Dr. Ed Smith</b> Penn State Univ.	<b>Crew Stations: Room 104AB</b> Session Chair: <b>Andrew Smith</b> Boeing Co.	<b>Handling Qual. I: Room 102AB</b> Session Chair: <b>Dr. Carlos Malpica</b> NASA Ames
1:45 - 2:15 Paper #1	<b>Suction and Oscillatory Blowing Flow Control of External Store Support System Flight Hardware</b> (244) David Schatzman*, Jacob Wilson, US Army ADD CCDC AvMC; Avraham Seifert, Ofek Drori, Tel Aviv University	<b>Design-Oriented Study on the Public Acceptance of cargo eVTOL aircraft as a Revolutionary Vehicle Concept</b> (272) Yu Ito*, Yamato Holdings Co., Ltd.; Nanami Furue, Tokyo University of Science	<b>Drivetrain Influence on the Blade Loads of Hingeless Helicopter Rotors</b> (21) Felix Weiss*, Christoph Kessler, DLR	<b>A Comparison of Control Activity and Heart Rate as Measures of Pilot Workload in a Helicopter Tracking Task</b> (297) Andrew Law, Sion Jennings*, Kris Ellis, NRC	<b>The Use of the Open-Loop Onset Point (OLOP) to Predict Rotorcraft Pilot-Induced Oscillations</b> (9) Mike Jones*, DLR
2:15 - 2:45 Paper #2	<b>A Full-scale Rotor-wake Investigation of a Free-flying Helicopter in Ground Effect using BOS and PIV</b> (68) Clemens Schwarz*, Andre Bauknecht, Claus Christian Wolf, Markus Raffel, Alexander Coyle, DLR	<b>Basic Design Limitations for Urban Electric VTOL Aircraft</b> (248) Olivier Cornes*, Aurora Flight Sciences	<b>Correlation of Full-Scale Isolated Proprotor Performance and Loads</b> (55) Sesu Kottapalli*, Cecil W. Acree, Jr., NASA Ames Research Ctr.	<b>A Strategy for Determining Optimal Crewing in Future Vertical Lift: Human-Automation Function Allocation</b> (75) Katie Ernst, C. Sushereba, Laura Militello*, J. Dilulio, S. Wonderly, Applied Decision Science; D. Klein, Marimo; S. Scheff, HF; G. Taylor, US Army	<b>Rotorcraft Flight Control Design with Alleviation of Unsteady Rotor Loads</b> (58) Umberto Saetti*, Joseph Horn, Penn State Univ.; Tom Berger, Mark Tischler, US Army ADD
2:45 - 3:15 Paper #3	<b>Helicopter Rotor Boundary Layer Transition Measurement in Forward Flight using an Infrared Camera</b> (37) Anthony Gardner*, Christian Wolf, Miles Barnett, Markus Raffel, DLR; JT Heineck, NASA	<b>Asymmetric Distributed Electric Propulsion VTOL Flying Wing: Conceptualization, Design and Flight Test</b> (189) Keen Ian Chan*, ST Engineering Aerospace Ltd.	<b>Simulation of the Free Flying Helicopter by Coupling of a New Comprehensive Aeromechanics Code with an Advanced Flexible Multibody Model</b> (197) Maximilian Mindt*, DLR; Stefan Dietz, Martin Schulze, Herve Mabou, Dassault Systems	<b>Cheeseeman Award Paper: Isomorphic Spatial Visual Displays for Operations in DVE for Obstacle Avoidance</b> (447) Martine Godfroy-Cooper*, Joel Miller, Edward Bachelder, US Army ADD; Elizabeth Wenzel, NASA Ames Research Ctr.	<b>Robust Use of Horizontal Stabilator in Feedback Control on a UH-60 Black Hawk</b> (162) Praneet Vayalali*, Michael McKay, Jayanth Krishnamurthi, Farhan Gandhi, RPI
<b>Refreshment Break: 3:15 - 4:00</b>					
4:00 - 4:30 Paper #4	<b>Coaxial Rotor Wake Measurements in Hover Using Phase-Resolved and Time-Resolved PIV</b> (318) Patrick Mortimer*, Jayant Sirohi, Univ. of Texas Austin; Juergen Rauleder, Stefan Platzer, Technical Univ. of Munich	<b>Computational Study of the Side-by-Side Urban Air Taxi Concept</b> (60) Patricia Ventura Diaz*, Seokkwan Yoon, Wayne Johnson, Jasim Ahmad, NASA Ames	<b>Advanced Rotorcraft Aeromechanics Simulations Using HPCMP CREATE(TM)-AV Helios</b> (271) Beatrice Roget*, Science Tech Corp; R. Blumenstein, H. Saberi, M. Taheri, Adv. Rotorcraft Tech ; J. Sitaraman, Parallel Geometric	<b>Augmented-Reality Multimodal Cueing for Obstacle Awareness: Towards a New Topology for Threat-Level Presentation</b> (433) Martine Godfroy-Cooper*, Joel Miller*, SJSU/NASA/ADD; Zoltan Szoboszlai, US Army ADD	<b>Flight Testing of Coupled Flight Controls toward Reducing Pilot Workload during Landing in DVE</b> (209) Jeffery Lusardi, Brian Fujizawa*, Mark Cleary, US Army
4:30 - 5:00 Paper #5	<b>Rotorwash Characterization of a Counter-rotating Coaxial Rotor System</b> (313) Lokesh Silwal*, Karllye Munz, Vrishank Raghav, Auburn University	<b>Performance and Design Optimization of the F-Helix eVTOL Concept</b> (57) Umberto Saetti*, Joe Horn, Jacob Enciu*, Penn State Univ.	<b>Aeromechanics of a Coaxial Mars Helicopter using High-Fidelity CFD/CA</b> (346) Daniel Escobar*, Inderjit Chopra, Anubhav Datta, Univ. of Maryland	<b>An Alternative Forcing Function for Identifying Pilot Frequency Response Using a Series of Mesas</b> (384) Edward Bachelder*, San Jose State Univ. Research Foundation	<b>A quasi-Linear Parameter Varying (qLPV) Approach for Tiltrotor Conversion Modeling and Control Synthesis</b> (270) Hafiz Noor Nabi*, G. Quaranta, Politecnico di Milano; C. de Visser, M. Pavel, Delft Univ. of Tech.
5:00 - 5:30 Paper #6	<b>Blade Tip-Vortices of a Four-Bladed Rotor with Axial Inflow</b> (86) Andreas Goerttler*, Johannes Braukmann, Anthony Gardner, Markus Raffel, Christian Wolf, DLR	<b>Jaunt: Design, Build, and Test of an eVTOL Aircraft for Urban Air Mobility</b> (411) Kaydon Stanzione*, Jaunt Air Mobility LLC; Daniel Schrage*, Georgia Tech.; Apinut Sirojivisuth, PRICE Systems	<b>Adaptive, Parallel Discretization of Periodic Systems</b> (140) Judah Milgram*, NSWC Carderock Division	<b>Comparison of Two Visual Symbology Sets in Rotary-Wing Aircraft</b> (337) Kathryn Feltman, Kyle Bernhardt, Amanda Hayes*, US Army Aeromedical Research Lab	<b>Development of a Limit Avoidance Framework for Active Pilot Cueing</b> (389) Gonenc Gursoy, Aerotim Engineering; Zeynep Unal*, B.E Akmenek, I. Yavrucuk Middle East Technical Univ.
5:30 - 6:00 Paper #7	<b>Performance Effects of Hover In-Ground-Effect over Sloped Terrain</b> (354) John Tritschler*, John Holder, US Naval Test Pilot School; Joseph Milluzzo, US Naval Academy	<b>The Rapid Design to Prototype Process of the Hummingbuzz Individual Flying Machine</b> (383) Michel Lacerda, Daniel Schrage, Srujal Patel, Alistair Sequeira*, Dongjin Park, Zujia Huang, Georgia Tech.			<b>MPPI Parallel Trajectory Optimization for Guidance in Rotorcraft Shipboard Landing</b> (269) Vinodhini Comandur*, Robert Walters, J. V. R. Prasad, Georgia Tech.
6:00 - 6:30 Paper #8		<b>Hydrogen Fuel Cell and Battery Hybrid Architecture for Range Extension of Electric VTOL (eVTOL) Aircraft</b> (149) Wanyi Ng*, Mrinalgouda Patil, Anubhav Datta, Univ. of Maryland			<b>Longitudinal Control Strategy Investigation for Coaxial Compound Helicopters</b> (74) Ye Yuan, Renliang Chen, Nanjing Univ. Aeronautics & Astronautics; Douglas Thomson*, Univ. of Glasgow

Main author is listed first, \* denotes presenter.

<b>Technical Session C: Wednesday, May 15 - Afternoon, 1:45 p.m. - 6:00 p.m.</b>				
	<b>HUMS II: Room 105B</b> Session Chair: <b>Catherine Cheung</b> NRC	<b>Operations: Room 304</b> Session Chair: <b>Daniel Janson</b> Boeing Co.	<b>Struct. &amp; Materials II: 107B</b> Session Chair: <b>Kit Fry</b> US Army AED	<b>Unmanned I: Room 103C</b> Session Chair: <b>Dr. Jack Langelaan</b> Penn State Univ.
1:45-2:15  Paper #1	<b>Progress Towards Autonomous Structural Health Management</b> (332) Avinash Sarlashkar*, Matthew Harrigan, Theodore Meyer, James Dzakowic, Darryl Toni, Sikorsky, Lockheed Martin Co.; Derrell Lorthridge, Nathaniel Bordick, US Army	<b>Numerical Study &amp; Optimization of a Novel Architecture of Vertiport and Vertistop for Urban Air Mobility</b> (124) Francesco Ielmini*, Edoardo Cacciavillani, Airbus Helicopters	<b>Post-Buckling Design Analysis for Stiffened Helicopter Fuselage Aluminum Panels</b> (298) Ismail Cengiz*, Turkish Aerospace; Faruk ELALDI*, Baskent University	<b>Design and Experimental Evaluation of a Multi-Ship Sensor-Based 3D World Modeling Architecture</b> (20) Chris Boggs*, Max Taylor, Vladislav Gavrilets, Collins Aerospace
2:15-2:45  Paper #2	<b>Paint Additive/Non-Destructive Interrogation (PANDI) System for Early Detection of Corrosion</b> (69) Stephen Keller, Alexander Naumov, Gregory Waligorski, Martin Lopez, Bryan Holloway, Robert Mino, Victor Grubsky, Eric Gans*, Physical Optics; John Moffatt, US Army	<b>Speed and Maneuverability Benefits of Sikorsky's X2 Technology™ vs. Air Defense Artillery</b> (136) Alex Weintraub, Bjorn Foote*, Jordan Kaye, Sikorsky, Lockheed Martin Co.; Mark Robeson, Jay Kiser, Daniel Camp, US Army ADD	<b>Structural Optimization of Composite Rotor Blade for Unmanned Helicopter using Variational Asymptotic Beam Sectional Analysis and Multi-Objective Bat Algorithm</b> (436) Abhiram Dandinasivara, Ranjan Ganguli*, Dineshkumar Harursampath, Indian Institute	<b>Manned-Unmanned Teaming Cooperative Formation Flight - A Project Review</b> (284) Andreas E. Voigt*, Alexander Donkels, DLR; Kristian Fettig, TU Braunschweig
2:45-3:15  Paper #3	<b>Spectrum Reconstruction for Oil Cooler On Condition Monitoring</b> (159) Andrew Wilson, Daniel Wade, US Army AMRDEC; Daniel Martinez*, US Army ERDC	<b>An Innovative Approach for Establishing Power Train Inspection Intervals of Modern Helicopters</b> (120) David Green*, Starmark Corporation; Hamid Nouri, Bell; Harrison Chin, HHC Data Lab; Abdel Bayoumi, Univ. South Carolina	<b>Hierarchically Organized Nanocomposites for Enhanced Fatigue Life of Rotorcraft Components</b> (193) Mithil Kamble*, Aniruddha S Lakhnot*, Catain Picu, Nikhil Koratkar, RPI	<b>Helicopter Formation Control Algorithm for Manned-Unmanned Teaming</b> (45) Andreas Voigt, Alexander Donkels*, DLR
<b>Refreshment Break: 3:15 - 4:00</b>				
4:00-4:30  Paper #4	<b>Diagnostic Features from Aircraft Propulsion Bearings in Accelerated Aging Experiments</b> (366) Edward Zhu, Brian Dykas, Adrian Hood*, US Army Research Lab; Nenad Nenadic, Rochester Inst. Technology	<b>Development of a Probability of Hover Analysis Capability to Support Rotorcraft Conceptual Design</b> (39) Geoffrey Chen*, US Army Combat Capabilities Development Command	<b>Hybrid Natural Fiber Composites in a Helicopter Cabin Door - Mechanical Properties and Ecological Efficiency</b> (141) Katharina Strohrmann*, Nicolas Andr 'e, Hajek Manfred, Technical University Munich	<b>Real-time Path Planning for Time-Optimal Helicopter Shipboard Landing via Trajectory Parameterization</b> (304) Di Zhao*, Sandipan Mishra, Farhan Gandhi, RPI
4:30-5:00  Paper #5	<b>Model-based Engine Health for Turboshift Engines with Limited Instrumentation</b> (168) Daniel Cornelius*, Scott Hannula, GE Aviation	<b>Modeling Ice Accretion: Full Integration into Navier-Stokes Solver</b> (213) Avani Gupta*, Lakshmi Sankar, Georgia Tech.; Richard Kreeger, NASA Glenn Research Ctr.	<b>Parallel Sensitivity Analysis of Rotor Blade Cross-sections</b> (421) Alfonso Callejo*, Olivier Bauchau, Boris Diskin, Univ. of Maryland	<b>Flight Envelope Determination Using Physically Motivated Margin Indicators for Unmanned Helicopters</b> (285) Andreas E. Voigt*, Johann C. Dauer, Martin Laubner, DLR
5:00-5:30  Paper #6	<b>Vibration and Acoustic Emission Characteristics of a Gearbox Following Loss of Lubrication</b> (54) Brian Dykas*, Stephen Berkebile, US Army Research Lab; Jason Hines, NAVAIR	<b>Helicopter Trajectory Optimization after Aerial Slung Load Release</b> (260) Luofeng Wang*, Renliang Chen*, Xufei Yan, Nanjing Univ. of Aeronautics & Astronautics	<b>Development of a Comprehensive Rotorcraft Model to Study the Susceptibility of Teetering Rotors to Mast Bumping Accidents</b> (36) Joseph Robinson*, Kyle Collins, Dimitri Mavris, GA Tech.	<b>Flight Dynamic Modeling and Control of an Unmanned Helicopter During Autonomous Autorotation</b> (186) Sagar Setu*, Abhishek Abhishek, Indian Institute Tech. Kanpur
5:30-6:00  Paper #7	<b>Probabilistic Active Sensing Acousto-Ultrasound SHM Based on Non-Parametric Stochastic Representations</b> (401) Ahmad Amer*, Fotis Kopsaftopoulos, Rensselaer Polytechnic Institute	<b>NexGen UAS in the Counter Integrated Air Defense Environment</b> (174) Scott Swinsick*, Hendrik Gideonse, Boeing Co.		<b>Autonomy Experimentation in an Operationally Relevant Scenario</b> (371) Jason Jewell*, Aurora Flight Sciences
6:00-6:30  Paper #8	<b>Uncertainty Quantification of Guided Waves Propagation for Active Sensing Structural Health Monitoring</b> (410) Shabbir Ahmed*, Fotis Kopsaftopoulos, RPI			<b>Performance and Control of Variable Pitch Proprotors for Multi-Scale Quadrotor Biplane Tail-sitters (QBiTs)</b> (360) Brandyn Phillips*, Derek Safieh, Vikram Hrishikeshavan, Derrick Yeo, Inderjit Chopra, Univ. of Maryland

Main author is listed first, \* denotes presenter.

Technical Session D: Thursday, May 16 - Morning, 8:00 a.m. - 12:00 p.m.				
	Aerodynamics IV: Room 108B Session Chair: <b>Dr. Rohit Jain</b> US ArmyADD	Acoustics III: Room 105B Session Chair: <b>Dr. Doug Boyd</b> NASA Langley	Aircraft Design III: Room 103A Session Chair: <b>Michael Avera</b> US Army Research Lab	Dynamics III: Room 103B Session Chair: <b>Dr. Christoph Kessler</b> DLR
08:00 - 08:30 Paper #1	<b>2nd Rotor Hub Flow Prediction Workshop - Experimental Data Campaigns &amp; Computational Analysis</b> (225) Sven Schmitz*, Leonard Metkowski, David Reich, Nicholas Jaffa, Charles Tierney, Penn State Univ.; Louis Centolanza, Mathew Thomas, US Army ADD	<b>Acoustic Scaling for Small Rotors in Hover</b> (351) Charles Tinney*, John Valdez, University of Texas Austin	<b>Optimized Requirements Verification for Flexible Drive Shafts</b> (236) Raghu Iyer*, Joyel Schaefer*, Michael King*, UTAS	<b>Adaptive Frahm for Variable-Speed Rotor Helicopters</b> (97) Mark Ott*, ITT Enidine, Inc.
08:30 - 09:00 Paper #2	<b>Assessment of HPCMP CREATE™-AV Helios for Interactional Aerodynamics of Hub Wakes Impinging on a Horizontal Stabilizer</b> (214) Mark Potsdam*, US Army; Jayanarayanan Sitaraman, Parallel Geometric Algorithms	<b>High-Fidelity Multidisciplinary Design Optimization of Low-Noise Rotorcraft</b> (184) Li Wang*, Boris Diskin, Nat'l. Institute of Aerospace; Robert Biedron, Leonard Lopes, Eric Nielsen, Elizabeth Lee-Rausch, NASA Langley Research Ctr.	<b>Fifty-years of Fenestron Improvement in the Service of Safety</b> (71) Christophe Serr, Vincent Routhieau*, Airbus Helicopters	<b>H160 Dynamics Development: Setting New Standards</b> (111) Yan Skladanek*, Julien Hocquette, Paul Cranga, Airbus Helicopters
09:00 - 09:30 Paper #3	<b>Prediction of Rotor Hub Flow Using Mercury Framework</b> (301) Bumseok Lee*, Yong Su Jung, Dylan Jude, James Baeder, Univ. of Maryland	<b>Comparison of Acoustic Predictions Using Distributed and Compact Airloads</b> (374) Matthew Misiorowski*, Farhan Gandhi, RPI; Phuriwat Anusonti-Inthra, US Army Research Lab	<b>The Blue™ Edge Blade Continuation</b> (312) Jean-Francois Hirsch*, Paul Cranga, David Alfano, Vincent Gareton, Frederic Guntzer, Airbus Helicopters	<b>Prediction of AW609 Rotor Loads by Means of Neural Networks</b> (330) Davide Prederi*, Marco Favale, Alberto Angelo Trezzini, Leonardo Helicopters
<b>Refreshment Break: 9:30 - 10:00</b>				
10:00 - 10:30 Paper #4	<b>Effects of Transition Modeling on the Simulation of Helicopter Rotor Hubs</b> (143) James Coder*, University of Tennessee	<b>Aeroacoustic Study of Coaxial Rotor under Varying Trim Conditions and Rotor Orientations using Free Wake Analysis</b> (400) Kalki Sharma*, Kenneth Brentner, Penn. State Univ.; Seongkyu Lee, Zhongqi Jia, Univ. of California Davis	<b>35th Student Design Competition Graduate Winner: <i>Metaltail - A Reconfigurable VTOL Aircraft</i></b> Brandyn Phillips*, Fred Tsai*, Univ. of Maryland	<b>Experimental and Analytical Validation of Rotor Components Static Substantiation Process</b> (331) Davide Cuffiani*, Piergiorgio Ferro, Leonardo Helicopters; Fabrizio Petri*, Sistemi Dinamici
10:30 - 11:00 Paper #5	<b>Validation of Boundary Layer-Transition Computations for a Rotor with Axial Inflow</b> (217) Kurt Kaufmann*, Philip Stroer, Anthony Gardner, Normann Krimmelbein, DLR; C Lienard, P Gardarein, F Richez, ONERA	<b>Tonal Noise Control using Rotor Phase Synchronization</b> (103) Noah Schiller*, Kyle Pascioni, Nikolas Zawodny, NASA Langley Research Ctr.	<b>35th Student Design Competition Undergraduate Winner: <i>Kwatee - A Reconfigurable VTOL Aircraft</i></b> Ian Bahr*, Alexander Cheung*, Univ. of Maryland	<b>Vibration Reduction &amp; Rotor Performance Analysis of Lift-offset Rotors using Individual Blade Pitch Controls with Multiple Harmonic Inputs</b> (88) Jae-Sang Park*, Ye-Lin Lee, Young-Min Kwon, Chungnam Nat'l. Univ.; Do-Hyung Kim, Sanghyun Chae, Korea Aero. Rsch.
11:00 - 11:30 Paper #6	<b>Uncertainty Quantification for Laminar-Turbulent Transition on Airfoil and Fuselage</b> (196) Yong Su Jung*, James Baeder, Univ. of Maryland	<b>Rotor/Airframe Aeroacoustic Prediction for eVTOL UAM Aircraft</b> (352) Daniel Wachspress*, Michael Yu, Continuum Dynamics Inc.; Kenneth Brentner, Penn State Univ.		<b>Experimental Strain Measurements of Highly-Curved Blades</b> (251) Tyler Sinotte*, Olivier Bauchau, Univ. of Maryland
11:30 - 12:00 Paper #7	<b>Computational Assessment of Laminar-Turbulent Transition for a Rotor in Forward-Flight Conditions</b> (89) Jared Carnes*, James Coder, University of Tennessee	<b>Noise Prediction of Multi-rotor Unmanned Aerial Vehicle Considering Wake Interaction Effect</b> (424) Hakjin Lee, Duck-Joo Lee*, Korea Adv. Institute of Science & Tech.		<b>Effect of Ground Proximity on the Regressive Lag Mode during Ground Resonance : An Experimental Study</b> (295) Salini Sivadasan Nair*, Ranjith Mohan, Akshay Ramachandran, Bittesh Pandey, Rohith M, Indian Institute of Tech. Madras

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<b>Technical Session D: Thursday, May 16 - Morning, 8:00 a.m. - 12:00 p.m.</b>				
	<b>Manuf. Tech II: Room 107B Structure &amp; Materials III</b> Session Chairs: <b>Dr. Dhiren Marjadi, Altair Kit Fry, US Army AED</b>	<b>Modeling &amp; Sim II: Room 102AB</b> Session Chair: <b>Dr. Mike Jones DLR</b>	<b>Safety: Room 104AB</b> Session Chair: <b>Tony Randall Bell</b>	<b>Unmanned II: Room 103-C</b> Session Chair: <b>Dr. V. Hrishikeshavan Univ. of Maryland</b>
08:00 - 08:30  Paper #1	<b>Additive Manufacturing of C64 for Aerospace Gear Applications</b> (90) Thomas Kozmel*, Chris Kantner, Brittany Nez, Jeff Grabowski, Jason Sebastian, QuesTek Innovations; Jason Fetty, US Army	<b>Flight Simulator Testing to Enhance Comprehension and Modeling of Rotorcraft Pilot Couplings</b> (259) G. Quaranta, R. Paolini*, A. Zaroni, P. Masarati, M. Galli, M. Zago, Politecnico di Milano; M. Murawa, Poznan Univ.; G. Maisano, Leonardo; L. Frigerio, Lineup Aviation	<b>The Test Pilot Role in Risk Management of Helicopter Design and Test</b> (372) David Blair*, Sikorsky, Lockheed Martin Co.	<b>System Identification Guidance for Multirotor Aircraft: Dynamic Scaling and Test Techniques</b> (239) Christina Ivler, Elizabeth Rowe*, James Martin*, Univ. of Portland; Mark B. Tischler, Mark J.S. Lopez, US Army
08:30 - 09:00  Paper #2	<b>Selective Laser Melting of Aluminum Based Materials</b> (293) Radosław Wojtuszewski*, Aleksander Banas*, Mateusz Oliwa*, PZL Mielec, a Sikorsky Co.	<b>Towards a Wind Tunnel Testing Environment for Rotorcraft Operations Close to Obstacles</b> (218) Neda Taymourtash, Daniele Zagaglia, Giuseppe Gibertini, Giuseppe Quaranta*, Alex Zanotti, Politecnico di Milano	<b>Rotorcraft Flight Information Inference from Cockpit Videos using Deep Learning</b> (255) Hikmat Khan*, Ghulam Rasool, Nidhal Carla Bouaynaya, Rowan University; Charles Johnson, FAA	<b>Hover/Low Speed Dynamics Model Identification of a Coaxial Tricopter in Hover using Joint Input-Output Technique</b> (247) Subodh Bhandari, Sung Hyeok Cho*, V Gonzalez, California State Polytechnic Univ.; M. Tischler, US Army; K
09:00 - 09:30  Paper #3	<b>Analysis and Comparison between Different Joining Technology of Aircraft Structures including Innovative FSW &amp; RFSSW Processes</b> (361) Grzegorz Luty*, Agata Wronska, Jacek Andres, Waldemar Login, Tomasz Galaczynski, PZL Mielec, a Sikorsky Co.	<b>Flight Training Simulator Fidelity Req. to Address Rotorcraft Loss of Control In-flight</b> (323) Mark White*, Gareth Padfield, Neil Cameron, Univ. of Liverpool; Sunjoo Advani*, Int'l. Dev. Tech.; Linghai Lu, Liverpool Univ.	<b>Application of Principles, Processes and Technologies to Design and Develop the SkyFlight Risk Assessment</b> (314) Susanna De Bernardi*, Leonardo Helicopters	<b>Rotor Fault Detection and Identification on a Hexacopter Based on Statistical Time Series Methods</b> (296) Airin Dutta*, Michael McKay, Fotis Kopsaftopoulos, Farhan Gandhi, RPI
<b>Refreshment Break: 9:30 - 10:00</b>				
10:00 - 10:30  Paper #4	<b>Autonomous Camber Morphing of a Helicopter Rotor Blade with Temperature Change using Integrated Shape Memory Alloys</b> (263) Matthew DiPalma*, Farhan Gandhi, RPI	<b>Model-based Uncertainty Quantification, Propagation, and Analysis using Generalized Polynomial Chaos</b> (230) Jared Cooper*, Michael DeVore, Adam Reed, Barron Associates; David Klyde, Systems Technology	<b>Filter-Based Detection of the Proximity to Loss of Tail Rotor Effectiveness within Helicopter Flight Data Monitoring</b> (237) Paola Zanella*, Dimitri N. Mavris, Kyle B. Collins, Georgia Tech.; Charles Johnson, FAA	<b>Handling Qualities Based Assessment of Scalability for Variable-RPM Electric Multi-Rotor Aircraft</b> (190) Ariel Walter*, Michael McKay, Robert Niemiec, Farhan Gandhi, RPI; Christina Ivler, Univ. of Portland
10:30 - 11:00  Paper #5		<b>The Aerodynamic Effect Of An Oblique Wind On Helicopter Recovery To The Queen Elizabeth Class Aircraft Carrier</b> (157) Neale Watson*, Michael Kelly, Mark White, Ieuan Owen, Univ. of Liverpool	<b>System Safety for Vertical Flight</b> (428) John Hewitt*, Sikorsky Aircraft, a Lockheed Martin Co.	<b>Flight Test Comparison of Gust Rejection Capability for Various Multirotor Configurations</b> (335) Mark Lopez*, Mark Tischler, Ondrej Juhasz, US Army ADD; Anthony Gong, Frank Sanders, San Jose State Univ.; Jonathan Soong, Samuel Nadell, Universities Space Research Assoc.
11:00 - 11:30  Paper #6		<b>Interplay Between Optic Flow, Pilot Workload &amp; Control Response During Aggressive Approach to Hover Maneuvers for Three Vertical Lift Vehicle Models</b> (385) Edward Bachelder*, Martine Godfroy-Cooper, San Jose State Univ. Research Foundation; Bimal Aponso, NASA Ames	<b>A Score System to Prioritize Design Safety Features</b> (442) Matteo Ragazzi*, Giorgio Dossena*, Marco Terzi*, Barbara Nassi, Leonardo Helicopters	<b>Modeling and Trajectory Control of a Transitioning Quadrotor Biplane Tailsitter</b> (364) Jean-Paul Reddinger*, US Army Research Lab; Di Zhao, Sandipan Mishra, Kristoff McIntosh, RPI
11:30 - 12:00  Paper #7		<b>Multirotor Electric Aerial Vehicle Model Validation w/ Flight Data: Physics-Based &amp; System Identification Models</b> (238) Christina Ivler*, Univ. of Portland; Robert Niemiec*, Farhan Gandhi, RPI; Frank Sanders, San Jose State Univ. Research Foundation		<b>Mission Based Design Optimization of Fixed Pitch Coaxial Propeller System for VTOL UAV</b> (392) Abhishek Abhishek*, Pankaj Patil, Indian Institute of Tech. Kanpur

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<b>Technical Session E: Thursday, May 16 - Afternoon, 1:30 p.m. - 5:30 p.m.</b>				
	<b>Aerodynamics V: Room 108B</b> Session Chair: <b>Arnaud Le Pape</b> <b>ONERA</b>	<b>Adv. Vert. Flight III: Room 103A</b> Session Chair: <b>Andrew Kreschock</b> <b>US Army Research Lab</b>	<b>Crash Safety: Room 105B</b> Session Chair: <b>Dr. Joseph Pelletiere</b> <b>FAA</b>	<b>Dynamics IV: Room 103B</b> Session Chair: <b>Dr. Paul Cranga</b> <b>Airbus</b>
1:30 - 2:00  Paper #1	<b>Collaborative Airfoil Design for Dynamic Stall Performance</b> (128) Vineet Ahuja*, Stephen Barr, Combustion Research & Flow Tech.; Mark Potsdam, US Army ADD; Pourya Nikoueeeyan, Tanner Harms, Jonathan Naughton, Univ. of Wyoming	<b>Flight Power Modeling of VTOL Aircraft for Exploration of Titan</b> (155) Daiju Uehara*, Jayant Sirohi, Univ. of Texas Austin; Larry Matthies, Jet Propulsion Lab, California Institute of Tech.	<b>Evaluation of Composite Energy Absorbers for use in UAM VTOL Vehicle Impact Attenuation</b> (73) Justin Littell*, Jacob Putnam, Robin Hardy, NASA Langley Research Ctr.	<b>Whirl Flutter Investigation of Hingeless Proprotors</b> (169) Hyeonsoo Yeo*, US Army AMRDEC; Andrew Kreshock, US Army Research Lab
2:00 - 2:30  Paper #2	<b>Data-Driven Optimal Basis Clustering To Characterize Cycle-to-Cycle Variations in Dynamic Stall Measurements</b> (370) M. Ramasamy*, J. Wilson, P. Martin, US Army; A. Sanayei, STC Corp.; T. Harms, P. Nikoueeeyan, J. Naughton, Univ. of Wyoming	<b>Common Research Configuration for Collaborative Advancement of Scalable VTOL UAS Technologies</b> (414) Rajneesh Singh*, V. Hrishikeshavan, US Army Research Lab; Jayant Sirohi, Univ. of Texas Austin	<b>Evaluation of Impact Energy Attenuators and Composite Material Designs of a UAM VTOL Concept Vehicle</b> (114) Jacob Putnam*, Justin Littell, NASA Langley Research Ctr.	<b>Analytical Study of an Isolated Coaxial Rotor System with Lift Offset</b> (178) Jimmy Ho*, Science & Tech. Corp.; Hyeonsoo Yeo, US Army AMRDEC
2:30 - 3:00  Paper #3	<b>Simulation of Dynamic Stall on an Elastic Rotor in High-Speed Turn Flight</b> (150) Johannes Letzgius*, Manuel Keßler, Ewald Kramer, Univ. of Stuttgart	<b>Lichten Award Paper : Ground and Flight Tests of a Cable-Driven Four-Bar Linkage Robotic Landing Gear for Rotorcraft</b> (294) Benjamin Leon*, Claudio Di Leo, Julian Rimoli, GA Tech	<b>An Update on AVCP's Zero-Zero Safety System for VTOL Aircraft</b> (216) Roger Sloman*, Active VTOL Crash Prevention Ltd.	<b>Wind Tunnel Test on a Slowed Mach-Scaled Hingeless Rotor at High Advance Ratios</b> (265) Xing Wang*, Andre Bauknecht, Shashank Maurya, Inderjit Chopra, Univ. of Maryland
<b>Refreshment Break: 3:00 - 3:30</b>				
3:30 - 4:00  Paper #4	<b>Investigation of Active Rotor Design and Control for Performance Improvement</b> (205) Dominik Komp*, Sumeet Kumar, Amine Abdelmoula, Juergen Rauleder, Manfred Hajek, Technical Univ. Munich	<b>The Challenges for the Integration of the Drive Shaft in the RACER's Wing Configuration</b> (24) Martin Blacha*, Adriana Garcia-Rios*, Marc Schelcher, Airbus Helicopters	<b>Rotorcraft Hydrodynamic Ram Compliant and Inerted Self-Sealing Fuel Cell Structures</b> (288) Dennis McCarthy*, Lisa Chiu, Christopher Gatley, Clark Andrews, Jamie Childress, Boeing Co.; Mark Robeson, US Army AMRDEC	<b>Investigation of Structural Coupling Problems in Tiltrotor Aircraft</b> (321) Vincenzo Muscarello*, Politecnico di Milano
4:00 - 4:30  Paper #5	<b>Experiments on Flow Control of the Rotor via Synthetic Jets</b> (277) Xi Chen*, Qijun Zhao, Bo Wang, Yiyang Ma, Nanjing Univ. of Aeronautics & Astronautics	<b>A Systematic CFD-Based Examination of Rotor-Rotor Separation Effects on Interactional Aerodynamics for Large eVTOL Aircraft</b> (379) Richard Healy*, Matthew Misiorowski, Farhan Gandhi, RPI	<b>Methodologies to Assess the Influence and Cost Benefit of Technology on Vertical Lift Aircraft Mishaps and Fatalities</b> (409) Christopher Martin*, Thomas Allen, Mark Couch, Jack Law, Joshua Schwartz, Paul Jones, Institute Def. Analysis	<b>Stability Analysis of Whirl Flutter in a Nonlinear Gimballed Rotor-Nacelle System</b> (398) Christopher Mair*, Djamel Rezgui, Branislav Titurus, Univ. of Bristol
4:30 - 5:00  Paper #6	<b>RACER Aero-acoustic Propeller Analysis and Design</b> (317) Julien Decours*, Biel Ortun, Yves Delrieux, Joelle Bailly, Sylvette Canard-Caruana, ONERA; Raphael Fukari, Frederic Guntzer, Airbus Helicopters	<b>Numerical Simulation of Fluidic Oscillators for Flow Control</b> (50) Nicholson Koukpaizan*, Daniel Heathcote, Ari Glezer, Marilyn Smith, Georgia Tech.	<b>Evaluation of Collisions with Small Unmanned Aerial Vehicles and their Consequences to Rotorcraft</b> (19) Uli Burger*, Technische Hochschule Ingolstadt	<b>Time- and Frequency-Domain Whirl-Flutter Analysis using a Vortex Particle Method</b> (399) Ethan Corle*, Sven Schmitz, Penn State Univ.; Hao Kang, Matthew Floros, US Army Research Lab
5:00 - 5:30  Paper #7	<b>Assessment of Current CFD Performance Predictions for Novel Rotor Blade Planforms</b> (232) Thomas Fitzgibbon*, George Barakos, Mark Woodgate, Univ. of Glasgow	<b>Computational Modeling of Trailing Edge Fluidic Actuation for Rotor Blade Vibration Control</b> (175) Ryan Patterson*, Peretz Friedmann, Univ. of Michigan; Yuehan Tan, Ari Glezer, GA Tech.		

Main author is listed first, \* denotes presenter

<b>Technical Session E: Thursday, May 16 - Afternoon, 1:30 p.m. - 5:30 p.m.</b>			
	<b>Handling Qualities II: Room 107B</b> Session Chair: <b>Dr. Carlos Malpica</b> NASA Ames Research Ctr.	<b>Modeling &amp; Simulation III: Room 102AB</b> Session Chair: <b>Todd Smith</b> Sikorsky, Lockheed Martin Co.	<b>Propulsion III: Room 103C</b> Session Chair: <b>Bruce Jensen</b> Sikorsky, Lockheed Martin Co.
1:30 - 2:00 Paper #1	<b>Flight Test Assessment of the Break Turn and High-Speed Acceleration/Deceleration Mission Task Elements using a UH-60M Black Hawk</b> (256) Tom Berger*, Carl Ott, Jeffrey Cox, Paul De Cecchis, John Wood, US Army ADD	<b>Multi-Domain Model for Rotorcraft Countermeasure Dispensing</b> (191) Robert McKillip*, Todd Quackenbush, Continuum Dynamics Inc.	<b>Lessons Learned in Fabrication of a High-Specific-Torque Concentric Magnetic Gear</b> (181) Zachary Cameron*, Thomas Tallerico, Justin Scheidler, NASA Glenn Research Ctr.
2:00 - 2:30 Paper #2	<b>Flight Control Design and Simulation Handling Qualities Assessment of High Speed Rotorcraft</b> (167) Tom Berger*, Chris Blanken, Mark Tischler, US Army ADD; Joseph Horn, Penn State Univ.	<b>Helicopter Ship Landing Envelope for Model Predictive Control</b> (156) William Greer, Cornel Sultan*, Virginia Tech.	<b>Modeling Turboshaft Engines for the Revolutionary Vertical Lift Technology Project</b> (231) Christopher Snyder*, Michael Tong, NASA Glenn Research Ctr.
2:30 - 3:00 Paper #3	<b>Flight Test Evaluation of Proposed High-Speed Break Turn MTE</b> (160) James Bumbaugh*, John Tritschler, Christopher Mattei, Michael Mosher, Robert Barthelmes, US Navy	<b>A Framework for Modeling Two-Point Statistics of Coherence from a Database for Airwake with Helicopter Downwash</b> (35) Vaishakh Krishnan*, Gopal Gaonkar*, Florida Atlantic University	<b>Design of Composite Materials for Improved Loss-of-Lubrication Survivability of Hybrid Rotorcraft Gears</b> (206) Matthew Waller*, Kevin Koudela, Sean McIntyre, Penn State Univ.
<b>Refreshment Break: 3:00-3:30</b>			
3:30 - 4:00 Paper #4	<b>Agility Assessment of Helicopter Main Rotor Design</b> (250) Arda Yucekayali, Murat Senipek*, Yuksel Ortakaya, Turkish Aerospace	<b>Multidisciplinary, Multiobjective Trim Optimization for a Coaxial-Pusher Rotorcraft Configuration</b> (46) Thomas Herrmann*, Roberto Celi, James Baeder, Univ. of Maryland	<b>Intelligent Propulsion Materials for Rotorcraft Gas Turbine Engine Component Applications</b> (183) Muthuvel Murugan*, Anindya Ghoshal, Michael Walock, US Army Research Lab
4:00 - 4:30 Paper #5	<b>Handling Quality Analysis and Control Design using Polynomial Chaos Model-based Uncertainty Methods</b> (224) Jared Cooper*, Michael DeVore, Adam Reed, Barron Associates, Inc.; David Klyde, Systems Technology, Inc.	<b>Simple Inflow and Structural Dynamics of a Coaxial Rotor with Time Delays and Adjoint Variables</b> (10) Cory Seidel*, David Peters, Washington University St. Louis	<b>Material Property Characterization for Low Pressure Carburization Process Design using Computer Modeling</b> (27) Zhichao (Charlie) Li*, Justin Sims, Lynn Ferguson, DANTE Solutions, Inc.; Jason Fetty, Treven Baker, US ADD, AMRDEC
4:30 - 5:00 Paper #6	<b>Aggregate Investigation of Rotorcraft Approach Profiles and Pilot Control Inputs: Shipboard versus Shore Landings</b> (233) Erica Scates*, Phong Nguyen, Michael Belyea, NSW Carderock; J Tritschler, US Naval Test Pilot School; K Cahill, US Naval Air Systems Command; Cara Johnson, CACI	<b>Simulation and Analysis of Oscillating Airfoil Ice Shapes via a Fully Unsteady Collection Efficiency Approach</b> (199) Myles Morelli*, Alberto Guardone, Politecnico di Milano; Beckett Zhou, Technical University of Kaiserslautern	<b>Swept Volume Approach for the Characterization of Pumping Loss of Shrouded Meshed Cylindrical Gears</b> (134) Michael Hurrell*, HX5 Sierra, Irebert Delgado, NASA
5:00 - 5:30 Paper #7	<b>Flight Test Vehicle for Determination of Multi-Rotor UAV Trim Conditions</b> (391) Achal Singhal*, Ryan Thorpe, Matthew McCrink, James Gregory, Ohio State University	<b>Validation of a Dynamic Stall Model Extended to Pitching Moment and Drag with Unsteady, Yawed Free-Stream</b> (307) Michael Malick*, David Peters, Washington University St. Louis	<b>Advanced High Temperature Propulsion Materials Research Project: An Update</b> (420) Anindya Ghoshal*, US Army Research Lab; et.al.

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## Forum 75 Special Session Schedule (Room 108A)

### Monday, May 13

#### **Special Session 1 (1:30 pm – 3:00 pm):**

##### **The Army's Vision for Future Vertical Lift**

Moderated by COL Matt Isaacson, US Army, FVL CFT

- “Future Vertical Lift Needs,” COL Matt Isaacson, US Army, Ops Officer Future Vertical Lift Cross Functional Team
- “Army CS3/Future Long-Range Assault Aircraft (FLRAA),” COL Steve Clark, US Army, PM FVL, PEO Aviation
- “Army CS1/Future Attack Reconnaissance Aircraft (FARA),” Mr. Dan Bailey, FARA CP PM, Army Futures Command
- “Army Advanced Unmanned Aircraft Systems (AUAS),” COL Joseph Anderson, PM UAS, PEO Aviation

#### **Special Session 2 (3:30 pm – 5:30 pm):**

##### **Perspectives on 75 Years of Vertical Flight**

Moderated by Frank Colucci, Senior Editor, *Vertiflite*

- “Rotors on the Rooftop: The 'I Want' Song of Vertical Flight,” Roger D. Connor, Vertical Flight Curator, Smithsonian National Air and Space Museum
- “Flying Igor's Nightmare: The Early Years of USCG Helicopter Aviation,” Beth L. Crumley, Assistant Historian of the US Coast Guard
- “Advancing Vertical Flight: The History of AHS/VFS,” Rhett Flater, Executive Director Emeritus, AHS International

### Wednesday, May 15

#### **Special Session 3 (8:00 – 9:30 am):**

##### **US Military Programs Flight Test Panel**

Moderated by Lt Col Rory Freely, USMC, Executive Officer, US Naval Test Pilot School

- Mr. Bob Nantz, Joint Strike Fighter (JSF) Program Office, Tech. Specialist for Performance & External Environment
- LCDR Raymond Miller, US Navy, Small Tactical Unmanned Aircraft System (UAS) Program Office, Naval Air Systems Command
- Mr. Raymond Dagenhart, V-22 Lead Test Engineer, Air Test & Evaluation Squadron HX-21, Naval Air Warfare Center
- LT Neil Whitesell, US Navy, Fire Scout Project Pilot, Air Test & Evaluation Squadron UX-24, Naval Air Warfare Center
- Dr. John “JT” Tritschler, Rotary Wing Instructor, US Naval Test Pilot School

#### **Special Session 4 (10:15 am – 12:15 pm):**

##### **US Army Aviation Program Briefings**

Moderated by COL Robert Barrie, PEO Aviation Military Deputy

- Mr. Rodney Davis, Deputy PM Cargo Helicopters
- LTC Jeffrey Poquette, PM Apache Production and Fielding
- MAJ Marshall Gray, APM H-60M Utility Helicopters
- Mr. Bob Sheibley, Deputy PM Aviation Turbine Engines
- Dr. Wayne Hudry, Deputy PM Multi-National Special Project Office (MASPO)

#### **Special Session 5: (1:45 – 3:15 pm):**

##### **NATO Next Generation Rotorcraft Capabilities**

Moderated by Dan Bailey, US Army Futures Command

- NGRC Team of Experts (TOE), Dan Bailey, US Army Futures Command
- Science & Technology Organization (STO), Pat Collins, UK Defence Equipment & Support

- NATO Industry Advisory Group (NIAG) Sub Group Study SG-219: Next Generation Rotorcraft Capabilities, Dan Newman, The Boeing Company
- NIAG Sub Group Study SG-239: Integrated Sustainability for the Next Generation Rotorcraft, Chris Lyman, US Army Aviation Development Directorate

#### **Special Session 6 (4:00 – 6:00 pm):**

##### **US Navy/US Marine Corps Program Manager Briefings**

Moderated by Timothy E. Gowen, Asst. Program Exec. Officer Engineering, US Navy PEO(A)

- COL Scott Wallace & LTCOL Matt Gidley, USMC PMA-275, V-22 Joint Program Office
- Mr. David Baden, PMS-276, USMC Light/Attack Helicopter
- Ms. Jamie Grubb, PMS-261, H-53 Heavy Lift Helicopters
- Mr. Mike Fallon, PEO(A) Science & Technology

### Thursday, May 16

#### **Special Session 7 (8:00 am – 9:30 am):**

##### **Urban Air Mobility Innovations**

Moderated by Dr. Ken Rosen, ASTA

- Bill Goodwin, Head of Policy, Regulatory, Legal, Skyryse
- Don Woodbury, Chief Technology Advisory, Skyworks Global
- Kaydon Stanzione, Founder, Jaunt Air Mobility

#### **Special Session 8 (10:00 am – 12:00 pm):**

##### **Challenges in Electric VTOL**

Moderated by Chris Silva, NASA Ames Research Center

- Chris Silva, NASA Revolutionary Vertical Lift Technology (RVLT)
- Davis Hackenberg, NASA Urban Air Mobility (UAM) Grand Challenge
- Parimal Kopardekar, NASA Unmanned Traffic Management (UTM) Project
- Cliff Johnson, FAA Aviation Research Division, NextGen Tech Center Office
- Gwen Lighter, CEO, The GoFly Prize
- LTC Nathan Diller, USAF, J-8 Joint Staff

#### **Special Session 9 (1:30 – 3:00 pm):**

##### **Electric VTOL System Safety Panel**

Moderated by Jonathan Hartman, Disruptive Technology Lead, Sikorsky, A Lockheed Martin Co.

- Patrick Darmstadt, Drive Systems Engineer, Boeing
- Sean Redfern, Director Sales & Business Development, Associated Aircraft Group
- Brandon Keene, Chief Technology Officer, BLADE
- Ife Ogunleye, Acting Manager, Regulations and Policy, Rotorcraft Standards Branch, FAA

#### **Special Session 10 (3:30 pm – 5:30 pm):**

##### **Progress in Development of Electric VTOL**

Moderated by Jim Sherman, Vertical Flight Society

- “Misconceptions of eVTOL Aircraft for UAM,” Mark Moore, Director of Aviation Engineering, Uber Technologies
- “The Nexus Air Taxi,” Scott Drennan, VP Innovation, Bell
- “Electric VTOL at Airbus,” Tomasz Krysinski, VP Research & Innovation, Airbus Helicopters
- “Boeing's Passenger Air Vehicle & Cargo Air Vehicle eVTOL Demonstrators,” Brian Yutko, Aurora Flight Sciences, a Boeing Company