

8th Biennial Autonomous VTOL Technical Meeting & 6th Annual Electric VTOL Symposium 2019

Mesa, Arizona, USA
28 January – 1 February 2019

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Monday, January 28, 2019: Registration Desk Hours 7:00 am–5:00pm (Canyon Foyer)		
8:00 am – 5:00 pm: Short Course on Electric VTOL Design , Dr. James Wang		
Tuesday, January 29, 2019: Registration Desk Hours 7:00 am–5:00pm (Canyon Foyer)		
Tuesday-Thursday: Exhibits (Canyon AB Foyer)		
Plenary Presentations (Canyon Ballroom)		
Needs for Future Autonomous VTOL Aircraft Moderator: Dr. Ram JanakiRam, The Boeing Co.		
8:00–8:10	Welcome , Dr. Ram JanakiRam, The Boeing Co.	
8:10–8:30	Autonomy for Next Generation VTOL Systems , Dr. Bill Lewis, US Army, Aviation Development Directorate	
8:30–9:00	The Electric VTOL Revolution , Mike Hirschberg, Vertical Flight Society	
9:00–9:30	Army VTOL UAS Development Efforts , LTC Mike Osmon, US Army, Aviation Development Directorate	
9:30–10:00	Agility, Cyber and Emerging Technologies for Naval UAS , Dr. Robert Ernst, NAVAIR PMA-266	
10:00–10:30 am Break Sponsored by Honeywell		
10:30–11:00	Analyzing Electric VTOL for the Joint Force , Lt Col Nathan P. Diller, US Air Force, J8 Joint Force Integration Cell, Joint Staff	
11:00–11:30	Boeing's Autonomous Systems Portfolio , Mark Jordan, Boeing Autonomous Systems	
11:30–12:00	Needs for the Uber Elevate Ecosystem , Mark Moore, Uber	
12:00–1:30 pm Lunch Sponsored by The Boeing Co.		
Track	Autonomous VTOL Technical Meeting (Canyon Rooms)	Electric VTOL Symposium (Canyon Rooms)
Session	UAV Design, Analysis and Testing	Progress in Electric VTOL
Moderator	Dave Mittleider, Boeing	Mike Hirschberg, Vertical Flight Society
1:30–2:00	Development of the Quad Tilt Prop UAV , Seongwook Choi, Korea Aerospace Research Institute 1	The XTI TriFan 600 , Bob Labelle, CEO, XTI Aircraft N/A
2:00–2:30	Development of UAV-Scale Cyclocopter , Adam Kellen, Joel White and Moble Benedict, Texas A&M University 8	Terrafugia TF-2 Overview , Carl Dietrich, Co-Founder/CTO, Terrafugia N/A
2:30–3:00	Configuration Redesign & Prototype Flight Testing of an Unmanned Fixed-Wing eVTOL Aircraft with Under-Fuselage Hover Lift & Pusher Wingtip Propulsion System , Philipp Stahl, Christian Rößler and Mirko Hornung, Technical University of Munich 19	Karem Butterfly , Ben Tigner, President, Karem Aircraft N/A
3:00–3:30	Comparative eVTOL UAV Design Optimization , Thomas Seren, Christian Rößler and Mirko Hornung, Technical University of Munich 29	Electric VTOL on the Boeing Horizon , Troy Rutherford, Senior Director for eVTOL, Boeing NeXt N/A
3:30–4:00 pm Break Sponsored by XTI Aircraft		
Session	UAV Design, Analysis and Testing (con't)	Challenges in Electric VTOL
Moderator	Dave Mittleider, Boeing	Jim Sherman, SAE International
4:00–4:30	Analysis Methods for Tilting Wing and Tailsitter E-VTOL Configurations , Todd R. Quackenbush, Daniel A. Wachspress, Glen R. Whitehouse and Michael K. Yu, Continuum Dynamics, Inc. 42	Distributed Electric Propulsion (DEP) Failure Modes , Patrick Darmstadt, The Boeing Co. [technical paper] N/A
4:30–5:00	NexGen UAS Take-off and Landing Methods and Sizing Studies Solution for UAS , Robin Preator, The Boeing Co. 52	Gust Rejection , Nick Brake, Empirical Systems Aerospace N./A
5:00–5:30	NexGen UAS in the Counter Integrated Air Defense Environment , Scott Swinsick, Hendrik Gideonse, Keith Meeker and Mark Clemente, The Boeing Co. N/A	VTOL Flight Control for Safety , Justin Paines, Chief Test Pilot, Joby Aviation N/A
6:30–7:00 pm Reception Sponsored by Karem Aircraft (Courtyard, weather permitting; Canyon rooms, inclement weather)		

STEM Trailer Tour

Presented by Rick Gutridge, President, Technical Research & Engineering Co.

Thursday, January 31 @ 9:00 am–8:00 pm

Public viewing of a trailer for science, technology, engineering and math (STEM) education and a demonstration of its educational activities and simulators will be held outside the conference center entrance. Light refreshments will be available.

symposium presentations will vary in length from 20–30 minutes. Symposium panels will be primarily discussion.

Thank you
to our host



Vertical Flight Society
Arizona Chapter

Note: Electric VTOL



A special thanks to the following chapter officers for their tireless support of this event:
Kendra Befort (Deputy Technical Chair), Christa Luna (Administrative Chair), Ram JanakiRam (Technical Chair) and Tonja Reinert (Arizona Chapter President)

Wednesday, January 30, 2019: Registration Desk Hours 7:00 am–5:00pm (<i>Canyon Foyer</i>)		
Track	Autonomous VTOL Technical Meeting (<i>Canyon rooms</i>)	Electric VTOL Symposium (<i>Canyon rooms</i>)
Session Moderator	UAV Design, Analysis and Testing II <i>Hieu Ngo, Boeing</i>	Standards and Regulations Panel <i>Tom Gunnarson, Kitty Hawk</i>
8:00–8:30	Precision Docking for Multi-UAV Cooperative Transportation , Kevin Webb, Jared Elinger and Jonathan Rogers, Georgia Institute of Technology 62	<ul style="list-style-type: none"> • Anna Dietrich, Co-Founder, Terrafugia • Ajay Sehgal, Chief Engineer, KBRWyle • Dr. Mark DeAngelo, Aerospace Standards Engineer, SAE International • Greg Bowles, VP, Global Innovation & Policy, GAMA
8:30–9:00	New Architectures for VTOL All-Electric Craft Using Enhanced Specific Power Electric Motor , Oved Zucker, POLARIX Corporation and Christopher Liu, University of California 69	
9:00–9:30	Algorithmic Icing Detection for On-Demand Electric Aircraft , Robert McKillip, Jr., Andrew Kaufman, Todd Quakenbush, Continuum Dynamics, Inc. 75	
9:30–10:00	Fleetwide Integrated Prognostics Health Management for Emerging eVTOL Operations , Andrew Vechart, Sentient Science and Jacek Kawecki, Uber 86	
10:00–10:30 am Break Sponsored by Empirical Systems Aerospace		
Session Moderator	UAV Design, Analysis and Testing (cont) <i>Hieu Ngo, Boeing</i>	System Safety Panel <i>Dan Newman, The Boeing Co.</i>
10:30–11:00	Multi Objective Optimization of Wiring Harnesses for Overall System Performance of Electric Fixed Wing VTOL UAVs , Sebastian Oberschwendtner, Christian Rößler and Mirko Hornung, Technical University of Munich 95	<ul style="list-style-type: none"> • Jonathan Hartman, Disruptive Technologies Lead, Sikorsky, a Lockheed Martin Company • Kyle Heironimus, Innovation Engineer, Bell • Andrea Signorini, Head of Safety & Airworthiness, Sistemi Dinamici, a Leonardo company
11:00–11:30	Resolving the Conflict Between Ship Design and UAV Launch and Recovery Deck Limits , Bernard Ferrier, Dr. Robert Ernst and Ajay Sehgal, Naval Air Systems Command 112	
11:30–12:00	Challenges for Vehicle and Occupant Safety in Autonomous Electric Vertical Take-off and Landing (eVTOL) Vehicle Crashworthiness , Justin Littell, NASA Langley Research Center 127	
12:00–1:30 pm Lunch Sponsored by Terrafugia		
Session Moderator	UAV Aerodynamics and Noise <i>Robin Preator, Boeing</i>	Vehicle Technologies <i>Johnny Doo, International Vehicle Research</i>
1:30–2:00	Aerodynamic Modelling of Coaxial Counter-Rotating UAV Propellers , Moritz Thiele and Mirko Hornung, Technical University of Munich 144	<ul style="list-style-type: none"> • Hybrid Electric Propulsion System Advantages & Disadvantages, Eric Blumer, Honeywell N/A • New Lithium Sulfur Battery Development, Dr. Zachary Favors, Nextech Batteries N/A • Fuel Cell Technology, Dr. Rick Sickenberger, Teledyne Energy Systems N/A • Demonstration of an Autonomous Optical Launch & Recovery System, Avinash Gandhe, SSCI [technical paper] N/A • A Multi-Physics Prognostics Framework for Urban Mobility Operations, Dr. Amine Chigani, Sentient Science N/A
2:00–2:30	Scaling Investigation of Electric Quasi-Quadrotor Hover Endurance , Budhyant Venepalli and Dr. Stefan Dancila, University of Texas at Arlington 157	
2:30–3:00	Empirical Study of Aerodynamic Interference for Mid-air Docking Strategies for Multirotors , Karan Jain, Trey Fortmuller and Mark W. Mueller, University of California, Berkeley N/A	
3:00–3:30	CFD-CSD Coupled Aeroelastic Analysis of a Highly Flexible Flapping Wing in Hover , Xuan Yang and Moble Benedict, Texas A&M University 179	
3:30–4:00 pm Break Sponsored by Sentient Science		
Session Moderator	UAV Aerodynamics and Noise (cont) <i>Robin Preator, Boeing</i>	Missions and Applications <i>Jim Sherman, SAE International</i>
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4:30–5:00	Developing Noise Metrics for Urban VTOL Aircraft: A Progress Report , David Josephson, Josephson Engineering 205	
5:00–5:30	Aerodynamic and Mechanical Design of a Morphing Winglet for a Quadrotor Biplane Tail-sitter , Peter Ryseck, Vikram Hrishikeshavan, Derrick Yeo and Inderjit Chopra, UMD 211	
5:30–7:00 pm	Reception and Banquet Sponsored by Bell (<i>Canyon Ballrooms</i>); Cash Bar Banquet Keynote: "Autonomy at Bell," Michael Thacker, Executive VP for Technology & Innovation, Bell	

Note: Electric VTOL symposium presentations will vary in length from 20–30 minutes. Symposium panels will be primarily discussion.

Want to learn more about in Electric VTOL? Check out the Vertical Flight Society's "Electric VTOL News" and subscribe to the free eVTOL eNewsletter or check out the VFS World eVTOL Aircraft Directory: www.eVTOL.news

Thursday, January 31, 2019: Registration Desk Hours 7:00 am–5:00 pm (Canyon Foyer)		
Track	Autonomous VTOL Technical Meeting (Canyon rooms)	Electric VTOL Symposium (Canyon rooms)
Session	UAV Controls, Flight Dynamics and Navigation I	Infrastructure and Passenger Experience
Moderator	<i>Jason Graham, Boeing</i>	<i>Michael Dymont, NEXA Advisors</i>
8:00–8:30	Stabilization of a Quadrotor in Wind with Flow Sensing: Linear Modeling and Control for Attitude and Position Hold , William Craig and J.T. Lewis, Derek A. Paley, University of Maryland 219	Urban Air Mobility (UAM) — Economics and Global Markets , Michael Dymont, NEXA Advisors N/A
8:30–9:00	An Assessment of Heave Response Dynamics for Electrically Driven Rotors of Increasing Diameter , Ariel Walter, Michael McKay, Robert Niemiec, Farhan Gandhi, Colin Hamilton, Rensselaer Polytechnic Institute 229	Vertiport Integration Constraints , Rex Alexander, 5-Alpha N/A
9:00–9:30	Kinematic Velocity Commander for Obstacle Field Navigation , Chad Goerzen, San Jose State Univ., Marc Takahashi, Matt Whalley, US Army ADD; Maj. Mark Cleary, Jeffrey Cox, US Army AMRDEC 237	Vertiport Design Possibilities , Mark Pilwallis, Gannett Fleming N/A
9:30–10:00	Position Control of an Autonomous Unmanned Aerial Vehicle (UAV) Based on Accelerometer Response for Indoor Navigation , Sagufta Kapadia and Syed Misbahuddin, Vaughn College of Aeronautics and Technology N/A	eVTOL Noise Considerations , Dr. Ken Brentner, Penn State University N/A
10:00–10:30 am Break Sponsored by Thales		
Session	UAV Controls, Flight Dynamics and Navigation I (cont)	eVTOL Opportunities
Moderator	<i>Jason Graham, Boeing</i>	<i>Mike Hirschberg, Vertical Flight Society</i>
10:30–11:00	Development of a Reconfigurable Multicopter Flight Dynamics Model from Flight Data Using System Identification , Mark J. S. Lopez, Mark B. Tischler, Ondrej Juhasz, Anthony Gong, Frank C. Sanders, US Army Aviation Development Directorate; San Jose State University 261	A Review of Current Technology and Research in Urban On-Demand Air Mobility Applications , Nicholas Polaczyk and Enzo Trombino, Iowa State University [technical paper] 333
11:00–11:30	A Comprehensive Simulation Framework to Certify Autonomous eVTOL Aircraft , Kara Gremillion, ANSYS, Inc. 272	A Venture Capitalist's Perspective on eVTOL , Peter Shannon, Levitate Capital N/A
11:30–12:00	Improvements Gust Tolerance of a Cyclocopter UAV using Onboard Flow Sensing , Elena Shrestha, Derrick Yeo, Vikram Hrishikeshavan and Inderjit Chopra, University of Maryland 249	<i>Exhibitor Showcase:</i> <ul style="list-style-type: none"> • eVTOL Aircraft Analysis Tools Continuum Dynamics, Dan Wachspress N/A • DSIAC Overview: Defense Systems Information Analysis Center, Daniel Whipp N/A • Door-to-Door eVTOL, NFT, Guy Kaplinsky N/A • OpenECUs for eVTOL, Pi Innovo, Dwight Hansell N/A
12:00–1:30 pm Lunch Sponsored by NEXA		
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Moderator	<i>Jason Graham, Boeing</i>	<i>Bruce Holmes, SmartSky Networks</i>
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1:30–2:00	Horizon Estimation from Thermal Cameras for Unmanned Aerial Vehicles , Keith Sponsler and Srikanth Saripalli, Texas A&M University 290	
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Session	eVTOL and VTOL Design	eVTOL for Good
Moderator	<i>Hieu Ngo, Boeing</i>	<i>Johnny Doo, International Vehicle Research</i>
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3:30–4:00	IGBT Robustness Capabilities and Setting Appropriate Protection Thresholds in High Power Propulsion Inverters , Satyavrat Laud, Renesas Electronics America, Automotive Unit 122	
4:00–4:30	Usability of a Steering Wheel Control Concept for a Highly Augmented Personal Helicopter , Bianca Schuchardt, DLR Institute of Flight Systems, German Aerospace Center 317	
4:30–5:00	Integrated Occupant Safety of Urban Air Transport Emergency Landing Applications , Gerardo Olivares, F. Caralt, and A. Vina; National Institute for Aviation Research and BRS Aerospace 326	
5:00–5:30	Complexities of Lightning Certification of VTOL Aircraft , George Tian and Justin P. McKennon, NTS Lightning Technologies 312	Electric VTOL Symposium Wrap-up , Mike Hirschberg, VFS Executive Director N/A

Additional Paper:

Evaluation of Reconfigurable Rotorcraft Concepts as Viable Combined High Efficient Hover and Forward Flight Solutions for Unmanned Aerial Systems (UAS), David Adams, Daniel P. Schrage, Carter Crouch 165

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