Transformative Vertical Flight 2020

Aeromechanics for Advanced Vertical Flight Technical Meeting **Jan. 21-23, 2020**
International Powered Lift Conference **San Jose, CA, USA**
7th Annual Electric VTOL Symposium

Presented By

Vertical Flight Society

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The International Powered Lift Conference (IPLC) rotates between and is jointly supported by the American Institute of Aeronautics & Astronautics, the Royal Aeronautical Society, SAE International and VFS. This year it is hosted by VFS and integrated into the technical paper tracks with the Aeromechanics Technical Meeting.

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Monday, January 20, 2020: Badge Pick-up Hours: 3:00 pm – 5:00 pm (Gateway Foyer)

7:00 am – 9:00 am: Short Course on Electric VTOL Fundamentals, Short Course Badge Pick-up *(Donner Foyer)*

8:00 am – 5:00 pm: Short Course on Electric VTOL Fundamentals, Dr. Anubhav Datta, Dr. Brad Paden, Bob Hess, Dr. James Baeder *(Donner)*

Tuesday, January 21, 2020: Badge Pick-up Hours: 7:00 am – 5:00 pm (Gateway Foyer)

Tuesday – Thursday: Exhibits *(Bayshore Foyer)*

Plenary Presentations *(Oak-Fir-Pine)*

Opening Plenary and eVTOL Symposium Online Q&A

*Please go to **bit.ly/tvf2020** to ask and vote on questions for the speakers during the Opening Plenary and eVTOL Symposium. While you're there, please take a minute to answer a few survey questions about what part of the industry you're in, your research priorities, and potential interest in NASA tools and/or collaboration!*

Transformative Vertical Flight 2020 Moderator: Colin Theodore, NASA

(0800 – 0810)	**Welcome and Introductions,** Colin Theodore, NASA, and Mike Hirschberg, VFS
(0810 – 0835)	BG Walter Rugen, Director, US Army Future Vertical Lift Cross-Functional Team, US Army
(0835 – 0900)	Parimal Kopardekar, Director of NASA Aeronautics Research Institute, NASA
(0900 – 0930)	Mike Romanowski, Aircraft Certification Service (AIR), Director of the Policy & Innovation Division, Federal Aviation Administration (FAA)
(0930 – 1000)	Nathan Diller, Assistant Director of Aeronautics, White House Office of Science and Technology Policy (OSTP)
(1000 – 1030)	*Networking Break in Exhibits (Bayshore Foyer)*

Transformative Vertical Flight 2020 Moderator: Jim Sherman, VFS

(1030 – 1100)	*Glenn Isbell, Vice President, Rapid Prototyping & Manufacturing Innovation, Bell Flight*
(1100 – 1130)	*Rick Mange, F-35 Chief Engineer, Lockheed Martin*
(1130 – 1200)	*Mark Moore, Engineering Director of Aviation, Uber*
(1200 – 1330)	*Lunch in Exhibits (Bayshore Foyer)*

Electric VTOL Symposium (Oak-Fir) Moderator: Carl Russell, NASA

(1330 – 1500)	***Ride-Sharing Panel*** *In a few areas, Urban Air Mobility is already a reality. This session provides insights from operators who are moving urban passengers from place to place within the current airspace system.* ***Moderator:*** ***Carl Russell, NASA*** *Kolin Schunck, Lufthansa Innovation Hub* *Brandon Keene, Blade* *Luke Fischer, UberCopter* *Danny Sitnam, HeliJet*
(1500 – 1530)	*Networking Break in Exhibits (Bayshore Foyer)*

Electric VTOL Symposium (Oak-Fir) Moderator: Graham Warwick, *Aviation Week*

(1530 – 1710)	***eVTOL Industry Updates*** The first eVTOL/Urban Air Mobility vehicles are in flight testing – getting the flight characteristics correct, and working out the bugs. As more companies announce solutions to this emerging market, they will encounter similar issues and challenges. This session provides valuable information from systems / flight test of various eVTOL platforms configurations.
	Vahana's Successful Flight Test Campaign Completion, *Zach Lovering, Vice President of Urban Air Mobility Systems, Airbus A^3*
	Eradicating Pilot Error, *Justin Paines, Chief Test Pilot, Joby Aviation*
	Delivering Bulk and Standard-Container Cargo to Impossible Locations, *Ed De Reyes, Chairman and CEO, Sabrewing Aircraft*
	PA890 eVTOL Program Update, *John Piasecki, President & CEO, Piasecki Aircraft*
(1710 – 1730)	**Certification and event Updates from Europe and China,** *Willi Tacke, Flying Pages GmbH*
(1730 – 1830)	***Reception in Exhibits (Bayshore Foyer)***

Wednesday, January 22, 2020: Badge Pick-up Hours: 7:00 am – 5:00 pm (Gateway Foyer)

Electric VTOL Symposium (Oak-Fir) Moderator: Parimal Kopardekar, NASA

(0800 – 1000)	***Manufacturing & Lightweighting Opportunities*** Managing the supply chain for eVTOL / UAM will provide unique challenges for most aerospace developers. This along minimizing structural weight to enable longer flight time will be critical to eVTOL success. This session will cover these topics in detail.
(0800 – 0830)	**Supply Chain Management Considerations for UAM and the Aerospace Ecosystem,** *Parimal Kopardekar, NASA*
(0830 – 0840)	**Thermoplastics Impact on Scaling eVTOL Production Costs and Rates,** *Jay Wakenshaw, Toray-TAC*
(0840 – 0910)	**How Lightweight Thermoplastic-Based Solutions for Commercial Aerospace Can Support eVTOL,** *Gilles Larroque, Victrex*
(0910 – 0930)	**Designing Light Weight Products Faster and Cheaper — History and Future,** *Dhiren Marjadi, Altair*
(0930 – 1000)	**UAM and Composite Materials & Structures,** *Colleen Pritchett/Imad Atallah, Hexcel*
(1000 – 1030)	*Networking Break in Exhibits (Bayshore Foyer)*
(1030 – 1200)	***eVTOL Cargo Delivery Panel*** This session will explore the use of eVTOL vehicles in package delivery and cargo movements.
(1030 – 1200)	***Moderator:*** ***Ajay Sehgal, KBR*** *Yu Ito, Yamato* *Edgar Valdez, UPS* *David Merrill, Elroy Air* *Nicholas Brodeur, Bell APT*
(1200 – 1330)	*Lunch in Exhibits (Bayshore Foyer)*

Wednesday, January 22, 2020: Badge Pick-up Hours: 7:00 am – 5:00 pm (Gateway Foyer)	
Electric VTOL Symposium (Oak-Fir) Moderator: Justin Littell, NASA	
(1330 – 1500)	***Crashworthiness Panel*** This session will discuss the market barriers for the eVTOL vehicles as the specifically pertain to crashworthiness and occupant protection. These market barriers include onboard safety systems, public perception, and certification obstacles.
(1330 – 1500)	***Moderator:*** ***Justin Littell, NASA*** *Ryan Naru, Uber* *Joseph Pellettiere, FAA* *Michael Smith, Bell* *Martin Peryea, Jaunt*
(1500 – 1530)	*Networking Break in Exhibits (Bayshore Foyer)*
Electric VTOL Symposium (Oak-Fir) Moderator: Jim Sherman, VFS	
(1530 – 1700)	***eVTOL Systems Development*** Modeling, simulation and utilization of technologies from other markets will be critical for aircraft designers' success. This session will explore how established providers are addressing the eVTOL market.
(1530 – 1540)	**Advances in UAM Technologies,** *Larry Surace, Honeywell*
(1540 – 1610)	**Electrification of Aviation,** *Bob Hess, BAE Systems*
(1610 – 1620)	**Flight For All**, *Mark Blackwell, SkyDrive*
(1620 – 1630)	**eVTOL Aircraft Aerodynamic Analysis Tools**, *Dan Wachspress, Continuum Dynamics*
(1630 – 1700)	**eVTOL High Fidelity Simulation for Design,** *Ronald du Val, Advanced Rotorcraft Technology, Inc.*
Wednesday, January 22, 2020: Reception and Banquet 6:00 pm – 7:30 pm (Bayshore Ballroom)	
(1830 – 1900)	**AIAA Newbold Award,** *presented by Dr. Geoffrey Jarem, US Army ADD* **Banquet Keynote Address,** *JoeBen Bevirt, Founder, Joby Aviation*
Thursday, January 23, 2020: Badge Pick-up Hours: 7:00 am – 4:00 pm (Gateway Foyer)	
Electric VTOL Symposium (Oak-Fir) Moderator: Anubhav Datta, University of Maryland, VFS eVTOL TC Chair	
(0800 – 0900)	***Association Cooperative Activities Panel*** Various industry associations and societies are working toward achieving the goal of the UAM / eVTOL market introduction. This session will also summarize the association activities and their responsibilities.
(0800 – 0900)	***Moderator:*** ***Anubhav Datta, eVTOL TC Chair*** *David Alexander, SAE International* *Christine DeJong, General Aviation Manufacturers Association (GAMA)* *Ajay Sehgal, KBR* *Anna Dietrich, Community Air Mobility Initiative (CAMI)*
(0900 – 0930)	**Toward Consensus on Community Noise Metrics for UAM,** *David Josephson, Josephson Engineering*
(0930 – 1000)	**Hazards and Failure Mode Analysis of Emerging (Hybrid) Electric Propulsion Systems**, *Patrick Darmstadt, Boeing*
(1000 – 1030)	*Networking Break in Exhibits (Bayshore Foyer)*
Electric VTOL Symposium (Oak-Fir) Moderator: Rex Alexander, Five-Alpha	
(1030 – 1200)	***Infrastructure*** Experts in developing aviation infrastructure will explore and provide guidance on the requirements for eVTOL / UAM.
(1030 – 1050)	**Powered for Take Off,** *Jagmeet Khangura, Black & Veatch*
(1050 – 1110)	***Power Storage: An Evaluation of Storage Requirements for VTOL Power Options,*** *Teresa Peterson, Gannett Fleming*
(1110 – 1140)	**Designing Safe, Performance-based Infrastructure,** *Rex Alexander, 5-Alpha*
(1140 – 1200)	**Vertiports. It's Airport Operations, Jim, But Not As We Know It,** *Darrell Swanson, Swanson Aviation Consultancy*
(1200 – 1315)	*Lunch in Exhibits (Bayshore Foyer)*
Electric VTOL Symposium (Oak-Fir) Moderator: Parimal Kopardekar, NASA	
(1315 – 1445)	***Economics of and Investing in eVTOL Panel*** Investing professionals will discuss strategies for investing in eVTOL / UAM.
(1315 – 1445)	***Moderator:*** ***Parimal Kopardekar, NASA*** *Michael Dyment, NEXA* *Peter Shannon, Radius* *Sudip Mukhopadhay, Business Finland* *Kirsten Bartok, AirFinance*
(1445 – 1515)	*Networking Break in Exhibits (Bayshore Foyer)*
Electric VTOL Symposium (Oak-Fir) Moderator: Carl Russell, NASA	
(1515 – 1700)	***eVTOL Competitions and Funding Opportunities*** Many opportunities exist to advance eVTOL and UAM and this session will provide insight on how.
(1515 – 1535)	**Racing for the Advancement of eVTOL,** *Matt Pearson, Airspeeder*
(1535 – 1555)	**UAM Grand Challenge,** *Starr Ginn, NASA*
(1555 – 1615)	**Air Force Interest in TVF,** *Nathan Diller, US Air Force*
(1615 – 1645)	**VFS / NASA TVF & UAM Working Groups** WG2 – *Yolanka Wulff, CAMI* WG3 – *Seren Weber, University of Hawaii* WG4 – *Johnny Doo, International Vehicle Research, Inc.* UAM WGs – *Michael Tsairides, NASA*
(1645 – 1700)	**Event Wrap-up,** *Carl Russell, NASA, and Jim Sherman, VFS*

Aeromechanics and IPLC Technical Paper Presentations

Tuesday, January 21, 2020: Badge Pick-up Hours: 7:00 am – 5:00 pm (Gateway Foyer)

	Aeromechanics – Aerodynamics 1 (Cedar) Chair: Prof. Jim Gregory, Ohio State University	***Aeromechanics – Aerodynamics and Flight Dynamics (Pine)*** Chair: Dr. Chris Brackbill, US Army CCDC AvMC AED
(1330 – 1400)	***The Influence of Laminar-Turbulent Transition on Rotor Performance at Low Reynolds Numbers*** Finbar Argus, University of Auckland; Geoffrey Ament and Witold Koning, NASA Ames Research Center	***Rapid Vehicle Aerodynamic Modeling for Stability and Control Analysis*** Javier E. Pascasio, Amanda Grubb, and Marilyn J. Smith, Georgia Institute of Technology
(1400 – 1430)	***Recent Efforts Enabling Future Mars Rotorcraft Missions*** Shannah Withrow-Maser, NASA Ames Research Center; Witold Koning, Winnie Kuang, Science and Technology Corp.; and Wayne Johnson, NASA Ames Research Center	***An Integrated Simulation Tool for e-VTOL Aeromechanics and Flight Control Analysis*** Jean-Pierre Theron, Joseph F. Horn, Penn State University; and Daniel A. Wachspress, Continuum Dynamics
(1430 – 1500)	***An Experimental Investigation on the Dynamic Ice Accretion Process and Its Effects on the Aeromechanic Performance of Drone Propellers*** Zhe Ning, Nianhong Han, Yang Liu, and Hui Hu, Iowa State University	***Computational Studies to Understand Flight Stability and Control of a Robotic Hummingbird*** Xuan Yang and Moble Benedict, Texas A&M University
(1500 – 1530)	*Networking Break in Exhibits (Bayshore Foyer)*	

	Aeromechanics – Aerodynamics 2 (Cedar) Chair: Dr. Ram JanakiRam, Boeing	***Aeromechanics – Aeroelasticity (Pine)*** Chair: Mr. Tom Parham, Jr., Bell
(1530 – 1600)	***Vertical Climb Testing of a Full-Scale Proprotor on the Tiltrotor Test Rig*** C.W. Acree, Jr., NASA Ames Research Center	***Aeroelastic Stability Analysis of Hingeless Coaxial Rotors in Hover and Forward Flight*** Puneet Singh and Peretz P. Friedmann, University of Michigan
(1600 – 1630)	***Impact of Configuration Changes on the Wake Breakdown of Hovering Rotors*** Jennifer N. Abras and Nathan Hariharan, HPCMP CREATE™ Quality Assurance Group	***Vortex Particle Method Whirl-Flutter Predictions of a Tiltrotor with Wing Extensions*** Ethan Corle, Penn State University; Matthew Floros, US Army CCDC ARL; and Sven Schmitz, Penn State University
(1630 – 1700)	***Aerodynamic Analysis of an Asymmetric Lift-Offset Compound Helicopter in Forward Flight using the Mercury CFD Framework*** Jan-Arun Faust, Technical University of Munich; Yong Su Jung, James Baeder, University of Maryland; and Jürgen Rauleder, Technical University of Munich	***Aeroelastic Simulation of the UH-60M Fuselage*** Nicolas D. Reveles, Tyler J. Pierce, Eric L. Blades, ATA Engineering; Sandeep Agarwal, Byung-Young Min, and Bill A. Welsh, Lockheed Martin
(1730 – 1830)	**Reception in Exhibits (Bayshore Foyer)**	

Wednesday, January 22, 2020: Badge Pick-up Hours: 7:00 am – 5:00 pm (Gateway Foyer)

	Aeromechanics – Acoustics 1 (Cedar) Chair: Prof. Ken Brentner, Penn State University	***IPLC – UAM Design and Configurations (Pine)*** Chair: Dr. Peter Bi, NSWC Carderock
(0800 – 0830)	***A Quiet Helicopter for Air Taxi Operations*** Wayne Johnson, NASA Ames Research Center	***Handling Qualities Investigation of Variable Pitch and Variable Speed Controlled eVTOL Quadrotor Concepts for Urban Air Mobility*** Carlos Malpica and Shannah Withrow-Maser, NASA Ames Research Center
(0830 – 0900)	***Parametric Aeroacoustic Analysis of Two Fans in Hover Flight Condition*** Bernardo Pacini, University of Michigan; Giovanni Droandi and Monica Syal, A^3 by Airbus	***Accessibility Design and Operational Considerations in the Development of Urban Aerial Mobility Vehicles and Networks*** Larry Young, NASA Ames Research Center
(0900 – 0930)	***Acoustic Testing of the Bell 699 Rotor in the National Full-Scale Aerodynamics Complex 40- by 80- Foot Wind Tunnel in Conversion and Airplane Configuration*** Kelly Shelts, Wichita State University/NASA Langley Research Center; and Natasha Schatzman, NASA Ames Research Center	***Passive Pendulum Body: a Novel eVTOL Configuration*** Eiji Shima, Seiji Tsutsumi, Kei-ichiro Fujimoto, Japan Aerospace Exploration Agency; and Hiroyuki Ito, Ryoyu Systems
(0930 – 1000)	***Development of Instrumentation and Methods for Time-Domain Measurement of Rotor-Type Noise Sources in a Hard Wall Wind Tunnel*** Nathan J. Burnside and William C. Horne, NASA Ames Research Center	***Life Cycle Economic Analysis and Optimization for Urban Air Mobility (UAM)*** Nate Sirirojvisuth, PRICE System; Simon Briceno, Aerospace Systems Design Laboratory; and Cedric Y. Justin, Georgia Institute of Technology
(1000 – 1030)	*Networking Break in Exhibits (Bayshore Foyer)*	

	Aeromechanics – Acoustics 2 (Cedar) Chair: Prof. Eric Greenwood, Penn State University	***IPLC – eVTOL Performance (Pine)*** Chair: Prof. Jayant Sirohi, University of Texas, Austin
(1030 – 1100)	***Predictive Acoustic Modeling of Open Propellers Using Analytical Tools and RANS Simulations*** Dominic Lallier-Daniels, F. Bolduc-Teasdale, S. Moreau, M. Lévesque-Leduc, D. Rancourt, Optis Consultants; P. Guilleminot-Simon, Université de Sherbrooke; and M. Sanjosé, École de Technologie Supérieure	***Comprehensive Preliminary Sizing for a Lift Fan Aircraft*** Jewan Ryeom, SunHoo Park, TaeYoung Chun, and SanJoon Shin, Seoul National University
(1100 – 1130)	***Aeroacoustic Predictions of the Free-Wake, Vortex Particle Method, and Computational Fluid Dynamics for a Coaxial Rotor System*** Kalki Sharma, Kenneth S. Brentner, Penn State Univ.; Zhongqi Jia, Seongkyu Lee, Univ. of California, Davis; and Phuriwat Anusonti-Inthra, US Army CCDC ARL	***Performance Validation of a Novel High Speed, eVTOL Compound Helicopter Demonstrator*** Joseph Andrews, Kymatics
(1130 – 1200)	***Investigation of Propeller-Wing Interaction Noise and the Potential Contribution to eVTOL Noise*** Bhaskar Mukherjee and Kenneth S. Brentner, Penn State University	***Statistical Time Series Methods for Multicopter Fault Detection and Identification*** Airin Dutta, Michael McKay, Fotis Kopsaftopoulos; and Farhan Gandhi, Rensselaer Polytechnic Institute
(1200 – 1330)	*Lunch in Exhibits (Bayshore Foyer)*	

	Aeromechanics – Interactional Aerodynamics 1 (Cedar) Chair: Mr. Marvin (Marty) Moulton, US Army CCDC AvMC ADD	IPLC – eVTOL Propulsion (Pine) Chair: Mr. Michael Strauss, Sikorsky
(1330 – 1400)	***Simulation of Airfoil Interaction in Co-Rotating Coaxial Rotors with Uncertainty Quantification*** Miranda Costenoble, James Baeder, University of Maryland; Rajneesh Singh and Phuriwat Anusonti-Inthra, US Army CCDC ARL	***The Realization of the High Specific Power ACTS Motor for VTOL and Other Airborne Applications*** Oved Zucker, Polarix
(1400 – 1430)	***Impact of Vortex–Wake Interference on Rotor Trim*** Berend G. van der Wall, German Aerospace Center	***Characterization and Modeling of Brushless DC Motors and Electronic Speed Controllers with a Dynamometer*** Robert Brown, Anubhav Datta, and Inderjit Chopra, University of Maryland
(1430 – 1500)	***Modeling and Analysis of eVTOL Air Vehicle Interactional Aerodynamics and Mission Performance*** Jeewoong Kim, Chengjian He, and Jan Goericke, Advanced Rotorcraft Technology	***Fundamental Studies of Variable-Voltage Hybrid-Electric Powertrains*** Brent Mills and Anubhav Datta, University of Maryland
(1500 – 1530)	*Networking Break in Exhibits (Bayshore Foyer)*	

	Aeromechanics – Cycloidal Rotors and Test Bed Design (Cedar) Chair: Prof. Inderjit Chopra, University of Maryland	IPLC – eVTOL Propulsion and Acoustics 3 (Pine) Chair: Mr. Andrew Kreshock, US Army CCDC ARL; and Dr. Doug Boyd, NASA Langley Research Center
(1530 – 1600)	***Mechanical Design of the Multirotor Test Bed*** Sarah Conley and Carl Russell, NASA Ames Research Center	***Impact of Lithium Sulfur Batteries on Electric VTOL Aircraft*** Emily Fisler and Anubhav Datta, University of Maryland
(1600 – 1630)	***Understanding Upward Scalability of Cycloidal Rotors for Large-Scale UAS Applications*** Atanu Halder and Moble Benedict, Texas A&M University	***Acoustic Analysis of Urban Air Mobility Quadrotor Aircraft*** Zhongqi Jia and Seongkyu Lee, University of California, Davis
(1630 – 1700)	***Prototype of Cycloidal Rotor with Elliptical Trajectory of Blade*** Alexander Balitsky and Mykola Maliar	***UCD-QuietFly: A New Program to Predict Multi-Rotor eVTOL Broadband Noise*** Sicheng Li and Seongkyu Lee, University of California, Davis
(1800 – 1930)	*Reception and Banquet (Oak-Fir-Pine)*	

Thursday, January 23, 2020: Badge Pick-up Hours: 7:00 am – 4:00 pm (Gateway Foyer)

	Aeromechanics – Performance (Cedar) Chair: Dr. Juergen Rauleder, Technical University of Munich	Aeromechanics – Dynamic Inflow (Pine) Chair: Mr. Phuriwat Anusonti-Inthra, US Army CCDC ARL
(0800 – 0830)	***Forward Flight Rotor Performance at Martian Atmospheric Densities and Sensitivity to Low Reynolds Numbers*** Brenda Natalia Perez Perez, Science and Technology Corp.	***An Approximate Finite State Dynamic Wake Model for Predictions of Inflow Below the Rotor*** Feyyaz Guner, J.V.R. Prasad, Georgia Institute of Technology; and David A. Peters, Washington University in St. Louis
(0830 – 0900)	***Investigation of Stacked Rotor Performance in Hover Part 1: Experimental Measurements*** Chloe Johnson, Jayant Sirohi, University of Texas at Austin; George Jacobellis, Rajneesh Singh, US Army CCDC ARL; and Rob McDonald, Uber	***Coupled Inflow and Structural Dynamics of a Coaxial Rotor with Time Delays and Adjoint Variables Including Multiple Inflow States*** Cory Seidel and David Peters, Washington University in St. Louis
(0900 – 0930)	***Investigation of Stacked Rotor Performance in Hover Part 2: Computational Validation*** George Jacobellis, Rajneesh Singh, US Army CCDC ARL; Chloe Johnson, Jayant Sirohi, University of Texas at Austin; and Rob McDonald, Uber Elevate	***Calibration of Velocity Potential Superposition Inflow Model using Computational Fluid Dynamics Data*** Po-Wei Chen, Feyyaz Guner, Lakshmi N. Sankar, J.V.R. Prasad, Georgia Institute of Technology; and Chengjian He, Advanced Rotorcraft Technology
(0930 – 1000)	***Investigation into Dynamic Calibration and Rotor-Body Interaction*** Robert P. Thornburgh, Matthew L. Wilbur, Andrew R. Kreshock, US Army CCDC ARL; and Brendon D. Malovrh, NASA Langley Research Center	***Experiments and Computations Towards an Improved Understanding and Modeling of the Dynamic Inflow of Rotors in Hover*** Stefan Platzer, Jürgen Rauleder, Manfred Hajek, Technical University of Munich; Patrick Mortimer, Palash Jain, and Jayant Sirohi, University of Texas at Austin
(1000 – 1030)	*Networking Break in Exhibits (Bayshore Foyer)*	

	Aeromechanics – Interactional Aerodynamics 2 (Cedar) Chair: Dr. Berend van der Wall, German Aerospace Center	Aeromechanics – Rotor Loads (Pine) Chair: Dr. Jouyoung (Jason) Choi, Bell
(1030 – 1100)	***An Experimental Study on the Rotor-to-Rotor Interactions of Small Unmanned-Aerial-Vehicle Propellers*** Wenwu Zhou, Zhe Ning, and Hui Hu, Iowa State University	***Predicting Wake and Structural Loads in RPM Controlled Multirotor Aircraft*** Abhishek Shastry and Anubhav Datta, University of Maryland
(1100 – 1130)	***Prediction of the Aerodynamic and Acoustic Impact of Propeller-Wing Interference*** Jianhua Zhang, Kenneth S. Brentner, and Edward C. Smith, Penn State University	***Loads Correlation of a Full-Scale Proprotor on the Tiltrotor Test Rig*** Sesi Kottapalli, NASA Ames Research Center
(1130 – 1200)	***Analysis of the Interactional Aerodynamics of the Vahana eVTOL Using a Medium Fidelity Open Source Tool*** Davide Montagnani, Matteo Tugnoli, Alex Zanotti, Politecnico di Milano; Monica Syal and Giovanni Droandi, A^3 by Airbus	***Machine Learning Based Aerodynamic Models For Rotor Blades*** Daniel Martinez, Science and Technology Corp. (STC); Jay Sitaraman, Parallel Geometric Algorithms; Wesley Brewer, US Army Engineer Research and Development Center; Peter Rivera, University of Puerto-Rico; and Dylan Jude, STC
(1200 – 1315)	*Lunch in Exhibits (Bayshore Foyer)*	

	Aeromechanics – CFD Methods (Cedar) Chair: Prof. Marilyn Smith, Georgia Institute of Technology	Aeromechanics – Vibration (Pine) Chair: Mr. Erez Eller, Sikorsky
(1315 – 1345)	***Multirotor Trim using Loose Aerodynamic Coupling*** Austin D. Thai, Boston University; Beatrice Roget, Science and Technology Corp.; Jay Sitaraman, Parallel Geometric Algorithms; and Sheryl M. Grace, Boston University	***Influence of Atmospheric Turbulence on Helicopter Elastic Rotor Hub Vibrations*** Willem Rex and Manfred Hajek, Technical University of Munich
(1345 – 1415)	***Assessment of Different CFD Download Strategies with Helios*** Andrew Wissink, US Army CCDC AvMC ADD; Vinod Lakshminarayan, Dylan Jude, Science and Technology Corp.; Buvana Jayaraman, US Army CCDC AvMC ADD; and Jayanarayanan Sitaraman, Parallel Geometric Algorithms	***Quadcopter Rotor Phasing for Minimization of Aircraft Vibratory Loads*** Nicholas Kopyt, Robert Niemiec, and Farhan Gandhi, Rensselaer Polytechnic Institute
(1415 – 1445)	***Improvements to Automated Strand Meshing Capabilities for Rotary Wing Applications*** Vinod Lakshminarayan, Science and Technology Corp., Andrew Wissink, Rohit Jain, US Army CCDC AvMC ADD; and Jayanarayanan Sitaraman, Parallel Geometric Algorithms	***Vibration Reduction Simulations for Rotor and Airframe of a Lift-offset Compound Helicopter Using Two Active Vibration Control Techniques*** Ye-Lin Lee, Chungnam National University; Do-Hyung Kim, Korea Aerospace Research Institute; Jae-Sang Park and Sung-Boo Hong, Chungnam National Univ.
(1445 – 1515)	*Networking Break in Exhibits (Bayshore Foyer)*	
(1515 – 1700)	*Electric VTOL Symposium continues in Oak-Fir*	

Upcoming Events

FORUM 76
VERTICAL FLIGHT SOCIETY
MAY 19-21, 2020 MONTRÉAL, QUÉBEC, CANADA

Thank you for joining us here in San Jose for **Transformative Vertical Flight 2020**! We hope you learn much this week and translate that to your daily work.

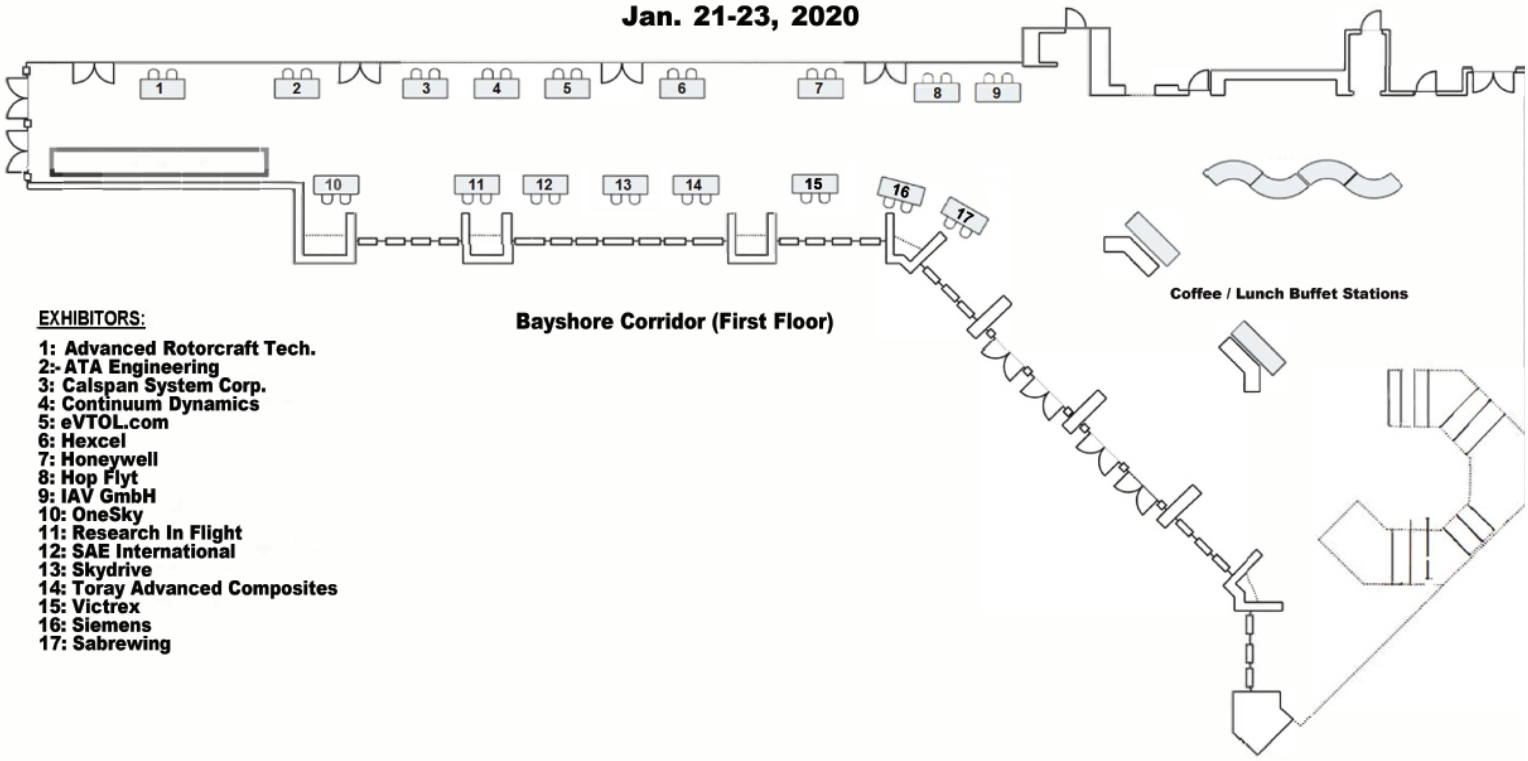
Plan now for the VFS **9th Biennial Autonomous VTOL Technical Meeting and 8th Annual eVTOL Symposium**, January 2021 in Mesa, AZ.

Keep up to date with the latest advances in VTOL technology. Our full list of upcoming events is online at **www.vtol.org/events**

Transformative Vertical Flight (TVF) Exhibits

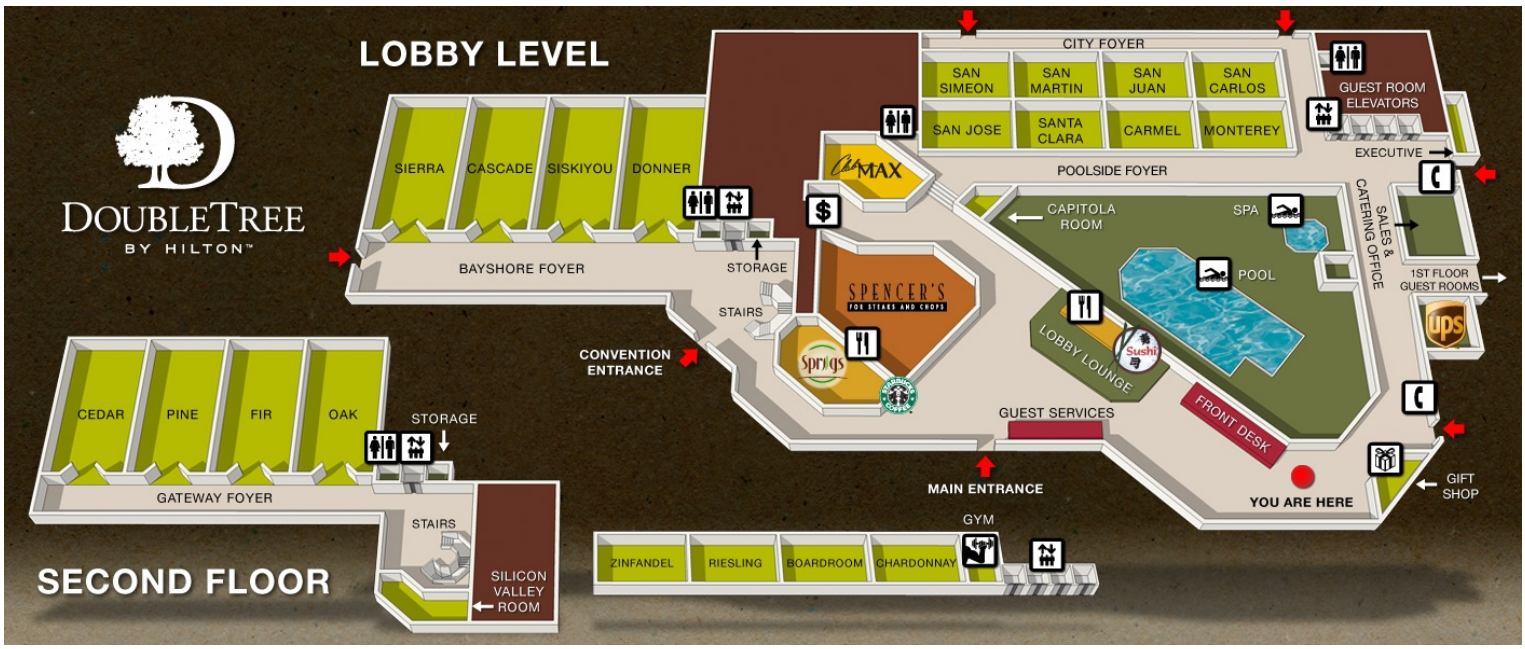
Doubletree San Jose

Jan. 21-23, 2020



EXHIBITORS:

1: Advanced Rotorcraft Tech.
2: ATA Engineering
3: Calspan System Corp.
4: Continuum Dynamics
5: eVTOL.com
6: Hexcel
7: Honeywell
8: Hop Flyt
9: IAV GmbH
10: OneSky
11: Research In Flight
12: SAE International
13: Skydrive
14: Toray Advanced Composites
15: Victrex
16: Siemens
17: Sabrewing



VFS is successful only because of the efforts of our members who dedicate their time, working to advance vertical flight. Many thanks to all our TVF2020 conference organizers, especially:

- **General Meeting Chair:** Dr. Colin Theodore, NASA Ames Research Center
- **Aeromechanics for Advanced Vertical Flight Technical Chair:** Dr. Mark Fulton, US Army CCDC AvMC ADD
- **IPLC Technical Chair:** Dr. Michael Yu, Continuum Dynamics, Inc.
- **7th Annual Electric VTOL Symposium Technical Chair:** Mr. Carl Russell, NASA Ames Research Center