Autonomous VTOL Conference and eVTOL Symposium

Even a widespread internet outage couldn't tamp down enthusiasm for first VFS event of 2021

When the VFS Arizona Chapter began holding biennial conferences in 2005, the focus was on looking at new unmanned rotorcraft that were then in development. While the focus of the technical papers have expanded to encompass all levels of autonomy for all types of vertical takeoff and landing (VTOL) aircraft, the program also included invited presentations. The concurrent Electric VTOL Symposium, VFS members and VIP speakers highlighted technology developments that are also driving investment in vertical flight aircraft development and the urban air mobility (UAM) and advanced air mobility (AAM) ecosystem. The combined event set a new attendance record (for a non-Forum event) with 592 attendees, beating the 2020 mark by over 100 new attendees.

A combined opening general session featured representatives from government and industry providing a vision for the future, along with a roadmap on how to get there. The opening keynote speaker, Robert Pearce, Associate Administrator for NASA, outlined the programs that NASA has undertaken to overhaul and modernize the airspace, including the all-encompassing AAM National Campaign. He pointed out that the consensus of many marketing studies is that UAM/AAM will provide a potential market of $320B over the next 20 years. Integrating smart cities initiatives with AAM will be driving value for cross-industry innovation to release that potential. A key aspect of AAM is unlocking the airspace through air traffic management, and ultimately, highly automated systems to overcome the complexity and enable scalability. Integral to achieving these goals are the AAM National Campaign, which is "an integrating element" to all these technologies. Designed as a series of test over multiple years to demonstrate these technologies and inform standards, policies and community development.

The US Army Program Manager for UAS, COL Joseph "Scott" Anderson provided a detailed overview of the US Army's plans for unmanned and autonomous systems. He provided a detailed roadmap for both VTOL (FTUAS) and fixed-wing programs. The FTUAS platform is intended to be a runway independent Group 2/3 unmanned aircraft that provides the Brigade Combat Teams with an expeditionary, more mobile reconnaissance, surveillance, and target acquisition (RSTA) capability.

US Air Force COL Nathan Diller provided an overview of the AFWERX Agility Prime program and its role in developing the eVTOL/UAM/AAM ecosystem, including reducing financial risk, technical risk and establishing a supply chain.

The FAA's Jay Merkle then provided an overview of the FAA's position on AAM, including high-level definitions, from recreational drones to passenger taxi services. Merkle pointed out that the FAA is working to evaluate all the possibilities of potential AAM, including recreational, commercial, cargo and passenger applications to meet the market on time. The FAA is working to understand how the "3As of flying" are being blurred through AAM – aviators, aircraft, and airspace. Merkle also confirmed that there are 30+ companies working toward certification, including seven (7) electric engine companies.

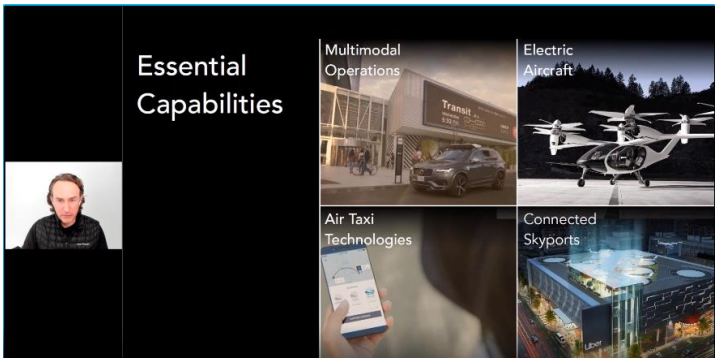
Correspondingly, the scope of this year's eVTOL symposium was much broader than in the past, with the addition of speakers on topics such as detailed modeling and simulation, advanced manufacturing, infrastructure, realistic flight training, workforce development, standards activities and investment opportunities, along with VFS's traditional eVTOL focus on aircraft developments, technology, regulations.

eVTOL Developers are Making Great Progress

The VFS eVTOL Symposium is an annual opportunity for the vertical flight community to measure progress across the emerging eVTOL industry and associated ecosystem. This year, the mood at the symposium was extremely positive, thanks to a series of public announcements and revelations over the preceding 60 days.

Companies providing detailed updates at the symposium included Airbus, Vertical Aerospace, Beta Technologies, Wisk, SkyDrive, Airspace Experience Technologies (ASX), Pipistrel and Piasecki, along with updates from Airflow.aero and Ampaire from the eCTOL/eSTOL adjacent market.

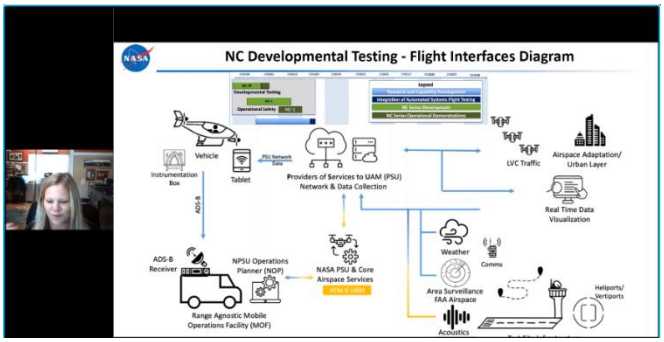
With Joby's taking over Uber Elevate's operations, Eric Allison highlighted how the Elevate program will complement the Joby mission of "saving 1 billion people an hour a day." He detailed the four enabling technologies that need to be created to enable this vision – multimodal operations, electric aircraft, air taxi technologies and connected skyports. Eric also restated some of the lessons learned from the Elevate studies, such as everyday flight requires a behavioral change, customer perception of safety is critical, and multimodal integration is difficult but when done correctly seems like magic.



Market Insights

NASA's Parimal (PK) Kopardekar moderated a session that highlighted the potential market opportunities for eVTOL/AAM featuring Cyrus Sigari of UP.Partners, Michael Dyment of NEXA Advisors, Jim Viola of HAI and Starr Ginn of NASA. Sigari covered details of many aspects of AAM from commercial drone applications, from cargo and medical applications to passenger transport. Sigari reported that the industry has so much potential "that in one week alone, we saw 50 new companies" join the AAM space.

Dyment provided a case study of the Vancouver market in response to the Canadian Advanced Air Mobility Consortium. The study showed a benefit to Vancouver, which already has a robust helicopter transport industry, of thousands of direct and in-direct jobs and over $1B in gross domestic product benefits. Jim Viola indicated the HAI is now ready to support and foster the AAM industry from the perspective of operators. Finally, while not a direct market analysis presentation, Starr Ginn provided details of the AAM National Campaign. From evaluating the performance of vehicle in real-world scenarios, to air traffic management technologies and infrastructure design. The goal of the campaign is to evaluate the potential missions, and identify gaps in technology and operations and inform the industry, academia and regulatory bodies. The structure of the Campaign is a design-of-experiments utilizing the current technologies that are available, and is planned to continue through calendar year 2023.



Enabling eVTOL / AAM

While some of the technologies presented in the program this year address updates to key technologies covered in previous programs, including modeling and simulation and advanced manufacturing, new topics addressed emerging needs – realistic training and simulation for flight test and workforce development. In partnership with ARINC Industry Activities, the session focused on creating operational scenarios to provide pilots realistic situations that cannot be provided during standard pilot training.

With an all-star panel, moderated by Dan Newman, featuring leading industry and academia representatives, the current state of VTOL education system, and highlighted the needs and changes required to address this upcoming future. The panel determined that not one single change is required, but a near overhaul of system to include cross-functional integration between departments, more hands on mentoring and adjusting curricula for supporting functions, such as maintenance to meet the needs. Since workforce development is a key VFS mission, we have made this session available to the public at www.youtube.com/vtolsociety.

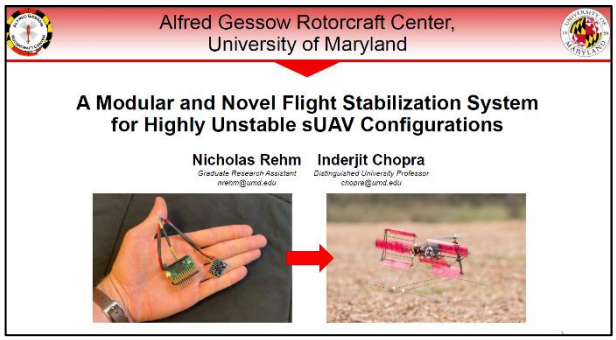
Throughout the rest of the symposium, our speakers and sponsors provided detail on topics ranging from hydrogen for eVTOL, certifying avionics through DO-178 and DO-254, partial electric discharge prevention and crashworthiness certification. VFS thanks all of the sponsors, exhibitors, advertisers and attendees for their continued support of eVTOL Symposium and looks forward to providing future eVTOL events.

Autonomous VTOL (AVTOL) Technical Meeting

Held in conjunction with the eVTOL Symposium, the 9th Biennial Autonomous VTOL (AVTOL) Technical Meeting was a great success featuring 27 presentations, both technical paper presentations and those from invited speakers. Dr. Ram JanakiRam (Boeing, Retired) presided over the development of the broad technical program.

On the opening day, the program featured invited speakers from the US Army, Sikorsky, Bell, University of Maryland and Near Earth Autonomy with Ajay Sehgal (KBR) moderating the session. These speakers set the stage for use-cases in autonomy, highlighted current projects under development, provided insight into how autonomy can improve AVTOL vehicle safety, and explored growing potential applications for AVTOL.

The second day kicked off the technical paper presentation portion of the meeting with Dr. Russell Enns (Boeing) chairing the morning session on flight dynamics, controls, and simulation. Technical presentations were made by NASA Langley, Cranfield University, Hoffman Engineering, Penn State, and The University of Maryland. Technical paper presentations ranged from topics on wing-tilt scheduling in tandem-wing configurations to a novel flight stabilization system for unstable sUAV configurations.



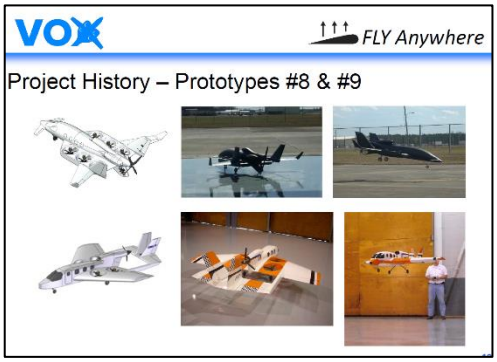
The afternoon session was chaired by Dr. Sankar (Georgia Tech) with technical presentations on

aerodynamics and acoustics. Experts from NASA Ames, Georgia Tech, Penn State, University of Maryland, and from Continuum Dynamics presented papers on topics spanning from aeroelastic analyses of UAM rotors to time variation of rotor broadband noise.

On the last day, Dr. Daniel Schrage chaired the morning session on UAV operations and certification with first an invited technical presentation by Daedalean, followed by paper presentations from DLR Institute of Flight Systems, Georgia Tech, NASA Ames, and Nodein Autonomy. Experts discussed challenges in this area such as those associated with the certification of safety-critical avionics, detection of obstacle-free landing zones in crowded environments, and concept of operations in maritime rescue operations.

Tethered ship deck landing of DLR's superARTIS

The technical meeting concluded with presentations on the design and structures of AVTOL vehicles with Dr. Inderjit Chopra (University of Maryland) moderating the final afternoon session. Discussions included topics on high-rate manufacturing and improvements of aerospace composite parts, high-speed long range powered-Lift e/h VTOL dual system aircraft design, and Mars rotorcraft. The presentations were made by experts from Embry-Riddle Aeronautical University, Victrex and TxV Aero composites, NASA Ames, VOX Aircraft, Solvay Composite Materials.



Administration of the program was supported by many members of the VFS Arizona chapter to moderate and share the presentations, including Colton Marchesseault (Arizona Chapter Program Director), Tonja Reinert (Arizona Chapter President), Ion Vintilescu (STEM and Program Deputy Director),Scott Swinsick (Western US Region Director on the VFS Board of Directors, 2020-2021), Conor Briggi (Arizona Chapter VP), Bryan Chu (Arizona Chapter Technical Director), Mike Burgess (Arizona Chapter Secretary), Chris Wezdenko (Arizona Communications Director), Cole Jackson (ASU Chapter President), Arizona Chapter 2019 Friedrich Straub Memorial Scholarship winner Katarina White and 2019 Western Regional Lichten Award winner Andres Sandoval. It was indeed a very successful meeting.