

# Electric Aircraft Symposium Highlights AAM Progress



Attendees at EAS 2023 give their thumbs up after a deeply informative event. (VFS photos by Warren Liebmann except where noted)

The 17th Annual EAS 2023, hosted by VFS, featured solid updates and fresh insights into the growing electric aviation industry.

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By Dan Gettinger, Managing Editor

**T**he Vertical Flight Society drew a record crowd for its 17th Annual Electric Aircraft Symposium (EAS). The two-day event ran between July 22–23, the weekend prior to the Experimental Aircraft Association (EAA) annual AirVenture in Oshkosh, Wisconsin, the world’s largest aviation event (see “A VTOL AirVenture,” pg. 50).

In addition to the roughly 40 virtual attendees, nearly 200 people attended the event in person, a 65% increase over the prior year, at the University of Wisconsin Oshkosh’s Culver Family Welcome Center.

One of the benefits of the annual symposium is that engineers and others deeply immersed in the development of electric vertical takeoff and landing (eVTOL) aircraft get to hear and learn from international experts across the electric aviation and advanced air mobility (AAM) community utilizing similar technologies and facing common challenges.

Originally established in 2007 by the Comparative Aircraft Flight Efficiency (CAFE) Foundation, EAS is the world’s longest-running electric aviation technology meeting. VFS began co-sponsoring the event in 2018 and has since assumed full responsibility for the symposium. VFS Board members Ken Swartz and Yolanka Wulff were the key organizers of the event, which has helped increase VFS’ global profile and membership.

This year’s event featured more than a dozen panels and lectures on electric aircraft and AAM. Attendees heard speakers from industry, government and academia address topics like community integration, regional air mobility, electric motors and batteries, aircraft autonomy and noise, recreational aircraft, critical challenges and much more. In all, more than 40 speakers and moderators — including more than a dozen CEOs — participated in the wide-ranging event.

## **Community Acceptance**

Multiple speakers at EAS 2023 underscored the critical role that community voices will play in the success or failure of eVTOL and AAM operations around the country. “Community acceptance is one of the biggest challenges we face,” said Rex Alexander, CEO of Five-Alpha and VFS Infrastructure Advisor, in the first panel discussion of the conference. The issue is fundamentally different than that facing heliports in the country today, added Alexander, the vast majority of which rarely see much traffic. The vertiports of the AAM industry, by contrast, are likely going to require a high tempo

of operations in keeping with the short-duration flights envisioned by many eVTOL aircraft developers.

The excitement surrounding eVTOL aircraft could make issues of community acceptance and integration easier than other types of aviation, observed Grant Fisk, Co-Founder of Volatus Infrastructure. Nonetheless, panelists at EAS emphasized that eVTOL aircraft developers and other companies in the AAM industry should find ways of educating local authorities on the opportunities and challenges associated with this emerging field in aviation. “You’re bringing something that’s foreign to a lot of these people and you need to frontload that with education,” said Alexander.

Many regulatory issues pertaining to AAM infrastructure will be settled at the local level and not by federal aviation authorities, observed Clint Harper, a community AAM advocate. “The city planners are probably the most important people to engage with right now,” said Harper. Because many city planners typically view heliports as an industrial use property, it could be difficult to incorporate vertiports into high-density areas such as the centers of many cities. Other infrastructure issues, such as firefighting and other critical emergency services, will also need to be resolved by engaging with local authorities.

### User Experience

The degree to which eVTOL aircraft are accepted by community members could, in many instances, be decided by whether customers feel comfortable enough using these vehicles. Arthur Gilmore, the President and CEO of The Gilmore Group, urged those in attendance to focus on the integration of human factors into the design of eVTOL aircraft and infrastructure. Issues such as the ergonomics of the vehicle, psychological factors and interior design will



Yolanka Wulff (left) moderated the Community Integration panel with (L-R): Rex Alexander, Clint Harper, Starr Ginn and Grant Fisk. (screenshot from the livestream)

be key to securing public confidence in these vehicles and, consequently, ensuring commercial success. “If we apply the same creative innovation to human experience design, this is not only going to be sustainable, it is really going to work,” said Gilmore. “And you’re going to have a fantastic revolution in this particular industry.”

Many of the first generation of eVTOL aircraft that are currently under development will lack all of the features that make them accessible to all, observed Whisper Aero CEO Mark Moore. Successive generations of eVTOL and AAM vehicles will incorporate new technologies, including new propulsion technologies that bring improvements in noise and efficiency. “Propulsion has been the driving force for aviation improvements over the past 80 years,” noted Moore. Whisper, which has developed what it describes as a uniquely quiet and efficient electric fan, believes that larger electric engines result in thermal management and integration problems. “We’re absolutely positive that electric engines on aircraft want to be small and distributed,” said Moore. Technologies such as these will determine whether AAM vehicles can meet the ambitious vision for a low-cost, widely available means of transportation.

### More VFS Resources

If you missed EAS 2023, the presentation slides and video recordings are available for purchase. See the website for details: [www.vtol.org/eas](http://www.vtol.org/eas). Attendees can access the videos and presentations for free. EAS 2024 is planned for July 20–21, 2024, again the weekend prior to AirVenture.

For those interested in learning more about issues concerning community acceptance and infrastructure, VFS is holding its 7th Workshop on AAM Infrastructure, Sept. 26–28, in Cape May, New Jersey. See [www.vtol.org/inf-2023](http://www.vtol.org/inf-2023).

### eVTOL Aircraft Developers

More than a dozen companies developing electric VTOL aircraft were represented among the speakers at this year’s EAS. In one panel, executives from a few of these companies discussed the path ahead for their aircraft, including how eVTOL aircraft could bring greater equity to the transportation system. “The journey from 5 to 50 miles [8–80 km] is the sweet spot for where people want to go,” said Dr. Mike Romanowski, Head of Government Relations at Archer Aviation. Overair, meanwhile, is working towards assembling its XP-1 demonstrator aircraft and flying it within the next six months or so, said John Criezis, Head of Mobility Operations at Overair.

## EAS 2023 Speakers and Moderators

- **Angelo Collins**, Executive Director, Vertical Flight Society
- **Yolanka Wulff**, Executive Director, CAMI
- **Willi Tacke**, President, Flying Pages
- **Dr. Sebastian Seemann**, CTO, Væridion
- **Rex Alexander**, President, Five-Alpha
- **Clint Harper**, Community AAM Advocate
- **Starr Ginn**, AAM Lead Strategist, NASA Armstrong
- **Grant Fisk**, Co-founder, Volatus Infrastructure
- **Ken Swartz**, Principal, Aeromedia Consultants
- **Dr. Mike Romanowski**, Govt Relations, Archer Aviation
- **Ryan Naru**, Govt Affairs Senior Specialist, Joby Aviation
- **John Criezis**, Head of Mobility Operations, Overair
- **Arthur Gilmore**, President & CEO, The Gilmore Group
- **Mark Moore**, CEO, Whisper Aero
- **Chris Caputo**, Flight Test Director, Beta Technologies
- **Tomohiro Fukuzawa**, CEO, SkyDrive
- **Dr. Hamid Hamidi**, CEO, Limosa
- **Ryan Steinbach**, Office of Aviation AnalysisDOT
- **Annie Petsonk**, Assistant Secretary for Aviation & International Affairs, DOT
- **Dr. Parimal “PK” Kopardekar**, AAM Mission Integration Manager, NASA
- **Darshan “Dash” Divakaran**, Airspace Innovation & Prime Partnerships, AFWERX
- **Peter Irvine**, Executive Lead for Aviation Policy, DOT
- **Andy Mearns**, Principal, Multicopter Aerospace Consulting
- **Don Shaw**, CEO, Rotor X
- **Rani Plaut**, CEO, AIR
- **Stéphan D’haene**, CEO, Jetson Aero
- **Steve Tibbitts**, CEO, ZEVA
- **Ken Karklin**, CEO, Opener
- **Matt Thurber**, Editor in Chief, AIN Publications
- **Ajay Lukha**, Chief Commercial Officer, Evolito
- **Sebastien Demont**, CTO, H55
- **Olaf Otto**, President, Rolls-Royce Electrical
- **Santh Sathya**, CEO, LuftCar
- **Dr. Anita Sengupta**, CEO, Hydroplane
- **Dr. Michael Armstrong**, CTO, Electric Power Systems
- **Kevin Bruce**, Dir. Quality & Airworthiness, Diamond Aircraft
- **Eric Lithun**, CEO, Elfly
- **Rob Scholl**, CEO, Textron eAviation
- **Dr. Carl Dietrich**, CEO, Jump Aero
- **Jen Uchida**, Manager of Test Engineering, AeroTEC
- **Tom Gunnarson**, Regulatory Affairs Lead, Wisk Aero
- **John Sawyer**, Technical Manager, Airspace Innovation, AFWERX
- **Dan Dunne**, VP Engineering, Inceptra
- **Starr Ginn**, AAM Lead Strategist, NASA Armstrong
- **Dr. Sergio Cecutta**, Founder & Partner, SMG Consulting
- **Diane Carrington**, Sr. Manager, Prime Partnerships, AFWERX



Angelo Collins chaired the AAM Developers session with representatives from (L-R): Beta, SkyDrive and Limosa. (screenshot)



Ryan Steinbach moderated the US government AAM Interagency Working Group panel, featuring (L-R): Assistant Secretary of Transportation Annie Petsonk, Darshan Divakaran, Parimal Kopardekar and Peter Irvine. (Ken Swartz for VFS)

Executives from eVTOL aircraft developers stressed that the path towards the successful implementation of their aircraft will require aviation authorities in multiple countries and regions to work together. The harmonization of certification requirements and regulations is critical, said Ryan Naru, Government Affairs Senior Specialist at Joby Aviation. “Fundamentally, yes, we do want to market these products overseas eventually,” said Archer’s Romanowski, though the company will first seek to certify its products in the US. Archer has made progress, added Romanowski, when “communities and political leaders see the capability gain from these vehicles.”

Personal and private eVTOL aircraft could usher in significant changes to the general aviation market, observed Andy Mearns of Multicopter Aerospace Consulting, potentially transforming it from a pastime enjoyed by a relatively small number of enthusiasts to one with a much broader audience. The level of interest in and demand for personal eVTOL aircraft is not the problem, said AIR CEO Rani Plaut. Rather, the priority now is to prove that the air vehicle is safe and that customers are using it in a safe way. To that end, the developers of these aircraft are incorporating various means of training customers on the operation of their aircraft. Jetson and ZEVA are considering establishing training



The Personal/Private eVTOL Session was moderated by Andy Mearns and featured the CEOs of (L-R): Opener, ZEVA, Jetson, AIR and Rotor X.



EAS 2023 organizer Ken Swartz chaired the session on Regional Air Mobility with executives from (L-R): Diamond Aircraft, Elfly and Textron eAviation.

schools, while AIR and Opener are eyeing extensive simulator courses to bring their customers up to speed.

## A National Strategy

Among the panelists at EAS 2023 were members of the federal agencies participating in the Department of Transportation's AAM Interagency Working Group, which the DOT established after Congress passed the AAM Coordination and Leadership Act in October 2022 (see "Washington Report," *Vertiflite*, Nov/Dec 2022). The AAM IWG includes representatives from 19 federal agencies and is a truly integrated effort, said Ryan Steinbach of the DOT. "It's about more than advanced air mobility," said Steinbach. "We want a transportation system of systems, for people to get to where they want to go and leave the car behind." The Working Group is under pressure to produce a draft of a national strategy for the integration of AAM vehicles by February 2024, before submitting the final version before the end of the fiscal year.

The AAM IWG has divided its work into five categories — automation, security, air traffic, infrastructure and community roles — the work of each of which is coordinated by a federal agency. "We are now trying to figure out where each agency has its specific role and where we have to identify

the gaps," explained Darshan "Dash" Divakaran of the US Air Force's AFWERX. This summer, the AAM IWG solicited public feedback on the five categories of activity to identify concerns that members of the public might have with its approach and whether there are any areas that should be incorporated into its strategy. The goal of the strategy, said the DOT's Peter Irvine, was to identify a critical path for near- and medium-term and to think about broader, long-term perspectives. "The idea is to be able to get things going as soon as the vehicles are ready," said NASA's Dr. Parimal "PK" Kopardekar.

## Electric and Hydrogen Power

Battery-electric and hydrogen-electric motors are among the core capabilities that are underpinning the ability of aircraft developers to meet the sustainability goals promised by electric aircraft.

In a panel addressing the former, Sebastien Demont, CTO of Switzerland's H55, explained that the lifecycle of batteries is highly dependent on the type of operations in which one is likely to engage, as well as the environmental conditions in which the aircraft is operating. For example, H55 is studying multiple approaches to operating battery-electric motors in cold weather, including pre-heating the batteries prior to takeoff. The core technology behind electric motors has been proven in the automotive sector, said Ajay Lukha, CCO of UK-based Evolito. The challenges lie with certification and the fact that the certifying authorities are also on a steep learning curve when it come to this technology. "We're helping to educate them on the possibilities offered by electric motor technology," said Lukha.

High-endurance operations will likely require liquid hydrogen fuel cells, explained Hydroplane CEO Dr. Anita Sengupta. Hydroplane's goal is to develop a modular hydrogen-based power solution for small aircraft, one that could eventually be applied to regional aircraft. Santh Sathya, CEO of LuftCar, outlined the partnerships and progress his company has made in developing a modular, multi-modal hydrogen transportation system for moving goods or people.

The automotive sector, which in some ways is much more challenging than aviation, has done a lot to mitigate the safety concerns associated with hydrogen, said Sengupta. Dr. Michael Armstrong, CTO of Electric Power Systems (EPS), agreed: "I love the fact that we're in aviation and we have a lot of heritage from automotive that we can pull from — why reinvent the wheel if we don't need to." Still, every aircraft will have different requirements, said Armstrong, and there may be compelling reasons to develop aviation-specific standards.

## Future Perspectives

The conference closed out with an engaging discussion on how the electric aircraft industry might evolve. Over the coming decades, said Whisper's Moore, key constraints on the current ability to successfully conduct electric aircraft operations at scale are likely to fall away. For example, Moore expects that by 2040, batteries will be easier to produce



Carl Dietrich, CEO of Jump Aero, chaired the Critical Challenges Session with (L-R): Jen Uchida, John Sawyer and Tom Gunnarson.

and charge, autonomy will be more widespread throughout society, and industrial and government investment will provide a foundation and framework for scaling the electric autonomy. Dr. Sergio Cecutta, Founder and Partner at SMG Consulting, argued that the production of electric batteries will need to grow substantially to meet the demand.

The next decade will be one encumbered by the growth pains of adolescence for the electric aircraft industry, said Cecutta. “We need to make sure the foundation we’re establishing now is going to be good for the next 17 years.”

The Air Force is already working towards one scenario for the future, said Diane Carrington of US Air Force’s AFWERX,



Starr Ginn moderated the closing panel featuring (L-R): Mark Moore, Sergio Cecutta and Diane Carrington.

one in which small, distributed bases are likely to replace the sprawling air bases of today. In this scenario, electric VTOL aircraft could play a central role in providing logistic and transportation support. Moore agreed: “The future is ‘smaller is better’ across just about every industry.”

VFS would like to express its gratitude to sponsors The Gilmore Group (Platinum), Inceptra (Gold), and Astrolabe Analytics and Opener (Silver) for their generous support of EAS 2023. Astrolabe Analytics, Inceptra, Radbon and Toray were exhibitors. VFS thanks all the panel moderators and speakers for their contributions to making this event a resounding success. 🦅

# Transformative Vertical Flight 2024

## 11<sup>th</sup> Annual Electric VTOL Symposium

### 6<sup>th</sup> Decennial VFS Aeromechanics Specialists’ Conference

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