



SESSION 5

**THE FUTURE IS COMING – ADVANCED AIR MOBILITY (AAM)
AND URBAN AIR MOBILITY (UAM)**

Speakers:

**Jeff Borowiec, Ph.D., Aviation Program Director - Statewide
Planning and Emerging Technologies, Woolpert**

Sam Hobbs, Team Member - Charging Group, BETA

**Moderator: Matthew Coffelt, AAM & UAS Development Manager,
Georgia Department of Transportation (GDOT)**



Session 5: Advanced Air Mobility

Matt Coffelt, C.M., ACE

Jeff Borowiec, Ph. D.

Sam Hobbs

November 2, 2023



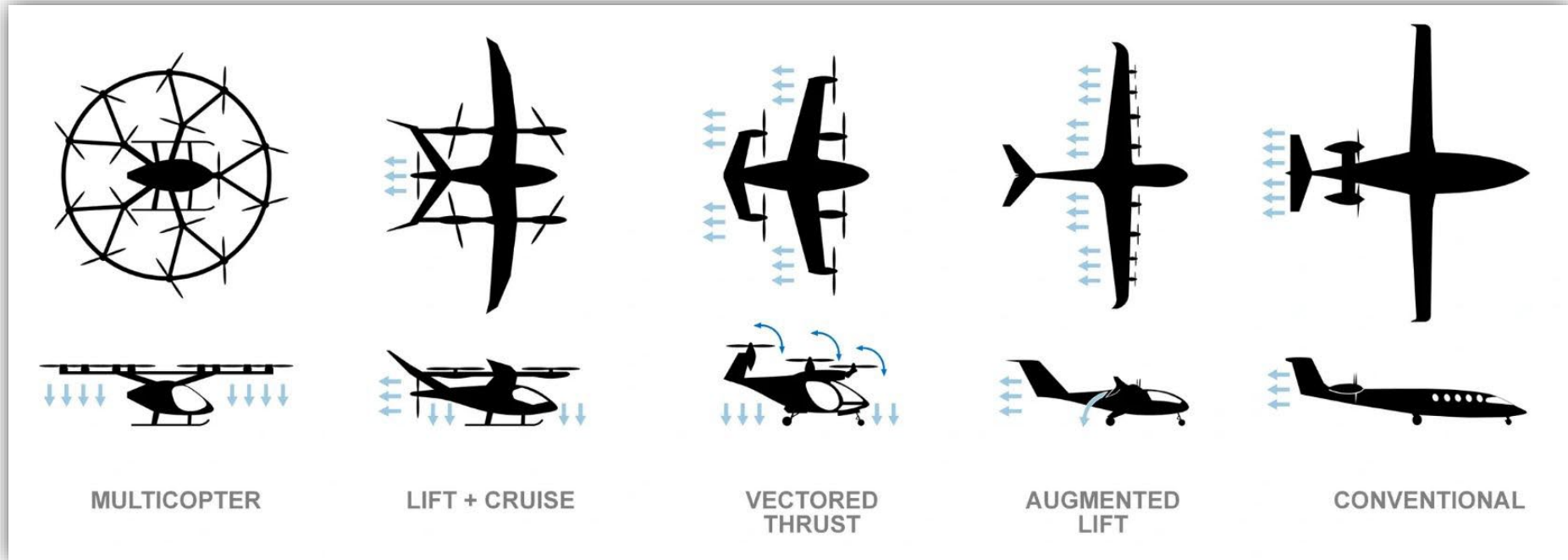
What is an eVTOL?

- ✈ eVTOL are electrically powered aircraft that take-off and land vertically
- ✈ Much quieter and environmentally friendly than traditional combustion engine aircraft
- ✈ eVTOL aircraft can reach speeds of up to 200 MPH, and/or ranges up to 250 miles
- ✈ Leading eVTOL manufacturers include Archer (pictured), Beta, Joby, Volocopter, and Lilium



Courtesy: Archer

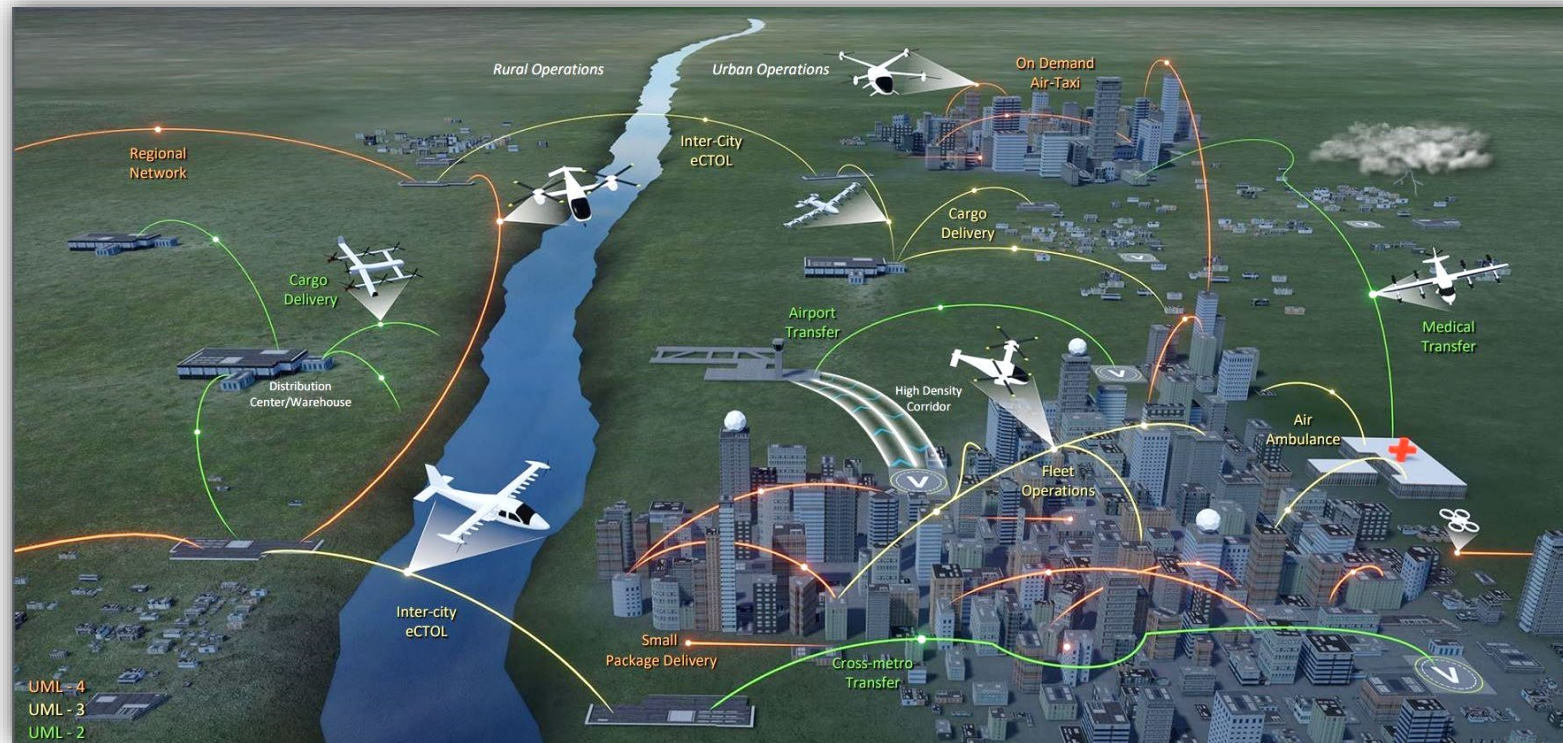
Types of Electric Aircraft



Courtesy: SMG Consulting

What is AAM?

- ✈ AAM is a concept that introduces new and innovative ways to move people and cargo between places underserved by aviation today.
- ✈ AAM aims to integrate emerging aircraft technology like eVTOL aircraft and other remotely piloted vehicles (drones) with existing flight operations.



Types of Operations



Air Taxi

- Passenger travel in urban and regional areas, usually under Part 135 certificate
- Generally, <200 miles and <8 passengers
- Airport shuttles, city center → city center, short intra-city hops



Air Cargo

- “Middle mile,” i.e., transporting existing cargo to/from airports or cargo facilities to distribution centers
- High-value or time-sensitive cargo



Public Service

- Supplementing helicopters for search and rescue, disaster relief, air ambulance, among other uses

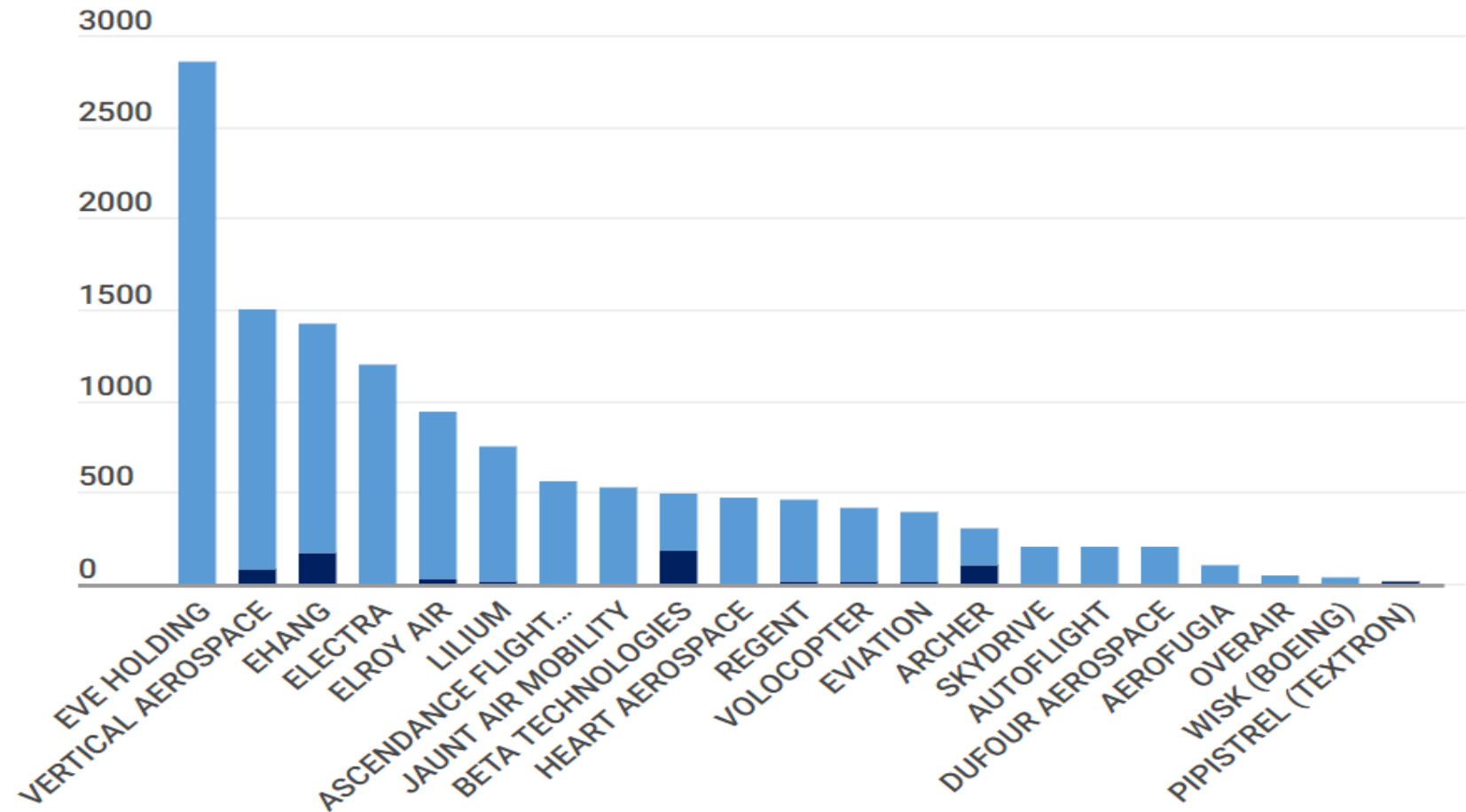
AAM Aircraft Reality Index

OEM (stock ticker)		ARI	Funding (\$M)	Use Case	Vehicle Type	Propulsion	Operation	Vehicle	First Flight	EIS	Country
Joby Aviation (NYSE: JOBY)	↔	8.7	\$2,251.3	Air Taxi	Vectored Thrust	Electric	Piloted	-	2018	2025	USA
Beta Technologies	↑	8.6	\$796.0*	Cargo, Regional, Air Taxi	Conventional / Lift + Cruise	Electric	Piloted	CX300 / Alia-250	2020 / 2022	2025 / -	USA
Volocopter	↔	8.6	\$761.0*	Air Taxi	Multicopter / Lift + Cruise	Electric	Piloted	VoloCity / VoloRegion	2021 / 2022	2024 / 2026	Germany
Archer (NYSE: ACHR)	↔	8.1	\$1,096.3	Air Taxi	Vectored Thrust	Electric	Piloted	Midnight	2023	2025	USA
Ehang (NASDAQ: EH)	↔	8.1	\$160.4	Tourism, EMS, Firefighting	Multicopter/Lift + Cruise	Electric	Autonomous	EH216-S / VT-30	2018 / 2021	2023 / -	China
Wisk (Boeing)	↑	7.8	Corporate backed	Air Taxi	Vectored Thrust	Electric	Autonomous	Generation 6	-	-	USA
Elroy Air	↔	7.4	\$50.0	Cargo	Lift + Cruise	Hybrid	Autonomous	Chaparral C1	2023	2024	USA
AutoFlight	↔	7.2	\$200.0	Air Taxi	Lift + Cruise	Electric	Piloted	Prosperity I	2022	2026	China
Eve Holding (NYSE: EVEX)	↔	7.2	\$377.4	Air Taxi	Lift + Cruise	Electric	Piloted	Eve	2024	2026	Brazil
Pipistrel (Textron)	↔	7.2	Corporate backed	Cargo	Lift + Cruise	Hybrid	Autonomous	Nuuva V300	2024	2025	USA
Aerofugia	↑	7.1	\$38.0	Tourism, Cargo, EMS	Vectored Thrust	Electric	Piloted	AE200	2023	2028	China
Vertical Aerospace (NYSE: EVTLL)	↑	7.0	\$347.8	Air Taxi, Cargo, EMS	Vectored Thrust	Electric	Piloted	VX4	2023	2027	UK
Lilium (NASDAQ: LILM)	↔	6.8	\$1,342.3	Regional, Cargo, Biz Av	Vectored Thrust	Electric	Piloted	Jet	2024	2026	Germany
Airbus	↔	6.5	Corporate backed	EMS, Tourism, Air Taxi	Lift + Cruise	Electric	Piloted	CityAirbus NextGen	2024	-	France
Supernal	↔	6.5	Corporate backed	Air Taxi	Vectored Thrust	Electric	Piloted	S-A1	2024	2028	South Korea

Source: August 2023 SMG AAM Reality Index

AAM Aircraft Orders & Options

BY OEM



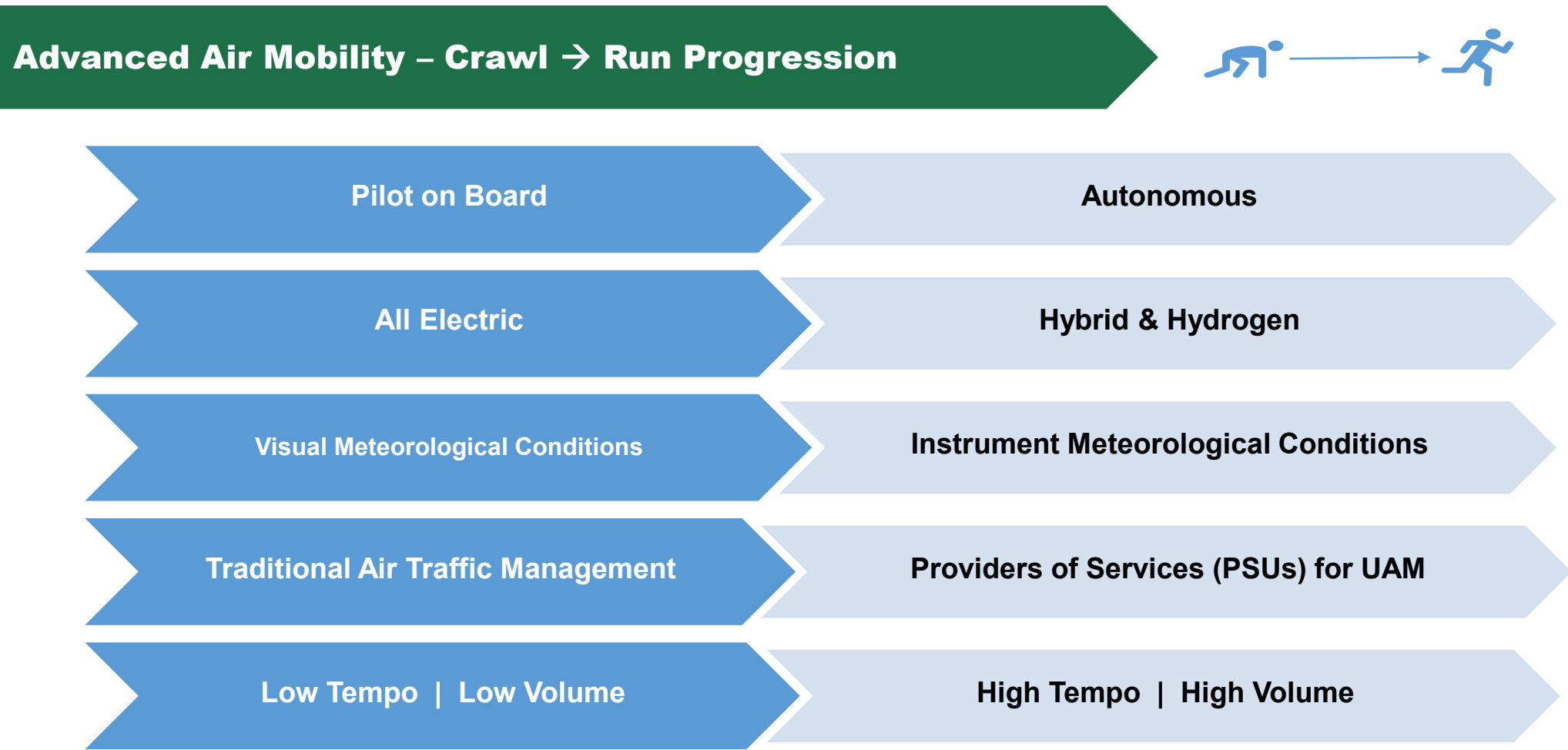
Vertiports

- ✈ Vertiports are spaces intended for the landing and take-off of eVTOL aircraft
- ✈ Provide battery charging, mechanical services, and more
- ✈ Ideas for vertiport locations are stand-alone, on top of parking garages, on or near mass transit, airports, and more
- ✈ For early operations, general aviation (GA) airports will likely be utilized until stand-alone vertiports in urban areas can be developed



Courtesy: Skyports

Progression of AAM From Start to Finish





Advanced Air Mobility Study



Study Overview

- ✈ Task 1: Assessment of AAM Activities and Potential In Georgia
- ✈ Task 2: Inventory State's Potential AAM Landing Areas and Evaluate Airport Charging Capabilities and Needs
- ✈ Task 3: Create A Community Guidebook
- ✈ Task 4: Develop A Statewide AAM Action Plan



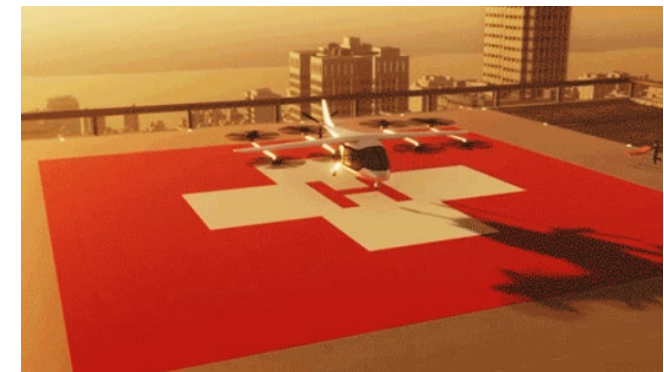
Source: Woolpert

The AAM Study is being finalized and will be presented for approval to the State Transportation Board in January 2024

Assessment and Inventory of AAM and Landing Areas

✈ Task 1: Assessment of AAM Activities and Potential In Georgia

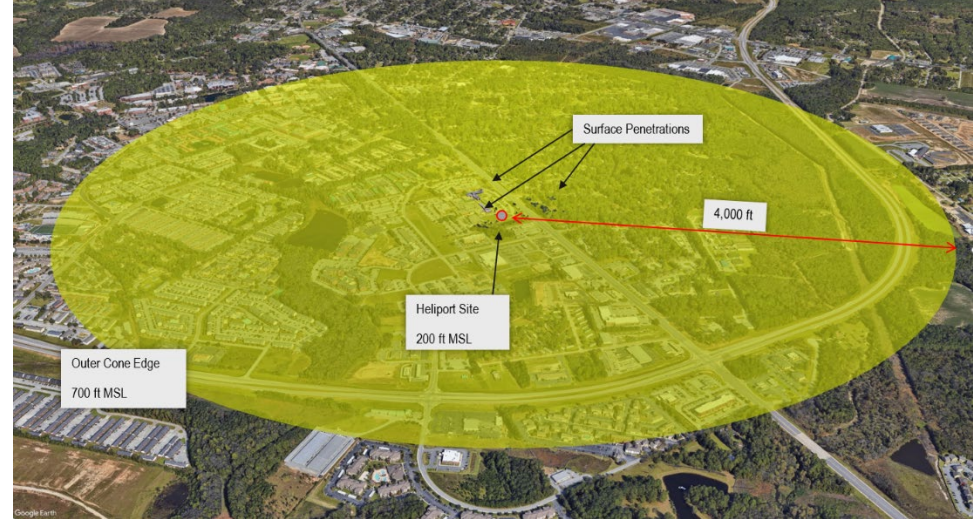
- Nationwide AAM actions
- Use cases in Georgia
- Best practices for AAM landing areas
- Marketing Georgia for AAM
- Economic Impact



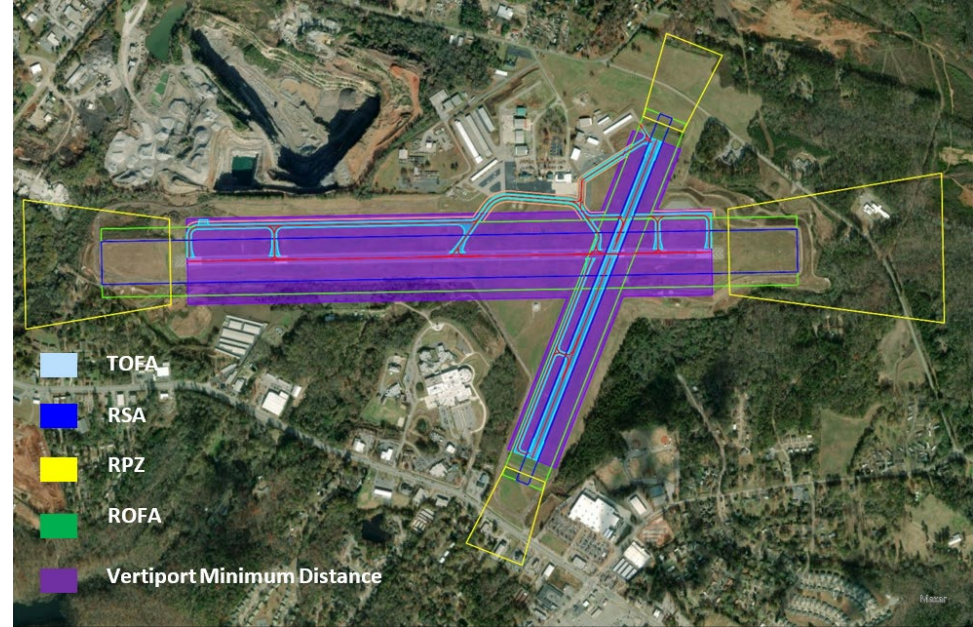
Assessment and Inventory of Aviation Infrastructure

✈ Task 2: Inventory Georgia's Potential AAM Landing Areas and Evaluate Airport Charging Capabilities and Needs

- Heliport inventory and compatibility assessment
- 10 initial airport compatibility reports
 - AGS AHN CSG DNN FTY
 - JCA MCN PDK PUJ SAV
- Airport charging needs and cost assessment



Airspace cone and surface penetrations (GA28)



Critical airport design areas for vertiport siting (AHN)

Community Guidebook for AAM

- ✈ AAM 101
- ✈ Roles & Responsibilities
- ✈ Community Preparedness
- ✈ Best Practices
- ✈ Toolkit



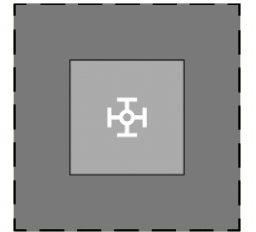
Community Guidebook: Roles and Responsibilities



ENTITY	AREA OF RESPONSIBILITY
Federal Aviation Administration	Certification of Aircraft, Vertiport Standards, Airspace, Air Traffic Control, Operational Regulations
Georgia DOT	Statewide AAM Coordination, Vertiport Standards, Inspections
Local Government	Zoning Protection, Land Use Compatibility Planning
Infrastructure Developers and Operators	Vertiports, Utility Providers
Service Providers	Aircraft Operations, Flight Scheduling, Aircraft Maintenance, Pilot Training
Stakeholders	Public Engagement

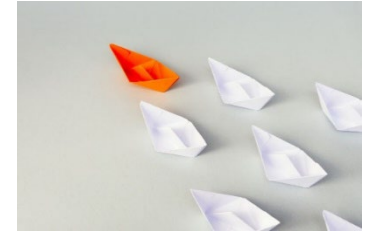


Municipality



Community Guidebook: Best Practices

Best Practice	
<p>Appoint an AAM Lead Staff Member</p>	<ul style="list-style-type: none"> Assume the role of the principal spokesperson, responsible for staying well-informed about AAM advancements and effectively representing the community's requirements and best interests.
<p>Coordinate Early with Stakeholders</p>	<ul style="list-style-type: none"> Results in a greater understanding of AAM in the community and increases the likelihood of successful integration
<p>Review Zoning Ordinances</p>	<ul style="list-style-type: none"> Review existing zoning and incorporate overlay zoning for vertiports to ensure the safe operation of vertiports. Outline permitted and prohibited land uses, vertiport development standards, and incorporate vertiports into comprehensive plans.
<p>Map Aeronautical Use Facilities, 14 C.F.R. Part 77 Surfaces</p>	<ul style="list-style-type: none"> Identify existing aeronautical uses, research Part 77, and map out these surfaces to avoid airspace conflicts.



Community Guidebook: Best Practices

Best Practice	Additional Information
<p>Ensure Land Use Compatibility</p>	<ul style="list-style-type: none"> • Review and incorporate the FAA advisory circular on land use compatibility planning. • Plan and zone for vertiports considering structures and compatible land use.
<p>Identify Existing Ambient Noise Levels</p>	<ul style="list-style-type: none"> • Understand the ambient noise levels in areas where vertiports may be proposed. • Stay abreast of development in AAM noise metrics.
<p>Establish an Electric Aircraft Fire Safety Protocol</p>	<ul style="list-style-type: none"> • Establish guidance and train for handling electric aircraft fires.
<p>Create Community First AAM Policies</p>	<ul style="list-style-type: none"> • Promote equitable mobility choices for all segments of society • Support community-friendly flight routes and operation times • Encourage integration with existing transportation options to maximize benefits • Foster positive economic growth



Community Guidebook: Toolkit

- ✈ **External guidance that can be used in the areas of:**
 - AAM 101
 - Land Use Compatibility
 - Noise
 - Infrastructure
 - Airspace

- ✈ **There are embedded links and descriptions of the applicability of each item in the toolkit.**



Action Plan

GDOT is reviewing initiatives and legislative actions to advance AAM. Below are categories of potential initiatives:

- ✈ Continued Engagement with Stakeholders
- ✈ Support to Local Governments
- ✈ Support Economic Development



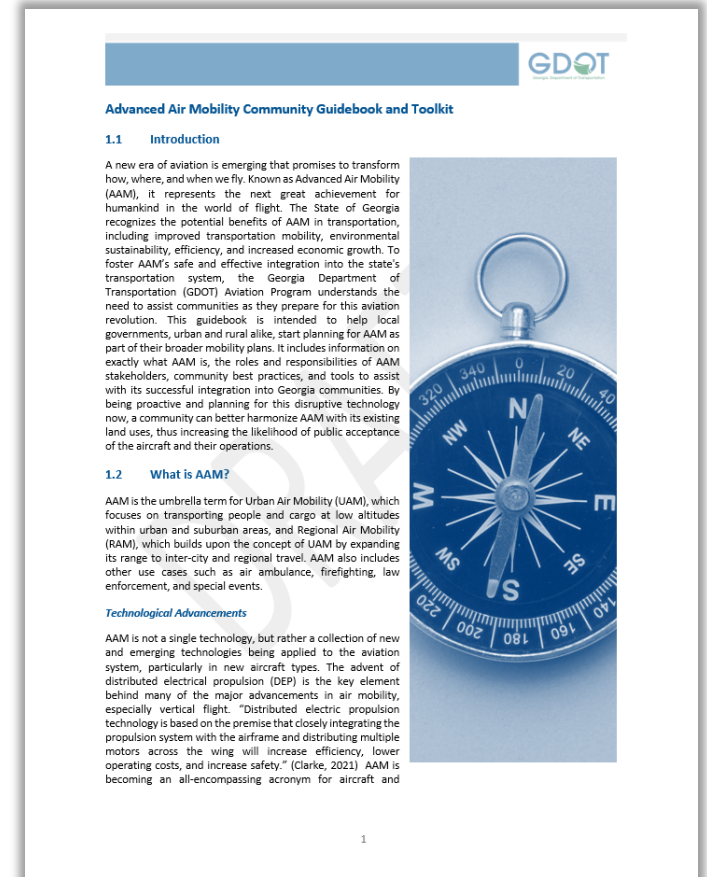
Action Plan: Continued Engagement with Stakeholders

Action	Responsible Parties	Purpose
<p>Continue to engage the AAM working group periodically and reevaluate the membership and structure of the group.</p>	<p>GDOT, working group members</p>	<p>To continue to bring together key stakeholders to network, raise awareness of issues, and to provide industry updates</p>
<p>Develop or utilize additional stakeholder engagement tools, including an email newsletter and a dedicated AAM page on GDOT's website.</p>	<p>GDOT</p>	<p>To build upon the success of the working group by incorporating broader stakeholder outreach into GDOT's AAM efforts</p>



Action Plan: Support to Local Governments

Action	Responsible Parties	Purpose
Distribute the guidebook and conduct targeted workshops to educate local officials about AAM.	GDOT	To raise awareness of AAM among local decision-makers so that they can make informed decisions about AAM in their communities
Develop a Land Use Compatibility Tool	GDOT	To streamline the process for local governments to map out aeronautical or other incompatible uses



Action Plan: Support Economic Development

Action	Responsible Parties	Purpose
Coordinate with GDEcD Center of Innovation for Aerospace	GDOT/GDEcD	To provide support for the AAM industry in Georgia
Integrate AAM into the work of the Georgia Electric Mobility and Innovation Alliance (EMIA)	GDOT/GDEcD	To ensure AAM is included in the planning for statewide electric mobility



Next Steps

The following are the major next steps GDOT is considering to take following the finalization of the AAM Study:

Action	Responsible Parties	Purpose
Continue to engage the AAM working group periodically and reevaluate the membership and structure of the group.	GDOT, working group members	To continue to bring together key stakeholders to network, raise awareness of issues, and to provide industry updates
Develop a Land Use Compatibility Tool	GDOT	To streamline the process for local governments to map out aeronautical or other incompatible uses
Distribute the guidebook and conduct targeted workshops to educate local officials about AAM.	GDOT	To raise awareness of AAM among local decision-makers so that they can make informed decisions about AAM in their communities
AAM Pilot Program	GDOT, others	To create an AAM route from the Atlanta Metro Area via eVTOL and identify gaps and solutions for AAM in the state



A Sustainable Future for Aviation



BETA
TECHNOLOGIES

A Systems Company

All the elements needed for deployment of electric aircraft



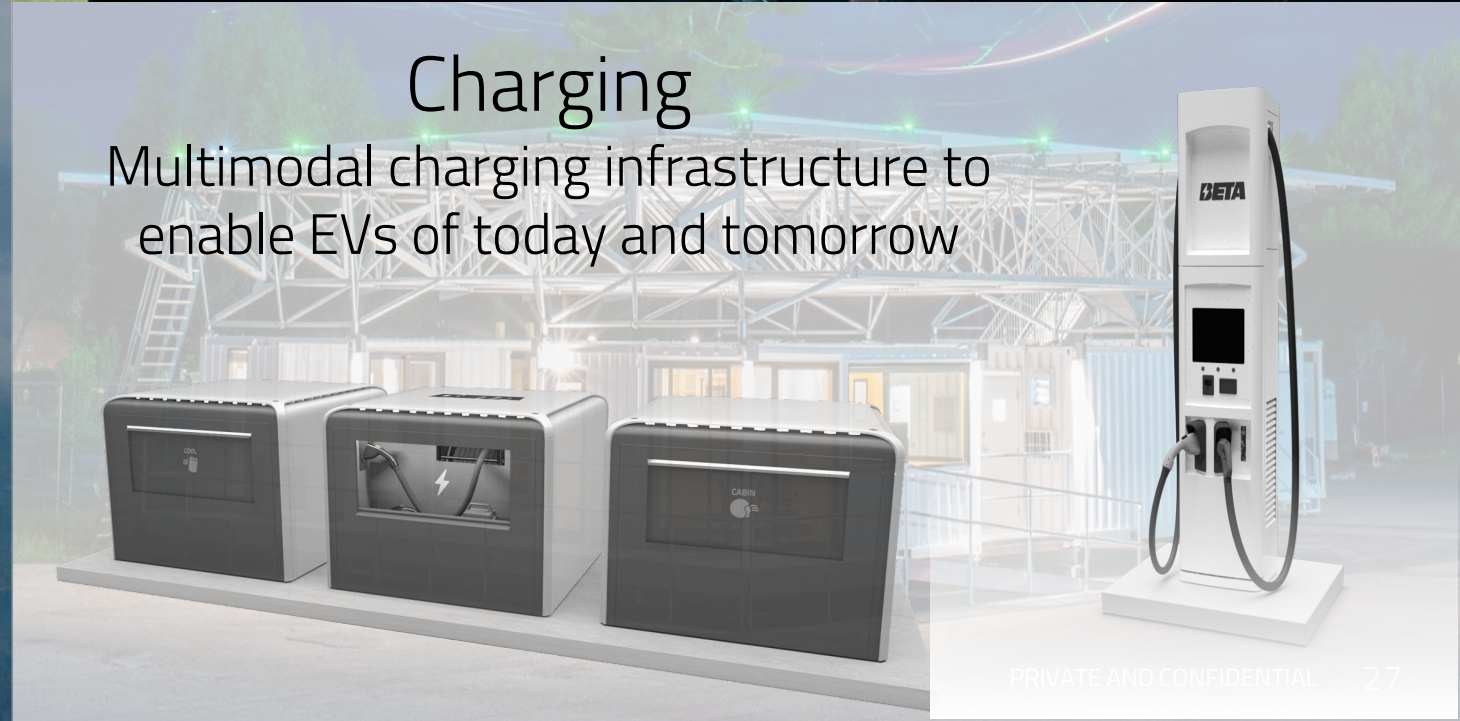
Aircraft

cCTOL and eVTOL aircraft with distributed electric propulsion to make aviation greener, cleaner, and more efficient



Training

Flight training curriculums and immersive simulators to train pilots and mechanics on electric aircraft



Charging

Multimodal charging infrastructure to enable EVs of today and tomorrow

ALIA Today: Demonstrated Real-Life Performance

- Operating under Market Survey flight certificate from FAA
- Qualification evaluation flights with FAA, U.S. Air Force, Army
- Louisville and back on own charging infrastructure (1,600+ mi)
- Bentonville and back on own charging infrastructure (2,400+ mi)
- Met with U.S. Secretary of Transportation
- Flown through Class B and C airspace
- Completed 386 mile flight on five battery packs
- Completed first 50ft battery drop test (with FAA, NIAR)
- 3+ years of flights (*full-scale pre-engagement program*)

Revitalizing Existing Infrastructure

Local airports provide the infrastructure to reach rural communities, and new electric aviation technology offers an improvement in efficiency, affordability, and integration.

Together, this will enable new accessibility and bring new opportunities (cargo, passenger service; charging) to underserved geographies.

0.6% of U.S. airports support 70%+ of domestic travel

5,050 underutilized public-use airports in the U.S.

16 minutes from the airport most Americans live

1.6% of trips between 50 and 500 miles are completed by air

146 U.S. airports have renewable energy projects in progress



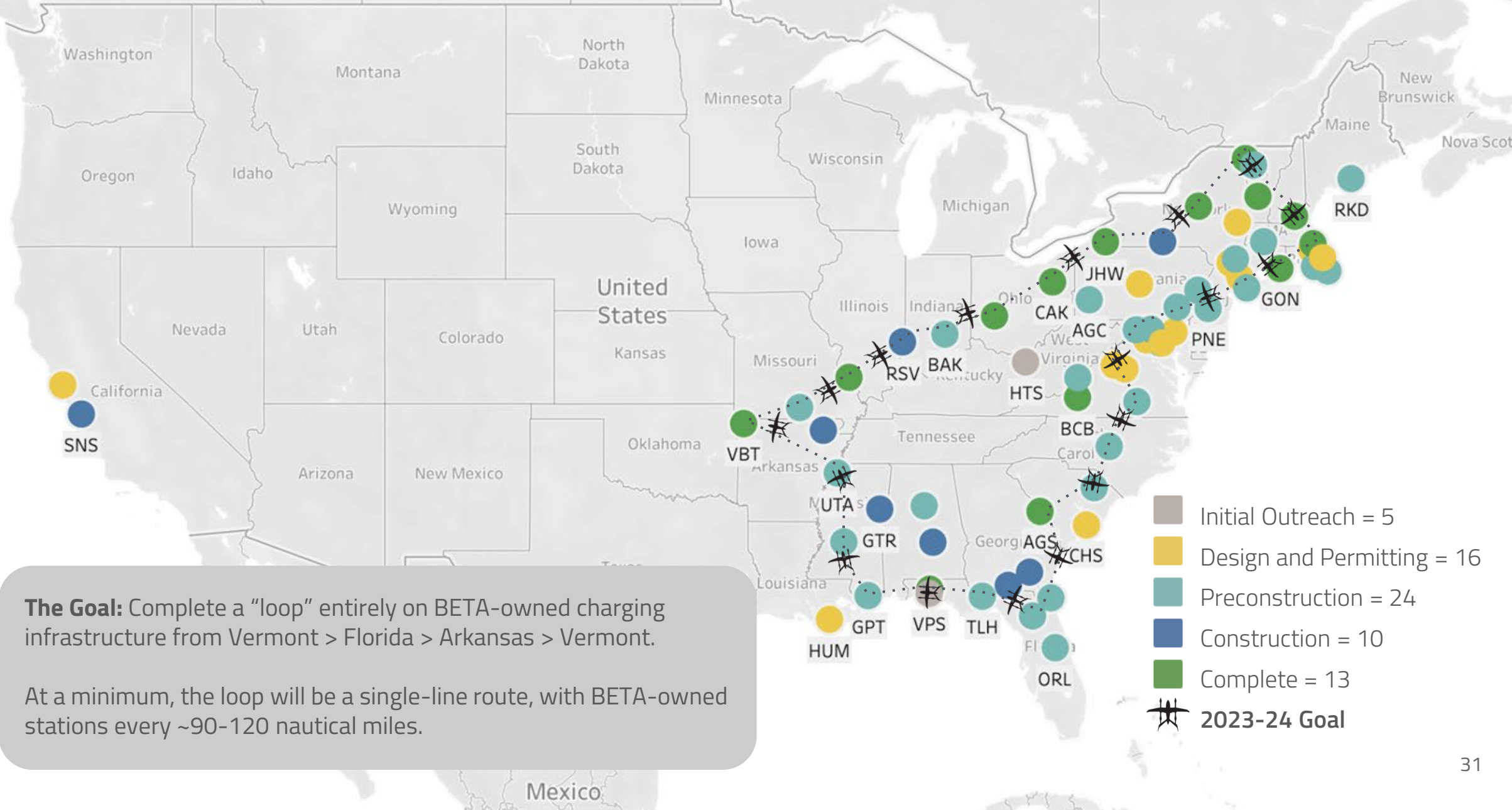
Increasing Rural Access

Electric aviation is a sustainable, cost-effective solution to restructuring our air networks to unlock access for rural and underserved geographies.

- **70%+** of domestic U.S. travel is routed through just **0.6%** of airports
- Rural dwellers have **~2x** the travel time to nearest hospital, compared with urbanites
- **28%** of the US population lives in lower-48 zip codes where cargo companies will assess rural or extended delivery area surcharges.



BETA Charging Network 2023-24



The Goal: Complete a "loop" entirely on BETA-owned charging infrastructure from Vermont > Florida > Arkansas > Vermont.

At a minimum, the loop will be a single-line route, with BETA-owned stations every ~90-120 nautical miles.

This high power self serve charging dispenser can charge Alia in under an hour

BETA

BETA
FLIGHT RECHARGED

Pragmatic Charging Solutions



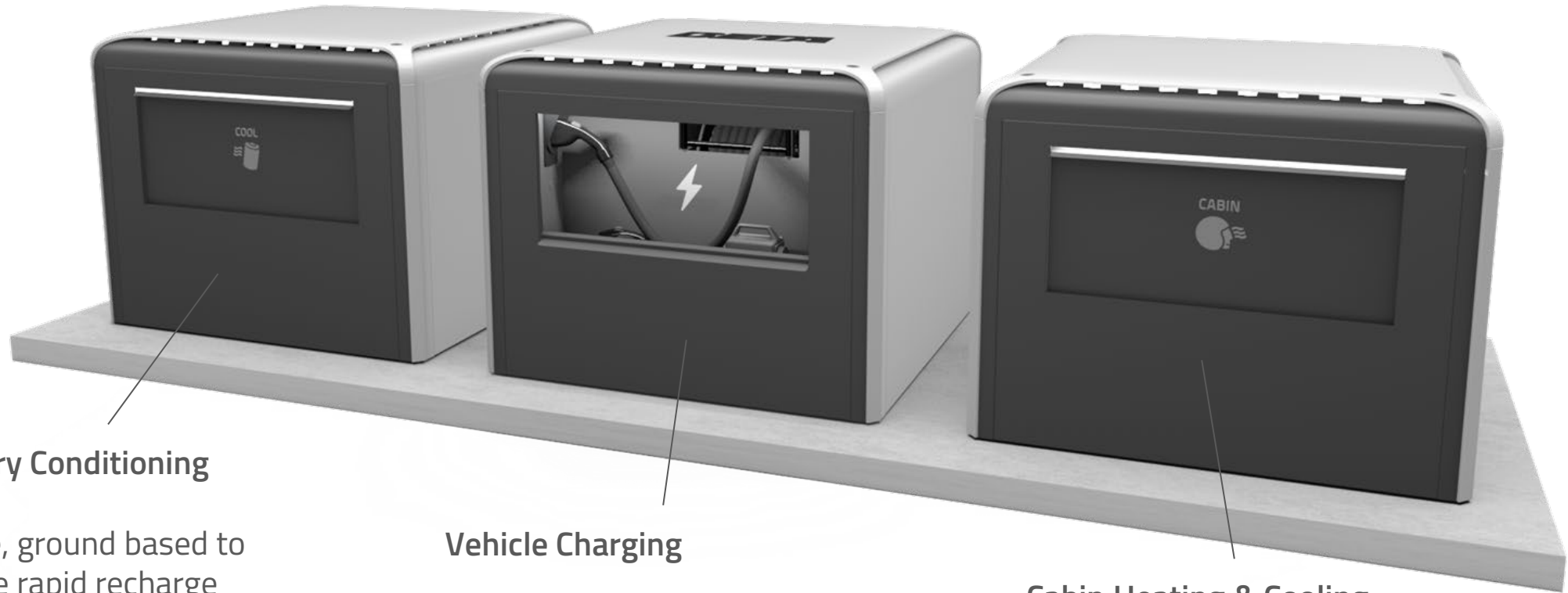
Multimodal: EV charging that supports all EVs – aircraft, trucks, cars – not just BETA's ALIA

<1 Hr. Charge: Harmony between the aircraft and charging systems enable safe supercharging

50ft retractable reel: The 50 foot cord provides flexibility in aircraft parking orientation and location to minimize aircraft ground handling.

Mobile App: Powered by a mobile-app that allows for seamless, touch-free access to reliable charging.

Simple, elegant, and effective on-airport charging



Battery Conditioning

Active, ground based to enable rapid recharge (<1hr) and proper conditioning of batteries for mission performance and long life.

Prototype being finalized.

Vehicle Charging

350kW (900V) with integral motorised cable retract reel.

Successful testing complete.

Cabin Heating & Cooling

Preflight soak reduces onboard air conditioning systems weight and energy for mission performance.

Prototype being finalized.



N250UT

BLADE