MIAMI-DADE AIR MOBILITY BLUEPRINT

Phase 1: An Ecosystem to Launch and Scale Urban Flights

DECEMBER 2021

EVE

L3HARRIS™ Skyports CAMI Community Air Mobility Initiative

CLICK ON THE SUBJECT TO GO

ACRONYMS

ATC	Air Traffic Control
ATM	Air Traffic Management
CO_2	Carbon Dioxide
CONOPS	Concept of Operations
DHS	Department of Homeland Security
EASA	European Union Aviation Safety Agency
eVTOL	Electric Vertical Take-off and Landing Vehicle
FAA	Federal Aviation Administration
FATO	Final Approach and Take-Off Area
MIA	Miami International Airport
MBCC	Miami Beach Convention Center
MDC	Miami-Dade County
NASA	National Aeronautics and Space Administration
PSU	Provider of Services to UAM
RAM	Regional Air Mobility
TSA	Transportation Security Administration
UAM	Urban Air Mobility
UATM	Urban Air Traffic Management
UML	UAM Maturity Levels

GLOSSARY

eVTOL	An electric, zero-emissions aircraft that takes off vertically. Typically, these aircraft will carry 4-6 passengers on short hops across the city.
Provider of Services to UAM (PSU)	An organization that provides a variety of services to users of the UAM system. These services may include traffic management and weather information.
Urban Air Mobility (UAM)	The use of aircraft to travel across a large urban area. Historically, UAM has generally used helicopters but eVTOLs will introduce a zero-emission, quiet, and accessible mode for urban flights.
Urban Air Traffic Management (UATM) Provider	Urban Air Traffic Management (UATM) refers to the systems and services (including organizations, airspace structures and procedures, environment, and technologies) that support UAM operations and maximize the performance of UAM and low-level airspace.[1] In the context of this CONOPS, the UATM Provider is a PSU that exchanges data with UAM stakeholders, plans and authorizes flights, manages the flow of traffic in the UAM ecosystem, monitors conformance to flight plans, and dynamically manages the airspace for UAM operations.
User Journey	A visual representation of the path taken by an end user to accomplish a goal. User Journeys are helpful for identifying potential barriers and solutions to help an end user complete their goal safely and efficiently.
Vertiport	A vertiport is the infrastructure intended for eVTOL aircraft to take off and land. It can have a single or multiple Final Approach and Take-Off Areas (i.e., landing pads). Vertiports will also provide services, including weighing passengers and bags to ensure the weights are within limits.

ACKNOWLEDGEMENTS

We would like to thank the following organizations for contributing their expertise, time, and suggestions to the development of the Phase 1 UAM Ecosystem Concept of Operations for Miami-Dade County:

- Associated Aircraft Group (AAG)
- City of Miami Beach Department of Transportation
- Federal Aviation Administration (FAA)
- Florida Power and Light (FPL)
- Greater Miami Convention and Visitors Bureau
- Miami Beach Convention Center
- Miami-Dade Beacon Council
- Miami-Dade County
- Miami-Dade Fire Rescue Department
- Miami International Airport (MIA)
- Transportation Security Administration (TSA)

We would also like to thank those residents who contributed their thoughts on UAM and its possibilities for Miami-Dade County.

BACK TO MENU

1 SUSTAINABLE AVIATION WILL TRANSFORM **URBAN MOBILITY**

Quick, quiet, and green urban flights across Miami-Dade County (MDC) will soon be a realistic and accessible option. Within 5 years, a new technology called electric vertical take-off and landing vehicles, or eVTOLs (pronounced ee-vee-tols), will open up the sky to more people as an option for zero-emission urban mobility.

Our journeys to work, school, and play will no longer be determined solely by traffic conditions and transit timetables. We will have the option of flying across the County and complementing transit trips with a new mode of transportation. Urban flights will start at the local vertiport—a facility like a small airport—where we'll take-off in an eVTOL and a few minutes later, land at another vertiport near our destination. The time savings will be significant. Trips that can take an hour by road today, will be completed in minutes (Figure 1).

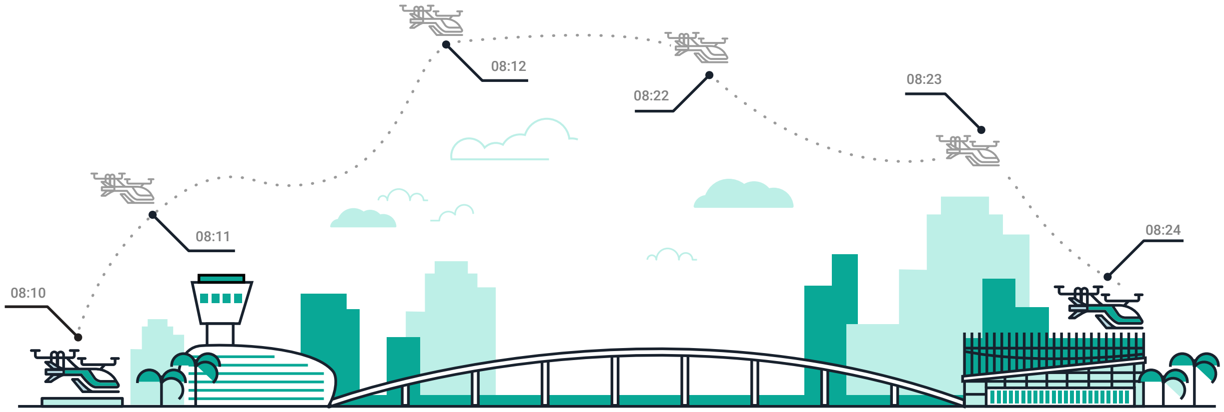


Figure 1. Trips across the city that take an hour by car could soon take minutes.

As demand for urban flights grows, MDC will also reap a wide range of economic and environmental benefits. It will be able to diversify the local economy with new sources of revenue, attract green infrastructure investment, and accelerate the decarbonization of the transportation system. Electric urban air mobility (UAM) will also open the door to new training opportunities and green jobs that will support passengers, fleet operations, and beyond.

Governments, industries, and communities will need to start planning today if these benefits are to be fully realized. Across the world and in the U.S., electric UAM operations are expected to launch by 2025. The market will grow quickly and scale toward high-frequency operations within a decade. MDC will need an integrated ecosystem of regulations, technologies, and infrastructure to support safe and efficient operations while meeting growing passenger demand for urban flights.

1.1. WHAT IS AN ELECTRIC VERTICAL TAKE-OFF AND LANDING VEHICLE (eVTOL)?

An eVTOL is an electric aircraft that will take off and land vertically. These aircraft are designed explicitly to ensure safety, improve the affordability of urban flights, and minimize noise to gain community acceptance.

eVTOLs will operate initially with a pilot on board but will transition to autonomous flights once the data to support the safety case are robust, the technology matures, and regulators allow it. Being electric-powered, eVTOLs will need facilities to recharge or swap batteries between some but not all flights.

Figure 2 presents features of the eVTOL design from Eve Air Mobility. While designs and noise profiles will differ across manufacturers, these features are generally consistent across most eVTOLs.

Figure 2. Key Features of eVTOLs

A TYPICAL UAM JOURNEY

DISTANCE: 10 - 30 miles **DURATION:** 7 – 17 minutes **ALTITUDE:** 800 - 1000 ft

PASSENGERS: 4 passengers + 1 pilot (5 - 6 passenger capacity when operating autonomously)

BACK TO MENU

HOW ARE eVTOLS DIFFERENT FROM HELICOPTERS?

Significantly Quieter: Noise profiles will vary but eVTOLs will be significantly quieter than helicopters because they are engineered for community acceptance.

Zero-Emissions: eVTOLs will be powered by electricity. Time and facilities will be needed to recharge or swap batteries between some flights.

Minimal Hover Duration: eVTOLs are designed to go directly from A to B to optimize battery performance. Therefore, they are unlikely to hover for long periods, minimizing any noise impact.

Designed for Short Hops: Missions will generally focus on short- to moderate-distance trips.

More Affordable and Accessible: Electric motors will make eVTOL flights more affordable than helicopters. Once autonomous flights are approved, the cost of flights can be further reduced.

Multiple Rotors and Redundancies: eVTOLs will have multiple rotors driven by electric propulsion. This design makes eVTOLs safer than helicopters and provides more safety redundancies.

1.2. WHAT IS URBAN AIR MOBILITY (UAM)?

UAM simply refers to short-distance, intra-city flights. Until now, UAM has primarily been achieved by using helicopters. A similar concept is Regional Air Mobility (RAM) which will also use eVTOLs but for longer distance flights within a region (i.e., intra-regional flights). Electric RAM operations will have similar regulations, infrastructure, and technologies. Indeed, UAM and RAM services may even complement each other in some situations.

1.3. THE NEED FOR AN ECOSYSTEM TO SCALE UAM

eVTOLs will introduce aircraft and urban flights with unique characteristics. While initially, UAM operations will operate with existing procedures and airspace infrastructure, the expected increase in UAM demand and operational tempo will present significant challenges. Research and simulations to date suggest that UAM operations using current day infrastructure and airspace procedures will not be suitable beyond a limited number of eVTOL flights[1].

As a result, UAM operations necessitate an ecosystem to address a complex array of issues that include:

- Safe integration with other aircraft in the low-level airspace;
- Flight procedures for the unique characteristics of eVTOL flights;
- New roles and responsibilities for UAM stakeholders;
- Technologies and data exchange to support a higher density of low-level flights; and
- Ground infrastructure and electrical supply for battery recharging or swapping.

1.4. PURPOSE OF THIS DOCUMENT

A consortium, comprised of Eve Air Mobility, L3Harris, Skyports, and Community Air Mobility Initiative (CAMI) developed this Phase 1 Concept of Operations (CONOPS) for a UAM ecosystem. The purpose of this CONOPS is to help MDC prepare for the launch and growth of this new transportation mode.

A CONOPS describes how an integrated ecosystem that includes air and ground infrastructure, technologies, regulations, and procedures will work together. This ecosystem will enable UAM operations to integrate safely into the airspace with community acceptance.

This work builds upon the material developed by Airservices[1] & EmbraerX and is a Phase 1 CONOPS. As such, the contents will grow and evolve as we gain a deeper understanding of MDC's needs, constraints, and opportunities. We hope this document initiates conversations about sustainable UAM in MDC and the opportunities that UAM could offer. This CONOPS includes a high-level overview of:

- eVTOLs and zero-emissions UAM;
- The step-by-step activities of passengers and eVTOLs in a UAM User Journey;
- The proposed UAM ecosystem of infrastructures, procedures, and technologies;
- Environmental and economic benefits that electric UAM could bring to communities.

1.5. AUDIENCE

This document has been written for MDC leaders, communities, businesses and economic development bodies, and businesses interested in participating in the sustainable UAM industry.

1.6. SCOPE

This document provides a high-level overview of a proposed UAM ecosystem and its components. It focuses on operations between launch and a mature market when a pilot is still on board the aircraft (i.e., not autonomous operations). While the needs of RAM operations will be similar to UAM, this document focuses solely on UAM, although many of the concepts will also be applicable.

1.7. DOCUMENT OVERVIEW

Section 1 introduces the concept of electric UAM, provides background information on sustainable UAM, and why it is necessary to start planning an integrated UAM ecosystem today.

Section 2 provides insight into the expected electric UAM market in MDC and its potential benefits for commuters and communities.

Section 3 contains the CONOPS for a UAM ecosystem as described through User Journeys. This section also provides a high-level overview of the challenges to implementing UAM and the necessary enabling technologies and infrastructure.

Section 4 presents potential next steps for advancing the implementation of sustainable UAM in MDC.

BACK TO MENU

2 DELIVERING SUSTAINABLE UAM TO MIAMI-DADE COUNTY

Miami-Dade County can be a global leader in the introduction of sustainable UAM. Zero-emission UAM could help MDC address the significant challenges from traffic congestion and climate change while also delivering new job opportunities and economic benefits to communities.

Some of the major constraints on mobility in MDC

Traffic Congestion

Miami-Dade was the 5th most congested county in the country in 2020 and the pressure on road infrastructure is growing. Furthermore, car ownership in the county is rising while ridership in the transit system is steadily declining.

Pollution, CO_2, and Climate Change

Communities are placing significant pressure on governments to decarbonize all activities and improve resiliency to climate change. In MDC, 55% of emissions were from transportation[2].

Reliance on Bridges to Access Miami Beach

Miami Beach is accessed by causeways, some of which are drawbridges. Aging infrastructure has closed the Venetian Causeway multiple times, and drawbridges periodically close for repairs. As a result, access to Miami Beach is unpredictable, limited, and susceptible to significant delays and congestion.

The growth of electric UAM offers MDC the potential to address these key challenges and sustainably deliver a wide range of economic and environmental benefits.

NEW JOB OPPORTUNITIES

As UAM scales, the industry will create over 6000 blue- and white-collar jobs and unlock training opportunities in a green industry.

GREEN INVESTMENT

Electric UAM growth will also attract investment in green infrastructure. Between 2020-40, $318 B will be spent in infrastructure investments globally.

NEW & DIVERSIFIED REVENUE STREAM

Taxes and fees from UAM operations could generate a new and diversified revenue stream for MDC. This will reduce the County's reliance on tourism as a primary source of revenue.

ZERO-EMISSION TRANSPORT

Electric UAM flights have the potential to slow the growth of traffic congestion, complement transit systems, and accelerate the decarbonizaton of MDC.

2.1. ELECTRIC UAM MARKET FORECASTS FOR MIAMI-DADE COUNTY

Electric UAM operations are expected to scale quickly across the world. By 2035, over 50,000 eVTOLs are expected to be serving a global UAM market worth more than $200 billion[3].

With a focus on the MDC market, Eve conducted an intra-county assessment by using a market-modeling tool that was developed in collaboration with the Massachusetts Institute of Technology (MIT). Estimates of the potential UAM market size considered variables that included Origin-Destination data, census tract-level demographics, current cost and time of ground transportation, Eve's eVTOL operational assumptions (including different price points), and inferred passengers' willingness-to-pay for other transportation modes. The modeling tool used these inputs to generate the market size and routes and simulated short-term and long-term predictions (for a mature market).

2.2. MARKET FORECAST FOR 2026

Figure 3. In 2026, 7 Vertiports could be Serving Miami-Dade County.

Early projections predict that by 2026 in an unconstrained market (i.e., not accounting for factors that would limit or prohibit operations), MDC could have 7 vertiports with 40 to 63 eVTOLs carrying up to 600,000 passengers a year[a].

[a]Eve Air Mobility projections based on unconstrained market and expected initial demand.

2.3. MARKET FORECAST FOR 2035

The UAM market is expected to grow rapidly after initial launch. By 2035, MDC could have up to 32 vertiports and 210 eVTOLs. By this time, 4 million passengers are expected to travel across 88 routes annually in MDC, generating a new and diversified source of revenue for the County (Figure 5). By 2035, eVTOL technology and the UAM ecosystem will have matured significantly and the technology in

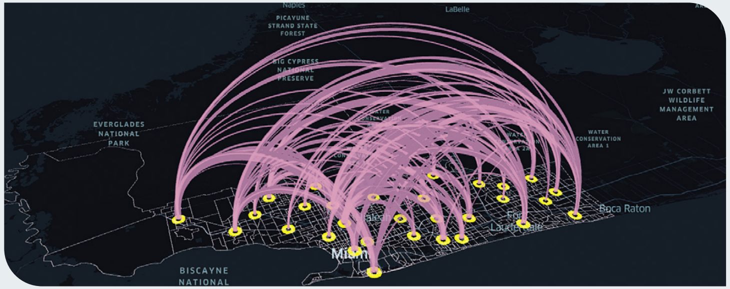


Figure 4. Forecasted Unconstrained UAM Route Network in 2035 with a Mature Market.

eVTOLs will be expected to be certified for autonomous operations. Once autonomous operations are allowed, the price of UAM flights is expected to decrease.

BACK TO MENU

UAM IN MIAMI-DADE COUNTY IN 2035[b]

210 eVTOLs

88 Routes

32 Vertiports

4 M Annual Passengers

$191M Annual Revenue

$84M MD County Cumulative Revenue

$53,000 Average salary for direct UAM jobs

6000+ Direct and Indirect Blue-and White-Collar Jobs

Figure 5. Snapshot of the UAM Market in MDC by 2035 in an unconstrained market

[b]These projections are based on an unconstrained market. Unconstrained projections do not take into factors such as airspace restrictions or regulatory limits on operations.

2.4. UAM JOBS AND WORKFORCE DEVELOPMENT

By 2035, MDC is forecast to have over 6000 diverse types of jobs stemming from UAM. These jobs will also unlock training and workforce development opportunities and enable more people to benefit from this new, green industry. For example, ground handling personnel will be needed to support vehicle turnaround and assist passengers to board and disembark. Aircraft battery technicians will be needed to support vehicle charging. New urban traffic management organizations will also require staff to fill roles that do not exist today.

2.5. EMISSION REDUCTIONS BY 2035

Apart from the economic benefits from the growth of UAM, environmental benefits can also be realized. In an unconstrained market, UAM has the potential to reduce carbon dioxide (CO_2) emissions in MDC by over 11,000 tons annually, equal to the emissions from driving around Earth over 1,100 times. These calculations factor in the anticipated emissions for battery recharging that comes from power plants in 2035. Should more renewable energy be available by then, the CO_2 reduction could be even greater.

CO_2 REDUCTION

By 2035, UAM Could Reduce CO_2 Emissions by over 11,000 tons annually in MDC.
This is equivalent to:

- Emissions from almost 1,700 cars a year
- Emissions from driving around the world over 1100 times

3 A PHASE 1 CONCEPT OF OPERATIONS

This Phase 1 CONOPS presents a proposed ecosystem to enable electric UAM operations to launch and scale safely in Miami-Dade County.

3.1. FOUNDATIONS FOR ECOSYSTEM DESIGN

The CONOPS was built on the following foundations:

SAFE
Ensures UAM flights are safely separated in the air, integrated with other airspace users, and supports shared situation awareness and coordinated decision making for all stakeholders.

AGNOSTIC
Ensures investments in UAM provide sustained value for the community in the long term. Agnostic ecosystems also provide all operators with access to UAM infrastructure, which in turn, benefits the community and passengers.

SCALABLE
Ensures the UAM ecosystem is flexible, adaptable, and sustainable as demand for UAM grows, technologies evolve, and regulations shift.

3.2. PHASES OF FLIGHT[1]

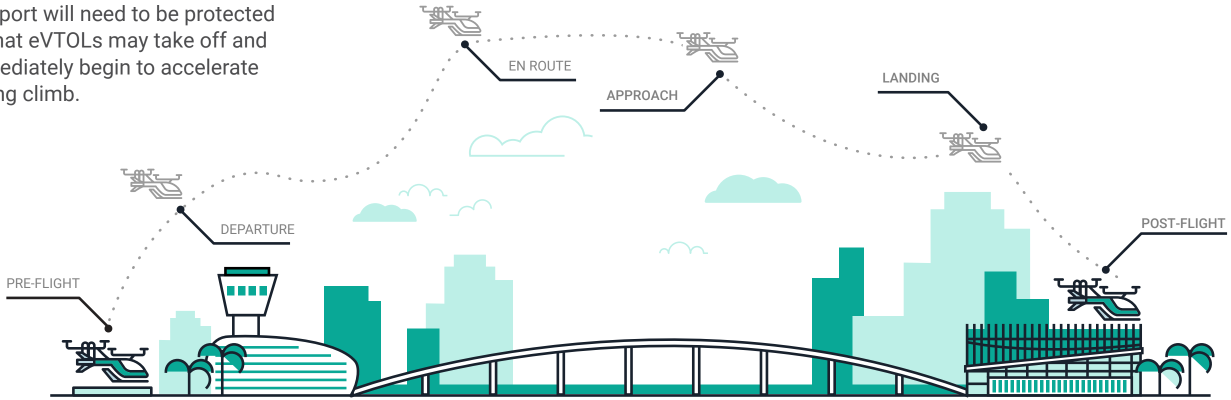
1 PRE-FLIGHT
Any activity related to flight preparation, including passenger check-in, vehicle inspection, battery charging, flight planning, boarding of passengers and/or cargo.

2 DEPARTURE
This is the period in which the eVTOL takes off and reaches its cruise altitude. It is expected that eVTOLs will hover for a few moments and achieve forward speed before climbing out to their cruise and/ or en route altitude. Utilizing the vertical component of lift, eVTOLs will start climbing to their cruising altitude moments after departure. The airspace above and around the vertiport will need to be protected so that eVTOLs may take off and immediately begin to accelerate during climb.

3 EN ROUTE
The point at which the vehicle reaches cruise altitude up to the point at which it begins the approach to the destination vertiport. After reaching cruise altitude, the eVTOL will fly at optimum cruise speed until it is time to commence descent.

4 APPROACH
The period between the eVTOL reaching the descent commence point to the assigned destination vertiport and reaching the decision altitude/height for landing. The eVTOL will begin to decelerate as it approaches the destination.

5 LANDING
The point at which the decision is made to continue to the destination vertiport from the decision altitude/height until the eVTOL lands. The airspace above and around the vertiport will need to be protected so that eVTOLs may descend to the vertiport at an angle.



6 POST-FLIGHT
The period after the eVTOL is turned off, the flight closes and securing the vehicle commences. Post-flight activities typically include de-boarding passengers and/or cargo and vehicle servicing activities (e.g., battery charging, maintenance).

3.3. ROLES AND RESPONSIBILITIES ACROSS THE UAM ECOSYSTEM

New roles and responsibilities will be needed to support the ecosystem, particularly as the UAM route network becomes more complex and flights become more frequent. In each flight phase, an integrated ecosystem of technologies, stakeholders, and infrastructure will continually share data in real time to ensure safe and seamless operations. The most significant new roles in a UAM ecosystem are:

VERTIPORT OPERATOR

A vertiport operator will provide a place for UAM flights to land, take off, and park. They will also provide a place for passengers to board and disembark.

URBAN AIR TRAFFIC MANAGEMENT (UATM) PROVIDER.

This is a new organization that will provide traffic management services over the urban area. The UATM Provider will have a role similar to air traffic control (ATC) but its responsibilities will cover only the low-level urban airspace where UAM flights operate[c].

UAM FLEET OPERATOR

Similar to an airline, a UAM Fleet Operator will manage and operate a fleet of eVTOLs that provide UAM flights.

[c]The Federal Aviation Administration (FAA)'s UAM CONOPS expects numerous organizations to deliver different services to the UAM ecosystem. They will be called a Provider of Services to UAM (PSU). In the context of this CONOPS, the PSU is the UATM Provider even though other PSUs may deliver services, such as weather information.

Figure 6 highlights the roles and responsibilities of the UAM ecosystem. More details about these new roles are presented below.

URBAN AIR TRAFFIC MANAGEMENT PROVIDER
Provides traffic management services for low-level UAM operations. Manages urban traffic and shares data with stakeholders.

eVTOL
Carries passengers and a pilot. Capable of autonomous flights in the future.

AIRPORT
Connects passengers between the airport vertiport and the terminals. May provide facilities for eVTOL fleets.

VERTIPORT
Provides ground facilities to take-off, land, and recharge and passengers to board and disembark.

PILOT
Ensures the flight is safe, efficient, and complies with the flight plan.

BOOKING PLATFORM
Books UAM flights and coordinates bookings with fleet operators.

UAM FLEET OPERATOR
Operates UAM flights. Employs dispatchers who coordinate aircraft and pilots who fly eVTOLs.

PASSENGER
Travels on scheduled or on-demand flights.

GROUND HANDLER
Supports passengers and vehicles at the vertiport

MECHANIC
Maintains UAM aircraft.

Figure 6. Key Roles and Responsibilities in the UAM Ecosystem

3.3.1. What is a Vertiport Operator?

Figure 7. An Example of a Vertiport with One FATO and Three Stands.

A vertiport is the infrastructure where eVTOLs take off and land and passengers board and disembark. They may be built on the ground or on the top of buildings. Existing helicopter sites could operate as vertiports provided they comply with regulations and have the required systems in place (such as electric charging capability). Vertiport capacity will significantly affect the capacity of the overall UAM system. Vertiport operators will manage these infrastructures and deliver services to UAM flights.

VERTIPORT DESIGN

A vertiport can have single or multiple Final Approach and Take-Off Areas (FATOs) and single or multiple stands for parking and passenger boarding. It will also have taxiways, a terminal, and associated charging, safety, and maintenance equipment.

BACK TO MENU

VERTIPORT LOCATIONS NEAR AIRPORTS

Airports will need vertiports that offer quick and seamless transfers to and from the passenger terminal. In addition to simplifying the passenger experience, decisions about airport vertiport locations will need to be made in consultation with the FAA to minimize risks to eVTOLs and arriving or departing flights. Airspace procedures will need to protect the airspace around vertiports. In consultation with FAA, simulations and safety evaluations will be needed to examine the feasibility of vertiport locations.

VERTIPORT SERVICES

Passengers will weigh themselves and their luggage at the vertiport before boarding. This information will be used to ensure eVTOLs operate within weight and balance limitations. Ground handlers will assist passengers and load bags into the eVTOL. Vertiports will also provide maintenance, aircraft cleaning, and battery recharging/swapping services between operations. Standardized designs for battery recharging facilities will help minimize the time and cost required to recharge each eVTOL. The Vertiport Operator will continually transmit information about the status of the FATO, stands, charging facilities, and other services to support real-time flight planning decisions across the ecosystem.

VERTIPORT EQUIPMENT

Vertiports will require navigation aids or high-intensity lights and/or corresponding flight procedures to enable operations during night and low-visibility conditions. Infrastructure and equipment requirements related to safety will need to be standardized.

VERTIPORT PERSONNEL

Personnel are expected to include passenger service staff, ground crew, and janitorial workers. Landside personnel responsibilities include security, luggage management, and other passenger-facing functions. Airside responsibilities include boarding assistance, pre-flight checklists, and general FATO and gate management.

3.3.2. What is an Urban Air Traffic Management (UATM) Provider?

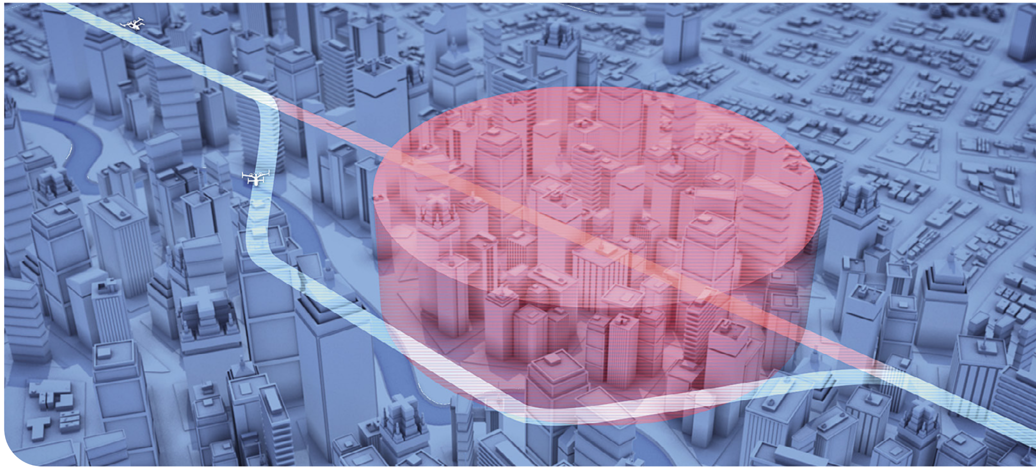
Airspace integration will be critical for scaling UAM operations, particularly when UAM flights operate close to airports and other aircraft. As such, a critical role will be the provider of urban air traffic management (UATM) services. While much of the UATM Provider's services will be delivered through automation, a human will still oversee the operation and be able to assist when necessary. For example, if a pilot experiences an in-flight emergency, a person at the UATM Provider will assist. Until autonomous operations are approved, an eVTOL pilot will need access to voice communications.

UATM SERVICES

UATM Services will include: flight planning, flight plan authorizations, flow management, conformance monitoring and dynamic airspace management. When authorizing flights, they will also reserve FATOs and stands at vertiports. The UATM Provider will also share information about weather and airspace status. Most of these services will be automated, particularly because manual planning will be untenable with growing demand and little time between passenger booking and flight departure. When unexpected events occur (e.g., a fire downtown that blocks off the airspace), the UATM Provider will automatically inform all UAM stakeholders and issue alternative flight plans so that business continuity is assured.

INFORMATION EXCHANGE ACROSS THE UAM ECOSYSTEM

The UATM Provider will also provide an information exchange – a cloud platform – that enables booking platforms, fleet operators, and vertiport operators to exchange data, collaborate in decision making, and amend strategic traffic management plans. It will also exchange data with other airspace users—primarily air traffic control (ATC) and drone operators. The UATM Provider must operate within rules and regulations set by FAA and possibly additional rules as determined by FAA, aviation industry, and other stakeholders.



3.3.3. What is a UAM Fleet Operator?

A UAM Fleet Operator will provide pilots and eVTOLs for UAM flights. They may serve a range of missions including medical transport, tourism, cargo delivery, and passenger commuting. An urban area will likely have many Fleet Operators.

FLIGHT PLANNING

Dispatchers will manage the Fleet Operator's resources and plan flights which may be scheduled or on-demand. They will need to collaborate closely with the UATM Provider during pre-flight planning. They will exchange information with the UAM ecosystem throughout the course of the flight.

FLEET MAINTENANCE

The Fleet Operator may have ground crew at vertiports that service their aircraft and assist passengers. Fleet Operators will need facilities in the urban area in which to store and maintain their eVTOL fleet.

3.4. LEVELS OF MATURITY

The concept of *Horizons* is used to describe the evolution of UAM operations (Figure 8). Each Horizon requires different technical, regulatory, and infrastructural capabilities[1].

This CONOPS focuses on piloted operations in Horizons 1 to 2, the period between launch and medium-density operations when pilots will still be flying the eVTOL (i.e., non-autonomous operations).

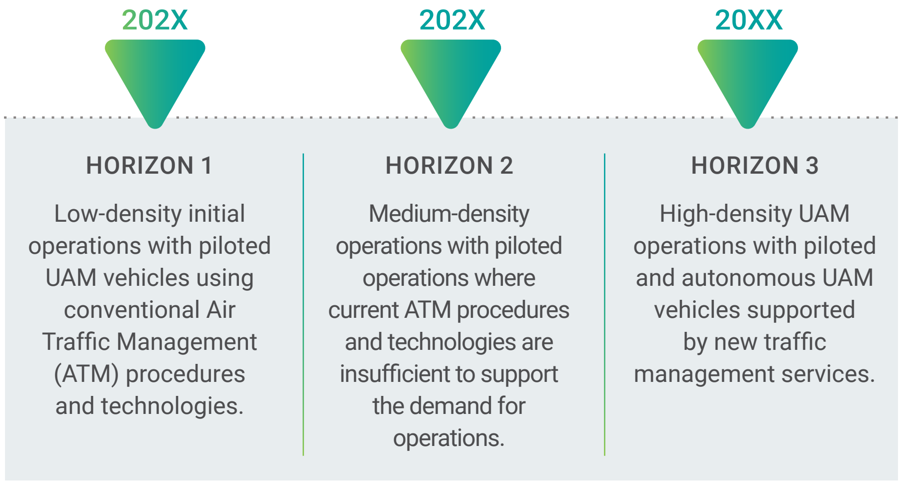


Figure 8. Horizons Describe the Evolving Maturity of Electric UAM Operations in the Urban Airspace

The Horizons align generally to the National Aeronautics and Space Administration (NASA) UAM CONOPS's UAM Maturity Levels (UML) (Figure 9) that map the evolution of UAM operations[4].

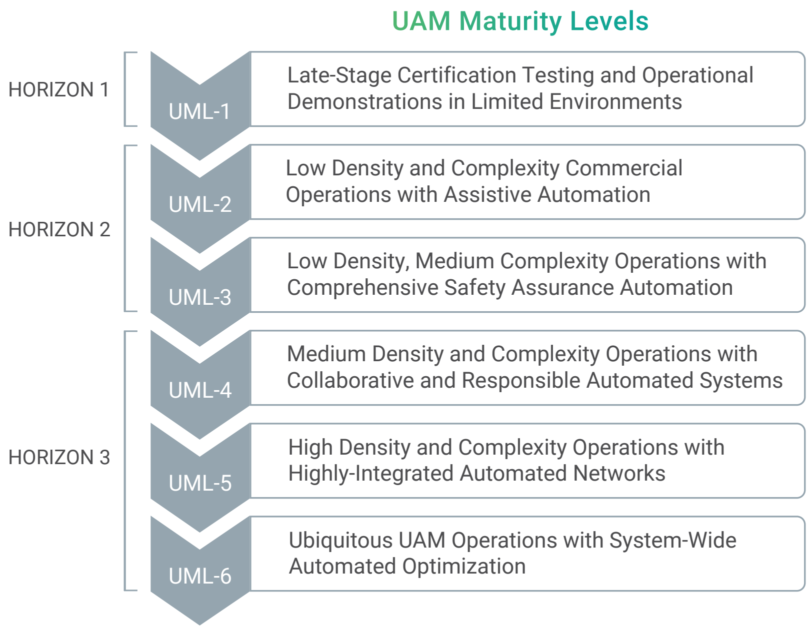


Figure 9. Alignment Between UAM Maturity Organized by Horizons and NASA UML Levels

3.5. THE AIRPORT SHUTTLE USE CASE: MIA TO THE MIAMI BEACH CONVENTION CENTER

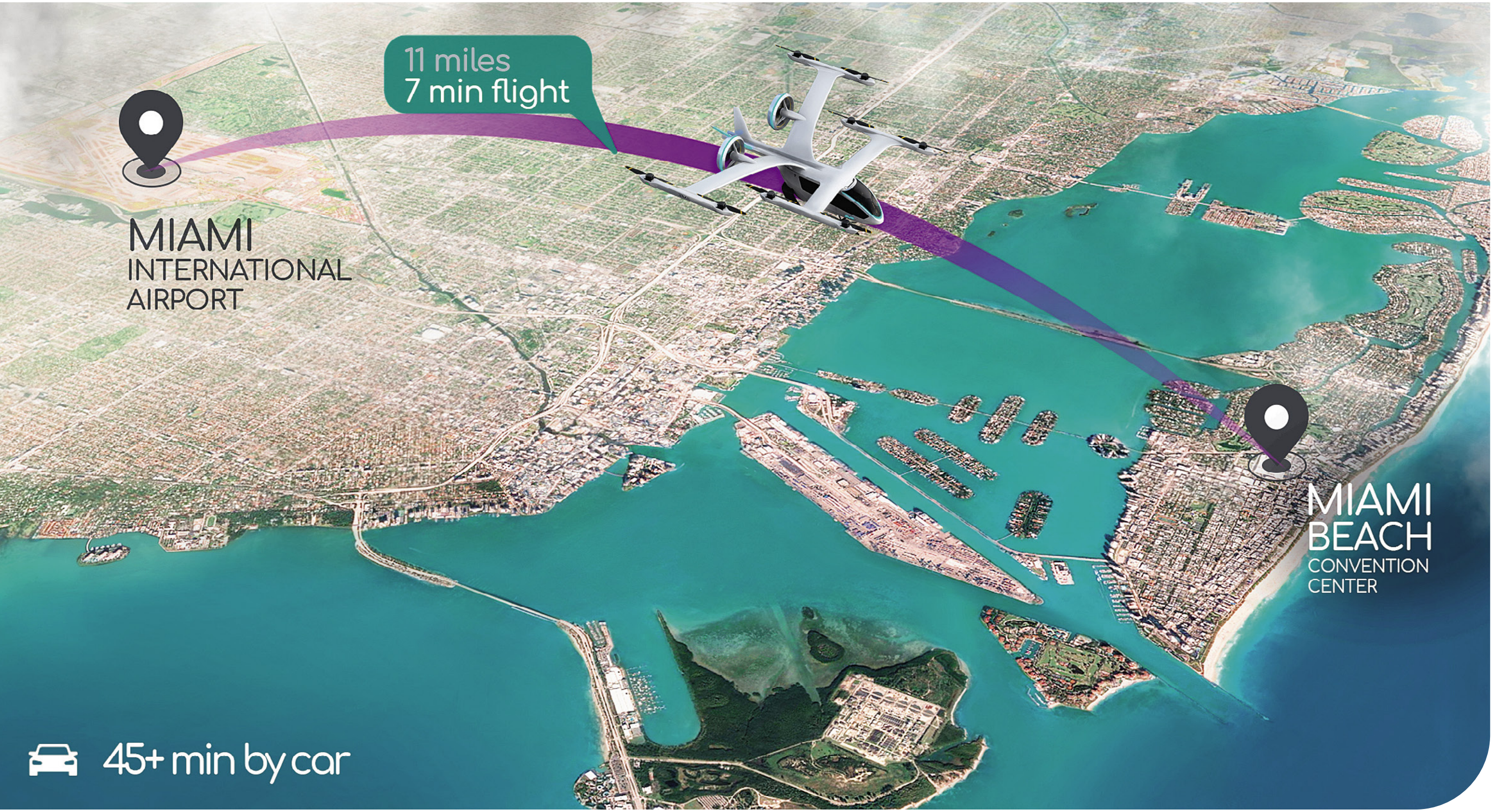
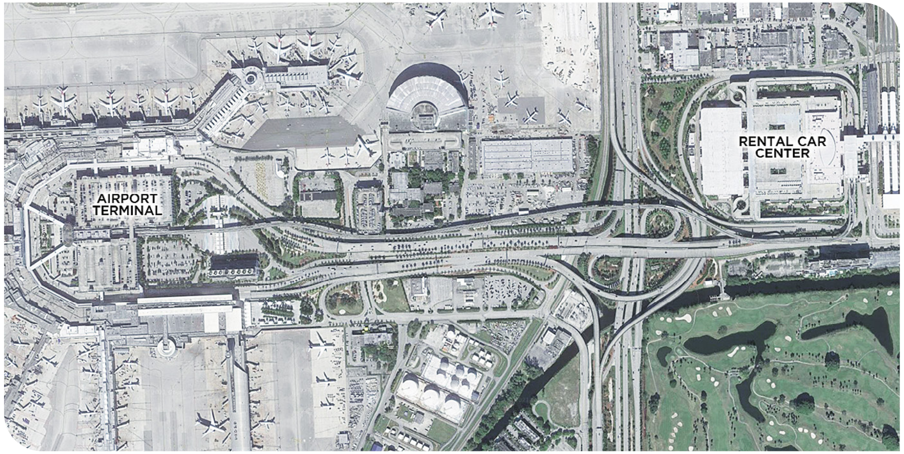


Figure 10. The UAM CONOPS Airport Shuttle Use Case

This Phase 1 CONOPS is based on an airport shuttle Use Case that connects passengers between Miami International Airport (MIA) and the Miami Beach Convention Center (MBCC). Under heavy traffic conditions, such as during high-impact events, this drive can often take 45 minutes or more. With the need to cross causeways or bridges to get to and from Miami Beach, a small accident can cause significant delays. When using app-based car services, passengers must also factor in the wait for a car to arrive.

Alternatively, a UAM flight could provide a more predictable trip. Passengers could travel between these locations via a 7-minute flight (Figure 10). When factoring the time to also travel to a vertiport to board a flight, the UAM trip is expected to take just over 30 minutes.

3.5.1. Miami International Airport

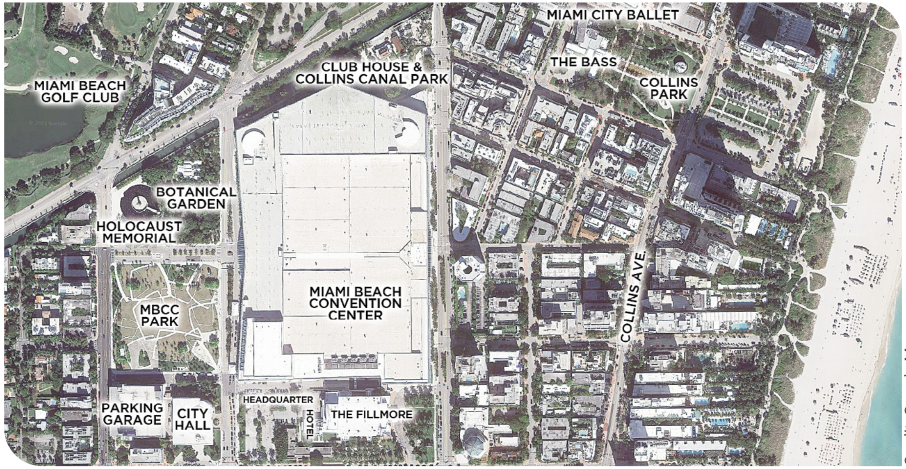


Credit: Google Maps.

MIA serves over 40 million passengers in a typical year and serves as a feasible UAM Use Case destination. If UAM were to transport just 1% of all passengers going to or from MIA, the market would still be significant: 400,000 passengers a year could be using UAM. Assuming that there is an average eVTOL load factor of 2.6 passengers per flight, there could be demand for 420 flights per day to or from MIA.

The Airport Shuttle Use Case assumes that the vertiport will be located at the current rental car center. Passengers will connect to the terminal by using the MIA Mover.

Miami Beach Convention Center (MBCC). The MBCC was selected as the other vertiport location on Miami Beach due to its proximity to residents and visitors going to and from events at the MBCC as well as South Beach, Mid Beach, the Lincoln Road area, and residential zones such as Collins Park. The large area on the MBCC rooftop also has easy street access, making it an ideal location to develop a vertiport. Due to the proximity to residents who live near the MBCC, this Use Case enabled us to examine factors that would potentially affect community acceptance.



Credit: Google Maps.

Figure 11. The MBCC is in a central location in Miami Beach.

3.6. PASSENGER UAM USER JOURNEY

A User Journey mapped the steps that passengers take to catch a UAM flight in each direction: from MIA to the MBCC, and the reverse, from MBCC to MIA.

3.6.1. Passenger Journey from MIA to MBCC

The journey starts when a passenger arrives at MIA and follows their journey to catch a UAM flight and ends when they arrive at the MBCC vertiport (Figure 12). The steps are arranged by phases of flight and shows the services that the passenger needs, as well as the people involved in the journey and the estimated duration of each step.

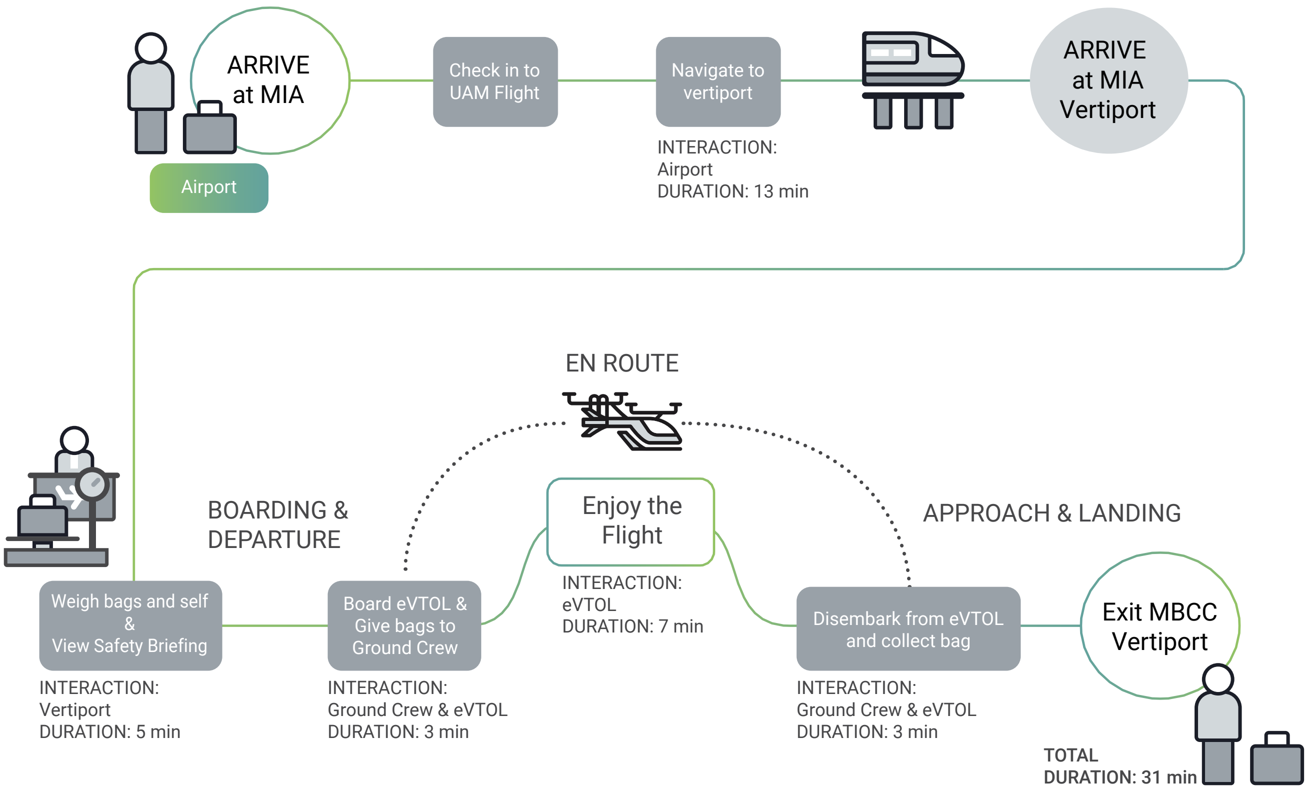


Figure 12. Passenger Journey from MIA to MBCC

3.6.2. Passenger Journey from MBCC to MIA

The journey from MBCC requires the passenger to navigate to the rooftop vertiport to board the UAM flight. After arrival at MIA, the passenger needs to transfer to the airport terminal. Figure 13 illustrates the journey, which also indicates interactions with stakeholders and an estimate of the time required in each step.

Note that a significant proportion of the journey is required for the transfer from the Rental Car Center to the MIA terminal. As a result, the door-to-door trip from MBCC to MIA will take approximately 35 minutes. The journey can be reduced to 25 minutes if the vertiport were to be located above the current parking structure, opposite the MIA terminals.

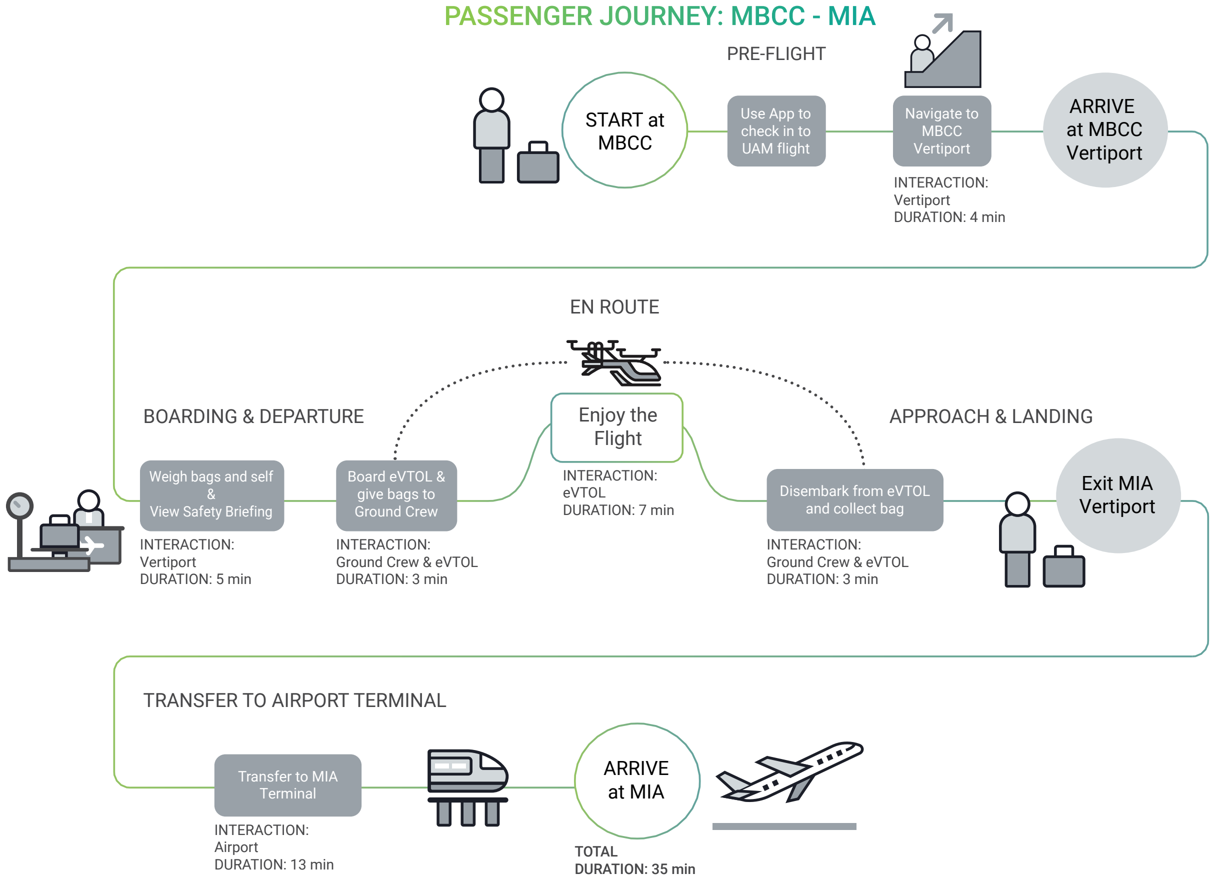


Figure 13. Passenger Journey from MBCC to MIA

3.6.3. Time and Cost Comparison Across Mobility Modes

Selection of a transportation mode will depend on many factors including cost, time savings, predictability, convenience, comfort, and dependability of the service. In the case of an airport shuttle, research has also shown that passengers are willing to pay more for the peace of mind from knowing they will be on time to catch their flight[5].

Table 1 compares the time and price of an airport trip between MBCC and MIA across different travel modality choices. The distance is approximately 11 miles. The price estimates for a UAM flight are based on two different evolutionary steps, with a pilot remaining on board in Horizon 2, and then dropping significantly when autonomous flights are enabled (when more passengers can share the cost of each flight and the operations do not need to factor in the cost of the pilot). The time and price estimates for a car service are based on a heavy traffic scenario during high-impact events and weekends in Miami Beach.

	Basic Car Service	XL Car Service	UAM at Moderate Maturity with Pilot (HORIZON 2)	Autonomous Flights and Vertiport Closer to MIA Terminal (HORIZON 3)
Passenger Journey	3 min: Walk to pick-up point 7 min: Wait for car at MBCC 50 min+: Drive to MIA (duration depends on car availability, traffic, any accidents, status of bridges)		4 min: Navigate up to MBCC vertiport 8 min: Weigh bags, board eVTOL and depart 7 min: UAM Flight 3 min: Disembark and collect bags 13 min: Transfer from rental car center to MIA terminal	4 min: Navigate up to MBCC vertiport 8 min: Weigh bags, board eVTOL and depart 7 min: UAM Flight 3 min: Disembark and collect bags 3 min: Walk to terminal (if vertiport is opposite terminal)
Time from door-to-door	60 minutes + (depending on traffic)		35 minutes	25 minutes
Time Savings	–		25 minutes+	35 minutes+
Price	$100	$128	$90	$45

Table 1. Comparison of Time and Price Across Modes for Airport Shuttle During a High-Impact Event

3.6.4. Factors Affecting the Passenger Experience

PRICE, TIME SAVINGS, AND CONVENIENCE

Price, time savings, and convenience are the primary motivators for user experience and transportation mode choice. Another factor influencing price is the peace of mind that a reliable service brings. In these situations, passengers would be willing to pay more for reliability.

ACCESSIBILITY

Electric UAM has the potential to transform urban mobility for people with disabilities. This new ecosystem is an opportunity to ensure a positive customer experience for passengers with physical, developmental, and sensory challenges. Some key design considerations include:

- **Accessible main entrances to vertiport and related UAM infrastructures:** Ability to use ramps and automatic doors at main entrances to avoid backdoor alternative routes.
- **Restrooms for all:** Restrooms at vertiports should accommodate not only a wheelchair, but also space for that person to move around, particularly if they travel with a companion.
- **Alternative and accessible routes:** When an elevator is out of service, an alternative access mode will be required for people with limited mobility.
- **Protection from poor weather conditions:** Rain and related conditions can damage electric wheelchairs and other mobility-assisted devices.
- **Accommodations for people with visual and / or hearing impairments:** For people with visual or auditory challenges, provide technologies and other accommodations support finding their way between airport terminals and vertiports.

LUGGAGE TRANSFERS

Passengers may need luggage transfer services when the weight, size, or number of bags exceeds the limits for UAM flights (e.g., sports equipment, car seat, large suitcases).

SECURITY

For passengers going to the airport, security screening will not be needed if the airport vertiport is outside the sterile area (i.e., landside). A potential benefit may exist for passengers going to the airport if they could be screened prior to arriving at the terminal. This would create a more seamless passenger experience. Efforts to refine the passenger journey will need to minimize the time and effort required for UAM passengers to be screened while ensuring that security standards are being maintained. Note that it is possible that as UAM demand grows, Transportation Security Administration (TSA) may require screening before passengers board a UAM flight from the airport. TSA will monitor and consider any new security screening needs as UAM operations grow.

3.6.5. Envisioning the future of UAM in Miami-Dade: Key insights from residents.

Our interviews with Miami-Dade residents to understand their perceptions of electric UAM and opportunities for enhancing mobility in MDC uncovered three major themes.

1 Frequent travelers who are familiar with UAM are excited to bring it to Miami

SUMMARY
Frequent travelers likened UAM to helicopter airport shuttles. They were excited about bringing UAM services to MDC and expanding services in the county.

OPPORTUNITY
UAM appeals to environmentally-conscious travelers who want a more sustainable choice. UAM services could include an airport shuttle as well as tourism offerings, such as services to the Florida Keys and the Everglades.

"I love that it's an electrical service as well... It's really terrible that I fly so much, but it's the infrastructure we have, right? To me, it's an investment, and also the future."

2 Public transportation in MDC is not considered to be a reliable option. Instead, there is a huge reliance on app-based, on-demand cars

SUMMARY
Locals felt that the only way to get around MDC was by car. Transplants living by the MBCC choose to live there so that they could ditch their car and walk to work and play. When they need to get some place by car, they rely on on-demand car rides.

OPPORTUNITY
A seamless service that integrates cars and UAM will be important to locals and frequent travelers. For travelers who use a specific airline out of MIA, infrastructure that connects vertiports to terminals and lounges could be particularly attractive.

"[Public transit] is almost non-existent in Miami. There's one rail line that goes from south Miami and then sort of to the airport, but that's it."

3 Frequent travelers have a well-rehearsed routine for traveling to and from MIA

SUMMARY
Travelers leave their homes extra early for fear of missing their flight. They use TSA PreCheck® and Clear to avoid crowds and delays. When arriving early at the airport, they spend the extra time at lounges to relax before their flight.

OPPORTUNITY
UAM will complement a well-planned routine to MIA. Door-to-gate service with UAM could offer travelers an opportunity for travelers to spend more time at MIA concessions.

"...you really need to leave yourself quite a bit of a time on the Miami end to make sure that you're not literally running for your flight"

3.7. THE eVTOL JOURNEY

The eVTOL User Journey presents activities in each flight phase in Horizon 2, when flights are expected to depart every 5-7 minutes.

3.7.1. Horizon 2 User Journey

In Horizon 2, UAM operations will be tightly integrated with automated systems that will transmit and share data about factors such as weather, vertiport status, eVTOL aircraft health, and any changes to the flight plan.

Figure 14 illustrates each step of the eVTOL journey with descriptions of the eVTOL touchpoints. The unfilled boxes indicate where automated systems receive or share information.

THE FLEET OPERATOR WILL CONTINUALLY COLLABORATE WITH THE PSU (WHICH IS THE UATM PROVIDER IN THIS CONTEXT) TO PLAN FLIGHTS AND EXCHANGE INFORMATION WITH OTHER STAKEHOLDERS.

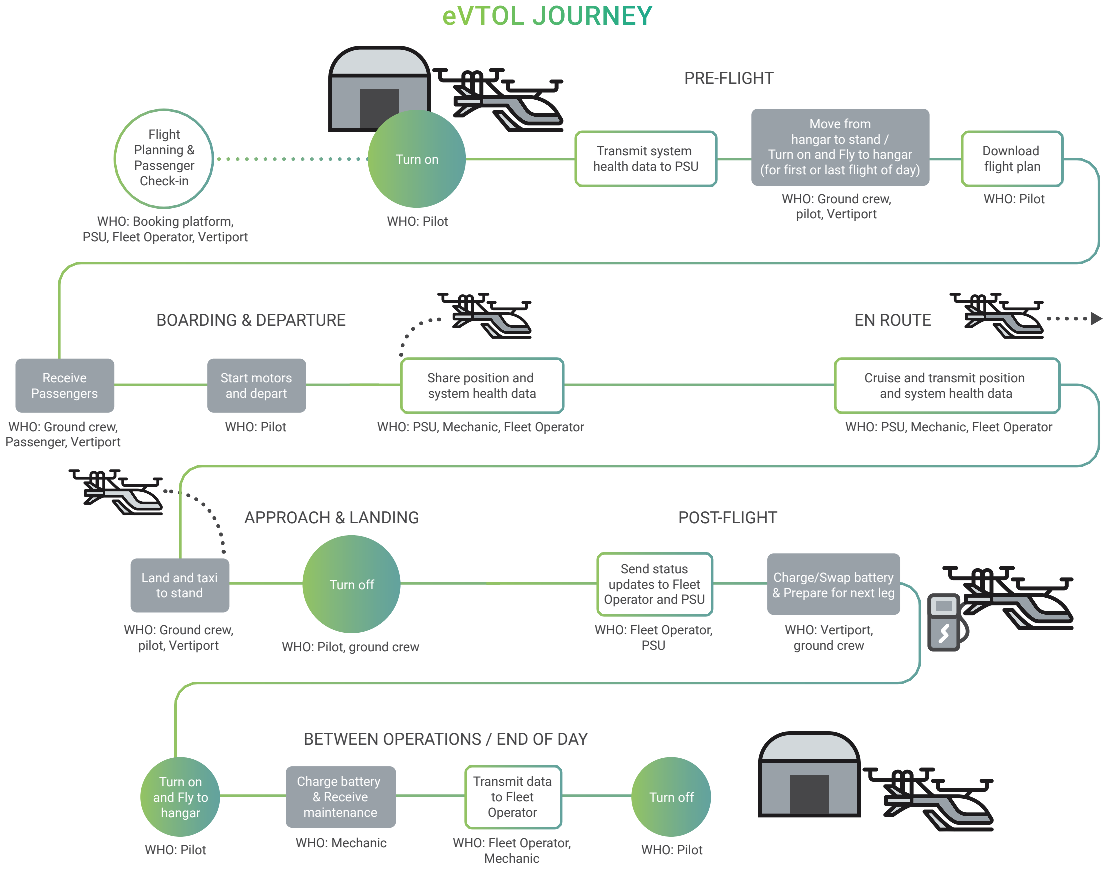


Figure 14. The eVTOL User Journey for the airport shuttle in both directions.

3.7.2. Pre-Flight

Similar to operations today, in Horizon 2, most stakeholder interactions will occur in the pre-flight phase. Automated systems will exchange data in real time, enabling accurate and timely situation awareness for planning. Booking platforms will transmit passenger details to the Fleet Operators. Subsequently, the PSU will issue flight authorizations and approve 4D flight plans that ensure aircraft are safely separated. Flight plans will include a reservation for a FATO and stand at the vertiport.

3.7.3. Boarding and Departure

During boarding and departure in Horizon 2, the pilot checks the status of the eVTOL, confirms and downloads the flight plan to the eVTOL, assesses airspace conditions, and prepares to take off. Passengers board the eVTOL with the assistance of ground handlers. The PSU confirms reservations for vertiport FATOs, stands, and battery charging resources. The vertiport operator will play a role in this since they are responsible for resources on the vertiport.

3.7.4. En Route

After take-off, the eVTOL starts to transmit its position to the PSU. The PSU shares this information with the Fleet Operator and the Mechanic and automatically starts to monitor the flight for conformance to the 4D flight plan. The PSU also ensures the flight is safely separated from other airspace users and sends the pilot instructions if the flight begins to deviate from the plan, or if there are changes to the flight plan.

3.7.5. Approach and Landing

The PSU ensures the eVTOL is safe from traffic near the vertiport. The vertiport operator will play a role in this, especially in the immediate vicinity of the vertiport. The pilot lands on the assigned FATO, and taxis to the stand. The pilot turns off the motors before opening the doors. Ground handlers assist passengers and unloads any luggage from the eVTOL.

3.7.6. Post-Flight

After passengers disembark, the pilot closes the flight and sends a message to the PSU. The eVTOL automatically sends information about vehicle health and status to the Fleet Operator's dispatcher. If necessary, the eVTOL battery is recharged. Ground handlers inspect the eVTOL after each flight and prepare to turn it around for the next leg.

3.7.7. End of Day

At the end of the day, the eVTOL is moved to a storage facility and will have its battery recharged overnight. It may also receive maintenance if needed. The eVTOL will send data about its system health to the Fleet Operator, Mechanic, and PSU. Throughout the eVTOL journey, a data exchange network facilitates interactions between UAM stakeholders and equipment.

3.8. CHALLENGES TO SCALING UAM

INTEGRATING UAM INTO THE URBAN AIRSPACE. UAM operations will need to be integrated into the low-altitude airspace. This is of particular importance near MIA, where flights are approaching and departing. Procedures and airspace designs need to enable all airspace users to operate safely with minimal delays. In areas away from airports, integration with other airspace users—such as helicopters and general aviation aircraft—will also need to be considered along with community needs and expectations.

OPTIMIZING VERTIPORT LOCATIONS. Vertiport locations, particularly at MIA, will significantly affect the passenger experience and the time savings of UAM. If a vertiport is located near the rental car center, it will require passengers to take the MIA Mover, which could reduce the time benefits from taking a UAM flight. A more seamless UAM passenger journey could be achieved if the vertiport were located at the current Dolphin and Flamingo parking garages. However, determining the feasibility of this location will require consultation with MIA, MDC, and the FAA to ensure operations remain safe, do not affect the safety of flights arriving and departing at MIA, and the vertiport airspace is protected and optimized. MIA also needs to consider how vertiport locations may affect other operational constraints and plans.

GAINING COMMUNITY ACCEPTANCE. The potential for negative community perceptions could pose challenges to adoption and mainstreaming. A few key potential concerns include noise, visual pollution, privacy, social equity (perceptions that UAM is a mode for wealthy households to buy their way out of congestion), and safety and security.[6]

3.9. ENABLING INFRASTRUCTURE AND TECHNOLOGIES

Scaling UAM operations will require infrastructure and technologies that support flight procedures, real-time information exchange, and passenger needs.

3.9.1. Vertiports and Vertiport Operator

On Miami Beach, the MBCC emerges as the strongest option to place a vertiport. The good street access would also serve eVTOL passengers well. During Horizon 1, the vertiport may be somewhat modest in size, with only one FATO. However, as operations grow, it may be desirable to expand the vertiport with additional FATOs.

The impact of a vertiport on parking capacity is an important consideration, as the MBCC must serve customers who drive to the facility. This trade-off may ultimately drive a design decision to construct an additional deck level on which to place the vertiport. The MBCC has potential concerns about vibrations from UAM operations. These vibrations could disrupt events inside the building and may lead the City of Miami Beach to consider the addition of a deck for a vertiport.

3.9.2. UATM Provider

MDC will need to ensure that a PSU is established and ready to provide UATM services to all stakeholders as operations evolve toward Horizon 2. The PSU will exchange information with all stakeholders, including ATC and drone operators. These services will require a high-speed information exchange network and UATM software. The need to monitor UAM traffic and communicate with pilots will require communication, surveillance, navigation and information technologies that are suitable for the dense urban environment.

3.9.3. Booking Platform

Flight booking platforms may be used to book UAM flights from one or many fleet operators. Alternatively, fleet operators may have their own booking platform. The booking platforms will need to be integrated with the information exchange within the UAM ecosystem.

3.9.4. UATM and Information Exchange Network

UATM technologies and services will be critical to supporting the safety and efficiency of the UAM ecosystem. UATM technologies are needed to ensure UAM traffic flows are safely and strategically planned, vertiport's resources are communicated efficiently, and that all stakeholders share safety-critical information in real time.

As such, a cloud-based information exchange network will be needed to enable high-quality, relevant, timely, and consistent digital data to be shared across the UAM ecosystem. The data will contribute to increased safety and efficiency. UAM stakeholders will depend on this information, shared on a system-wide basis, to make informed collaborative decisions. This network will also need to meet the security standards to be defined by the FAA, Department of Homeland Security (DHS), and any other regulatory bodies.

3.9.5. Electricity Charging Networks and Battery Charging Facilities

Utility companies will need to install new electricity infrastructure and ensure that there is a sufficient and reliable supply of electricity to vertiports and maintenance facilities. As demand for UAM flights scale, utility companies will need strategies to meet the growing demand for power. After electric UAM operations commence, information about the availability of electrical power in the charging facilities will be an important factor for Fleet Operators to consider when making charging decisions.

For battery charging facilities, standardization will be important for numerous reasons, including:

- Simplifying maintenance and ground operations,
- Minimizing cost of battery equipment,
- Minimizing ground crew training time, and
- Minimizing fire risks by simplifying the range of battery infrastructure required.

3.9.6. Airspace Infrastructure and Procedures

Airspace designs and procedures should allow for quick exit and entry to and from vertiports. Procedures should minimize workload for pilots and ATC while optimizing operations so that UAM flights do not need to hover or wait for access. These procedures should also be designed to enable eVTOLs to move efficiently between a maintenance hangar and a departure stand. Furthermore, the airspace above and around vertiports will need to be protected to ensure safe and efficient arrivals and landings. Consultation with FAA will be critical to ensuring UAM airspace procedures and operations are safely integrated with all airspace users' needs. MDC will also need to consider how future building developments in and near the airport may affect eVTOL access to vertiports.

BACK TO MENU

3.10. OPERATIONAL RISKS

SAFETY OF EVTOLS

Safety is a priority throughout UAM operations. It is the priority consideration in the design of eVTOLs, extending through to airspace design and procedures, vertiport operations, training, maintenance and all UAM activities. The FAA has proposed creating safety requirements for eVTOLs at a higher standard than other aircraft categorized under Part 23 (Normal, Utility, Acrobatic, and Commuter Category Airplanes) and Part 27 (utility helicopters).

CYBERSECURITY OF AIRCRAFT SYSTEMS

To prevent unauthorized access to eVTOL controls, aircraft systems may be partitioned to isolate important system such as flight controls to avoid the introduction of malware. Going forward, regulatory agencies such as European Union Aviation Safety Agency (EASA) and FAA will issue new guidance for cybersecurity. To receive operational certification, the UAM industry will need to comply.

AIRCRAFT SECURITY

Aircraft designers will need to ensure that the pilot is safe from any unruly passengers in the cabin. Each eVTOL cabin design will need to comply with different governmental requirements.

DATA EXCHANGE SECURITY

Cybersecurity and cyber resilience will be foundational requirements for information exchange in the UAM ecosystem. The safety and continuity of the UAM ecosystem heavily depends on accurate and timely information. Furthermore, as passenger carrying flights, it is critical that UAM flights meet safety-critical standards for data encryption and security.

4 NEXT STEPS

This Phase 1 CONOPS is an initial document intended to facilitate conversations about the implementation of electric UAM. We look forward to collaborating with Miami-Dade County to explore the next steps in this journey. Some ideas for future industry and County collaboration include the following:

1.Plan Community Engagement

MDC may consider public participation and engagement at multiple stages. As part of long-range planning, MDC may consider public discussions about UAM. Exploratory scoping could be used to understand potential demand and viable locations for on-demand air mobility. As the planning process progresses, MDC may pivot toward more in-depth engagement processes that empower stakeholders to understand local concerns and vet infrastructure and service concepts and alternatives. It is recommended that key stakeholders work with a third-party that is “arms-length” from the project to engage the public to understand key community goals, concerns, and needs that could be incorporated into the service infrastructure and design.

2. Analyze Potential Route Network and Market Analysis

MDC may wish to consider developing a minimally viable network of vertiports. This may include existing airports in MDC as well as “brownfield” projects, or existing infrastructure that can be repurposed to function as a vertiport. Examples include rooftops of parking garages, hotels, malls, and other public use facilities. Through the development of a route network, coupled with a market demand forecast, we will be able to propose how this industry could scale safely using existing and future nodes that address the community’s intra-county transportation needs. This route network, supported by data from the County and local industry, could be the product of a Phase Two scope of work that will support future business models and simulations to further demonstrate the value of bringing sustainable UAM to MDC.

3. Plan for Simulation Flights

By partnering with existing operators in MDC, we can demonstrate the time and cost savings of eVTOL technology by using conventional helicopters and passengers. Many existing infrastructures and airspace constructs that already exist can be used to support UAM operations on “Day 1”. A simulation could study both the vehicle and passenger journey from beginning to end. As EVE demonstrated in a simulation in Rio de Janeiro, creating the user and operator experience will help us learn about the attractiveness of such a service, if people could afford it, and the time savings that can be given back to the community. After benchmarking the initial volume of flights and its impact on the local community, we can be in a better position to understand how more advanced procedures can help MDC scale beyond “Day 1” operations.

4. Identify and Address City and County Policy Gaps

UAM introduces a new mode of transportation that integrates into the urban environment differently than other modes. Thus, some existing policies and regulations may deserve reconsideration. Some examples include:

- Authority over future land development plans that may affect vertiport approach and landing flight paths.
- Any restrictions that limit where helicopters can operate are often put in place to limit noise in local communities; those restrictions may be unnecessary in the context of eVTOLs which will have low-noise levels.

A gap assessment could highlight the policies at county and city levels that should be reviewed as well as the implications of keeping or changing them. The County can also provide new guidance on the noise target levels for UAM operations. This guidance will be helpful as the UAM industry plans vertiport locations and routes.

5. Engage FAA On Airspace and Procedures Design to Enable UAM Operations

Although eVTOLs are not expected to start launch until 2024, MDC and industry stakeholders will need to start making decisions about investments in infrastructure in the next 12 to 24 months. For example, decisions about vertiport sites, securing and implementing electricity supply lines for battery recharging facilities will need to be made soon. It can take years to plan and build the necessary infrastructure and these planning decisions will need to be informed by FAA's input on where eVTOLs will be allowed to fly, how the airspace around vertiports will be protected, and how UAM operations will be integrated into the low-level airspace.

6. Engage Miami-Dade UAM Working Group

Should this document resonate well with local community leaders and MDC administrators, our intent is to continue building upon this foundation with the guidance from the Miami-Dade UAM Working Group. This group, comprised of public and private sector leaders, will be able to best guide how to execute on our proposed next steps as well ensure it is aligned with community needs with a clear benefit for the traveling public. The deliverables of the Working Group should be intertwined with our execution roadmap, which will ensure that our continued commitment to creating a safe, scalable UAM operation for all will be aligned with the Working Group's vision.

5 ABOUT THE CONSORTIUM

Eve Air Mobility, an Embraer Company, is dedicated to safely enabling the global Urban Air Mobility ecosystem for all. Benefitting from a startup mindset, and backed by Embraer's more than 50-year history of aircraft manufacturing and certification expertise, Eve offers a comprehensive approach to scaling the UAM industry by providing a holistic ecosystem of services. Its advanced electric vertical aircraft (EVA), coupled with its comprehensive global services and support network, and a unique air traffic management solution, make it a trusted and experienced partner. Eve is the first company to graduate from EmbraerX, the disruptive innovation division of Embraer, which has a proud 40+ year history in Florida.

L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across space, air, land, sea and cyber domains. L3Harris has approximately $18 billion in annual revenue and 47,000 employees, with customers in more than 100 countries.
Learn more at L3Harris.com.

Skyports is the leading enabler of advanced air mobility (AAM) and provides the critical link between the ground and the sky. The company designs, builds, and operates take-off and landing infrastructure for air taxis, and partners with world-class electric vertical take-off and landing (eVTOL) passenger and cargo vehicle manufacturers around the world to enable safe, sustainable and efficient flight operations within urban and suburban environments. Skyports also flies drones as a service, which is already proving the viability of the company's best-in-class unmanned systems technologies within the medical, e-commerce, maritime and logistics sectors. Based in London, United Kingdom, Skyports has projects operating in multiple continents, including in Asia, Africa, Australia, Europe, Middle East and North America. Skyports investors include Deutsche Bahn Digital Ventures, Groupe ADP, Irelandia Aviation and Levitate Capital.

The **Community Air Mobility Initiative (CAMI)** is a nonprofit organization founded to support the responsible integration of advanced air mobility into communities through education, communication, and collaboration. CAMI understands the importance of connecting communities and helps equip state and local decision-makers, planners, and the public with the information needed to formulate policy and identify and design the infrastructure and system elements needed to integrate advanced air mobility into transportation systems. CAMI connects communities and industry by providing expertise, resources, and peer collaboration opportunities to state and local leaders, decision-makers and planners that will be vital to the successful integration of aviation into our daily transportation options.

6 REFERENCES

[1]EmbraerX and Airservices Australia. (2020). Urban Air Traffic Management Concept of Operations. Version 1.0. Retrieved from https://embraerx.embraer.com/global/en/uatm

[2]Miami-Dade County. Emissions. Retrieved from https://www.miamidade.gov/global/economy/resilience/climate-strategy/emissions.page

[3]KPMG. (2021). Market for Urban Air Mobility, (Unpublished)

[4]Deloitte Consulting LLP. (2021). UAM Vision Concept of Operations (ConOps) UAM Maturity Level (UML) 4. Version 1.0 (January 2021). Retrieved from https://tinyurl.com/2kafzsj5

[5]Massachusetts Institute of Technology and Eve Air Mobility. (2021). Demand Potential for Urban Air Mobility. Retrieved from https://eveairmobility.com/eve-is-collaborating-with-mit-to-make-data-driven-decisions-to-build-the-urban-air-mobility-market/

[6]Cohen, A., Shaheen, S. A., and Farrar, E. M. (2021). Urban Air Mobility: History, Ecosystem, Market Potential, and Challenges. Retrieved from https://ieeexplore.ieee.org/document/9447255

MOBILITY REIMAGINED

eveairmobility.com

For more information, email us at: contact@eveairmobility.com

Follow us at:

eveairmobility