

Urban Air Mobility

Adding the Third Dimension to Urban and Regional Transportation

Aviation Noise & Emissions Symposium
March 2, 2020

Presented by: Yolanka Wulff, Co-Executive Director, CAMI

TECHNOLOGY IS REDEFINING FLIGHT

Tech Drivers

Propulsion
Electrification

Autonomous
Systems

Mobility Services

5G

New
Capabilities



eVTOL



Electric and
Hybrid-electric

Solution Areas

Moving goods

Moving people

Automating tasks

Thematic
Benefits

Lowers the barriers for leveraging UAVs to get jobs done

Lowers the operating cost of small aircraft on short routes

Increases the number of access points to the air

Stimulates latent demand for flight where ground transportation is used today

What is Urban Air Mobility (UAM)?



- UAM uses three-dimensional transportation to better serve the needs of our communities.
- UAM integrates with existing metropolitan transportation systems.
- Nothing new: regional airline travel and helicopter service (e.g., Blade) are current/historical forms of UAM in service today.
- Everything new: electric vertical takeoff and landing (eVTOL) aircraft make UAM safer, quieter, greener, and more economical than ever before.

What is Urban Air Mobility (UAM)?



Zones of operation:

- City center
- Suburbs to city
- Edge city to (edge) city
- Rural Access
- Hub Airport Access

Styles of operation:

- Airline
- Air metro
- On demand
- Airport shuttle
- Emergency services

What is Electric Vertical Take Off & Landing (eVTOL)?



Image courtesy of Bell

eVTOL aircraft use drone technology like electric motors to take off and land vertically and fly horizontally.

Benefits of eVTOL:

- Sustainable
- Quiet & Safe
- Affordable
- Community friendly

Uses of eVTOL:

- Passenger travel
- Cargo delivery
- Essential and emergency services

Urban Air Mobility: Statistics

- UAM industry projected to be **\$1.5T by 2040**, making it the single largest new industry to emerge this generation (Morgan Stanley research)
- Hybrid-electric aviation travel industry could reach **\$178B by 2028** (UBS)
- The world's drone use for industrial purposes will reach **\$40B by 2023**

Urban Air Mobility: Statistics

- In 2017 there were 12 known companies developing eVTOL aircraft
- Today there are at least 225 eVTOL aircraft, with a dozen in the process of FAA certification
- In 2019 alone, there were over 1,000 test flights of full size eVTOL aircraft.

Automotive OEMs Going Vertical

- Hyundai Motor Group
- Honda
- Porsche
- Tesla
- Toyota
- Mercedes
- Geely



TOYOTA

HYUNDAI
MOTOR GROUP



HONDA
The Power of Dreams

Social & Economic Impacts of Urban Air Mobility

- People are willing to spend up to 60 minutes for their daily commute
- UAM increases daily commute radius to 200 miles
- UAM can leapfrog infrastructure projects to deal with transportation deserts
- UAM unites geographically constrained areas and lessens the burden on ground infrastructure
- UAM brings housing options closer to economic centers and closes social divides

Challenges to UAM Implementation

- Technology
- Regulation / Certification
- Infrastructure
- Air Traffic Management
- Public Acceptance

“The future of the [drone] industry is still up for debate in many ways, since it depends on five factors... First, and perhaps most vital, is the issue of *public acceptance*... The industry has to build a lot of confidence before people will accept thousands of them flying overhead or board UAS air taxis.”

~ McKinsey & Co 12/2017

Noise & UAM: Necessary but not Sufficient

There are three critical factors that must be addressed to achieve public acceptance:

- Safety
- Public Benefit (e.g., increased travel options)
- Limited Adverse Impact (e.g., noise, visual impact, emissions).

To achieve or address these facets of public acceptance requires full and transparent engagement between the UAM industry (including the development of effective community engagement plans), regulators, and community members.

Even silence can be too loud

The perceived value of the thing making the noise is critical to whether or not it is perceived as “too loud” by the community.



New approach to noise: restricting or right-sizing?

- It is tempting to just set a maximum decibel level for any eVTOL aircraft that are utilizing a vertiport facility, but this oversimplifies the problem.
- When, why, who, and how many are equally important considerations
- Equip communities to gather the information they need (ambient noise levels, vehicle noise footprints, etc.) and balance noise impact against the value that the UAM operation will bring.

Getting noise right is key to political support

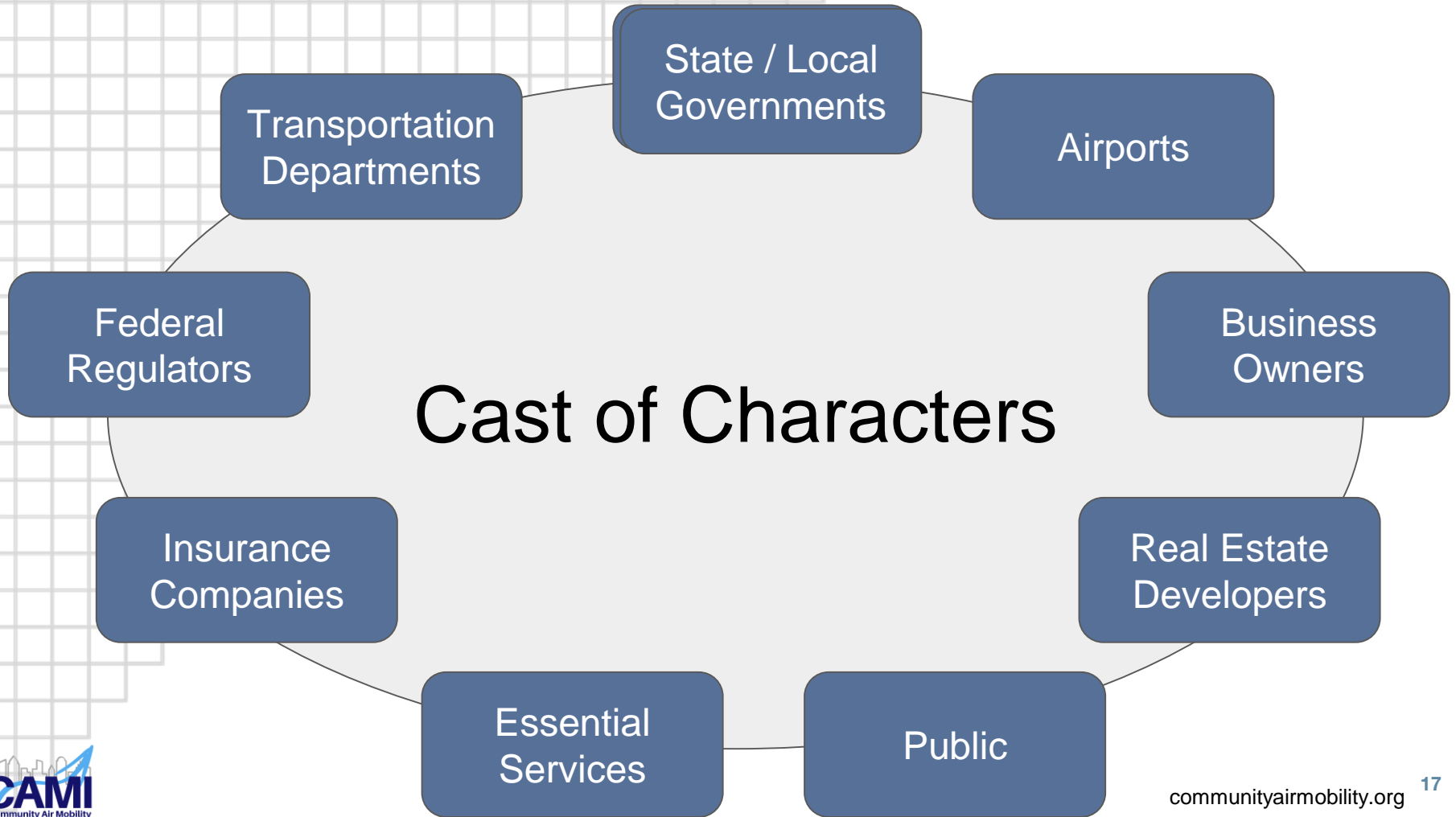
Elected officials and local decision makers don't want to get any more phone calls from people complaining about something, especially not noise.

Are cities prepared?

- Are they incorporating urban air mobility into their transportation plans? Into their Comprehensive Plan Updates?
- Are they aware of the state of the UAM industry? The urgency?
- Do they have the necessary infrastructure and ground support?

Or will they be reactive to industry?

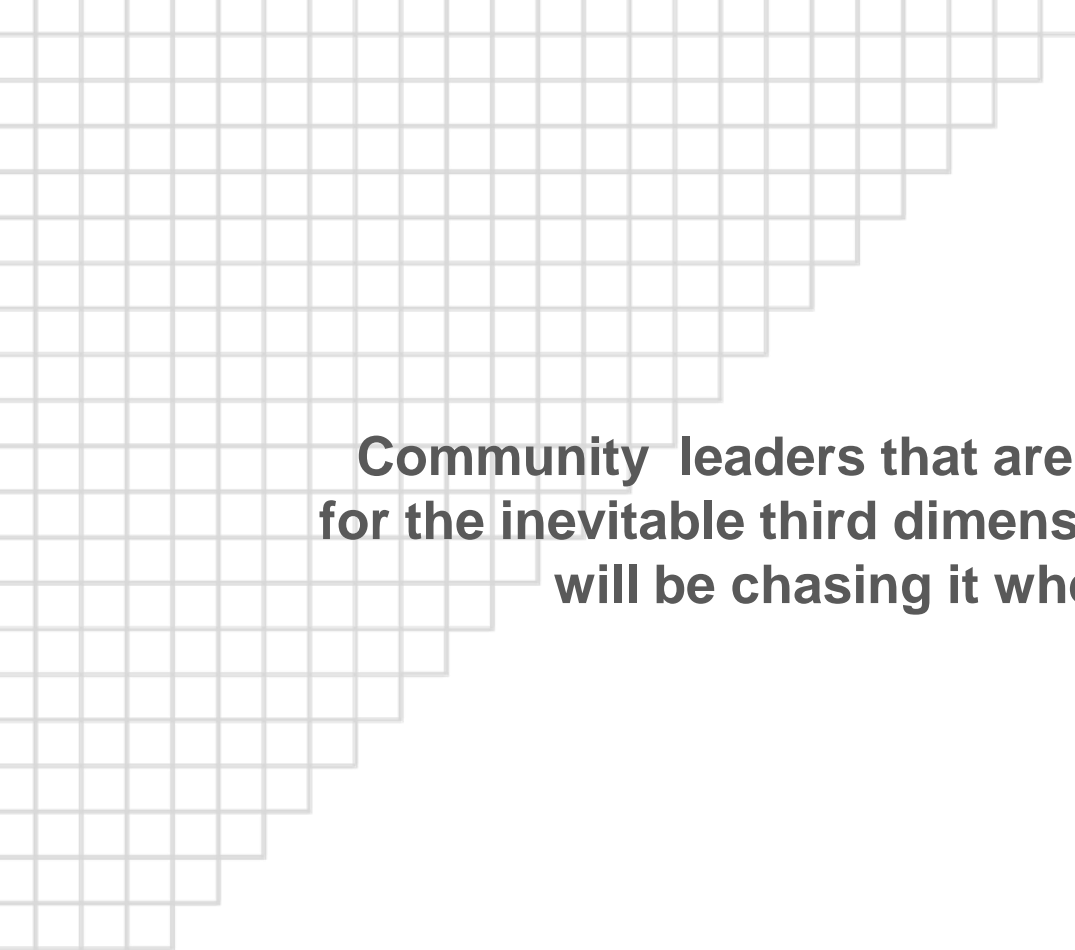
Cast of Characters



Crawl – Walk – Run Adoption Approach



- Crawl
 - Public engagement, safety, and legislation
 - Pilot projects, demonstrations and data gathering
- Walk
 - Repurpose existing infrastructure
 - Develop new regulations
- Run
 - Build and scale new infrastructure
 - Streamline new regulations, permitting and licensing
 - Develop data management practices for privacy and efficiency
 - Advocate and safeguard public safety

A decorative graphic in the top-left corner of the slide, consisting of a grid of squares that tapers off to the right, creating a staircase-like effect.

**Community leaders that are not planning today
for the inevitable third dimension of transportation
will be chasing it when it arrives**


Introducing... the Community Air Mobility Initiative

CAMI is a 501(c)(3) nonprofit organization dedicated to supporting the responsible integration of the third dimension of urban transportation at the **state and local level**.

CAMI **educates and equips state and local decision makers**, the public, and the media with the information they need to set policies and design infrastructure and systems that address transportation needs for their communities.



CAMI Resources



What is Urban Air Mobility (UAM)?

UAM uses three-dimensional transportation to better serve the needs of our communities.


A resource prepared by:

The Community Air Mobility Initiative (CAMI)

Supporting the responsible integration of the third dimension at the state and local level.

Q1 2020 | A. M. Dietrich

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What is Urban Air Mobility (UAM)?

UAM uses three-dimensional transportation to better serve the needs of our communities.



Urban Air Mobility (UAM), or the idea of integrating aviation into our cities and towns, is in some ways nothing new. Regional airline travel and helicopter service (both for medical emergencies and transportation) are forms of UAM that are in service today.

In other ways, UAM is revolutionary. New aircraft that use electric motors that are safer and quieter than traditional airplanes and helicopters are in development. These aircraft make UAM safer, greener, quieter, and more economical than ever before. Some of these aircraft look a lot like traditional airplanes. Others use multiple electric motors to take off and land vertically. Known as "eVTOL" (for electric vertical takeoff and landing) aircraft, these new aircraft are being developed by companies around the world and many are nearly ready for commercial operations.

UAM may share airspace with small unmanned aircraft systems (sUAS or "drones"), but it is not the same thing. An on-board or remote pilot and the size of the aircraft differentiate UAM from sUAS operations like cargo drone delivery.

As with other aircraft, authorities like the Federal Aviation Administration (FAA) in the United States and the European Aviation Safety Administration (EASA) in Europe are responsible for making sure the aircraft used in UAM operations are airworthy and can safely carry passengers. Existing air traffic control systems, airports and heliports, and other aspects of how aircraft are certified and operated today are also directly applicable to UAM, especially in the initial "crawl" phase which will be starting small. As UAM "takes off", stakeholders throughout the aviation and transportation ecosystems will need to work together to ensure that the promise of UAM is realized in a way that prioritizes safety and responsible integration of aviation into the rest of our daily transportation and community landscapes.


The following provides a snapshot of how UAM is expected to be used over different zones (or distances) and styles of operation. Zones of operation include: city center, suburbs to city, edge city to (edge) city, rural access, and hub airport access. Styles of operation include: airline, air metro, on-demand (or "air taxi"), airport shuttle, and emergency services. Of course, as UAM grows and matures, operations will likely evolve that are unique to communities and geographies, but these are intended to be a starting point for conceptualizing how the third dimension can better serve our transportation needs.

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What is Urban Air Mobility (UAM)?

UAM Zones of Operation



With new types of aircraft come new opportunities for connecting our communities. Operations within city centers are attracting a lot of attention for UAM, but other types of geographic connectivity are actually more likely for initial UAM operations due to existing infrastructure and airspace considerations. Successful implementation of UAM will coordinate with communities' existing transportation options and provide additional options for routine, urgent, and emergency travel across a variety of distances using a variety of aircraft, each appropriate to a given mission and range.

City Center

Flights from vertiport to vertiport within a city center promise an alternative to sitting in dense urban traffic. Existing heliports and new infrastructure will support this type of operation.

Suburbs to City

Flights from suburbs into the city center provide an alternative to automotive commuting and can be used in concert with light rail and other options. Existing community airports can be used effectively here.

Edge City to (Edge) City


Smaller communities that need access to each other and to the main urban core can use electric aircraft in a regional aircraft "micro haul" model to enable rapid and green transportation of goods and people.

Rural Access

Remote areas without efficient ground connectivity due to geography or other constraints can benefit from UAM both for routine and emergency transportation using new and existing infrastructure.

Hub Airport Access

Access to main commercial airport hubs can also be facilitated with UAM with "micro haul" flights from community airports as well as eVTOL operations from other surrounding locations.




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What is Urban Air Mobility (UAM)?

UAM Styles of Operation



Currently, on-demand operations are getting a lot of attention, but they are not the only way in which electric airplanes and eVTOL aircraft can be used to bring new transportation capabilities to our communities and daily lives. Different operating styles have different advantages, different regulatory requirements, and will use different types of aircraft. It is important that communities consider which styles of operation work best for their various needs and how each can integrate constructively into the existing transportation landscape through multi-modal connectivity. Whether a community favors public or private infrastructure and operations (or a mix) will likely also influence which styles of operation are appropriate.

Airline

Electric aircraft are being developed that will operate much like scheduled regional aircraft today, but with even more routes and smaller numbers of passengers on "micro haul" routes connecting smaller community airports.

Air Metro

Operating more like existing public transit on a recurring schedule and predictable route throughout the day, air metro operations integrate well into existing public transit systems and neighborhoods.

On Demand


Often called "air taxi", this operation is similar to ride hailing apps in use today and would allow passengers to pool flights on their schedule. This requires a mature vehicle-to-vehicle network, air traffic control integration, and vertiport infrastructure.

Airport Shuttle

Connecting passengers to major commercial airport hubs, either through a micro haul airline connection or through a more distributed model, this type of operation is done by helicopters and buses today.

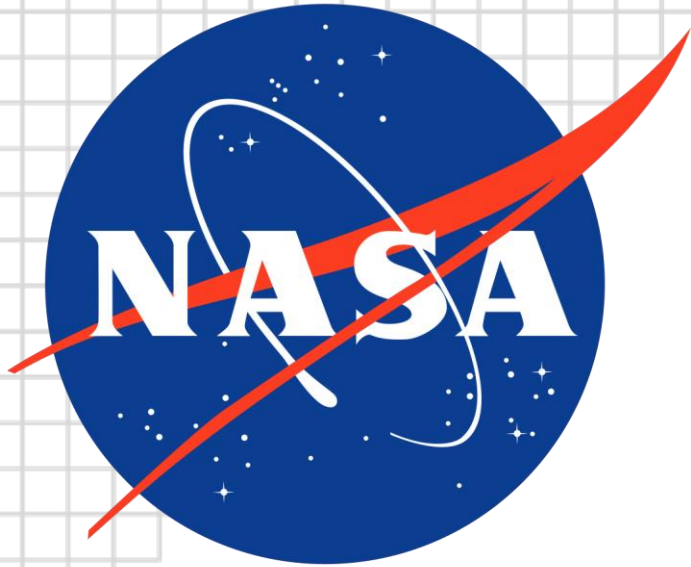
Emergency Services

The new eVTOL aircraft under development today promise to have faster response times, lower operating costs, and more targeted landing ability than the helicopters in use for medical flights today.



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CAMI Workshops



**An introduction to Urban Air Mobility
for state and local decision makers**

March 16, 2020 13:00 - 17:00

Glassboro, NJ

communityairmobility.org/events



Agenda

UAM Primer

- **Introduction to CAMI and Urban Air Mobility**
A. Dietrich & Y.Wulff (CAMI)
- **eVTOLS – What Are They?**
J. Sherman (Vertical Flight Society)
- **Infrastructure Considerations**
D. Swanson (Swanson Aviation Consultancy)
- **Legal and Insurance Issues**
E. Rivera Esq. (Fox Rothschild LLP)

Making UAM a Reality

- **Local Influences on UAM Development**
P. Vascik (BlueSky D2D LLC)
- **Integrating UAM into Urban / Regional Transportation**
C. Fernando (Aviation Consultant)
- **Available Tools and Resources**
D. Shapiro, (NASA)

Two Outstanding Back-to-Back eVTOL/UAM Events!



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for state and local decision makers**

March 16, 2020 13:00 - 17:00

Glassboro, NJ

communityairmobility.org/events



*Government
Employee
Discount
Available*



**UAM Infrastructure
Workshop**



**March 17-18, 2020
8:00 am – 5:00 pm**

Rowan University

vtol.org/infrastructure

CAMI wants to work with you...

- Find us at www.communityairmobility.org and on LinkedIn
- Contact us at contact@communityairmobility.org
- Sign up for newsletters and information on our website
- Join as a member – contact us or through our website
- Invite us to make a presentation to your company, agency or jurisdiction
- Ask us about customized local assistance with your project

We are here to help people and communities take to the skies!



Supporting the responsible integration of the third dimension into our daily transportation needs through education and advocacy.

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