



UNIVERSITY OF CALIFORNIA Berkeley Transportation Sustainability RESEARCH CENTER

# COMMUNITY INTEGRATION OF ADVANCED AIR MOBILITY: POTENTIAL IMPACTS OF NOISE

Aviation Noise & Emissions Symposium May 2, 2022





UNIVERSITY OF CALIFORNIA Berkeley Transportation Sustainability RESEARCH CENTER





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Supporting the responsible integration of the third dimension into our daily transportation needs through education, communication, and collaboration. CAMI is a 501(c)(3) nonprofit organization dedicated to the responsible integration of advanced air mobility into communities by providing education, communication, and collaboration.

CAMI understands the importance of connecting communities and industry by working with all stakeholders to develop advanced air mobility that integrates with existing and future urban and regional transportation systems.

CAMI educates and equips state and local decision makers, planners, and the public with the information they need to set policies and design infrastructure and systems to successfully integrate aviation into daily transportation options.



## **Presentation Overview**

- What is Advanced Air Mobility?
- Community Integration of AAM
- The Role of Stakeholders
- Background and Overview of AAM Noise
- Noise Risks
- Studies on AAM Noise
- Potential Impacts and Risk Mitigation Measures
- Role of Local Governments
- Additional Resources



# What is Advanced Air Mobility (AAM)?

A broad concept focusing on emerging aviation markets and use cases for aviation in urban, suburban, and rural communities. AAM includes local use cases of about a 50-mile radius in rural or urban areas and intraregional use cases of up to several hundred miles that occur within or between urban and rural areas



## **Emergency Services**

- Disaster response
- Aeromedical
- Firefighting
- Law enforcement





6

## Air Taxi

- On demand, point-to-point
- App-based like transportation network companies / ride hailing services.



Image: NASA

## Air Metro

- Fly a specified route on a specified frequency but without exact scheduled times
- Potential strategy to serve transportation deserts



Image: Cincinnati Bus Diagram from 2011

## **Microhaul Airline Operations**

- Scheduled air carrier flights with set routes and times
- Potential to serve regional air mobility, and for hub airport access.
- Potential to increase utility of smaller nearby airports and distribute passengers



Image: Cape Air New England Route Map

## The Role of Stakeholders

#### Local Communities

- City councils, mayors, city managers
- Urban planners, transportation engineers AAM/UAM
- Public transit
- Residents and businesses
- Disadvantaged communities
- Others

#### Aviation

- Federal government
- Port authorities
- Air carriers
- Manufacturers and suppliers
- Tenants and employees
- Communities impacted by operations
- Others

and UAS

Community

Integration

### Community Acceptance is Multifaceted



Trust		
	Safe Vehicles	
	Safe Infrastructure	
	Secure Operations	
Public I	Benefit	
	Emergency Services	
	Increased travel options	
	Economic opportunities	
Limited	Adverse Impacts	
)	Noise and visual impact	
2	Emissions and environment	
	Privacy	
Integration		
	Existing transit & roads	
_ _	Grid capacity	
	Social Equity	11

### **Potential Impacts of AAM**



Connect affordable housing with jobs and services



Reduced emergency response times



Stronger connection of rural areas to urban opportunities



Workforce development and economic opportunities



Increased utility of GA airport infrastructure



Noise and visual pollution



Increased demands on local grid capacity



Negative impacts on existing public transit



Sprawl and gentrification



Competition for funding for other critical infrastructure

## **Interface Points**

- Most aspects of Aircraft Certification are not a local issue and will be handled solely by the FAA (or other CAAs)
  - Noise: aircraft noise profiles could factor into vertiport locations
  - Fire/Crash Safety: possible interactions with fire code
- Land use and connection to other modes of transportation are much more solidly within the purview of local jurisdictions



# The intersection of airspace access and land use policy is key to AAM in communities

The location of the vertiports will have a significant influence over UAM corridor routing (where are Point A and Point B.

Land use surrounding vertiports has a large impact on safety and longevity as well: will need to protect the airspace so new buildings/towers don't obstruct.

In the AAM context, it's quite possible we may see cities develop policies/codes/design guidelines (or another approach) that:

- Expand affordability of AAM / UAM
- Ensure access for vulnerable populations
- Mitigate environmental and economic impacts
- Requires high-frequency public transit as a condition for vertiport approval
- Conditional use requirements (e.g, if someone wants to build a vertiport they have to agree to prohibit flights between 11PM and 6AM)

## **Multimodal Integration**

Integration with mobility on demand (MOD), mobility as a service (MaaS), and public transportation is key

Physical integration provides places where people can make seamless connections between travel modes (e.g., AAM, on-demand mobility, shared AVs, public transportation)

Co-locating multiple modes could support development of mobility areas and create a network effect that can multiply effectiveness of AAM, on-demand mobility, and shared AVs

#### **MOBILITY AREAS**



Shaheen and Cohen (2020)

### Interoperable Infrastructure

Remain aircraft-, propulsion-, technology-, and operator-agnostic in making long-term investments in AAM.

- Develop zoning classifications and building codes that encourage (or require) interoperable and openaccess take-off and landing facilities as a condition of approving a site for AAM operations.
- Provide zoning incentives, funding, and other inducements to encourage the development of infrastructure that is compatible for different aircraft types, propulsion systems, and available to multiple service providers.
- Integrate AAM into active transportation demand management (ATDM) programs to manage, control, and influence travel demand to optimize transportation flow and operations across the entire transportation network.
- Consider the sharing of enabling infrastructure with other modes of transportation such as charging, fueling, and information communications technology.

Shaheen and Cohen (2020)

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## **Community Engagement**



Acceptance is not the same as engagement

## **Background and Overview of AAM Noise**

- Aircraft and helicopter noise are a frequently cited nuisance in neighborhoods around airports and heliports
- High level of rotorcraft noise limits the use of helicopters in urban areas
- Proponents of AAM argue that a reduction in aircraft noise will be a key factor encouraging new use cases for urban and regional air mobility



Image Source: Greenwood and Schmitz (2018)

## **Noise Risks**

- Volume of AAM noise (e.g., dB level);
- Length of time AAM noise occurs;
- Time of day AAM noise occurs;
- Type or frequency of AAM noise;
- Number of people affected by AAM noise;
- Location of AAM noise and proximity to sensitive land uses;
- Number and location of take-off and landing infrastructure;
- Comparison of AAM noise to other ambient noise; and
- Differences between individual AAM aircraft noise compared to noise from scaled AAM operations.

#### Giuliani Plans To Reduce Copter Flights

One Heliport to Be Shut, To Ease Noise Pollution

By CLIFFORD J. LEVY Responding to a cascade of complaints about noise and safety, the Giuliani administration said yesterday that it would scale back the number of helicopter flights in New York City by closing one heliport and



# Exploratory Studies of Community Perceptions of AAM Noise

- Yedavalli and Mooberry (2019)
  - Conducted a general population survey across four locations (Los Angeles, Mexico City, Switzerland, and New Zealand)
  - 2<sup>nd</sup> and 3<sup>rd</sup> greatest factors impacting the public perception of AAM was the type of sound and the volume of sound generated by an eVTOL aircraft
- Shaheen, Cohen, and Farrar (2018)
  - Conducted focus groups in Los Angeles and Washington, D.C. and a general population survey in five U.S. cities (Houston, Los Angeles, New York City, San Francisco, and Washington DC)
  - Study found that noise levels could impact support for AAM by the public
- Yedavalli and Cohen (forthcoming)
  - Conducted an institutional survey of 105 U.S. public agencies on AAM issues
  - Cities and MPOs most concerned by the volume and time of day the noise occurs
  - State DOTs more concerned by how the noise sounds

## **Other Studies of AAM Noise**

#### Holden and Goel (2016)

- Estimates that an eVTOL aircraft should be one-half as loud as a medium-sized truck passing a house (75 to 80 decibels at 50 feet; approximately 62 decibels at 500 feet altitude)
- Approximately one-fourth as loud as the smallest four-seat helicopter on the market at the time of the study



## Potential Long-term Risks and Mitigation Measures

- Difficult to estimate the likelihood or magnitude of noise risk because public tolerance of AAM noise may vary by aircraft and propulsion type; noise characteristics; time of day; and use case
- Noise concerns could be mitigated through technological improvements (i.e., aircraft design and electrification) or ...
- Persist as the market matures into larger-scale operations (e.g., total ambient aircraft noise from multiple aircraft operating in close proximity)
- As surface transportation electrifies, a potential reduction in overall ambient urban noise could make aircraft noise more perceptible in the future than it is today

# **Potential Equity Impacts of AAM Noise**

- Where a vertiport gets placed could have huge implications on a variety of environmental impacts, including noise
- Examples:
  - Noise associated with fight paths to/from a vertiport
  - Noise in the vicinity of vertiports



# The Role of Local Governments and AAM Noise

- Under existing law, local governments can plan and mitigate aviation noise primarily by promoting compatible land uses, requiring real estate disclosures, and including noise data in municipal codes
- Airport Noise and Capacity Act (ANCA) of 1990 prohibits local governments from implementing aircraft noise restrictions for commercial aviation after October 1990
  - As of April 2020 no airports have successfully received FAA approval to implement additional noise restrictions
- AAM may need to meet a stricter noise standard due to the nature of low-level flight over highly populated urban areas, coupled with scaled operations

- Noise risk could be mitigated by not zoning or approving vertiports near sensitive land uses (or not allowing sensitive land uses near vertiports)
- During the vertiport planning process, a public agency may conditionally approve a site as long as the owner or operator prohibits flight operations during late night and early morning hours
- Public agencies may own, operate, and/or fund vertiports to retain greater influence on AAM operations
- Local governments may be able to reduce noise through building codes and incentives for the use sound deadening material in structures near vertiports and along key flight paths

# ADDITIONAL RESOURCES

## **Additional Research:**

Urban Air Mobility: History, Ecosystem, Market Potential, and Challenges

https://escholarship.org/uc/item/8nh0s83q

#### Advanced Air Mobility: Demand Analysis and Market Potential of the Airport Shuttle and Air Taxi Markets

https://www.mdpi.com/2071-1050/13/13/7421

#### The Potential Societal Barriers of Urban Air Mobility

https://escholarship.org/uc/item/7p69d2bg

#### NASA Urban Air Mobility Market Study

https://ntrs.nasa.gov/citations/20190001472

## USDOT Mobility on Demand Planning and Implementation Guide

https://rosap.ntl.bts.gov/view/dot/50553

#### More resources available at:

https://tsrc.berkeley.edu/research/urban-air-mobility

Urban Air Mobility: History, Ecosystem, Market Advanced Air Mobility: Demand Analysis and Market Potential, and Challenges Potential of the Airport Shuttle and Air Taxi Markets ris Fernandollos-2 com (C F) waint analysis, this study estimates that the air taxi and airment shuttle markets could cantum his study concludes that AAM passenger services could have a daily demand of 82,000 passe mately 4000 four- to five-seat aircraft in the U.S., under the m ting an annual market valuation of the 2.5 billion I wworde advanced air mobility (AAM): urban air alysis: air taxi: vertical take-off and landing (VTOL 1. Introduction A variety of technological adva omation, vertical take-off and landing (VTOL) aircraft, unmanned aerial systems (UAS ad air traffic management are enabling innovations in aviation, such as new aircra ness models. Advanced air mobility (AAM) is a bro The Potential Societa on Demand Planning and Implementation Barriers of Urban Air actices, Innovations, and Emerging Mobility Futures Mobility (UAM)

Se sustainability

MDPI

## CAMI's Online Resources

#### **CAMI Notes:**

- What is Urban Air Mobility?
- Community Benefits of Urban Air Mobility
- eVTOL Aircraft: What they are & why they matter
- Urban Air Mobility Operations Overview
- Legal Considerations for Urban Air Mobility Part 1: Aviation Law
- Components of Public Acceptance for AAM & UAM

#### Videos

- UAM 101
- American Planning Association: Advanced Air Mobility
- AAM 101

#### Guidebooks (coming soon)

- Why We Need Advanced Air Mobility for our Cities: A Planner's Guide to Advanced Air Mobility
- Incorporating Advanced Air Mobility into Regional and GA Airports
- Foundational Information for Advanced Air Mobility

https://www.communityairmobility.org/resources



## **Upcoming AAM Resources**

APA PAS Report Planning for Advanced Air Mobility



MINETA



**American Planning Association** 

Creating Great Communities for All

ACRP 11-02/Task 43 Successful Community Inclusion in Advanced Air Mobility





Considerations for Local Implementation of Advanced Air Mobility



## **URBAN AIR POLICY COLLABORATIVE | Mission and Participants**



The mission of the Urban Air Policy *Collaborative is to develop a policy* framework for the local implementation of advanced air mobility through the sharing of knowledge, discussion of issues, development of recommendations, and collaboration with peers through an ongoing program of workshops, presentations and conversations. The UAPC has two programs – the Cohort and the Forum





## **CAMI Upcoming Events**

- UAPC Cohort 2022 A began in April
- CAMI Quarterly Member Open House May 26
- UAPC Forum June (TBD)
- AAM 101 August 2 (in conjunction with the CalTrans / UC Berkeley conference Aug 3-5)
- Pacific Northwest AAM Summit Sept 30 Oct 1

# AAM 101 and Future of AAM Conference SFO Airport, August $2^{nd} - 5^{th} 2022$

The 101 workshop and conference will feature cutting-edge presentations and interactive sessions around the following core themes:

- Current practices, Innovations, and Emerging Futures
- Sustainable and Equitable Outcomes
- Public Sector Perspectives on Advanced Air Mobility
- Governing for On-Demand Air Mobility
- Workforce and Economic Development
- Stakeholder and Community Engagement
- Planning and Multimodal Integration
- Regional Air Mobility

More information available at: <u>https://www.techtransfer.berkeley.edu/future-aviation-2022</u>







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