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# integrating advanced air mobility: a primer for cities

Prepared by: Urban Movement Labs

**Integrating Advanced Air Mobility - A Primer for Cities** serves as a guide for cities to begin planning for the integration of advanced air mobility technologies, inspired by the work accomplished to-date by the City of Los Angeles in collaboration with Urban Movement Labs.

This primer provides city and other government stakeholders an overview of emerging advanced air mobility technologies, steps to consider during exploratory & initial planning phases, and considerations for the near future.

# Credits

## Published By

Urban Movement Labs, a first-of-its-kind nonprofit collaboration of government, businesses, and community to design and deploy transportation tech solutions in urban conditions.



**urban  
movement  
labs**



Archer Aviation's Maker

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• Indicates that this person is now serving in a different position.

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# Foreword

As Advanced Air Mobility (AAM) progresses towards commercial viability, Los Angeles has been identified by the AAM industry as one of a handful of US cities where this new aviation technology might first achieve scalable commercial operations due to the higher levels of current intercity aviation operations using helicopters and need for expanded multimodal solutions.

**This document presents Los Angeles' experience in preparing for AAM integration, along with considerations for other jurisdictions to emulate as appropriate. This plan is intended to inform policy development, planning processes, and regulatory decision-making associated with the integration of urban aviation into existing city, regional, county, state, and national transportation networks.**

As such, this primer provides relevant information to any local municipality planning for the integration of AAM into existing land use and transportation contexts. The Integrating Advanced Air Mobility: A Primer for Cities is informed by work Urban Movement Labs is leading with the City of Los Angeles and private industry partners under the AAM Partnership and reflects years of accumulated knowledge across a diverse spectrum of agencies and stakeholders.

**With this document, Urban Movement Labs presents an approach for AAM planning - called a conceptual Flight Plan - developed through first-hand experiences in Los Angeles via collaboration across city agencies, community partners, and industry leaders.**

The AAM Partnership approaches AAM as a component of land use and transportation planning to explore how aviation may be integrated into a multimodal environment.

The Integrating Advanced Air Mobility: A Primer for Cities' primary audience are U.S. cities, counties, and states. The secondary audience are industry stakeholders who wish to learn more about city processes to inform their integration strategy. While every city is unique and handles transportation and land use matters differently, the comprehensive approach in Los Angeles provides a template for other jurisdictions to work from. With many unknowns remaining associated with AAM, the Integrating Urban Air Mobility: A Primer for Cities should be considered a living document that will be released as a 'public draft' for continued refinement based on feedback from public agencies to inform a comprehensive landscape of integration options.

# Introduction

## What is Advanced Air Mobility?

Advanced Air Mobility (AAM) technology is a significant evolution within the aviation industry. AAM operations will be regulated by the Federal Aviation Administration (FAA), which maintains safety as the top priority. While AAM offers opportunities to complement other modes of transportation, AAM is not “flying cars” nor a new form of the private automobile.

Historically, urban air mobility described anything that moved over a city and through the air, most commonly helicopters, though the term has also referred to aerial cable cars or gondolas. In the late 1940's, it was possible to travel across the Southern California metro area by air when Los Angeles Airways provided helicopter service across the region, with similar services in Chicago, New York City, and San Francisco. Recently, private helicopter charters have moved people, cargo, and critical medical supplies over congested urban areas far faster than possible on the ground.

Today, the FAA defines AAM as a safe and efficient aviation transportation system that uses highly automated aircraft to transport passengers, or cargo, at lower altitudes within urban and suburban areas.\* Urban Air Mobility is a subset of Advanced Air Mobility (AAM) which includes rural applications, regional transportation, and other services like surveying, infrastructure inspections, and emergency response. This definition is inclusive of Uncrewed Aerial Systems (UAS) and electric Vertical Take-off and Landing (eVTOL) aircraft, and other advanced aircraft types. The FAA has indicated that this definition will be updated as technology matures. This primer focuses on eVTOL operations as that use case is more prominently discussed in the Los Angeles region. Other regions are more focused on UAS delivery opportunities.

\* Federal legislation, S.516 defines AAM as a transportation system that transports people and property by air between two points in the United States using aircraft with advanced technologies, including electric aircraft or electric vertical take-off and landing aircraft, in both controlled and uncontrolled airspace. For more details, see <https://www.congress.gov/bills/117/congress/senate/bills/516/text>.

#### **AAM vs. UAM: What's the Difference?**

The terms Advanced Air Mobility (AAM) and Urban Air Mobility (UAM) are often used interchangeably and creates confusion for those new to this industry. Although UAM was the first term used to describe this emerging field, the industry quickly recognized that not all use cases will be "urban." In many places across the country, drone delivery and emergency management use cases are advancing rapidly. Therefore, Advanced Air Mobility was adopted to account for non-urban use cases. Throughout this document, AAM is used to be inclusive of the diverse geography, which Los Angeles encompasses, and potential use cases.

For more information describing AAM and UAM visit the following websites: [FAA](#), [NASA](#), [CAMI](#), [CAAM](#), [Flight Crowd](#), [UC Berkeley's Transportation Sustainability Research Center](#) and [UML](#).

AAM concepts utilize new aircraft designs with innovative technologies in propulsion and automation:

#### **PROPULSION**

New propulsion systems, such as electric and hybrid motors, are in development for aircraft. Electric motors have far fewer moving parts and are less complex than internal combustion or turbine engines. A reduction in complexity is expected to reduce single points-of-failure and the potential for malfunction or fatal crash. New aircraft designs are incorporating multiple electric motors with redundant power sources, which are expected to increase overall safety. Additionally, electric propulsion technologies may substantially reduce the noise impact of aircraft, while also reducing the need for traditional carbon-based aviation fuels. Hydrogen engine concepts are also in development.

#### **AUTOMATION**

Automation reduces operator workload and streamlines air traffic management. For example, aircraft autopilot systems have significantly increased the safety of operations by reducing mid-air crashes. Though the media often communicates a vision of fully autonomous vehicles, for the foreseeable future most aircraft will continue to be operated by an FAA-licensed pilot under the existing airspace management and operations architecture. However, many of the new companies developing AAM vehicles desire to ultimately operate vehicles remotely, relying on heavily automated systems.

\*<https://escholarship.org/uc/item/8nh0s83q#main> provides an in-depth history of AAM

## Priorities

Agencies leading the integration of AAM into urban settings have identified common themes that facilitate successful collaboration across jurisdictions by approaching the new technology from common goals: equity, safety, sustainability, and economic growth. These goals are in alignment with LADOT's Strategic Plan Pillars.



### EQUITY

Each city has unique equity priorities that must be considered when planning new transportation technology (e.g., providing access for low-income residents, digital barriers, the unbanked, people with disabilities, etc.) For example, in Los Angeles, the city recognizes that transportation can be a powerful tool to deconstruct systematically racist policies and practices which disproportionately and intentionally impact Black, Indigenous, Latinx, Asian, and other communities of color. To ensure AAM complements and supports affordable, reliable, and safe transportation options that connect communities to needs, Los Angeles is prioritizing community-first engagement to ensure planning of AAM-related infrastructure addresses local issues to repair trust and accountability between the agency and the communities it serves. A recent example of how cities can apply lessons-learned is found with Los Angeles' dockless scooter program. In response to missed equity outcomes, the City established new equity zone designations to ensure new technology meets the unique mobility needs of residents:

- **Mobility Equity Zones (MEZ):** Areas that are transportation disadvantaged and meet the Hardship Index developed by the Nelson A. Rockefeller Institute of Government as a filter for socio-demographic vulnerability.
- **Mobility Disadvantage Zones (MDZ):** Areas that are transportation disadvantaged but do not meet the Hardship Index.

This same level of commitment and innovation must inform AAM development and respond to changing needs and lessons-learned. Urban Movement Labs will work with the AAM Partnership to engage stakeholders to identify ways of incorporating AAM as a component of a holistic transportation system that prioritizes the movement of people, not vehicles - be it by transit, bicycling, walking, or aviation.



### HEALTH & SAFETY

AAM should complement the city's efforts to eliminate transportation related deaths and serious injuries while improving the health and

\* For more information, see:

- [LADOT's 2021 Strategic Plan Update](#)
- [LADOT Year One Snapshot: A Review of the 2019-2020 Dockless Vehicle Pilot Program - A New Direction 03, A nuanced focus on mobility equity \(page 81\).](#)

wellbeing of communities. Commercial aircraft require FAA certification to ensure a high degree of safety for the aircraft, operation, pilot, passengers, and non-participating public bystanders. The FAA has made flying commercially one of the safest modes of transportation, and the industry understands that these high standards for safety must be met for AAM operations to scale. The FAA's cautious approach may create a perceived disconnect between what the industry envisions and what is safely achievable in the near term as new technology and policy are incrementally adapted. This work primarily focuses on the near term and preparing the City for initial operations after the first aircraft are certified.



### **SUSTAINABILITY**

AAM integration should complement the city's plan for a zero-emission transportation network to curb climate change and correct the harm of pollution on the city's most vulnerable populations. There are legacy concerns with aviation including emissions, noise, sustainability, and accessibility - especially in communities that have historically been burdened by polluting emissions and noise from transportation. Electric aircraft are in development to be safer, quieter, and more accessible, directly addressing these past trends while providing new levels of connectivity and reducing carbon impacts across shorter trips with lighter loads. As the industry scales and becomes more affordable and accessible, AAM may serve as a transportation alternative to the personal automobile for some trips as part of a future zero-emissions multimodal transportation network.



### **ECONOMIC GROWTH**

Los Angeles aims to help create jobs, support businesses, and provide economic opportunities for communities, while prioritizing the most underserved. While initial AAM operations may likely only be available as a service to higher income users, the jobs created by this new industry can positively impact community members and create new opportunities in an exciting industry. The median wage of the air transportation industry is well above the overall median wage. Workforce development programs can help ensure local communities are trained and ready to take advantage of new employment opportunities from manufacturing to aircraft maintenance, to operations. As the AAM operations scale, it will be important for cities to work closely with industry stakeholders to bring future service within financial reach to make new connectivity benefits available to as many community members as possible.

\* "Commercial" commonly refers to vehicles used for moving passengers, cargo, and other for-profit uses.  
\* Johnson, W., and C. Silva. "NASA concept vehicles and the engineering of advanced air mobility aircraft." *The Aeronautical Journal* 126, no. 1295 (2022): 59-91.

# Background

## AAM Partnership to Advance Policy

In December 2020 Los Angeles Mayor Eric Garcetti announced the Urban Air Mobility Partnership, now the Advanced Air Mobility (AAM) Partnership. This unique initiative confirmed Los Angeles' innovative leadership with respect to Urban Air Mobility at the national level and leverages a public-private partnership between the City of Los Angeles and the nonprofit Urban Movement Labs (UML).

Urban Movement Labs is uniquely positioned to convene Advanced Air Mobility stakeholders as a third party while allowing the City to remain focused on the pressing matters of today within public works, public safety, and community priorities. Urban Movement Labs provides technical expertise in AAM to promote a shared understanding of new aviation technology, which can be a challenging topic, while advancing policies that benefit Los Angeles residents.

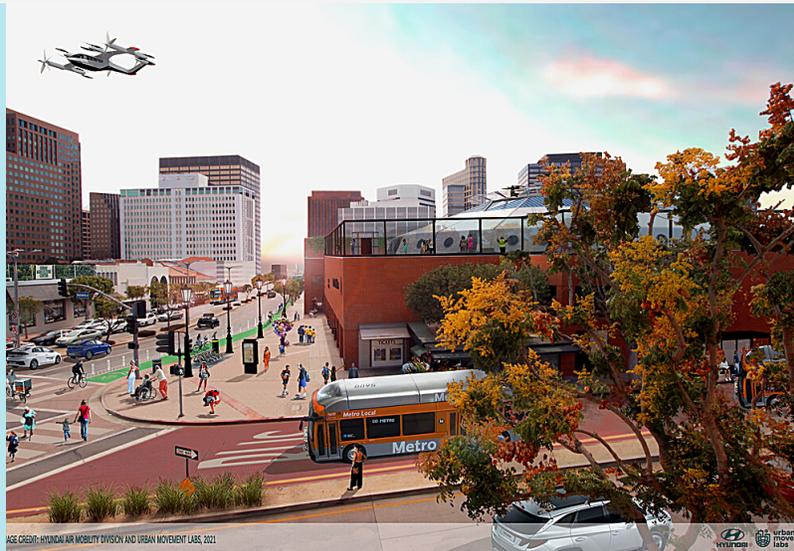


IMAGE CREDIT: HYUNDAI AIR MOBILITY DIVISION AND URBAN MOVEMENT LABS, 2021

A Vertiport as a component of a multimodal hub, featuring Supernal's SA-1 aircraft and the Urban-Air Port concept. (Photo Credit: Urban Movement Labs & Supernal)

The guiding goals of the AAM Partnership were developed in collaboration with its founding members:



#### **ENGAGE AND INFORM**

Urban Movement Labs is shaping the future of air mobility in Los Angeles through strategic outreach to engage Angelenos, policymakers, city staff, and research institutions. The goal of engagement is to foster a shared understanding of this new tech and its opportunities, and to empower stakeholders with current knowledge and information to shape AAM locally. Urban Movement Labs is accomplishing this through direct engagement with community members and by facilitating discussions between the City of Los Angeles, federal and state regulatory agencies, and private sector partners.



#### **INTERFACE WITH THE INDUSTRY**

Urban Movement Labs connects with aircraft manufacturers and operators, infrastructure developers, and other technology providers to help inform and guide evolving city policy and priorities. Through this interface, Urban Movement Labs provides industry stakeholders a well-rounded understanding of local issues around urban aviation. Urban Movement Labs also works with industry stakeholders to devise comprehensive, real-world solutions and sustainable business models using these insights.



#### **DEVELOP A MODEL FOR OTHERS TO FOLLOW**

Industry feedback confirms that Los Angeles is among the most desired "launch cities" for AAM. Leaders interested in AAM integration worldwide are looking to Los Angeles for leadership to successfully implement this new technology. Urban Movement Labs is building an industry-leading model with a community-first approach to AAM integration. This model will inform decision-makers both nationally and internationally.

## AAM Partnership Members

To guide AAM integration, the AAM partnership was established with a core group of partners that understood the importance of public agencies and industry leaders collaborating to engage communities and inform effective policy and regulations. Founding partners include the City of Los Angeles Mayor's Office of Economic Development, the Los Angeles Department of Transportation, Supernal (formerly Hyundai Urban Air Mobility), and Urban Movement Labs. As additional partners engage, the AAM Partnership expands to incorporate new perspectives, identify new challenges to plan for, and advance holistic AAM policies and regulations. The full roster of the AAM Partnership as of March 2022 is displayed below and reflects a shared commitment to collaboration.



### Supernal

"This partnership sets a precedent for how diverse stakeholders can collaborate on a safe, community-centered approach to integrating aerial mobility technology into existing and new multimodal platforms."

**Pamela Cohn, Chief Operating Officer of Supernal**

### Archer

"In identifying our first city partnership, it was critical to have a shared vision when it comes to how people will move seamlessly and with less impact on the environment around them,"

**Brett Adcock, Co-Founder and Co-CEO of Archer**

### Volocopter

"By leading the conversation about urban air mobility with broad stakeholders in Los Angeles, Volocopter can strategically identify and address how our services can benefit cities in the country."

**Christian Bauer, CCO at Volocopter.**



### **LOS ANGELES MAYOR'S OFFICE OF ECONOMIC DEVELOPMENT**

The [Mayor's Office of Economic Development](#) has been instrumental in identifying AAM as a disruptor in the transportation technology space. In 2020, the Mayor's Office staff collaborated with the World Economic Forum to create the Principles of the Urban Sky, which established a set of guiding principles that informed the launch of the Urban Air Mobility Partnership. In addition, the Mayor's Office built a coalition of allies within the industry through policy work at the federal, state, and local levels, to inform policy discussions across all levels of elected leadership in the US. Today, the AAM Partnership, led by Urban Movement Labs via the direct work of the AAM Fellow, continues to provide strategic leadership for Los Angeles and other global cities seeking to integrate AAM.

### **LOS ANGELES DEPARTMENT OF TRANSPORTATION**

The [Los Angeles Department of Transportation \(LADOT\)](#) seeks to create sustainable transportation choices that offer solutions to the city's equity challenges. LADOT is committed to learning from past transportation decisions that disproportionately burden disadvantaged communities through policy and strategic planning work. With these goals in mind, LADOT first engaged with the AAM industry at the Uber Elevate Summit in 2018. At the Summit, LADOT's General Manager emphasized the importance of working with cities early to ensure AAM technologies are equitable and sustainable. Since then, the Department has collaborated on various projects with the FAA and NASA to advance AAM with community representation. LADOT has continued to be engaged with AAM matters, releasing the Urban Air Mobility Policy Framework Considerations, in September 2021, and described in detail in Waypoint 4 of this document.

### **LOS ANGELES DEPARTMENT OF CITY PLANNING**

The [Los Angeles Department of City Planning \(LADCP\)](#) reviews project applications, processes entitlements, and issues approvals to ensure that future decisions about development are aligned with the City's land-use policies and regulations. City Planning's prioritized set of land use and transportation considerations strive toward equity in safety, public health, and access. DCP is also responsible for administering the Zoning Code, promoting urban design principles, and managing the City's historic resources. From overseeing the long-range planning efforts to managing the environmental review of projects, City Planning's work has a lasting impact on Los Angeles. DCP has been actively engaged in AAM matters since 2020.

### **SUPERNAL (FORMERLY, HYUNDAI URBAN AIR MOBILITY)**

[Supernal](#) is the AAM Partnership's inaugural private industry partner. Supernal's goal is to democratize flight and enable a more sustainable future by developing electric air vehicles to connect more people to more places. Supernal is working to achieve this by partnering with public and private sector partners to develop mobility solutions that augment existing transit networks. Four core principles (Safety, Noise Pollution Solutions, Affordability, and People First) guide this work. Supernal expects entry into service in 2028, later than peer eVTOL manufacturers, opting to direct near-term efforts in developing the AAM ecosystem.

### **ARCHER AVIATION**

[Archer's](#) mission is to advance the benefits of sustainable air mobility. It is developing an all-electric VTOL aircraft, which it will operate as an aerial ride-sharing service to move people around congested cities. Archer's aircraft will use technology that makes it quiet, safe, and sustainable to allow it to seamlessly integrate into urban environments. Safety is paramount at Archer as it works to certify its aircraft with the FAA to ensure its aircraft is as safe as commercial airliners today. With the goal of democratizing the skies, Archer is committed to developing an air mobility service that is accessible and affordable for the masses.



A Vertiport as a component of a multimodal hub, featuring Supernal's SA-1 aircraft and the Urban-Air Port concept. (Photo Credit: Urban Movement Labs & Supernal)

### **VOLOCOPTER**

[Volocopter](#) is working on several projects to develop a family of AAM ecosystem solutions to make aviation sustainable, accessible, and safe. Volocopter has three fully electric aircraft in development (VoloCity, VoloConnect, & VoloDrone) to address short and regional intracity passenger travel as well as autonomous cargo transport over arduous terrains. Understanding that all eVTOL aircraft will need to land and operate seamlessly within existing transport systems, Volocopter looks holistically at a AAM ecosystem, offering physical and digital infrastructure solutions (VoloPort & VoloIQ) to streamline flight planning and aircraft operations for a safer and more reliable service, beyond the aircraft. Volocopter will commence operations in the 2024 Paris Olympics.

### **BLADE**

[BLADE](#) is a technology-powered, global urban air mobility platform committed to reducing travel friction by enabling cost-effective air transportation alternatives to some of the most congested ground routes in the US and abroad. One of BLADE's primary missions is to help passengers safely and reliably experience new ways of traveling with the highest respect for, and least impact on the environment. BLADE strives to enable people to share aircraft instead of flying alone, thus making air travel more fuel efficient in many instances than riding in an SUV alone. BLADE is also a founding member of the Alliance for Quiet and Electric Aviation (AQEA). The AQEA's mission is to accelerate the transition to quiet, emission-free, electric aircraft through the preservation of existing aviation and urban air mobility infrastructure, enabling safe and affordable aerial alternatives to ground transportation.



Concept rendering of a Beta ALIA-250 operated by BLADE. (Photo Credit: BLADE)

## URBAN MOVEMENT LABS

[Urban Movement Labs](#) provides a third space for local agencies, communities, and companies to co-create and co-implement new mobility solutions. In cities, multiple agencies can share jurisdiction over various aspects of the transportation network, and a diversity of residents and stakeholders rely on, and are impacted by, both the transportation network and the vehicles that travel on it. Urban Movement Labs supports stakeholders in the city with information to understand and integrate new technologies and works with city partners to ensure new technologies can be integrated within existing city operations. Urban Movement Labs aims to make Los Angeles the model city for safe, sustainable, equitable, and efficient movement of people and goods and replicate these learnings around the world.

Urban Movement Labs hired the AAM Fellow in early 2021 to guide the AAM Partnership's community-first approach for integrating this new mode of transportation, and to represent the perspective of a local jurisdiction in industry conversations. The AAM Fellow's expertise with the aviation industry and familiarity with urban planning, transportation planning, and economic development aspects of aviation provide an unparalleled foundation upon which to execute the work of the AAM Partnership.



UML's Board and staff came together for an annual retreat, July 2022. (Photo Credit: Urban Movement Labs)

## Meet the AAM Fellow

Clint Harper brings 24 years of diverse aviation experience to Urban Movement Labs. A United States Air Force veteran with a dynamic aviation portfolio, Clint has direct experience in planning and operating airport, heliport, and Uncrewed Aerial Vehicle (UAV) facilities. He paired this experience with a Master of City and Metropolitan Planning degree and a specialization in Smart Growth and Transportation, as well as a Graduate Certificate in Urban Design.



***“For aviation to be taken seriously as an alternative mode of transportation, it must actively contribute to real, sustainable solutions alongside other transportation modes.” - Clint Harper***

Clint spent his post-military career pursuing thoughtful approaches to creating harmony between aviation and the community. In his previous role, Clint worked closely with communities across Utah to integrate their airports into regional economic development plans. In 2017, Clint began outreach and informing efforts around Urban Air Mobility, highlighting how existing aviation infrastructure could enhance connectivity in smaller communities through multimodal development.

Clint has made it his mission to explore how aviation can serve more impactful roles within communities. He challenges industry leaders to explore how aviation can make positive contributions to complex issues, such as homelessness, transportation inequity, and food insecurity.

# State of the Advanced Air Mobility Industry



While the AAM industry strives for fully autonomous, clean, affordable, and sustainable operations, technology to allow this is still maturing. To ensure that new technology is certified as safe for commercial use, incremental changes will be tested and refined slowly, to account for changes in other parts of the ecosystem, such as air traffic management. This section provides an overview of the state of current technology.

## Ecosystem Development

### **EVTOL DEVELOPMENT**

Aircraft certification is required by the FAA for any aircraft to operate commercially. Certification assures a high level of safety in a variety of operating conditions, such as differing weather conditions, loss of power or flight controls. Numerous eVTOL Original Equipment Manufacturers (OEMs) are progressing towards FAA aircraft certification, with six key milestones occurring since early 2020:

#### **JANUARY 2020**

FAA UAS Integration Office Executive Director Jay Merkle stated that six UAM aircraft are “well along” in pursuing FAA certification.

#### **JANUARY 2021**

FAA UAS Integration Office Executive Director Merkle update: over 30 AAM companies were in various stages of the development and certification process. At least two of those companies set targets to operate commercially in 2024.

#### **SEPTEMBER 2021**

FAA Administrator Steve Dickson predicted limited deployment of AAM within two years. At least two aircraft OEMs have received the G-1 Issue paper from the FAA, a significant milestone towards achieving FAA Certification.

#### **SEPTEMBER 2022**

The FAA published Engineering Brief 105, Vertiport Design. This design guidance provides the first vertiport design information since 2010, when the original Vertiport Design Advisory Circular, intended for tilt-rotor aircraft, was canceled. Safe vertiport infrastructure is key for aircraft operations.

#### **NOVEMBER 2022**

The FAA proposed an airworthiness criteria for Joby Aviation’s JAS4-1 aircraft. The criteria includes new definitions and considerations to accommodate a new class of “powered-lift” aircraft types.

While it is difficult to estimate when commercial deployment of AAM will be viable, the milestones achieved since 2020 indicate commercial deployment will likely be possible between 2025 and early 2026. A 2025 target to begin commercial deployment is potentially possible for early OEM entrants who are leveraging existing policies, including:

- Leveraging existing protocols and operating practices, early adopters aim to take advantage of the current air traffic management structure and ground infrastructure at airports and suitable heliports.
- FAA licensed pilots will fly these new aircraft with applicable credentials and experience (yet to be defined by the FAA).

After aircraft are certified, small-scale operations are expected to commence to refine business cases and fine-tune operations. Scaling of this technology to where it is a more common feature within cities will require OEMs to undergo a rigorous manufacturing certification process through the FAA, among other steps. Manufacturing certification is to ensure that aircraft can be manufactured and reproduced with a high degree of accuracy. AAM growth will be methodological, and it is very unlikely that we'll see eVTOLs cluttering cities overnight, as electric scooters did in 2017.



Rendering of Overair's Butterfly aircraft. (Photo Credit: Overair)

## **AUTONOMOUS OPERATIONS & UNCREWED AIRCRAFT SYSTEMS**

Significant advances in automation are happening within aviation's Uncrewed Aircraft Systems (UAS) sector, which is finding new and innovative uses for small drone aircraft and autonomous technology. Although AAM experts expect these innovations to merge with passenger or cargo transport use cases, it is difficult to establish a timeframe for this merger. As UAS use cases (surveying, mapping, infrastructure inspections, emergency management, and small parcel/last-mile delivery) become more common, the need to update the supporting ecosystem becomes more urgent.\*

The intent of automation is to decrease pilot or operator workload so attention can be paid to other critical safety tasks. Examples include:

- Near-object avoidance and stability augmentation that are already in use on UAS multicopter designs are being adapted to crewed aircraft to make them easier and safer to fly.
- New sensors and communications protocols are enabling Detect and Avoid (DAA) and Ground Collision Avoidance Systems (GCAS) to prevent mid-air collisions and reduce the likelihood of one of the largest sources of general aviation accidents today, controlled flight into terrain.
- Autonomous landing systems exist for emergency use to take over and land safely if the pilot becomes incapacitated.
- UAS corridors have been implemented for testing in New York, North Dakota, Ohio, and on the Choctaw Nation.

These innovations are making piloting aircraft more manageable and enhancing flight safety while advancing automation. To bring this new ecosystem together, the FAA has partnered with the National Aeronautics and Space Administration (NASA) to research, test, and integrate new technology in the safest and most efficient way possible. NASA's work presents opportunities for communities to engage in further technology development through targeted research programs, such as the Advanced Air Mobility National Campaign, the Advanced Air Mobility Cross Cutting Workshops, and through the development of emerging technology, such as Uncrewed Traffic Management and infrastructure integration.

<https://dronedj.com/2022/05/24/walmart-expands-drone-deliveries-to-4-million-potential-households/>  
<https://www.aviationtoday.com/2022/06/16/amazon-prime-air-drone-deliveries-2022/>

### **UNCREWED TRAFFIC MANAGEMENT (UTM)**

With uncrewed aircraft becoming more commonplace and the airspace becoming more crowded, new needs and opportunities emerge for technology to provide innovative risk management and flight operations technologies. These technologies are converging to inform an Uncrewed Traffic Management (UTM) system. NASA defines an UTM as is a collaborative, automated, and federated airspace management approach that enables safe, efficient, and equitable small UAS operations at scale. Recognizing that increasing UAS traffic will strain the existing centralized air traffic control structure. A less centralized management structure delegates some responsibility and authority to other entities. This distributed management concept presents opportunities for jurisdictions to actively participate in managing the airspace through data and information sharing to communicate potential risks to operators.

In 2020, NASA and the FAA released respective Concepts of Operations (CONOPS) envisioning how a future UTM may operate and proposed an architecture for stakeholders to communicate and share essential information. Importantly, these CONOPS identify future roles and responsibilities for agencies and authorities, highlighting new ways for communities to participate in the technology development processes. LADOT leveraged this opportunity with conceptual solutions laid out in LADOT's UAM Policy Considerations document (see section 1.2 with the LADOT UAM Policy Consideration document). With many differing perspectives on how the existing airspace structure will evolve to accommodate new aircraft and increased operational tempos, continued research and collaboration is necessary to advance UTM efforts.



Rendering of unmanned aircraft systems operating in the sky. (Photo Credit: NASA)

## INFRASTRUCTURE

Fixed infrastructure is vital to integrate AAM safely into cities' existing transportation fabric because all aircraft need a designated fixed location to takeoff and land. The FAA's number one priority is safety, and that priority extends to infrastructure. FAA infrastructure design guidance accounts for both typical operations and emergencies, with preparation for "the unknown" frequently guiding design and operation standards. For example, current heliport designs account for unplanned events by establishing safety areas, and making considerations for the surrounding airspace, ground protection zones, as well as other factors that mitigate risk to pilots, passengers, bystanders, and property on the ground during an emergency.

Vertiport is the common term referring to areas explicitly designed for eVTOLs to take off and land, similar to how a heliport is a designated area for helicopter operations. Many industry experts anticipate that vertiports will share similar characteristics with heliports, unlocking potential in existing and potentially underused heliport infrastructure. However, it is important to understand that a helicopter's operating attributes directly inform heliport design. In the same way, an eVTOL's operating attributes will inform vertiport design. While there is some obvious overlap in their operations, both helicopters and eVTOLs have unique operating considerations that must be included in infrastructure design.\*

\* For example, many current vertiport renderings, while aesthetically pleasing, may be infeasible due to as yet unknown safety/design considerations necessary in contingency situations. Ultimately, FAA design guidance will inform state and local authorities' efforts to evaluate and implement viable and safe designs.



Rendering of a Volocopter Velocity on approach to a Voloport vertiport. (Photo Credit: Volocopter)

To prepare for the expected certification of eVTOL aircraft, the FAA announced its intention of releasing a new Vertiport Planning & Design Advisory Circular in 2024. Understanding that this timeline may impede industry implementation plans, the FAA released an interim engineering brief in September 2022. The future AC will include a public feedback period, which provides cities with an opportunity to inform federal policies by uplifting community voices and identifying conflicts with local land use policies and regulatory structures.

Other infrastructure needs may include energy utilities, weather observation and reporting technology, airspace surveillance, communications, and infrastructure for complimentary surface mode integration. Future vertiports may serve as standalone facilities or incorporate a mix of the aforementioned new mobility infrastructure.

#### **A BRIEF HISTORY OF VERTIPORTS**

**Vertiports are not a new concept in aviation. The FAA released a Vertiport Design Advisory Circular in 1991 in response to then-emerging tilt-rotor aircraft technology, such as the Leonardo AW601, or the better-known CV-22 Osprey military transport aircraft. At that time, policymakers expected these new aircraft types to unlock the potential of UAM. However, in 2010, the Vertiport Advisory Circular was canceled as FAA certification of these new aircraft was delayed. With recent developments of eVTOL and related technologies, new aircraft capable of vertical take off and landing are being developed, and associated FAA guidance is currently being drafted.**



Vertiport Chicago, now an urban heliport, was once envisioned to accommodate tilt-rotor aircraft. (Photo Credit: Business Air News)

## Areas to Explore

As the AAM ecosystem continues to evolve, cities have an opportunity to guide a safe and competitive environment where AAM technologies can meet local needs, and work transparently with communities to identify potential benefits aligned with other city goals. This can then inform the prioritization of resource allocation. This section explores how early use cases may be thought of within the context of existing urban transportation challenges.

### **CREATION OF MULTIMODAL HUBS OF THE FUTURE\***

Multimodal hubs are widely envisioned to bring together a variety of modes in one seamless location. To achieve future sustainability targets these facilities may also function as energy hubs, incorporating charging infrastructure for multiple modes they may include microgrids and alternative energy sources such as solar, to the extent possible. This integration will require closer coordination and alignment of goals among energy providers, land-use planners, transportation planners, transit planners, aviation planners, and even economic developers.

\* For more information, see: <https://rosap.nrl.bts.gov/view/dot/50553>



A pedestrian viewpoint in a rendering of a vertiport featured as a component of a multimodal hub. (Photo Credit: Urban Movement Labs & Supernal)

### **A NEW MODE OF TRANSPORT UNCONSTRAINED BY SURFACE TRAFFIC CONGESTION**

Marketing for AAM began in 2016 when this new aviation technology was positioned as a solution to surface traffic congestion. The idea that air travel bypassing congested freeways and roads may seem like a solution to traffic congestion to some, it may equally concern others who fear the creation of "freeways in the sky." The reality is likely to be more complex, as the path to commercial operations of AAM will include a slow and methodical scaling of the number of vehicles flying, the numbers of daily flights, the number of origins/destinations served, and an associated cost to the user that the industry expects to decrease based on increased frequency and density of service. Therefore, in the initial years of AAM operations within an urban environment, the number of daily users of this new mode of transportation will not be of a level great enough to result in a substantial, or even noticeable, change in surface traffic congestion levels. As with other mobility solutions, induced demand is likely to result in unchanging levels of roadway congestion.

What AAM offers is a new mode of transportation that can travel distances in shorter time than existing surface transportation modes available. While charter helicopter travel is theoretically available today, the cost and limitations of operations means that air travel within urban environments is limited to only a handful of travelers. With the anticipated reduced costs of operations for eVTOL vehicles, AAM has the potential to be available to more travelers. In the initial years of operation, AAM travel costs will likely be high, and for some travelers the cost may be rationalized due to the ability to travel between key destinations much faster than available by surface transportation.



Archer Aviation and United Airlines recently announced a partnership to establish an eVTOL route between Newark Airport and downtown Manhattan. (Photo Credit: Archer Aviation)

### COMMERCIAL AND MEDICAL CARGO MOVEMENT

UAS use cases of AAM have the potential to offer important services accessible to more community members. Freight use-cases including mid-mile transport from manufacturer to warehouse or last-mile deliveries from warehouse to final destinations, offer aviation alternatives to moving time-critical, high-value assets across highly congested areas. For example, medical deliveries are of particular interest due to the broader societal benefits of receiving critical medical supplies, equipment, and even live organs, for life-saving purposes more quickly than possible by ground transportation.

Organ transportation is complicated due to the rapid decomposition rate of organs. In 2021, a drone delivered lungs in just six-minutes between two University Health Network hospitals in Toronto, Canada for a transplant patient. Similarly In 2019, a kidney was transported by drone for transplant between St. Agnes Hospital and the University of Maryland Medical Center in Baltimore, Maryland. This trip was completed in just 10-minutes.

UAS can also benefit industrial and high-tech industries that rely on specialized parts and equipment where aircraft are chartered to deliver parts quickly despite high costs, to avoid delays. UAS delivery can speed delivery across a region to keep industries moving.

\* <https://www.forbes.com/sites/victoriaforster/2021/10/14/drone-flies-lungs-between-hospitals-for-transplant-patient/?sh=2442282b6a5b>

\* <https://www.baltimoresun.com/health/bs-hs-organ-delivered-by-drone-20190426-story.html>



Volocopter's Volodrone undergoing cargo loading operations. (Photo Credit: Aerospace America)

# Flight Plan

## Why a Flight Plan?

Finding a common lexicon is important to integrate new aviation technology smoothly. Often, approaches to addressing a transportation topic are labeled as a roadmap with milestones to outline steps. Urban Movement Labs opted to take an opportunity to introduce a different, but analogous approach to introduce similarities in jargon between terrestrial transportation and aviation.

In aviation, a Flight Plan, like a roadmap, indicates a planned flight route or path that a pilot intends to follow. Waypoints, like milestones, define key points along the path and mark a transition to the next waypoint. Waypoints begin at "0", which indicates the starting point.

This Flight Plan provides a path for the integration of AAM by elevating intersections with civic concerns and identifying stakeholders to be engaged as partners for success. Several industry leaders are targeting Los Angeles as a priority market thus the City is positioned to be a global thought leader on AAM integration. This Flight Plan outlines six actionable waypoints to guide planning:

- WAYPOINT 0**      **Determine Level of Involvement**
- WAYPOINT 1**      **Leverage Executive Leadership & Resources**
- WAYPOINT 2**      **Initial Research**
- WAYPOINT 3**      **Engage and Inform Stakeholders**
- WAYPOINT 4**      **Create a Vision**
- WAYPOINT 5**      **Plan Strategically**



Waypoint 5 summarizes how AAM ecosystem components are currently viewed by the FAA, and flags opportunities for different jurisdictions to engage. However, how AAM is formally integrated is still under development. For steps beyond Waypoint 5, it would be inaccurate to continue using the term Flight Plan. For this reason, we frame the final three sections as opportunities and considerations that policy makers, industry members, and community members must collaborate to inform:



**CONSIDERATION 1 Engage in Federal Policy Development**

**CONSIDERATION 2 Contextualize the Current Urban Aviation Landscape**

**CONSIDERATION 3 Guide AAM Development through Local Policy**

Developed within the context of Los Angeles, this Flight Plan is meant to be accessible for other jurisdictions to adopt and customize as appropriate. As the AAM industry continues to evolve, the path to integration may not be linear, requiring actions of the proposed Flight Plan (termed “waypoints”) to be revisited or conducted out of order in response to new technology or federal and state policies, further highlighting the importance of collaboration and moving in step with overlapping agencies.

Waypoints 0-5 described in this section memorialize the work completed by the City and Urban Movement Labs to date, and serve as a reference for other jurisdictions considering the integration of AAM into urban environments. The Future Considerations and Opportunities lists preliminary topic areas for local and regional jurisdictions to collaborate and elevate local priorities and values to the national policy discussion.

## Waypoint 0: Determine Level of Involvement

Before working to integrate AAM, the question of whether AAM is right for a community must be considered. Community members and public agencies must work together with the industry, research institutions, and other regulators to determine if projected benefits of introducing, scaling, and integrating AAM will outweigh potential negative impacts. This flight plan outlines a process and key actions jurisdictions may take if stakeholders determine AAM is a good fit for a community.

AAM can be integrated through a variety of use-cases including small autonomous drone operations to supplement infrastructure inspections, commercial delivery to add new last-mile distribution options, and passenger transport. To help determine if AAM operations are appropriate in a community, stakeholders should consider how AAM can supplement local mobility networks.

The following highlighted impacts and use cases are not meant to be exhaustive but serve to help communities weigh new transportation options against common concerns. This discussion is intended to be a conversation starter for exploring AAM integration options, which will vary from jurisdiction to jurisdiction.



AAM Community engagement exhibition at the 2022 Experimental Aircraft Association AirVenture Airshow. (Photo Credit: Clint Harper)

## IMPACTS TO MITIGATE

While AAM can offer many new benefits and opportunities to cities, it would be a disservice not to be transparent about potential negative impacts. Noise, emissions, and economic imbalance are three key negative impacts that may emerge with AAM operations based on community feedback and issues typically tied to traditional aviation impacts. Other impacts, such as visual clutter, indirect emissions, and battery disposal will be addressed in future efforts.



### Noise & Vibrations

Noise will continue to be a community concern with aviation, whether aircraft are powered electrically or otherwise. While OEMs are striving for new aircraft to achieve quiet operations that blend into urban environments, motors and propellers will still emit noise. During busy times of day, AAM operations may blend into the background, but at other times of the day, there may not be enough ambient noise to mask aircraft operations, which may be a source of annoyance. Working with community stakeholders and policy makers will be essential to ensure AAM operations minimize noise pollution and associated nuisances for residents.



### Emissions

OEMs are working to develop next generation aircraft to reduce or eliminate emissions. While electric eVTOL operations will be emission free, hybrid concepts offer extended range by using traditional internal combustion engines during departure and arrival when energy consumption is at its highest, localizing emission impacts. Increased emissions may also result from increased roadway congestion to and from vertiport facilities from employees or individuals hoping to access services, making multimodal connectivity to vertiport jobs and operations necessary to minimize trips generated, and to help keep jobs local. Other sustainability concerns include visual pollution associated with a busier airspace, the disposal of lithium batteries, and emissions associated with enabling the industry.



### **Equitable Access to Economic Opportunity**

Airports are often seen as economic engines, yet adjacent communities often receive minimal benefits while bearing the greatest burden from aviation operations. To avoid the same dynamic, vertiports and operations should be guided by collaboration between community members, and professionals in aviation, transportation, land use, and economic development. This collaboration should result in policies with the goal of keeping economic benefits local and encouraging investment in communities hosting vertiport infrastructure to mitigate, or even reverse, historical effects between aviation infrastructure and adjacent communities.

## **POTENTIAL AAM USE CASES**

### **Uncrewed Aircraft Systems Delivery**

Uncrewed Aircraft Systems (UAS) delivery is becoming an increasingly attractive and viable option to meet the rising demands for next-day deliveries. Large commercial delivery companies are testing technology in preparation to meet future demand. In response to concerns about the implementation and scale of Uncrewed Aerial Systems delivery operations, some communities have worked to explore land use policies by engaging in national discussion to ensure the safety of non-participating bystanders. The National League of Cities offers a [primer](#) on Uncrewed Aircraft Systems delivery operations for local officials, and facilitates frequent web-based events for city officials to learn about the technology and ways to engage. Uncrewed Aircraft Systems and AAM applications may also facilitate delivery of critical medical supplies, which the Coalition for Advanced Health Mobility ([CAHM](#)) provides insights on.

### **Infrastructure Inspections**

Streamlined inspection processes enabled by autonomous UAS operations are improving efficiencies and cost savings for monitoring the maintenance status of transportation, communications, and energy infrastructure. Resources are available for cities through the Federal Highway Administration ([FHWA](#)) and the Federal Transit Administration ([FTA](#)) to deploy these tools locally. In addition to improving maintenance monitoring, UAS fleet operations introduce local jurisdictions to aviation topics that provide a baseline understanding as other use cases are explored.

### **Emergency Management**

Emergency Management use cases including search and rescue, wildfire management, and surveying, among others, are becoming more common in smaller jurisdictions. Such communities are dependent on roadway networks to evacuate and bring resources in response to incidents. However, natural disasters can have significant impacts on roadway networks, cutting off communities from critical supplies. AAM operations may offer an alternative delivery method to get critical supplies to responders and the communities that need them. Existing [FEMA grant programs](#) may provide access to UAS equipment for jurisdictions, which can help conduct surveying operations and smaller scale resource deployments ahead of AAM operations. Local, County, and State Emergency Management Offices should coordinate to ensure resources are utilized in a streamlined fashion.

### **Air Taxi & Mode Shifting**

In many large cities, traffic congestion is a serious concern impacting the movement of people and cargo resulting in negative regional or national freight related impacts. Building more roads simply does not solve the problem, due to resulting induced demand, and is not possible in most urban areas due to a lack of space for roadway expansion. Many cities are addressing this complex problem through transportation demand management (TDM) strategies that leverage land use interventions with new mobility choices and traffic operations management tactics. AAM may be leveraged within TDM strategies as both a land use intervention where strategically sited infrastructure serves to complement existing transit and active transportation networks; and as a new mode choice to travel greater distances at faster speeds than currently available for higher priority trips. Thoughtful vertiport infrastructure siting can contribute to mobility hub concepts where AAM, active transportation, and transit networks come together at key destinations, extending benefits to non-AAM users. As AAM operations scale and operating costs are lowered, this new mode will be available to more users. For most cities, this will be an intervention to an already strained transportation network and can serve rapidly growing cities or broad metropolitan areas.

**Regional Air Mobility at Existing Airports**

General Aviation (GA) airports located in smaller jurisdictions may serve as connecting points in an air network that connects large and small jurisdictions by way of existing airports capable of hosting traditional, electric, or hybrid aircraft. Strategic planning and coordination between communities can ensure connectivity via future AAM operations to areas of employment for industries where a physical presence may not be necessary on a daily basis. Providing the option to work remotely while having a quick way to access large cities from smaller communities can provide added flexibility in where people decide to live and may be a tool that alleviates housing pressures in large cities.

Depending on the scale and type of potential operations, additional considerations around security and passenger processing within terminals may be necessary. Coordination to assess security would include FAA and State Aviation officials, the Transportation Security Administration (TSA), and airports on the destination end of the trip will also need to be consulted.

**What is Regional Air Mobility?**

According to NASA, [Regional Air Mobility \(RAM\)](#) has the potential to fundamentally change how we travel by bringing the convenience, speed, and safety of air travel to all Americans. Through targeted advanced technology investments such as aircraft automation, enhanced operational models, more efficient aircraft and propulsion systems, and expanded airport renewable energy generation, RAM will increase the safety, accessibility, and affordability of regional travel while building on the extensive and underutilized federal, state, and local investment in our nation's local airports.

**AAM and Urban Sprawl**

Aviation-induced urban sprawl is often a concern. Unlike traditional sprawl, which is often characterized by a need to build expansive new roadways, regional air mobility maximizes the potential of existing, and often underutilized, GA airports. To layer benefits, local jurisdictions should explore economic development, transportation, and land use strategies around airports to encourage multimodal development that maximizes complimentary infrastructure investments. All airports should strive to serve as not just intermodal transfer nodes, but also as destinations. Airport sponsors should work closely with [State Aviation Offices](#) and departments of transportations to explore connectivity via AAM.

**THINKING ABOUT AAM HOLISTICALLY**

The City of Los Angeles proactively engaged in AAM discussions to guide how AAM operations integrate in the city and ensure city interests were represented with regards to equity, sustainability, and accessibility. This local involvement will ensure the development of infrastructure is guided with communities before the socialization of a new mobility option, a contrast to how road networks were planned and constructed in response to the propagation of the automobile. Policy makers have an opportunity to apply lessons learned from past transportation decisions that have overly burdened underserved and underrepresented communities, and instead plan for AAM in a way that prioritizes accessibility, equity, and sustainability.



Volocopter's 2X aircraft. (Photo Credit: Volocopter)

## Waypoint 1: Leverage Executive Leadership & Existing Resources

Public agencies are often challenged with managing limited resources to address existing priorities and have minimal bandwidth to address the dynamic challenges of emerging technologies. This often results with cities responding to, rather than collaborating with, new mobility services, without a clear place to start. The goal of this waypoint is to demonstrate that, with strong leadership and planning, local jurisdictions can identify a preliminary concept and approach to developing policies and implementation tools related to new mobility technologies.

The AAM Partnership has benefited from the leadership (in both emerging air mobility and transportation technology, more broadly) of Los Angeles Mayor Eric Garcetti and the General Manager of the Los Angeles Department of Transportation. Similar champions for transportation technology and innovation have emerged in cities across the US. For local jurisdictions seeking a pathway to integrate AAM operations into their respective geographies, this first waypoint can provide information on use cases or specific technical aspects to identify a champion at the local level.

**On April 27, 2021, Los Angeles Mayor Garcetti testified before the House Aviation Subcommittee. There, Mayor Garcetti highlighted the work that the City of Los Angeles had completed to date, particularly the Urban Air Mobility Partnership, and stressed the challenges of bringing aviation to dense urban areas - in particular, limited staff availability, conflicts with high density development, and equity. He also implored the FAA to work with cities to develop standards and policies that guide AAM operations.**

**His testimony emphasized the need for city agencies to collaborate with state agencies, federal agencies, and industry leaders to guide policies that will inform AAM's integration into urban environments. Urban Movement Labs continues to work with the Mayor's office in providing strategic leadership in exploring advanced air mobility in Los Angeles and beyond.**

### **MAYOR'S OFFICE OF ECONOMIC DEVELOPMENT (MOED)**

Los Angeles was fortunate enough to have a champion, first with Mayor Eric Garcetti, in recognizing that creating a pathway for transportation technology providers to collaborate with the city improves implementation and integration. Enabled by this leadership, MOED led the development of the Principles of the Urban Sky in collaboration with the World Economic Forum. MOED's leadership was instrumental in the creation of the Urban Air Mobility Partnership.

### **LOS ANGELES DEPARTMENT OF TRANSPORTATION (LADOT)**

When an OEM announced plans to launch AAM services within the city, LADOT leadership quickly engaged the aviation industry with a key message: OEM operational plans must align with Los Angeles' existing transportation goals and priorities. In 2020, LADOT spearheaded the City's involvement in NASA's Urban Air Mobility Grand Challenge (rebranded as the Advanced Air Mobility National Campaign), and, in 2021 became the first city representative on the FAA Drone Advisory Council (rebranded as the Advanced Aviation Advisory Council) to elevate community interests to technology developers. The department continues to work with other agencies and advocate for greater city involvement in AAM planning efforts.

### **LOS ANGELES FIRE DEPARTMENT (LAFD)**

After two years of research and careful implementation, the LAFD deployed drones to aid in the fight against the Skirball fire in 2017. Managing a drone program for emergency services or infrastructure inspections can serve as a launchpad for cities to begin understanding aviation because it requires knowledge of aircraft, the principles of flight, aviation weather, flight planning, and aviation communications. These topics are directly relevant in AAM applications, and this experience makes LAFD a valuable partner to inform local planning for AAM operations. As of early 2022, LAFD: Manages 17 FAA licensed drone operators; maintains 21 UAS aircraft; and has flown 275 missions, accumulating 450 flight hours (since 2020).

### **OTHER CITY AGENCIES**

Since the launch of the UAM Partnership, other city agencies have contributed to planning for UAM integration. The Department of City Planning was an early addition, bringing expertise in land use, zoning, and permitting. Similarly, the Department of Building and Safety has engaged to examine code enforcement and compliance considerations related to UAM infrastructure. Los Angeles World Airports (LAWA), responsible for operating the Los Angeles International Airport (LAX) and Van Nuys Airport (VNY) are engaged with NASA and the FAA, and participate regularly in related activities.

## Waypoint 2: Initial Research

Aviation is a new topic for most city agencies, requiring extensive research to determine how to approach regulation. As noted, agencies with drone programs already in place (e.g., for emergency management or infrastructure inspections) have an effective starting point to discuss AAM, and cities with airports also have resources to learn from. To better understand AAM specific topics, targeted research and analysis should be completed, even for cities with aviation experience.

This section outlines the specific efforts through which the city, prior to the work of the AAM Partnership, learned and became involved in AAM. For local jurisdictions seeking to integrate AAM operations, this waypoint identifies specific forums and research collaborations providing information on emerging AAM topics. The included efforts recognize recurring collaborations and does not include many informal or singular collaborations between agency representatives and industry leaders.

### **LOS ANGELES AND NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA) COLLABORATIONS**

The Los Angeles Department of Transportation participated in NASA's Urban Air Mobility Grand Challenge, an effort to establish a holistic concept of operations (CONOPS) for AAM. This CONOPS encompassed operations and infrastructure considerations for AAM to create a set of shared standards. The city explored the viability of recent innovations for [digital policy](#) monitoring in shared transportation data platforms, and digital policy tools within AAM contexts.

The Department of City Planning also worked closely with NASA for two years to inform a vertiport suitability model which identifies potential vertiport locations and guides city-wide policies to address vertiport siting. The vertiport suitability model inputs included: transit nodes, high-density employment centers, high-density housing, and sensitive land uses (such as childcare facilities or wildlife corridors) that may conflict with AAM operations. This model aims to provide an initial framework for policymakers to understand impacts of AAM in their communities and to guide land-use policies for eVTOL infrastructure to serve more people with existing mobility infrastructure, while prioritizing land-use sensitivities and compatible uses.

**WHY IS NASA INVOLVED?**

**NASA stands for the National Aeronautics and Space Administration. Aeronautics has always been a part of NASA's mission, although most of its notoriety comes from work in space. NASA is involved through the direction of the Federal government to provide the necessary research to facilitate a safe integration of AAM.**

**COMMUNITY AIR MOBILITY INITIATIVE (CAMI) -  
URBAN AIR POLICY COLLABORATIVE**

In March of 2021, LADOT participated in the Urban Air Policy Collaborative, facilitated by the Community Air Mobility Initiative (CAMI). The mission of the Urban Air Policy Collaborative is to responsibly integrate air mobility at state and local levels. Over a series of online workshops, participants were introduced to AAM through the lens of different stakeholders (academic, industry, and government), while connecting with other like-minded jurisdictions to build a supportive cohort. Through this work, LADOT was able to broaden its scope of knowledge around AAM and envision key policy areas to focus near term efforts on for AAM integration.

**FAA ADVANCED AVIATION ADVISORY COMMITTEE**

The objective of the Advanced Aviation Advisory Committee is to provide independent advice and recommendations to the United States Department of Transportation (USDOT) and the Federal Aviation Administration (FAA), and to respond to specific tasks received directly from the FAA. The advice, recommendations, and tasks aim to improve the efficiency and safety of integrating advanced aviation technologies into the National Airspace System (NAS). At the same time, the advice seeks to equip and enable communities to inform how UAS, AAM, and other technologies may operate in ways that are least disruptive. In response to FAA requests, the Advanced Aviation Advisory Committee provides the FAA and USDOT with information that may be used for tactical and strategic planning purposes.

## Waypoint 3: Engage and Inform Stakeholders

As electric scooters appeared on city streets across America in 2017, media coverage of emerging AAM opportunities grew more frequent. Often, this coverage contextualized AAM as “flying cars,” and general public sentiment indicated a fear that AAM meant these new aerial vehicles would soon start competing for space within the crowded public rights-of-way. The goal of this third waypoint is to provide a baseline of information to facilitate grounded conversations with stakeholders resulting in productive feedback. In Los Angeles, this effort was shepherded by the AAM Fellow, a community advocate whose unique blend of aviation and urban planning expertise resonated with a diverse range of stakeholders.

Traditional project-oriented outreach practices are not always best suited for this early level of engagement. The priority in this waypoint is to introduce the basics of AAM with stakeholders. Local jurisdictions considering AAM operations are encouraged to use a similar broad-based and community-first approach at the levels described below.

### BUILDING A BROAD COALITION

Due to challenges from COVID-19, Urban Movement Labs developed a multifaceted outreach strategy to hear community voices and communicate Los Angeles’ AAM goals to a wide range of stakeholders. To date, the AAM Partnership’s outreach efforts have reached 10 agencies within the City of Los Angeles, and 120 external organizations.

#### Inform & Solicit Feedback to Shape Los Angeles Policy

- 
 City Agency Outreach  
**10 City Agencies**
- 
 Local Communities  
**15 Local Communities**
- 
 Industry Experts  
**23 Industry Interactions**

#### Inform & Provide Leadership to Shape National UAM Policy

- 
 Media / Thought Leadership  
**30 Presentations**
- 
 Research and Outreach  
**30 Organizations**
- 
 Other Government Entities  
**22 Connections**

The goal of this stakeholder outreach is to inform and raise awareness of new and emerging AAM technology to solicit informed feedback. Stakeholders include industry leaders, research organizations, the media, community-based organizations, and other government agencies. This approach has allowed the AAM Partnership to gain insights from diverse perspectives, while championing a community-first approach to integrating AAM in cities.

For local jurisdictions looking to begin engaging in AAM, UML recommends engaging with the following organizations, which may serve as a resource for exploring AAM operations moving forward:

- Local transportation, sustainability, and equity advocacy groups
- AAM Ecosystem Partners
- World Economic Forum
- National League of Cities
- The FAA's Advanced Aviation Advisory Committee\*
- NASA'S AAM Ecosystem Working Groups (AEWG)
- National Association of State Aviation Officials (NASAO)
- Transportation Research Board
- American Association of Airport Executives
- Community Air Mobility Initiative (CAMI)
- Partnership with other global cities, airport operators, and research/nonprofit organizations exploring AAM operations in urban environments

\* The FAA AAAC is not an externally facing group. It exists in public but is solely tasked with responding to taskings from the FAA. However, the general public may review documents produced by this group or speak with a committee member regarding specific topics.



## **ENGAGING COMMUNITY**

To ensure AAM integration planning in Los Angeles elevates community voices and concerns, UML engaged with trusted community organizations throughout 2021 to listen and understand concerns and opportunities related to improved mobility for all Angelenos. Engagement efforts included a series of one-on-one interviews with community organizations and a virtual engagement event. In these forums, community members expressed excitement about AAM's role in expediting the electrification of mobility options, supporting multi-modal transportation hubs, and supporting freight movement. Consistent themes across conversations held with community organizations were desires for:



### **Community-First Approach**

A community-based planning process to guide the development of AAM services was imperative. Community organizations noted the importance of having all parties to proactively work to ensure this new travel mode builds on successes of prior public transportation investments, rather than exacerbating well-documented impacts and inequities.

### **Equitable Planning**

Equity must be prioritized to ensure AAM distributes its benefits to all communities. For example, AAM operations, investments and revenue should also improve the broader regional transportation network to enhance equitable mobility for all. AAM cannot be a tool that further divides communities in Los Angeles or adds new emissions and noise pollution to communities already burdened by the impacts of transportation infrastructure.

### **Transportation Integration**

AAM must be integrated with other modes of transportation as a part of a larger transportation demand management strategy to reduce single-occupancy vehicle miles traveled and provide more diverse mode choice options.

### **Planning for Diversity**

Transportation services must address mobility needs beyond commute trips - including the travel patterns of people with disabilities, women, parents, students, and seniors.

### **Acknowledge Main Social Issues in Los Angeles**

AAM planning must fully recognize existing social challenges systemically embedded by past transportation investments and decisions. AAM infrastructure should catalyze investments in some of Los Angeles' most pressing issues, such as transit infrastructure, pedestrian/bicyclist safety, housing, and homelessness.

### **MOVING FORWARD WITH A COALITION OF STAKEHOLDERS**

The FAA is expected to release policy and regulatory products as the AAM industry evolves and matures, which will provide insights on how AAM policies are being shaped at the federal level, as well as an opportunity to provide feedback to shape FAA policy. To guide responses to federal and state policies, it is important to engage with, and expand, a diverse coalition of stakeholders to incorporate AAM in Los Angeles, through a community-first approach. Waypoint 3 represents the beginning of stakeholder collaboration, which must continue throughout the policy development process to ensure a truly community-first approach.



Clint Harper presenting on AAM integration at the American Planning Association's 2022 National Planning Conference. Clint Harper was accompanied by Yolanka Wulff (Community Air Mobility Initiative), Adam Cohen (UC Berkeley), and Gabriela Juarez (Los Angeles Department of City Planning). (Photo credit: Behnaz Razavi)

## ONGOING ENGAGEMENT

This Waypoint is just the beginning of a continuous engagement strategy. It is the role of public agencies and industry stakeholders to frequently engage community members to share information about AAM's emerging opportunities and challenges. Feedback gained from these engagements inform policies to maximize benefits for AAM users and the broader communities in which AAM will operate. With a community-first approach, thoughtful engagement can also ensure issues of environmental justice, equity, mobility, land use policies, and others, are thoughtfully addressed. This establishes a solid foundation for future engagement with policy development and project-oriented engagement.

City, state, and federal agencies must work closely together to share feedback from engagement efforts to ensure well-rounded policy and regulation is developed across jurisdictions. While city agencies determine the scale of local aerial transportation networks via policies that inform vertiport placement, the FAA must establish and manage safe airspace that connects nodes. Local agencies should engage with regional FAA officials early and often to produce an approach that serves local needs and can be safely integrated into existing airspace. In Los Angeles, this is particularly important as vertiports are likely to be located near already complex and congested airspace.



Clint Harper (Urban Movement Labs) accompanied by Adrienne Lindgren (Supernal) and Michael Dymont (Nexa Advisors) to present on AAM Opportunities at the 2021 Airport Public-Private Partnership Summit. (Photo credit: Clint Harper)

## Waypoint 4: Create a Vision

The first three waypoints laid out in this Flight Plan provide inputs for public agencies to develop a vision for what AAM could look like locally. The goal of this waypoint is to develop local goals for AAM integration to help guide local planning efforts and set expectations that private industry can align with. Through this goal setting, common ground can be identified to foster collaboration between city agencies, neighboring jurisdictions, and industry.

For local jurisdictions, the development of a shared vision is critical for AAM operation when planning for a system that is still in development. The following documents are resources for local jurisdictions and provide considerations with broad applicability across the US.

### **AN AAM VISION IN LOS ANGELES**

"Los Angeles' approach for UAM implementation considers privacy, workforce development, data, and economic growth while developing policies for site and operation permitting. Achieving equitable access, acceptable noise and emission levels, multimodal transportation integration, understanding UAM impact on land use, density, and safety all require a careful and considerate evaluation of land use policies, permitting, planning, public engagement, and interagency coordination."

-LADOT UAM Policy Framework Considerations

### **PRINCIPLES OF THE URBAN SKY**

Los Angeles' first response to AAM came in September 2020 with the [Principles of the Urban Sky](#), created in collaboration with the World Economic Forum and a group of 50 industry, nonprofit, academic, and public sector stakeholders. The Principles of the Urban Sky are fundamental building blocks important to the short and long-range success of AAM within cities by factoring in themes common to other emerging transportation technology developments, such as data sharing, multimodal integration, and equity considerations. Los Angeles uses the Principles of the Urban Sky, shaped with feedback from leaders across the industry, as a guide for future policy development. The seven principles are displayed on the following page:

## The seven UAM principles

	<b>Safety</b> New forms of air transport must achieve levels of safety performance consistent with conventional aviation operations
	<b>Sustainability</b> UAM must improve environmental outcomes and embrace innovation to achieve more sustainable behaviours
	<b>Equity of access</b> There should be equitable access to mobility for disadvantaged communities
	<b>Low noise</b> Noise disturbances should be measured and mitigated by a community-first approach
	<b>Multimodal Connectivity</b> UAM should connect to existing, high-quality transport options, offering seamless travel
	<b>Local workforce development</b> UAM is expected to increase jobs on the ground and in the air
	<b>Purpose-driven data sharing</b> Data sharing should help providers quickly respond to passenger need and market demand

### LADOT URBAN AIR MOBILITY POLICY FRAMEWORK CONSIDERATIONS

Released in September of 2021, LADOT's [UAM Policy Framework Considerations](#) document outlines key policy areas for the city to focus near-term efforts for integration. These policy areas reflect existing priorities within LADOT's 2021 Strategic Plan and represent a step towards operationalizing the Principles of the Urban Sky.

The key policy areas are:

#### Equity

The AAM framework should establish an equitable process for siting vertiports that considers access and impacts to underserved communities and does not cause additional burdens.

#### Health and Safety

Safety, above all, is a fundamental requirement. LADOT is making stakeholder coordination an imperative with clear roles and communication protocols in place, as well as operational and safety requirements that are agreed upon and strictly enforced.

#### Sustainability

There should be clear guidelines for sustainable infrastructure integration, including adaptive reuse of existing infrastructure, like airports, heliports, and even parking garages, while facilitating a transition to clean energy.

**Data Responsibility**

AAM can efficiently integrate with the digital infrastructure to receive information on the state of both air and ground movements through digital tools, for example, Los Angeles uses LADOT's Mobility Data Specification (MDS), to facilitate efficient operations, compliance monitoring, and policy updates.

**Multimodal Connectivity**

Where possible, AAM should connect to existing, high-quality transportation options (public and/or private), offering seamless travel from the air to destinations in Los Angeles' diverse built environments.

**Economic Growth**

Every new employment opportunity in commercial AAM operations generates multiple jobs in manufacturing, maintenance, flight approval or other related positions down the line, generating economic growth.

**Transportation Network Adaptation**

The City should set clear guidelines surrounding vertiport implementation policies, permitting, and technology that are future-ready and incorporate sustainable practices to help reach environmental, economic, and social goals.



**SHAPING AAM IN LOS ANGELES THROUGH COMMUNITY ENGAGEMENT**

The feedback from Angeleno's (summarized in Waypoint 3) and documented in UML's [Shaping Urban Air Mobility in Los Angeles through Community Engagement](#), highlights community feedback received to inform policy associated with AAM integration in Los Angeles.

**REGIONAL INTEGRATION**

To ensure a comprehensive approach to AAM, jurisdictions in transportation planning and policy must manage and collaborate to meet the mission and goals of overlapping jurisdictions. Figure 2 highlights the mission statements and shared values of other jurisdictional entities pertinent to AAM in the Los Angeles Region.

FAA	CALTRANS	SCAG	LA COUNTY TRANSPORTATION	LADOT	LADCP
<b>Mission*</b>					
Provide the safest, most efficient aerospace system in the world	Provide a safe and reliable transportation network that serves all people and respects the environment	To foster innovative regional solutions that improve the lives of Southern Californians through inclusive collaboration, visionary planning, regional advocacy, information sharing, and promoting best practices.	Deliver regional infrastructure and services improving the quality of life for more than 10 million people in Los Angeles County.	LADOT leads transportation planning, project delivery, and operations in the City of Los Angeles. We are responsible for delivering a safe, equitable, and well-run transportation system that supports the growth and vitality of the city and region.	Los Angeles City Planning reviews project applications, processing entitlements, and approvals to ensure that future decisions about development are aligned with the City's land use policies and proposed land use regulations.
<b>Values**</b>					
<ul style="list-style-type: none"> <li>• Safety</li> <li>• Excellence</li> <li>• Integrity</li> <li>• People</li> <li>• Innovation</li> </ul>	<ul style="list-style-type: none"> <li>• Engagement</li> <li>• Equity</li> <li>• Innovation</li> <li>• Integrity</li> <li>• Pride</li> </ul>	<ul style="list-style-type: none"> <li>• Be Open</li> <li>• Lead By Example</li> <li>• Making An Impact</li> <li>• Be Courageous</li> </ul>	<ul style="list-style-type: none"> <li>• Safety</li> <li>• Community</li> <li>• Workforce Development</li> <li>• Transparency</li> <li>• Inclusivity</li> <li>• Innovation</li> </ul>	<ul style="list-style-type: none"> <li>• Safe &amp; Healthy</li> <li>• Equitable &amp; Inclusive</li> <li>• Accessible &amp; Affordable</li> <li>• Sustainable &amp; Resilient</li> </ul>	<ul style="list-style-type: none"> <li>• Economic Opportunity</li> <li>• Equity</li> <li>• Environmental Quality</li> <li>• Strategic Investment</li> <li>• Clear and Consistent Rules</li> <li>• Effective Implementation</li> </ul>

Common themes between agencies to guide collaboration into AAM policy and planning include:

- **Safe:** People should be safe to travel in their chosen mode, and this value should be reinforced by public investments. Cities should work closely with the FAA to understand how safety can be maximized.
- **Reliable:** A multi-modal transportation network must provide reliable alternatives to effectively serve people.
- **Equitable:** Mobility options must be accessible to all and must avoid and/or mitigate negative impacts to reinforce benefits.
- **Inclusive:** Mobility options must be accessible to all and must avoid and/or mitigate negative impacts to reinforce benefits.
- **Collaborative:** Diverse and inclusive perspectives are heard and incorporated into decision-making.
- **Information sharing:** Sharing critical data between public agencies and industry partners creates a more complete risk mitigation strategy.
- **Quality of life:** Mobility options contribute to a user's quality of life, and not be a "necessary evil."
- **Promoting growth and vitality:** Transportation investments must benefit communities, promote livability, and support local economic development for communities to thrive.

\*These are the mission statements of the respective agencies.  
 \*\*These are the value statements of the respective agencies.

## Waypoint 5: Plan Strategically

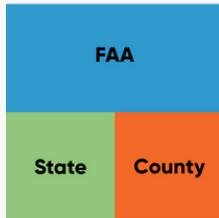
Due to the complex policy landscape that regulates aviation, operationalizing a vision for AAM requires a strategy for informing policy development across jurisdictional entities and levels of authority. The goal of this waypoint is to inform the development of this strategy. For local jurisdictions considering AAM operations, this waypoint can inform activities that can be led by the local jurisdiction, and those activities that will be led by county, state, and federal regulatory agencies.

The FAA conceptualizes the AAM policy and regulatory landscape under five ecosystem areas: aircraft, airspace, community, infrastructure, and operations. To help understand where local involvement and guidance may be most impactful (e.g., how a city like Los Angeles might best influence the integration of AAM into the existing urban fabric), applicable federal, state, county, and local regulatory codes were explored through the lens of these ecosystem areas, and documented in Appendix B. A review of existing codes and regulations define both the authorities and capabilities of the respective agencies regarding the future ecosystem of AAM operations and highlight where each agency may have the most influence and inform necessary resource allocations to effectively guide policy at the local level. While the regulatory code sections identified in Appendix B are provided primarily for the City of Los Angeles, they also provide valuable guidance to other local jurisdictions within California and across the US.



## DISTRIBUTION OF AIR TRANSPORTATION POLICIES ACROSS JURISDICTIONS

### Aircraft



Aircraft certification, licensing and registration are all overseen at the federal level and augmented at the state level to clarify requirements and enforcement practices and/or agency responsibilities. County code adds registration requirements for visiting aircraft to ensure that aircraft are compliant with state and federal regulations. Such requirements are also helpful in maintaining situational awareness over airport operations for airport sponsors. Federal regulators are most influential in this space with state, county, or local regulation augmentation for aircraft registration.

### Airspace



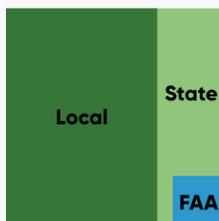
Equitable access to safe and navigable airspace is primarily regulated at the federal level, with state code reaffirming this federal authority. At the local level, airspace regulations protect navigable airspace, primarily around federally obligated public airports. Local jurisdictions reaffirm federal authority primarily through overlay zones around public airports to assure safe approach and departure routes. This area is most influenced at the federal level to protect and assert jurisdictional authority over navigable airspace. State and local policy affirms this authority, while local policy outlines how airspace will be protected for approach and departure routes around airports.

### Operations



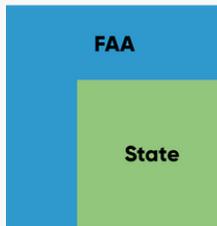
The FAA regulates pilot, crew member, and air traffic controller certification, and various operation types, such as charter, scheduled, private, and drone operations. State level code reaffirms the FAA's regulatory authority over navigable airspace to facilitate safe operations, particularly low altitude airspace accommodating safe arrivals and departures at an airport, as well as reasonable temporary helicopter operations. Local agencies regulate helicopter operations, such as allowable aircraft weight, operational tempo, and operational hours, through existing permit processes. Additionally, the Fire Department regulates operations for temporary/infrequent landings at locations other than heliports through existing operational permitting processes. The Fire Department also permits operations before commencing at new facilities, to assure aircraft rescue, firefighting, and life safety matters are adequately addressed.

### Infrastructure



At the federal level, there are requirements for providing notice to the FAA for issues impacting aviation infrastructure, funding, and inspecting public airports. State regulators influence permitting and design requirements for establishing new airports and heliports. Local agencies guide land use planning, zoning, and permitting for heliports, with a focus on Emergency Helicopter Landing Facilities (EHLF), private heliports, hospital heliports, and infrequent landing locations. There are also land use compatibility requirements to protect navigable airspace, as well as protecting community members from impacts of aviation operations. This area is more heavily regulated at the local level, though the FAA retains a degree of authority at public airports receiving federal grant funding.

## Community



Specific aviation-focused regulations concerning the community at the federal and state level are centered around community noise impacts surrounding airports. The FAA manages noise specific programs to solicit feedback from communities to inform mitigation strategies. The State of California builds on this issue by establishing Airport Land Use Commissions whose primary role is to flag development that may be incompatible with airport operations. At public facilities, the FAA relies on local communities in the implementation of noise programs and other community engagement needs. At heliports, local jurisdictions often mitigate community impacts through land use policy and regulation.

It is important to recognize that there are other aspects of aviation that impact communities, which frequently have nuanced regulations not readily apparent to community members. While local municipalities provide for the general welfare of communities within their jurisdiction, there are few explicit local codes that directly affect the aviation ecosystem. Working with communities and elevating concerns is an aspect of future AAM operations where local municipalities can explore opportunities to provide input to federal regulations, such as pending guidance on UTM or similar.

By pairing an understanding of the existing regulatory landscape with the joint visioning highlighted in Waypoint 4, jurisdictions can develop a strategy to guide policy development. Through the work of the AAM Partnership, Urban Movement Labs has identified specific policies and regulations in development within the Future Opportunities and Considerations section that address each aspect of the ecosystem. The next section describes opportunities and specific considerations for city agency coordination that address topics of interest.

# Future Opportunities and Considerations

Considerations in this section build upon the Principles of the Urban Sky, LADOT's UAM Policy Framework Considerations and Shaping Urban Air Mobility in Los Angeles through Community Engagement. They are not directive, nor do they reflect decisions made by the City. These considerations function as building blocks to shape future recommendations, and for jurisdictions exploring AAM integration.

## Near- & Mid-Term Goals

With the AAM industry targeting an initial commercial launch in 2025, it is important that an integration strategy focuses on the near term realities. These considerations reflect three primary goals and will guide the continued work led by Urban Movement Labs under the AAM Partnership in 2023 and beyond:

- Collaboration: Collaborate with other regulators to ensure the topics of safety, equity, and sustainability are addressed in a way that reflects and balances federal, state, county, and local priorities with industry business models.
- Local Influence: Maximize the City's ability to inform policy development at the federal and state levels, while advocating for local policies and regulations that benefit the City, its residents, and the planning of a future AAM ecosystem.
- Policy Development: Assist in identifying potential local policy and regulation opportunities that address safe and equitable AAM operations by 2025.

With these goals in mind, this document proceeds with:

### OPPORTUNITY AND CONSIDERATION 1

Engage in Federal Policy Development - Present local concerns in federal and state policy development efforts.

### OPPORTUNITY AND CONSIDERATION 2

Contextualizing the Current Urban Aviation Landscape - Assess how existing urban aviation environment may serve as a platform for AAM.

### OPPORTUNITY AND CONSIDERATION 3

Guide AAM work through Policy Development - Develop policy recommendation and tools

It is important to recognize that local policy and regulatory development cannot move forward without direct support from elected officials, and cities should consider funding dedicated city staff and resources to advance such work. Innovative collaborations, such as the AAM Partnership between the City of Los Angeles and Urban Movement Labs augment city staff to enable a better understanding of emerging technology and potential impacts but they cannot create policy. Policy development is accomplished through directed engagement of elected officials and city staff within accepted policy development protocols.

## Opportunity and Consideration 1: Engage in Federal Policy Development

### THE OPPORTUNITY

As discussed in Waypoint 5, many aspects of aviation are regulated and preempted by Federal authorities. Local jurisdictions have the opportunity to provide feedback to Federal policy development through formal comment periods. Comment periods also present an opportunity to continue local outreach efforts to inform stakeholders on specific ecosystem components and solicit targeted feedback that reflects community concerns and perspectives.

POLICY ITEM	DESCRIPTION
S.516 AAM Coordination and Leadership Act	Establishes an advanced air mobility interagency working group to plan for and coordinate efforts.
DRAFT Advanced Air Mobility Concept of Operations 2.0	Establishes a pilot program to provide grants related to advanced air mobility infrastructure, and for other purposes.
Notice of Proposed Rulemaking UAS Beyond Visual Line of Sight Operations	This rulemaking would relieve restrictions and enhance safety of the integration of uncrewed aircraft, and for certain crewed aircraft.
Final - UAS Beyond Visual Line of Sight Operations	See above.
Final - Modernization of Special Airworthiness Certification	See above.
Draft - Vertiport Advisory Circular	This performance-based AC will detail categories of vertiport facilities requiring different design criteria depending on the characteristics of the aircraft, as well as the activity levels at the facility.

**Consideration**

An interdepartmental working group could support collaboration interdepartmentally within the City and with external agencies and/or other stakeholders. This collaboration would support understanding local impacts of AAM policy and coordinated community outreach and engagement. The group would help to ensure that all perspectives are considered to provide meaningful feedback in Federal policy development efforts, and that local concerns are brought to the attention of Federal decision makers.

## Opportunity and Consideration 2: Contextualizing the Current Local Aviation Landscape

**THE OPPORTUNITY**

Understanding the existing context of local aviation is useful for identifying potential operational risks, infrastructure considerations, and other important factors. Exploring these topics collaboratively through a working group provides a framework to guide decision-making processes and community-led policies to optimize future AAM operations.

**CONSIDERATIONS**

These considerations might be explored through a local Concepts of Operations (CONOPS). AAM CONOPS have been created by the FAA and NASA, as well as in some local jurisdictions, but are often focused on industry needs and priorities. A community-driven CONOPS in Los Angeles could explore local needs and incorporate the considerations within these sections.

**Infrastructure**

An infrastructure inventory can aid in understanding the current urban aviation landscape. It can identify potential safety risks and infrastructure considerations for advanced air mobility operations. It is important to understand the capacity and limitations of these facilities to ensure that they can accommodate AAM traffic equitably and safely.

### **Emergency Response**

New AAM infrastructure, such as vertiports, have unique emergency response requirements that must be considered during planning. Today, heliports experience relatively low tempos of operations resulting in lower probabilities of incidents occurring that would require an emergency response. As eVTOL operations are expected to operate with more frequency, preparations to address potential incidents must respond accordingly.

### **Microclimate Impacts**

In addition to traditional weather forecasts, safe aviation operations are enabled through weather information collected via airport-based weather reporting infrastructure. Dynamic urban environments create new challenges, particularly with wind hazards. Uncrewed Aircraft Systems (UAS) can benefit from enhanced weather observing and reporting technology to operate with a similar level of safety.

### **Risk Mitigation**

Uncrewed Traffic Management developers are working to integrate new data into traffic management solutions for a safer AAM environment. Cities may consider working with these developers to also provide operators with ground risk and equity data for inclusion into solutions. Los Angeles' Mobility Data Specification (MDS), which allows cities to digitally communicate and enforce policy to transportation technology operators, may present opportunities to leverage existing technology and resources.

## Opportunity and Consideration 3: Guide AAM Development through Local Policy Opportunity

### **THE OPPORTUNITY**

Initial AAM infrastructure is expected to be primarily privately developed, therefore, land use policy represents a local jurisdiction's most influential role when planning for AAM integration. Land use policy is critical in ensuring that AAM can be integrated into the urban landscape. By planning for advanced air mobility early, local jurisdictions can ensure that policies encourage a holistic integration with other local goals and priorities.

## CONSIDERATIONS

The five-phase approach outlined in this section provides a framework to assist local jurisdictions in their policy development process for AAM integration. Community and stakeholder engagement is an iterative process that informs policy development aligns with local priorities and values. This intentional and comprehensive approach to gathering feedback provides insight to help inform and refine policy.

- 1 Comprehensive Policy Review**

Understanding the existing policy landscape informs the potential integration of AAM in communities. A comprehensive policy review includes a broad array of policy documents including and not limited to general plan elements, citywide ordinances, planning documents associated with transportation, aviation, and land use, and other local regulations.
- 2 Inform Policy Development**

Informing policy development consists of using various tools to draft recommendations. Examples of such tools include, but are not limited to: site suitability analysis; economic impact studies; environmental studies; and collaborative efforts with other stakeholders.
- 3 Draft and Refine Policy Recommendations and Implementation Tools**

As appropriate, a draft policy should identify and incorporate new industry terms consistent with federal and state definitions. These definitions can anchor future enabling regulations.
- 4 Adoption and Review**

After a collaborative process with iterative stakeholder engagement, city staff will present the final AAM policy and implementation recommendations with a draft environmental assessment for the local jurisdictions' review and adoption.
- 5 Post Adoption**

The evolutionary nature of this new mobility necessitates robust post-adoption evaluation and assessment. The rapidly evolving nature of this new industry challenges the ability to predict AAM operations and impacts with certainty. A scheduled systematic review of agreed upon metrics allows for the analysis of unintended consequences, changes in operations, or the enhancement of additional public benefits that were not previously understood.

# Conclusion

Urban Movement Labs looks forward to continuing to support the City as a global leader in exploring how AAM may successfully integrate and maximize potential benefits. While there is a sense of competition among industry players and desire to be 'first', Los Angeles is committed to getting the integration plan done right that reflects community needs and priorities.

Urban Movement Labs envisions the next phase of work as follows, which may change to meet the needs of the City and community:

- Continuing community engagement (Waypoint 3) and collaboration with City departments.
- Continuing involvement in Federal policy-making efforts (Consideration 1)
- Completing a Community CONOPS (Consideration 2)
- Supporting the city of Los Angeles in sharing insight and providing assistance to other jurisdictions exploring AAM Integration.

There are numerous bills related to AAM in development at the Federal level. These present opportunities for the City to leverage an interdepartmental working group to inform productive and meaningful feedback to Federal policy makers to advance AAM in an equitable and thoughtful manner that reflects local concerns.

Existing partnerships with the World Economic Forum, as well as new partnerships in South Korea with the City of Incheon, Incheon International Airport, and the Incheon Industry academy collaboration institute (IAIAC) are lending credibility and applicability to Los Angeles' efforts around the world. If you are interested in learning more about partnering, please contact [info@urbanmovementlabs.org](mailto:info@urbanmovementlabs.org).



# Appendix

## Appendix A: Common Acronym List

AAAC – Advanced Aviation Advisory Committee  
AAM – Advanced Air Mobility  
ARFF – Aircraft Rescue and Fire Fighting  
ATC – Air Traffic Control  
BVLOS – Beyond Visual Line of Sight  
CAAM – Canadian Advanced Air Mobility Consortium  
CAMI – Community Air Mobility Initiative  
Caltrans – California Department of Transportation  
CBO – Community Based Organizations  
eVTOL – Electric Vertical Take-off and Landing  
FAA – Federal Aviation Administration  
FD – Fire Department  
FHWA – Federal Highway Administration  
FTA – Federal Transit Authority  
LADBS – Los Angeles Department of Building and Safety  
LADCP – Los Angeles Department of City Planning  
LADOT – Los Angeles Department of Transportation  
LADWP – Los Angeles Department of Water and Power  
LAFD – Los Angeles Fire Department  
LAWA – Los Angeles World Airports  
NASA – National Aeronautics and Space Administration  
NFPA – National Fire Protection Association  
NPRM – Notice of Proposed Rulemaking  
MOED – Mayor’s Office of Economic Development  
MOSAIC – Modernization of Special Airworthiness Certification  
SCAG – Southern California Association of Governments  
UAM – Urban Air Mobility  
UAS – Uncrewed Aircraft Systems  
UAV – Uncrewed Aircraft Vehicle  
USDOT – United States Department of Transportation  
VTOL – Vertical Take-off and Landing

## Appendix B: Applicable Regulations by Agency and AAM Ecosystem Area

AIRCRAFT	
FAA	14 CFR Part 21: Certification Procedures for Products and Articles
	14 CFR Part 23: Airworthiness Standards - Normal Category Airplanes
	14 CFR Part 29: Airworthiness Standards - Transport Category Rotorcraft
	14 CFR Part 47: Aircraft Registration
State	PUC, Section 21411. Unlicensed Aircraft
	PUC, Section 21412. Posting Aircraft License; Inspection
County	LACC, 19.04.620: Aircraft - Storage license and registration requirements
	LACC, 19.04.640: Visiting Pilots Registration
Local	Nothing Significant Found

AIRSPACE	
FAA	14 CFR Part 71: Designation of Class A, B, C, D, and E Airspace Areas; Air Traffic Service Routes; and Reporting Points
	14 CFR Part 73: Special Use Airspace
	14 CFR Part 77: Safe, Efficient, and Preservation of Navigable Airspace
State	PUC 21402. Ownership; Prohibited Use of Airspace
	PUC 21652. Eminent Domain
	PUC 21656. Refusal to Issue Permit; Request for Hearing
	PUC 21569. Hazards Near Airports Permitted
	PUC 21669.5. Noise-sensitive projects; approval conditioned on aviation easement
County	Nothing Significant Found
Local	LAMC 12.50 Airport Approach Zoning Regulations
	LAMC 12.50 Transitional Surface Area Height Limits

## Appendix B (cont.)

INFRASTRUCTURE	
FAA	14 CFR Part 153: Airport Operations
	14 CFR Part 157: Notice of Construction, Alteration, Activation, and Deactivation of Airports
State	CCR, Title 21, Sections 3525 - 3560: Airports and Heliports
	PUC 21005. Effect of Part on Zoning Regulations
	PUC 21670. Airport Land Use Commission - Creation; Membership; Selection
	CBC 905.3.5. Helistops and Heliports
	CFC 105.6.44. Rooftop Heliports
	NFPA 418: Standards for Heliports
	CEQA
County	Nothing Significant Found
Local	LA Charter Section 630 - 636. Department of Airports
	LAMC 12.22.6. Infrequent Helicopter Landings
	LAMC 12.24.T.3.b. Vesting Conditional Use Permit - Airports or heliports in connection with an airport
	LAMC 12.24.U.1. Conditional Use Permits - Airports or heliports in connection with an airport
	LAMC 12.24.W..23. Authority of the Zoning Administrator for Conditional Uses / Initial Decision.
	LAMC 57.105.6.18. Heliport
	LAMC 57.4705.4. Emergency Helicopter Landing Facility
	LAMC 57.2007. Helistops and Heliports
	LAMC 57.2001.2.1. Standard (heliport)
	LAMC 57.2001.3.1. Permits Required (heliport)
	LABC 200. Definitions
	LABC 412.7. Aircraft-Related Occupancies
	LABC 905.3.6. Helistops and Heliports Standpipe Systems
	LABC 906.1. Portable Fire Extinguishers
	LABC 1206.14.3. Airport Noise Structures
	LABC 1607.6. Structural Design - Heliports
	LAFC 105.6.15. Permits - Heliport
	LAFC 105.7.1.7. Specific Action or Project Permits - Landing Aircraft Including Helicopters
	LAFC 2007. Helistops and Heliports
	LAFC 2001.3.1. Aviation Facilities Permits
LAFC 2001.2.1. Standards	
LAFC 4705.4. Emergency Helicopter Landing Facility	

## Appendix B (cont.)

OPERATIONS	
FAA	14 CFR Part 61: Certification: Pilots, Flight Instructors, and Ground Instructors
	14 CFR Part 63: Certification: Flight Crewmembers Other Than Pilots
	14 CFR Part 65: Certification: Airmen Other Than Flight Crewmembers
	14 CFR Part 89: Remote Identification of Unmanned Aircraft
	14 CFR Part 91: General Aviation
	14 CFR Part 93: Special Air Traffic Rules
	14 CFR Part 107: Small Unmanned Aircraft Systems
	14 CFR Part 111: Pilot Records Database
	14 CFR Part 121: Operating Requirements: Domestic, Flag, and Supplemental Operations
	14 CFR Part 135: Operating Requirements: Commuter and on Demand Operations and Rules Governing Persons on Board Such Aircraft
State	PUC 21006. Effect of Chapter on Use of Helicopters
	PUC 21401. Sovereignty
	PUC 21304. Lawful Flight; Flight Within an Airport Approach Zone
County	LACC 19.04.800. Helicopter Operations
	LACC 19.04.520. Commercial Operations - Requirements generally
	LACC 19.04.580. Commercial Operations - Permit procedures & fees
Local	LAMC 12.22.6. Infrequent Helicopter Landings
	LAMC 57.105.6.18. Heliport
	LAMC 57.105.7.1.7. Landing Aircraft Including Helicopters

COMMUNITY	
FAA	14 CFR Part 150
	14 CFR Part 151
	14 CFR Part 152
State	California Land Use Planning Handbook
	PUC 21669.5. Noise-sensitive projects; approval conditioned on aviation easement
County	Nothing Significant Found
Local	Nothing Significant Found

\*Note - Code of Federal Regulations (CFRs) contain many US Codes.

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