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Advanced Air Mobility Community Integration Considerations Playbook

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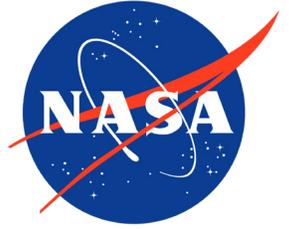
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Advanced Air Mobility Community Integration Considerations Playbook

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ADVANCED AIR MOBILITY

Advanced Air Mobility is safe, sustainable, affordable, and accessible aviation for transformational local and intraregional missions.

> CONTENTS

Introduction.....	4
Background	5
Scope	6
Stakeholders.....	8
Integration Challenges.....	9
Institutional Readiness	11
Equity	12
Community Engagement	13
Planning for Multimodal Integration	14
Funding	16
Economic Development and Workforce Readiness.....	17
Data.....	19
Operations and Interoperable Infrastructure.....	21
Environmental Sustainability	22
Conclusion.....	23
Acknowledgements	24
Points of Contact	24
References	25



> INTRODUCTION

Aviation is undergoing rapid change due to advancements in technology, new business models, changing consumer preferences, and other trends. These trends are poised to change the way people travel by air. Advanced air mobility (AAM) is a broad concept focusing on leveraging these trends to include routine aviation mobility in urban, suburban, and rural communities.

NASA envisions AAM as safe, sustainable, accessible, and affordable aviation for transformational local and intraregional missions. But it's worth noting that this vision, AAM associated terms, and even the definition of AAM will also continue to mature. The AAM Coordination and Leadership Act defines the terms "advanced air mobility" and "AAM" as a transportation system that transports people and property by air between two points using aircraft with advanced technologies, including electric aircraft or electric vertical take-off and landing aircraft, in both controlled and uncontrolled airspace.

AAM includes moving light, time-critical packages by small uncrewed air systems – informally known as "drones." These packages could include medical supplies to isolated areas or sensors to inspect pipelines or rail tracks. AAM also includes

the movement of people and cargo within communities, whether this is transporting rural patients to the hospital, passengers to the airport, or packages to a central distribution point where they could be delivered with the mail in electric vehicles. AAM includes regional travel too short or lacking demand for existing air travel, but too long for an easy ground trip. AAM is made possible through integrated and connected multimodal infrastructure and data networks. Infrastructure networks will include existing transportation structures such as roads, airports, and train and bus stations and new AAM infrastructure such as vertiports. Data networks include new equipment, such as navigational aids, connections, such as satellite frequencies, and data such as, local weather observations.

AAM has the potential to provide consumers and public service providers additional local and regional mobility choices that offer the potential for improvements, such as cost and time savings, greater equity, and increased sustainability. AAM has the potential to also offer flexibility for civic and transportation planners as AAM networks are tailorable to a community's needs, require less acreage than road and highway networks, and offer more flexibility to adapt over time.

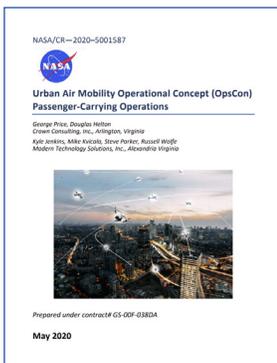
> BACKGROUND

This AAM Community Integration Considerations Playbook, from here on referred to as the “considerations playbook,” aims to provide an overview of planning considerations and the subject matter experts’ thinking relevant to local and regional AAM planning activities. It is intended to have a narrow scope and focus on considerations that could be initiated within the United States at the local and regional level. In the years to come, AAM will evolve requiring additional research, planning, and policymaking. The purpose of this document is to serve as a practical resource that can help provide initial information to inform local, regional, state, and tribal planning for AAM.

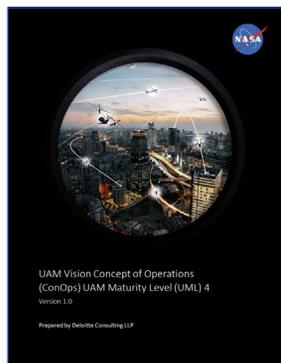
Multiple regulators, planners, decision makers, and stakeholders beyond the local level will be required to be involved in the implementation of

AAM. Other documents, forums, and processes are in place for information on federal and other areas of responsibility.

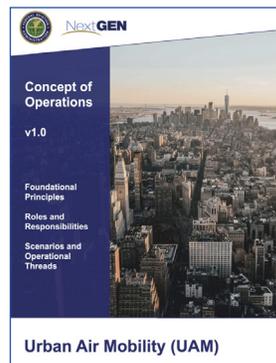
The playbook was compiled and created over a series of five workshops in partnership with five community-led teams responding to NASA’s announcement of the opportunity to partner on community and integration planning for AAM in February 2021. The considerations here are based upon a significant foundation of publicly available informational documents. To fully benefit from the information in this document, it would be helpful to be familiar with the material in those documents. These key foundational documents are shown and hyperlinked here (*see References on page 22 for URLs to these reports*).



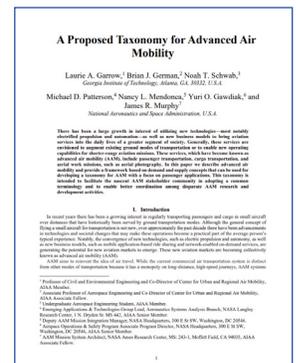
Urban Air Mobility Operational Concept (OpsCon) Passenger-Carrying Operations



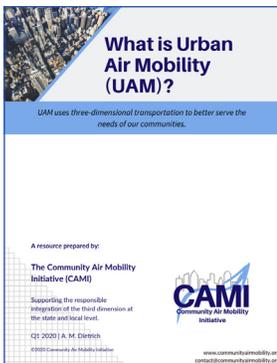
UAM Vision Concept of Operations (ConOps) UAM Maturity Level (UML) 4



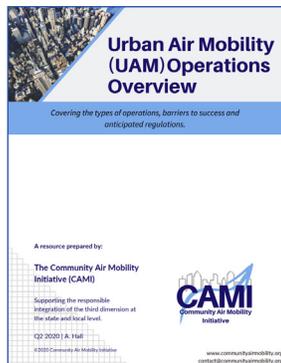
FAA NextGen Urban Air Mobility (UAM) Concept of Operations v.1



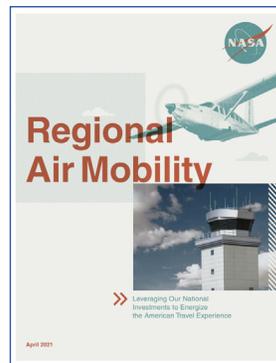
A Proposed Taxonomy for Advanced Air Mobility



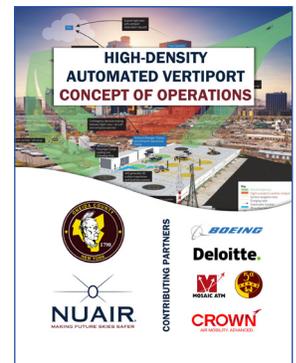
What is Urban Air Mobility (UAM)?



Urban Air Mobility (UAM) Operations Overview



Regional Air Mobility



High-Density Automated Vertiport Concept of Operations



> SCOPE

Local, regional, state, and tribal public agencies are confronted with a rapidly evolving ecosystem of mobility services, such as ride sharing, scooters, and automated vehicles, new business models, and questions about how to plan, prepare, integrate, and govern innovative transportation services. Without guidance, public agencies are likely to be uncertain and unprepared for these innovations, and these agencies have limited resources to plan, build, and manage new institutional capabilities.

The introduction of cars, highway systems, and recently, shared mobility, posed challenges to communities. AAM will also present communities with an array of challenges, including addressing public concerns about safety and security, environmental impacts (e.g., noise, aesthetics, privacy, emissions, etc.), infrastructure and multi-modal integration, equity, sustainability, and stakeholder and community engagement.

Although AAM offers probable benefits, as an emerging and potentially disruptive technology, AAM outcomes are unknown. It is widely anticipated that AAM will grow. However, cities may ask such questions as when and where, how AAM will be used and by whom, how aircraft will be charged and fueled, how safe AAM will be, how AAM will affect travel behavior, and who will pay for vertiports. While there is no consensus on the answers to these questions, identifying stakeholders, forming organizational strategies, performing research, and understanding the regulatory environment can help guide sustainable and equitable outcomes.

While planning for AAM, it's important for tribal, local, regional, and state agencies to learn about the AAM ecosystem vision and the policies that are in place and are being envisioned that may impact AAM operators, consumers, and communities. While not an exhaustive list, potential stakeholders could include city councils; boards



of supervisors; legislatures; departments or offices of planning, transportation, and zoning; economic development; regulatory enforcement bodies; and emergency services providers. Because of the large array of institutional stakeholders, agencies may undergo preliminary efforts before engaging AAM stakeholders that identify:

- > A community's broader vision, goals, and objectives.
- > Local goals that AAM can help meet.
- > Benefits AAM can add to a community.
- > The potential economic benefit of AAM.
- > Key stakeholders in the community and region who can plan and guide community engagement.
- > Policies and resources that a local agency has that can either support or impede the deployment of AAM.

During preliminary efforts, a community evaluates if AAM is appropriate, given its goals, and de-

termines if further institutional resources should be allocated to AAM planning and policy. Based on the findings from the scoping process, public agencies deciding to plan and implement AAM may use the included considerations to guide optimal outcomes. The challenges, plays, and considerations below are generally listed in an order that parallels both the strategic decision-making process as well as the chronological planning and implementation process. The order presented is not intended to reflect any prioritization or level of importance.

While this considerations playbook is focused at the local level, these considerations and the term "community" are intended to be flexible and expansive and could be considered to apply to a city, rural area, community, metropolitan area, region, state, or multiple states, as appropriate, for the entities involved and the goals they are working to achieve.

> STAKEHOLDERS

The number of public and private sector stakeholders involved in, influenced by, or impacted by AAM is envisioned to be greater than that of traditional aviation.

The number of public and private sector stakeholders involved in, influenced by, or impacted by AAM is envisioned to be greater than that of traditional aviation. These stakeholders can play a crucial role establishing priorities, strategies, and regulations, answering questions for integrating AAM into community planning and multimodal transportation networks, funding, and providing

AAM services, among others. Broadly, these stakeholders include federal, state, and local law-makers and agencies, infrastructure owners and operators, emergency services, commerce and industry, mobility and app service providers, and the public (both users and non-users). A non-prioritized potential list of stakeholders consolidated from other sources is included here.

- > Visionaries and executives
- > Local elected officials
- > Organizations leading AAM efforts
- > Local decision makers and municipal AAM leads
- > State and regional officials
- > State and local departments of transportation
- > Local planning offices
- > Emergency management/planning offices
- > Emergency services providers
- > Local building and safety offices
- > Engineering and public works
- > Environmental offices
- > Water and power departments
- > Commercial airport authorities
- > Local airport and port authorities
- > Public regional transportation entities
- > Local workforce agencies
- > Economic development organizations
- > Metropolitan planning organizations
- > Rural transportation planning organizations
- > Local colleges and universities
- > Federal representatives (e.g., FAA regional administrator, Transportation Security Administration)
- > Aircraft manufacturers and operators
- > Private regional transportation entities
- > Real estate developers
- > Local power companies/cooperatives
- > Communications providers
- > Significant local industries/early customers
- > Planning and modeling consulting companies
- > Aircraft maintenance and supply companies



> INTEGRATION CHALLENGES

As an emerging concept, AAM may present a number of community integration challenges, such as institutional readiness, equity, multimodal integration, funding, economic development, workforce readiness, sustainability, and environmental impacts, among others. This considerations playbook is organized into nine challenges. Each challenge is organized into plays, with a play being a forward-looking goal worded as an action statement that reflects guiding principles. Considerations within each play are to help communities, industry, and other stakeholders overcome the integration challenges to achieve the safe, sustainable, and equitable local deployment of AAM.

These plays and considerations are intended to help communities prepare for the growth and evolution of AAM and acknowledge current uncertainties and unknowns while providing an initial resource.

The considerations have been organized into three groups to both indicate potential stakeholders for addressing these considerations and illustrate how plays could be decomposed into actionable activities. The three groupings of considerations are:

- > **Organizational strategies**—considerations that could be undertaken by organizations responsible for or involved in the planning, implementation, or integration of AAM into communities.
- > **Research**—captures questions that will likely need to be answered before or during AAM planning and implementation.

- > **Policy Considerations**—considerations to be addressed by the appropriate regulatory body or by identifying and understanding the regulations that could impact enabling AAM.

This organization provides a framework for the inclusion of additional considerations and has been utilized in other transportation-related documents, including those published by the White House and Federal Highway Administration.

While aviation safety and airspace access are important issues, they are not included in the plays or as specific considerations because aircraft and airworthiness, operations (including crew requirements), and access to airspace are regulated by the Federal Aviation Administration. This initial set is focused on plays and considerations led or initiated at the local level.

The integration challenges contained in this playbook are:

- > Institutional Readiness
- > Equity
- > Community Engagement
- > Planning for Multimodal Integration
- > Funding
- > Economic Development and Workforce Readiness
- > Data
- > Operations and Interoperable Infrastructure
- > Environmental Sustainability

> INTEGRATION CHALLENGES



INSTITUTIONAL
READINESS



EQUITY



COMMUNITY
ENGAGEMENT



PLANNING FOR
MULTIMODAL
INTEGRATION



FUNDING



ECONOMIC
DEVELOPMENT AND
WORKFORCE READINESS



DATA



OPERATIONS AND
INTEROPERABLE
INFRASTRUCTURE



ENVIRONMENTAL
SUSTAINABILITY



> INSTITUTIONAL READINESS

AAM presents several potential institutional challenges as agencies and stakeholders adapt their roles and responsibilities to prepare for these innovations. As such, public agencies and/or a lead organization will need to identify local goals

for AAM and then plan and prepare for implementation, evaluation, and early demonstrations to assess the impacts of AAM and whether their goals are being achieved.

PLAY

Establish a roadmap to prepare for AAM that includes planning processes and policies that address emerging issues from new landing areas (vertiports) and novel aircraft types, such as building and fire codes, electrical capacity and infrastructure, and landing space needed for new AAM aircraft operations.

ORGANIZATIONAL STRATEGIES

- > Convene stakeholders from relevant areas (e.g., metropolitan and rural planning, policy and regulatory, workforce, infrastructure, investment, technology, manufacturing) to champion and plan for AAM initiatives.
- > Provide stakeholders with AAM information and engage them in discussions on such topics as potential benefits, requirements, business models, and use cases.
- > Assess the strengths, weaknesses, opportunities, threats, and potential prioritization of these AAM initiatives.
- > Develop a state/tribal/regional/local AAM vision and roadmap to achieve these initiatives. Examples include Ohio’s Advanced Air Mobility Framework and Minnesota’s Air Mobility Strategic Plan (see References, page 26).
- > Develop institutional capabilities to provide AAM planning and services oversight, regulation, data analytics, technology investment, demonstrations, and policymaking.
- > Foster an entrepreneurial culture that supports transportation innovation.
- > Expand existing risk and other management processes to include risks and

processes related to AAM and emerging aviation technologies.

RESEARCH

- > Work with subject matter experts and stakeholders to identify how AAM will be used and by whom.
- > Forecast potential for impacts to zoning, permitting, and planning coordination requirements such as adding electrical capacity and designing multimodal facilities.

POLICY CONSIDERATIONS

- > Understand which safety regulations can be modified to achieve community priorities (e.g., further restrict the allowed hours of operation contained in a final environmental assessment).
- > Understand which regulations will advance innovation and help ensure sustainable and equitable outcomes.
- > Work with civil aviation authorities and state and local agencies to design a local AAM system that improves local transportation efficiencies and complements existing transportation infrastructure while also improving safety.



> EQUITY

A number of potential social equity concerns have been raised about AAM. For example, there are concerns that underserved communities and vulnerable populations may bear a disproportionate share of the negative environmental impacts of AAM such as noise, visual, and other pollution associated with AAM flight paths. There are also concerns about gentrification and displacement around take-off and landing infrastructure. With

proactive planning, these potential negative equity impacts could be turned around to enable positive growth, employment opportunities, and community cohesion in communities that are currently underserved or disadvantaged. The public sector can play a key role in guiding equitable outcomes through community engagement and ensuring full and fair participation of all in AAM planning and decision-making.

PLAY

Evaluate the potential impacts of AAM on the three facets of equity—social, access, and financial—to enable positive outcomes.

ORGANIZATIONAL STRATEGIES

- > Leverage community engagement opportunities to identify where the community sees opportunities to increase equity.
- > Investigate opportunities for federal grants to leverage AAM to enable positive and equitable impacts.
- > Ensure design principles that enable equity are applied to AAM facilities and other physical and digital infrastructure to ensure access for all.
- > Ensure that underserved communities and vulnerable populations share in the broader benefits of AAM such as economic and workforce development opportunities.
- > Ensure that the type and placement of vertiports furthers the local community's economic and workforce development goals (e.g., enhancing the availability of skilled jobs).
- > Consider the efficacy of supporting equitable outcomes through various pricing models, subsidies, and programs that expand

AAM access to underserved communities and vulnerable populations.

RESEARCH

- > Examine the impacts of AAM service, infrastructure, and flight paths on underserved communities and vulnerable populations.
- > Leverage research opportunities to explore local opportunities where AAM could encourage equity and potentially reverse past unequitable decisions and actions.

POLICY CONSIDERATIONS

- > Collaborate with civil aviation authorities and state and other local governments to support the development of flight paths that mitigate adverse social and environmental impacts and equitably disperse the impacts (positive and negative) of AAM.
- > Identify a policy, framework, or strategy to capture community equity goals.



> COMMUNITY ENGAGEMENT

It is widely acknowledged that community engagement is critical to enabling AAM operations. The challenge is to identify paths for providing information to members of the community, forums to solicit and listen to feedback, and avenues and

opportunities for keeping them informed. Many of these forums and processes exist for use by other forms of transportation and community outreach and can be assessed for their abilities to be effectively employed to meet this challenge.



PLAY

Ensure broad and meaningful community engagement in the transportation planning process for AAM.

ORGANIZATIONAL STRATEGIES

- > Understand community stakeholders and the public’s interests, goals, and concerns regarding AAM planning and implementation.
- > Ensure historically underserved communities and vulnerable populations are included in the planning and implementation of AAM.
- > Work collectively to address community concerns and mitigate potential adverse impacts.
- > Create tailored AAM informational products for the general public and community groups that take into account their awareness and familiarity with aviation and AAM.
- > Conduct education and outreach, especially among underserved communities and vulnerable populations, about AAM and its impacts.
- > Respond to community feedback with meaningful responses and/or updates to the planning, design, and implementation of AAM, such as infrastructure siting and

service characteristics.

RESEARCH

- > Determine locally tailored best practices to increase the involvement of underserved communities and vulnerable populations in AAM studies and data collection activities. These could include conducting studies in the community that are convenient for the participants and working with community leaders and/or multilingual and multicultural staff to help provide and gather information.

POLICY CONSIDERATIONS

- > Supplement existing community engagement public comment processes for transportation planning with additional methods identified during research along with targeting potential communities. This could include focus groups, surveys, and town halls, and hosting community conversations with transportation advocates and metro, rural, and community leaders.

> PLANNING FOR MULTIMODAL INTEGRATION



Given that AAM flights are likely in the near future and growth over the next decade aligns with the long-range planning horizons of many transportation agencies, communities should consider how planning for AAM may be incorporated with other planning processes. Key aspects of this planning

should be connecting AAM with other modes, such as public transportation, enabling smooth transitions between modes, and planning considerations for access/egress to and from these multimodal facilities.

PLAY

Integrate AAM with other modal options to improve traveler connectivity, goods transfer, and transportation resiliency.

ORGANIZATIONAL STRATEGIES

- > Consider AAM using a long-term perspective envisioning a community-wide system encompassing multiples of vertiports.
- > Include AAM in capital planning for transportation at the state, regional, and municipal level, as well as in aviation system plans.
- > Emphasize intermodal connectivity in planning AAM services in order to facilitate transfers between modes, maximize public transit ridership, promote high vehicle occupancy, and increase sustainability, reliability, and resilience.
- > Consider the inclusion of AAM into existing and new intermodal passenger facilities, logistics hubs, and emergency response infrastructure.
- > Evaluate opportunities for a transportation energy strategy, shoring up capacity, increasing resilience, and ensuring electrification plans will meet the needs of multiple modes of transportation.
- > Ensure applicable stakeholders are incorporated into the planning process, including

communities, public transportation organizations, airports/port authorities, infrastructure owners/operators, and AAM service providers.

RESEARCH

- > Evaluate how technologies, such as automation, data analytics, and new propulsion fuels, along with how new structures and their codes and regulations, could impact plans, planning processes, and requirements development.
- > Assess potential mode shift and goods/people movement pattern changes resulting from emerging and mature AAM operations.

POLICY CONSIDERATIONS

- > Work with the FAA and the state transportation agency to understand the airspace implications of local AAM goals and a system consisting of multiples of vertiports.



PLAY

Consider how local and regional zoning, building codes, and other regulations may guide development of AAM infrastructure.

ORGANIZATIONAL STRATEGIES

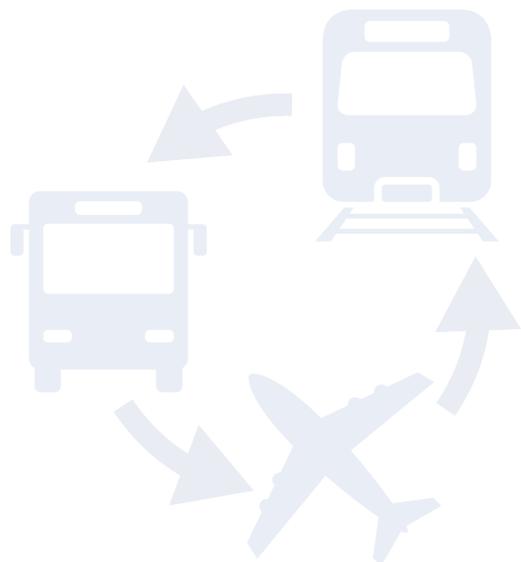
- › Understand local AAM goals, deployment plans, and how land use, zoning, building/fire codes, and permitting processes may support these goals.
- › Understand how existing and proposed AAM-related federal and state regulatory policies, planning practices, and environmental and other protection processes interface with local responsibilities for aviation services, operations, and facilities.
- › Evaluate AAM opportunities in conjunction with other opportunities (e.g., a multipurpose vertiport).
- › Understand the impacts of zoning and development rights on both sites being considered for vertiports and sites located in the vicinity of a potential vertiport.

RESEARCH

- › Assess the opportunities for state and regional harmonization of regulations and best practices among early adopter localities.

POLICY CONSIDERATIONS

- › Assess land use, zoning, building/fire codes, and permitting processes for the ability to support local AAM goals.
- › Balance AAM opportunities with safety requirements and land use compatibility restrictions.
- › Maintain awareness of where emerging technology introduction could lead to jurisdictional overlaps or gaps.



> FUNDING



As public agencies prepare for AAM, they may confront challenges deciding where to invest limited public resources, identifying funding to

integrate AAM into existing and new transportation infrastructure, and deciding where to invest limited public resources.



PLAY

Utilize AAM to provide a local benefit commensurate with the cost.

ORGANIZATIONAL STRATEGIES

- > Seek federal funding through existing grant programs.
- > Advocate at the state and federal level for increased grant funding to be dedicated to supporting capital investments in aviation mobility.
- > Consider the use of financing mechanisms to stimulate private and community investment (e.g., public-private partnerships, municipal bonds, grants, and tax increment financing).
- > Consider the implications of AAM funding on neighborhood revitalization, infrastructure, and community improvement projects around AAM facilities.

POLICY CONSIDERATIONS

- > Work with federal, tribal, state, and local regulatory officials to consider how AAM-related transportation grants could contribute to achieving long-range sustainability and resiliency goals and plans across the entire transportation system.
- > Understand federal, state, and local-specific federal laws and regulations relating to potential fees, taxes, and duties associated with AAM infrastructure.
- > Remain informed of current and potential federal and state grant legislation that could be utilized for AAM projects.

RESEARCH

- > Develop a cost-benefit analysis document that evaluates the benefits of alternative AAM implementation scenarios for use when considering the costs of design, funding, construction, operation, multiuse, and maintenance of AAM facilities and associated infrastructure.



> ECONOMIC DEVELOPMENT AND WORKFORCE READINESS



AAM presents a number of potential opportunities to improve the economic well-being and quality of life for communities. Actions are needed to help equitably leverage potential economic opportunities and prepare the workforce for future careers in AAM. The potential economic benefits

of AAM include attraction of businesses, such as aircraft manufacturers and operators, establishment of additional aviation supply chain nodes, commercialization of advanced technology from local universities, job creation, and workforce training opportunities.

PLAY

Ensure that AAM generates broad economic opportunities for people and businesses.

ORGANIZATIONAL STRATEGIES

- > Develop collaborations among the public and private sectors and academia to create a vibrant economy that encourages entrepreneurship, promotes growth and stable employment, and meets the needs of residents and businesses.
- > Work with AAM service providers to identify paths to enable AAM to provide economic benefit across multiple social and economic situations.
- > Incorporate AAM intermodal facilities into economic development plans.
- > Work with AAM service providers to provide more cost-effective transportation to and from remote destinations, transportation “deserts,” and economically depressed geographic markets.
- > Encourage business models that permit market competition and limit proprietary solutions.

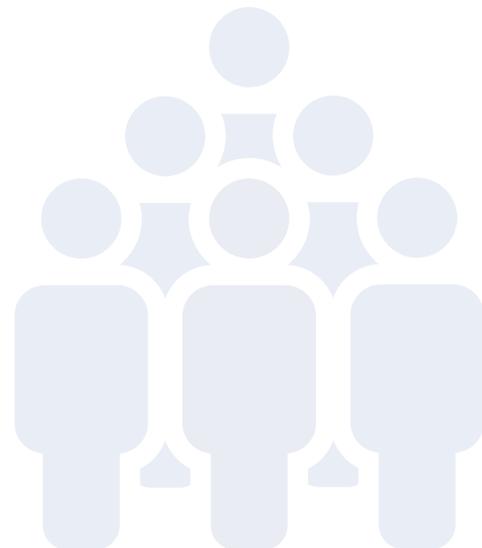
emerging and mature AAM operations. An example of this is Ohio’s AAM Economic Impact Report, included in the reference section of this considerations playbook.

POLICY CONSIDERATIONS

- > Craft regulatory processes and incentives to achieve economic priorities.

RESEARCH

- > Assess the potential economic benefit from



PLAY

Identify local emerging workforce needs and enable those needs to be fulfilled through potential AAM career paths.

ORGANIZATIONAL STRATEGIES

- › Engage key stakeholders such as departments of labor, chambers of commerce, unions, and industry associations to understand and prepare for potential workforce changes related to the AAM sector.
- › Leverage workforce development entities to implement AAM workforce development programs and track progress so that the local workforce benefits from local implementations of AAM.
- › Develop tools to assist the public in navigating upskilling opportunities and resources.

RESEARCH

- › Identify local employment areas likely to be reduced or increased with the implementation of AAM.
- › Estimate potential employment demand from direct and ancillary AAM services.

POLICY CONSIDERATIONS

- › Understand how worker-related regulations such as OSHA and ADA will impact AAM employment opportunities.

PLAY

Partner with the private sector, economic development organizations, academia, and others to further diversify, develop, and support AAM workforce training programs and provide employment opportunities.

ORGANIZATIONAL STRATEGIES

- › Partner with existing workforce development organizations and task force(s) to align efforts and accountability for desired outcomes.
- › Partner with departments of Veterans Affairs, Labor and Defense to develop programs to transition service members and veterans into the AAM workforce.
- › Work with training programs, trade schools, colleges, and universities to develop curriculums that help prepare students for careers in AAM.
- › Launch workforce advancement programs for interested and current aviation workforce members.
- › Develop training programs for AAM careers

for unemployed and early career personnel and members of underserved communities and vulnerable populations.

RESEARCH

- › Determine tailoring strategies to effectively reach out and upskill the local workforce.

POLICY CONSIDERATIONS

- › Collaborate with the FAA and Department of Labor to ensure the Standard Occupational Classifications remain current and local programs are able to leverage them to qualify for training and program grants.

> DATA



Standardization of AAM open data has the potential to enable public agencies to understand the impacts of AAM and integrate AAM with other transportation services. It is an opportunity to establish data governance structures for the entities generating and utilizing data such as supplemental data service providers and governance

for properly storing, securing, managing, and sharing data. AAM also provides the opportunity to move from preventative to predictive maintenance/data usage. This also includes the awareness of potential new data or data that could enhance safety and performance or be used to achieve other local goals.



PLAY

Support standards development and processes to facilitate the systematic and secure sharing of AAM data across stakeholders, agencies, and authorized parties.

ORGANIZATIONAL STRATEGIES

- > Determine the type of data useful for public agency and private sector use, including data for the planning, design, operation, safety, and maintenance of the transportation network and development of third-party apps.
- > Evaluate data policies to facilitate transparency of transportation data and the development of third-party applications and websites utilizing this information to serve the public.
- > Maintain awareness of and utilize applicable open-source mobility tools such as Mobility Data Specification (MDS) and other data standards being developed for AAM.
- > Work with standards organizations to establish data standards for collecting, sharing, disseminating, and protecting AAM data.

RESEARCH

- > Leverage data analytics capabilities to identify opportunities for transportation improvements.
- > Support the development of application programming interfaces (APIs) to allow public and private-sector partners to integrate AAM into digital mobility platforms (e.g., mobility on demand and mobility as a service).

POLICY CONSIDERATIONS

- > Develop policies and conditions of use to allow appropriate level of data access to AAM stakeholders and the public.
- > Adhere to data privacy and security regulations.

PLAY

Encourage the sharing of data to allow innovative uses of the data.

ORGANIZATIONAL STRATEGIES

- > Leverage other transportation data and processes to gain efficacies across the entire transportation system.

RESEARCH

- > Support efforts to develop transportation data innovation research.

POLICY CONSIDERATIONS

- > Work with standards organizations to standardize data formats to support innovation across transportation modes.



> OPERATIONS AND INTEROPERABLE INFRASTRUCTURE



Public agencies and local communities are likely to be presented with multiple opportunities to consider the addition of AAM into their jurisdiction. This raises the question of how AAM operations will be incorporated into existing and planned community transportation systems and

enable the efficient use of common, multi-purpose infrastructure. There may be deployment, operational, and technical limitations that agencies will need to consider as they review these opportunities.



PLAY

Consider technology-agnostic, long-term investments providing benefits across multiple modes of transportation.

ORGANIZATIONAL STRATEGIES

- > Develop zoning classifications and building codes that support achieving transportation goals.
- > Integrate AAM into transportation management programs to manage, control, and influence travel demand to optimize transportation flow and operations across the entire transportation network.
- > Consider the sharing of enabling infrastructure such as charging, fueling, and information communications technology with other modes of transportation, including air, ground, and maritime.
- > Confirm local AAM-related zoning and building codes and processes enable regional and state goals.
- > Consider how emergency response plans can be updated to reflect AAM operations

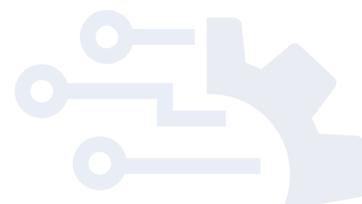
(e.g., utilizing drones to enhance situational awareness) and other transportation innovations (e.g., electric vehicle fires).

RESEARCH

- > Identify operational and interoperable efficiencies to gain improvements in quality of service and resiliency across the transportation system.

POLICY CONSIDERATIONS

- > Ensure ordinances are within the responsibility of the issuing entity and do not conflict with federal or state regulations.
- > Consider vertiport-related ordinances that are broadly applicable and agnostic to the purpose, characteristics, funding source, or operating entity of each vertiport.



> ENVIRONMENTAL SUSTAINABILITY



Interest in AAM has been closely linked to the development of novel aircraft designs and environmentally friendly and sustainable propulsion systems. However, the environmental impacts of AAM will likely be influenced by a variety of factors such as aircraft configuration and fuel utilized. Sustainability of AAM should be considered from a life-cycle perspective and in light of

multiple options available to achieve the intended mission.

Additionally, leveraging AAM-capable infrastructure such as local airports and re-purposing existing infrastructure such as surplus gas stations will likely be key to minimizing the environmental and infrastructure requirements for AAM.

PLAY

Consider life-cycle environmental impacts of AAM services, inclusive of the complete trip.

ORGANIZATIONAL STRATEGIES

- > Support AAM initiatives that will help achieve local environmental sustainability goals.
- > Consider AAM environmental impact planning from a state and regional perspective and in coordination with entities from those areas.
- > Investigate repurposing facilities, such as utilizing excess gas stations for vertistops, to support environmental sustainability goals.

RESEARCH

- > Evaluate the potential local ancillary impacts of AAM operations, including health, environmental, and congestion.
- > Understand local environmental impacts on potential business models, e.g., operations in and the impact of hot or cold temperatures or locally occurring severe weather phenomenon.
- > Develop key performance metrics to evaluate the transportation, environmental, and

other impacts of AAM on communities.

- > Examine the social and environmental impacts of AAM, specific deployments, and potential mitigation strategies.
- > Incorporate AAM into existing planning tools, where possible, to model and forecast the impacts of AAM (e.g., energy consumption, emissions, and other impacts) on communities and regions.
- > Evaluate transportation environmental impacts and trades from a full-life cycle perspective, including energy production and asset disposal implication.

POLICY CONSIDERATIONS

- > Ensure local ordinances support achieving federal and state environmental goals targeted to minimize environmental and operational impacts.



> CONCLUSION

Continued research, prudent policy, and stakeholder and community engagement are needed to prepare institutions and balance commercial interests, technology innovation, and the public good.

Advancements in technology, new business models, changing consumer preferences, and other trends are contributing to rapid change in aviation. In the coming decades, electrification, automation, and other innovations are poised to transform urban and regional aviation. AAM is a broad concept focusing on emerging aviation markets and use cases, such as emergency and humanitarian services, personal mobility, and goods delivery, for aviation in urban, suburban, and rural communities. While the impacts of AAM remain to be seen, the public and private sectors will likely need to prepare for a number of potential challenges, such as sustainability, community integration impacts, equity, planning, multimodal integration, economic development, labor readiness, and others. Continued research,

prudent policy, and stakeholder and community engagement are needed to prepare institutions and balance commercial interests, technology innovation, and the public good.

In closing, AAM is a rapidly evolving ecosystem with a large number of unknowns, and so the challenges, plays, and considerations within this document should be treated as initial perspectives rather than a prescriptive and exhaustive set of procedures. These considerations are reflective of thought leaders' reflections on the space and should be built upon with time. Overall, it is believed that with planning and analysis, AAM will bring positive benefits to local communities and enable them to achieve the multiple potential goals mentioned throughout this playbook.



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> REFERENCES

ACRONYMS

AAM	Advanced Air Mobility
ADA	American with Disabilities Act
ConOps	Concept of Operations
FAA	Federal Aviation Administration
NASA	National Aeronautics and Space Administration

OpsCon	Operational Concept
OSHA	Occupational Safety and Health Administration
TSA	Transportation Security Administration
UAM	Urban Air Mobility
UML	UAM Maturity Level

AAM CONCEPTS AND OVERVIEWS

A Proposed Taxonomy for Advanced Air Mobility, 2022
<https://ntrs.nasa.gov/citations/20220006225>

Urban Air Mobility Vision Concept of Operations (ConOps) UAM Maturity Level (UML) 4, 2021
<https://ntrs.nasa.gov/citations/20210010443>

Regional Air Mobility: Leveraging Our National Investments to Energize the American Travel Experience, 2021
<https://ntrs.nasa.gov/citations/20210014033>

High-Density Automated Vertiport Concept of Operations, 2021
<https://ntrs.nasa.gov/citations/20210016168>

Urban Air Mobility Operational Concept (OpsCon) Passenger Carrying Operations, 2020
<https://ntrs.nasa.gov/citations/20205001587>

FAA NextGen Urban Air Mobility (UAM) Concept of Operations v.1, 2020
https://nari.arc.nasa.gov/sites/default/files/attachments/UAM_ConOps_v1.0.pdf

Urban Air Mobility (UAM) Operations Overview, 2020
https://www.communityairmobility.org/s/UAMOperations_CAMI.pdf

What is Urban Air Mobility, 2020
https://www.communityairmobility.org/s/WhatIsUAM_CAMI.pdf

AAM PLANNING AND CHALLENGES

Planning for Advanced Air Mobility, American Planning Association, Forthcoming.

Ohio's Advanced Air Mobility Planning Framework, 2022

<https://uas.ohio.gov/initiatives/flyohio-initiative/advanced+air+mobility+framework>

Minnesota's Air Mobility Strategic Plan, 2022

https://edocs-public.dot.state.mn.us/edocs_public/DMResultSet/download?docId=19530624

Los Angeles Department of Transportation Urban Air Mobility Policy Framework Considerations, 2021

<https://ladot.lacity.org/sites/default/files/documents/ladot-uam-policy-framework-considerations.pdf>

Study on the Societal Acceptance of Urban Air Mobility in Europe, 2021

<https://www.easa.europa.eu/en/downloads/127760/en>

Mobility on Demand Planning and Implementation: Current Practices, Innovations, and Emerging Mobility Futures, 2020

https://rosap.ntl.bts.gov/view/dot/50553/dot_50553_DS1.pdf

Similarities and Differences of Mobility on Demand (MOD) and Mobility as a Service (MaaS), 2020

<https://trid.trb.org/view/1736632>

An Assessment of Public Perception of Urban Air Mobility (UAM), 2019

https://storage.googleapis.com/blueprint/AirbusUTM_Full_Community_PerceptionStudy.pdf

A Proposed Approach to Studying Urban Air Mobility Missions Including an Initial Exploration of Mission Requirements, 2018

<https://ntrs.nasa.gov/citations/20190000991>

Fast-Forwarding to a Future of On-Demand Urban Air Transportation," Uber Elevate, 2016

https://evtol.news/___media/PDFs/UberElevateWhitePaperOct2016.pdf

AAM MARKET AND DEMAND ESTIMATIONS

Ohio AAM Economic Impact Report (Infrastructure to Support Advanced Autonomous Aircraft Technologies in Ohio), 2021

<https://www.dot.state.oh.us/Divisions/Planning/SPR/Research/reportsandplans/Reports/Final%20Reports/136144%20Final%20Report.pdf>

Urban Air Mobility: History, Ecosystem, Market Potential, and Challenges, 2021

<https://ieeexplore.ieee.org/document/9447255>

Advanced Air Mobility: Demand Analysis and Market Potential of the Airport Shuttle and Air Taxi Markets, 2021

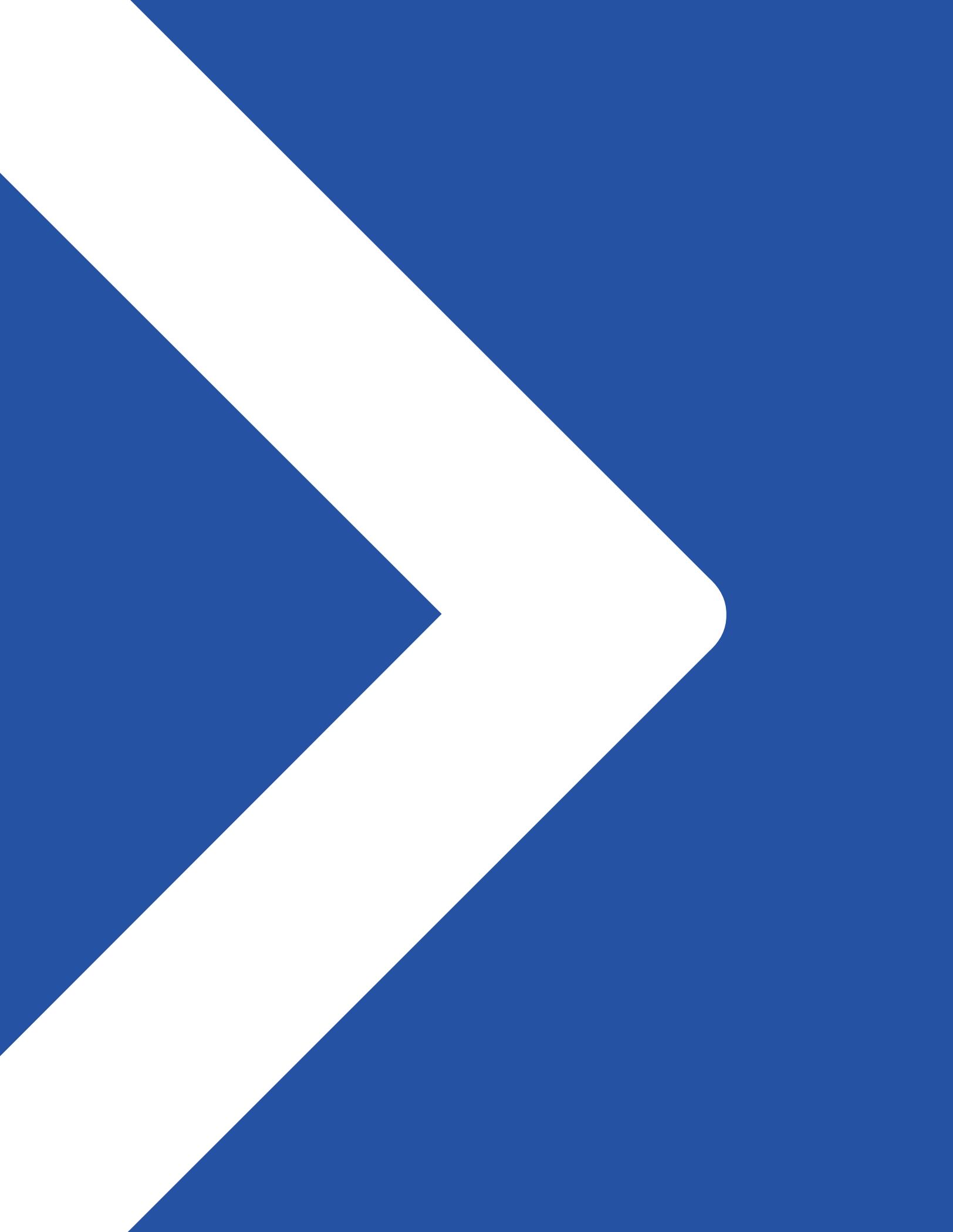
<https://www.mdpi.com/2071-1050/13/13/7421>

A Top-Down Methodology for Global Urban Air Mobility Demand Estimation, 2020

<https://www.aiaa.org/docs/default-source/default-document-library/publications/atop-downmethodologyforglobalurbanairmobilitydemandestimation.pdf>

Future of Vertical Mobility: Sizing the Market for Passenger, Inspection, and Goods Services Until 2035, 2018

<https://fedotov.co/wp-content/uploads/2018/03/Future-of-Vertical-Mobility.pdf>



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