ILLINOIS AVIATION

ADVANCED AIR MOBILITY SYSTEM PLAN

TECHNICAL REPORT

Illinois Department of Transportation

Kimley»Horn

In association with
The Aviation Planning Group

Published 2025

CONTENTS

CHAPTER 1. DEFINING THE SYSTEM: THE VISION AND GOALS 1

1.1. Introduction and Project Overview...1

1.1.1. EMERGENCE OF AAM IN ILLINOIS 2

1.1.2. PROJECT PROCESS 4

1.1.3. PROJECT ADVISORY COMMITTEE 5

1.1.4. ILLINOIS AAM COMPONENTS 6

1.2. Illinois AAM: Vision and Goals...10

1.2.1. A VISION FOR AAM IN ILLINOIS 10

1.2.2. ILLINOIS AAM GOALS 11

1.3. Definition of System 12

1.3.1. IASP SYSTEM...12

1.3.2. ILLINOIS AAM SYSTEM 14

1.4. Summary 16

CHAPTER 2. AAM INDUSTRY FORECAST ANALYSIS 17

2.1. Introduction 17

2.2. Use Cases... 17

2.3. Limitations in Forecasting AAM..22

2.4. AAM Forecast Summary 22

2.4.1. EXISTING NATIONAL AAM INDUSTRY FORECASTS 22

2.4.2. EXISTING INDUSTRY FORECAST ANALYSIS..35

2.4.3. ADVANCED AIR MOBILITY IN ILLINOIS (ILLINOIS CENTER FOR TRANSPORTATION) ...43

2.5. Summary 46

CHAPTER 3. ILLINOIS AAM OPPORTUNITIES AND THREATS........................47

3.1. Introduction *47*

3.1.1. ILLINOIS AAM OPPORTUNITIES AND THREATS 48

3.1.2. RELATIONSHIP TO GOALS AND RECOMMENDATIONS 49

3.2. Illinois AAM Opportunities *50*

3.2.1. EXISTING AVIATION INFRASTRUCTURE 51

3.2.2. WORKFORCE DEVELOPMENT 52

3.2.3. PARTNERSHIPS WITH ACADEMIA 53

3.2.4. DE-CARBONIZATION AND SUSTAINABILITY INITIATIVES 55

3.2.5. FUNDING AND INCENTIVE PROGRAM 56

3.2.6. SUMMARY OF OPPORTUNITIES 58

3.3. Illinois AAM Threats *60*

3.3.1. INCOMPATIBLE LAND USE 60

3.3.2. AIRSPACE USE 62

3.3.3. TECHNOLOGICAL LIMITATIONS 64

3.3.4. BATTERY WASTE 65

3.3.5. EQUITABLE ACCESS 66

3.3.6. REDUCED AVIATION FUNDING 68

3.3.7. LACK OF REGULATORY GUIDANCE 69

3.3.8. ELECTRIFICATION AND ENERGY CAPACITY/SCALING 70

3.3.9. PUBLIC ACCEPTANCE AND EXPECTATIONS 71

3.3.10. SUMMARY OF THREATS 71

3.4. Summary *72*

CHAPTER 4. AIRSPACE INTEGRATION 73

4.1. Airspace Structure Overview *73*

4.1.1. CONTROLLED AIRSPACE 74

4.1.2. UNCONTROLLED AIRSPACE 76

4.1.3. SPECIAL USE AIRSPACE 76

4.2. *AAM Airspace* 77

4.2.1. EXISTING HELICOPTER ROUTES IN ILLINOIS 77

4.2.2. UNMANNED AIRCRAFT SYSTEM TRAFFIC MANAGEMENT (UTM) 80

4.2.3. AAM AIRSPACE CORRIDORS 81

4.2.4. AIRSPACE INTEGRATION CHALLENGES 82

4.3. *AAM Corridor Modeling – Case Studies* 83

4.3.1. RAM CORRIDOR CASE STUDY - SCENARIO 1 (GREEN CORRIDOR) 85

4.3.2. RAM AIRSPACE CASE STUDY - SCENARIO 2 (BLUE CORRIDOR) 88

4.4. *Summary* 92

CHAPTER 5. RECOMMENDATIONS FRAMEWORK 93

5.1. *Introduction* 93

5.2. *Recommendations* 94

5.2.1. AAM INFRASTRUCTURE AND ZONING RECOMMENDATIONS 95

5.2.2. AIRSPACE AND SAFETY RECOMMENDATIONS 98

5.2.3. PUBLIC EDUCATION AND COMMUNITY ENGAGEMENT RECOMMENDATIONS 102

5.2.4. SYSTEM PLANNING AND ACCESS RECOMMENDATIONS 104

5.2.5. WORKFORCE DEVELOPMENT RECOMMENDATIONS 106

5.3.1. ILLINOIS AAM SYSTEM PLAN (PHASE II) 108

5.3.2. ILLINOIS AVIATION SYSTEM PLAN UPDATE 109

5.3.3. IDOT-SPECIFIC ACTIONS 109

5.4. *Regulatory Guidance* 110

5.4.1. FEDERAL GUIDANCE AND PLANNING DOCUMENTS 110

5.4.2. STATE GUIDANCE AND PLANNING DOCUMENTS 117

5.4.3. LOCAL GUIDANCE AND PLANNING DOCUMENTS 119

5.5. *Summary* 120

FIGURES

Figure 1.1: Illinois AAM System Plan Process....4
Figure 1.2: Role of PAC....5
Figure 1.3: Illinois' Four Components of AAM....6
Figure 1.4: AAM Aircraft Platforms in Development....7
Figure 1.5: Primary Ground Infrastructure Components....8
Figure 1.6: Illinois AAM Vision....11
Figure 1.7: LRTP, IASP, and AAM System Plan Goals....11
Figure 1.8: Existing IASP System....13
Figure 1.9: Illinois AAM System....15
Figure 2.1: Amazon Drone Delivery....18
Figure 2.2: AAM Passenger Aircraft....19
Figure 2.3: JOUAV CW-15....20
Figure 2.4: Valqari and Northwestern Medicine's Lab Trasport....20
Figure 2.5: Boeing's MQ-25....21
Figure 2.6: TALOS Drones DJI Agras T50....21
Figure 2.7: Sample OEM Cumulative Production Forecasts (2025-2040)....24
Figure 2.8: eVTOL Delivery Forecast....26
Figure 2.9: FAA Forecast for UAM Operational Use....28
Figure 2.10: ACRP Summary of Global AAM Aircraft Estimates....30
Figure 2.11: ACRP Summary of U.S. AAM Market Value Estimates....31
Figure 2.12: AAM Aircraft Sales and Market Projections....31
Figure 2.13: AAM Global Market Projections in ($ Billion)....32
Figure 2.14: AAM Global Forecasted Passenger Demand in Millions....33
Figure 2.15: 42 Primary MSAs....34
Figure 2.16: AAM Aircraft Forecast – Total Aircraft Produced Over Time (2025-2050)....36

Figure 2.17: AAM Aircraft Forecast Analysis Compared to OEM Production Forecasts (2025-2040)......38

Figure 2.18: Annual AAM U.S. Forecast Passenger Enplanements (2025-2040)...... 40

Figure 2.19: Daily AAM U.S. Forecasted Passenger Enplanements (2025-2040)......41

Figure 2.20: AAM U.S. Forecasted Market Valuation (2025-2035)......42

Figure 2.21: Middle-Case Scenario of Passenger Utilization to Illinois Airports...... 44

Figure 2.22: Potential AAM Air Routes in Illinois......45

Figure 3.1: Illinois AAM SWOT Methodology......47

Figure 3.2: Illinois AAM Opportunities and Threats...... 48

Figure 3.3: Illinois AAM System Goals...... 49

Figure 3.4: Summary of Potentially Achieved Statewide Transportation Goals......59

Figure 3.5: Summary of Potentially Jeopardized Statewide Transportation Goals......72

Figure 4.1: Proposed National Airspace Structure with AAM Corridors......73

Figure 4.2: Overlay of Primary Helicopter Routes in Chicago......79

Figure 4.3: RAM Case Studies Overview...... 84

Figure 4.4: RAM Corridor Scenario 1; Section 1......85

Figure 4.5: RAM Corridor Scenario 1; Section 2...... 86

Figure 4.6: RAM Corridor Scenario 1; Section 3......87

Figure 4.7: RAM Corridor Scenario 2; Section 1...... 89

Figure 4.8: RAM Corridor Scenario 2; Section 2...... 90

Figure 4.9: RAM Corridor Scenario 2; Section 3......91

Figure 5.1: Recommendation Categories...... 94

Figure 5.2: 2024 LRPT Suite of Programs......105

TABLES

Table 1.1: Illinois AAM System 14

Table 2.1: OEM AAM Aircraft Target Entry into Service Reported by ACRP Synthesis 130 29

Table 2.2: Forecasted AAM Daily Passenger Utilization in the 42 MSAs 34

Table 2.3: AAM Aircraft Production Forecasts Analysis 37

Table 2.4: AAM U.S. Enplanement Forecasts Analysis 39

Table 2.5: AAM Daily Enplanement Forecasts Analysis 41

Table 2.6: AAM U.S. Market Valuation Forecasts Analysis ($ Billions) 43

Table 2.7: Illinois Forecasted Daily AAM Utilization 43

Table 5.1: FAA Reauthorization Act of 2024 Guide 114

CHAPTER 1. DEFINING THE SYSTEM: THE VISION AND GOALS

1.1. Introduction and Project Overview

For more than a century, Illinois has been home to a vibrant and bustling aviation system, hosting the headquarters for international aircraft manufacturers and airlines, the world's tenth-busiest airport, and thousands of aviation businesses and private users alike.[1] Today, the aviation industry sits on the precipice of the greatest air travel revolution since the dawn of the jet age. Diverging from the jet technologies of the past, Advanced Air Mobility (AAM) employs smaller, more sustainable aircraft to improve connectivity within and between local and regional communities. AAM represents the next generation of transportation systems that use autonomous or semi-autonomous aircraft to support efficient and sustainable regional mobility solutions.

The Illinois AAM System Plan prepared the state for anticipated AAM growth. It engaged stakeholders, built consensus on an AAM vision, adopted statewide goals, and leveraged existing facilities to support future use.

AAM is anticipated to revolutionize air transportation through advancements in aircraft technology, including electric and hybrid energy sources, various propulsion systems, and automation. These advancements have the potential to transform aviation, leading to significant alterations in urban development plans and influencing social, environmental, and economic domains. Recognizing these potential impacts, the Illinois Department of Transportation (IDOT) Office of Planning and Programming, Bureau of Planning, funded and procured the Illinois Advanced Air Mobility System Plan (Illinois AAM System Plan) in 2023 to initiate this preliminary planning process and lead engagement and support for AAM in Illinois.

This plan was developed to foster collaboration with constituents, promote equity, and elevate opportunities for Illinois. It included various components, such as:

- Identify the current aviation system capable of supporting AAM infrastructure (e.g., existing aviation facilities, airspace)
- Establish a vision and goals that aligned with the State's Long Range Transportation Plan (LRTP)
- Create a framework for integrating AAM into the State's transportation network

Ultimately, the Illinois AAM System Plan laid the groundwork for the safe and efficient integration of AAM into the State's transportation network by prioritizing existing infrastructure and near-term AAM opportunities.

[1] ORD is the 10th-busiest airport by total airline capacity (seats). Source: Official Airline Guide (OAG), "The Busiest Airports of 2023", OAG, Accessed July 8, 2024, https://www.oag.com/busiest-airports-world-2023

Based on progress to date and anticipated production and approval timelines, commercial AAM flights may appear in the U.S. as early as 2025. Initial operations are expected to rely on existing airports and heliports to transport passengers and cargo, leveraging existing infrastructure. As the industry matures, AAM is anticipated to connect airports, mobility hubs, and regions currently underserved by traditional aviation. To prepare for this advancement, it is critical to employ a proactive approach that considers land use, infrastructure, investment planning, and policy planning, among many others to prepare for the industry's evolution and growth.


Source: Archer Aviation

1.1.1. EMERGENCE OF AAM IN ILLINOIS

Early emergence of AAM in Illinois is expected. The state offers a unique advantage in terms of its diverse landscape, including the bustling Chicagoland and more rural areas, and proximity to the aviation facilities in the St. Louis metropolitan area.[2] This diversity allows for a wide range of AAM opportunities, from serving densely populated urban areas with passenger air taxis and cargo delivery, to providing emergency medical services and transportation in remote regions. Illinois' mixture of urban and rural populations means that AAM operators can potentially reach a large customer base across these many use cases, leading to increased demand and revenue opportunities. Illinois also boasts strong transportation and logistics industries, with major airports, transportation hubs, and a robust aviation ecosystem. This existing infrastructure, combined with the State's commitment to innovation and technology, creates a supportive environment for the development and integration of AAM systems. These factors make Illinois an attractive location for future AAM operators, as evidenced by the plans proposed by Original Equipment Manufacturers (OEM) and future AAM operators discussed below.

ARCHER AVIATION/UNITED SHUTTLE

In 2023, United Airlines and Archer Aviation announced that Chicago O'Hare International (ORD) to Vertiport Chicago would serve as the expected initial route for their urban air mobility (UAM) network buildout. The operator plans to utilize Archer's electric vertical takeoff and landing (eVTOL) aircraft. As United's largest operations hub, ORD is an ideal location for United and Archer to initiate their UAM operations.[3] Initially, their UAM network will focus on airport-to-city

[2] St. Louis' dense population and proximity to Illinois creates a unique AAM opportunity for the State. For purposes of this plan, St. Louis' aviation facilities were considered and included in all analyses.

[3] Federal Aviation Administration "Urban Air Mobility (UAM) Concept of Operations." Urban Air Mobility (UAM) Concept of Operations | Federal Aviation Administration, www.faa.gov/air-taxis/uam_blueprint. Accessed 10 July 2024.

center transportation, also known as "trunk" routes. Once these trunk routes are established, their next plan is to establish "branch" routes to surrounding communities to "provide a safe, sustainable, low-noise, and cost-competitive alternative to ground transportation for residents and visitors in the Chicago Metropolitan Area starting in 2025".[4]

VERTIPORT CHICAGO

Source: Vertiport Chicago

Vertiport Chicago is a privately owned facility located three miles southwest of downtown Chicago. It features a 78-foot by 78-foot concrete helipad and serves as a Fixed Base Operator (FBO) for existing helicopter owners and operators. The facility is situated on ten acres of land and offers 30,000 square feet of hangar space, 11,700 square feet of office space, a single takeoff and landing area, and four helicopter parking stands. The location of Vertiport Chicago in the Illinois Medical District has made it an ideal hub for emergency medical services, specifically for handling emergency-medical flights for nearby hospitals. Additionally, Vertiport Chicago provides helicopter charter flight services and sightseeing tours. These charter services allow quick and convenient access in and out of the city, as well as to suburban airports and other Midwest destinations within a couple hundred miles. The advantages offered by Vertiport Chicago (e.g., hanger space, office space, and helicopter parking stands) have attracted operators, such as Eve Air Mobility and Archer Aviation, as potential future users.

Source: Vertiport Chicago

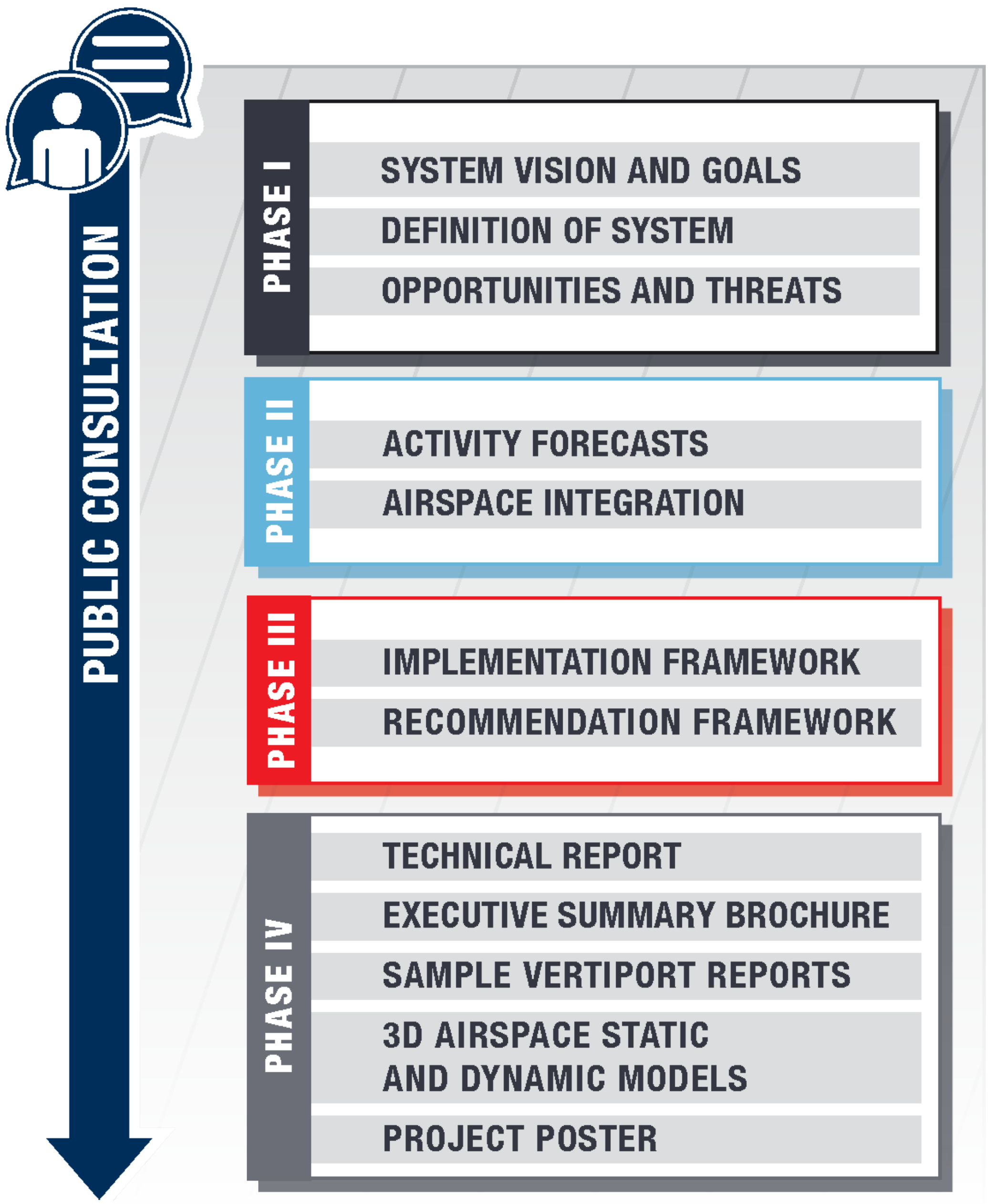
United Airlines' partnership with Archer Aviation, as well as the existence of Vertiport Chicago, are existing and tangible opportunities for AAM in Illinois. Along with other examples, these opportunities will continuously be referenced and evaluated throughout the Illinois AAM System Plan.

[4] "United Airlines and Archer Announce First Commercial Electric Air Taxi Route in Chicago" Archer, 23 Mar. 2023, https://investors.archer.com/news/news-details/2023/United-Airlines-and-Archer-Announce-First-Commercial-Electric-Air-Taxi-Route-in-Chicago/default.aspx

1.1.2. PROJECT PROCESS

The Illinois AAM System Plan was broken into four phases, as illustrated in **Figure 1.1** below. Public consultation throughout the project included a Project Advisory Committee (PAC), project website, and presentations at aviation advocacy conferences. Each phase of the Illinois AAM System Plan was accompanied by one or more chapters that are included as part of this Technical Report.

Figure 1.1: Illinois AAM System Plan Process



Source: Kimley-Horn

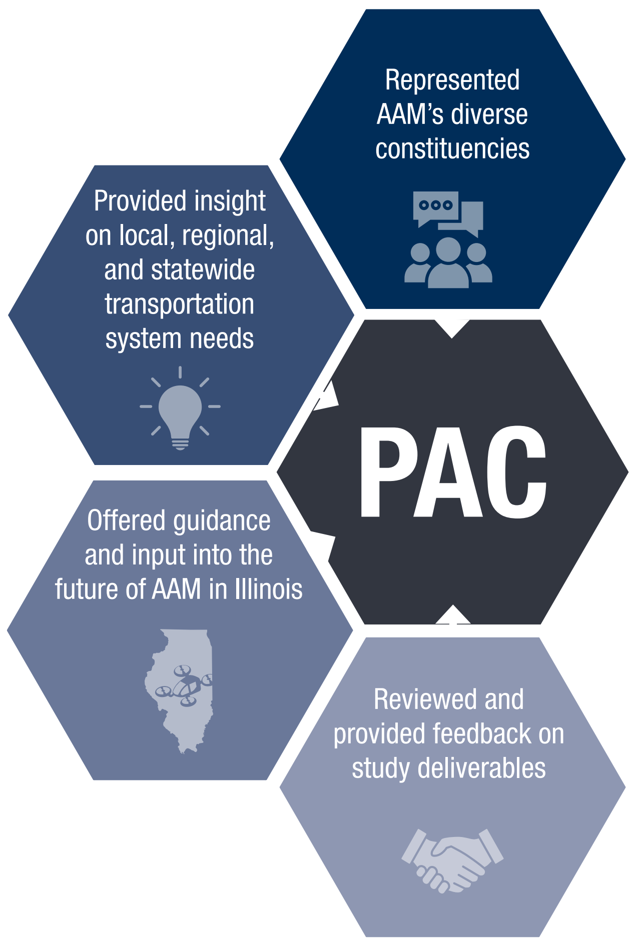
1.1.3. PROJECT ADVISORY COMMITTEE

A Project Advisory Committee (PAC) was established to provide ongoing guidance and support during the development of the Illinois AAM System Plan, as shown in **Figure 1.2**. IDOT selected members from a diverse range of organizations which offered local, regional, statewide, and national insights on various issues affecting the AAM industry. Throughout the process, PAC members were consulted, engaged, and provided feedback on the usefulness and effectiveness of each study task. The PAC consisted of stakeholders with extensive knowledge and experience in traditional aviation, AAM, transportation, and related fields. The following entities were represented on the PAC, including various offices from IDOT:

Throughout the 24-month project duration, the study team conducted two in-person meetings and one virtual PAC meeting.

- AAM Institute
- Archer Aviation
- BETA Technologies
- Chicago Department of Aviation (CDA)
- Chicago Executive Airport (PWK)
- Chicago Metropolitan Agency for Planning (CMAP)
- Chicago Transit Authority (CTA)
- Community Air Mobility Initiative (CAMI)
- FAA Great Lakes Airport District Office (ADO)
- FAA Greater Chicago Flight Standards District Office (FSDO)
- Illinois Department of Commerce and Economic Opportunity
- Invest Quebec Exportation
- Joby Aviation
- Lewis University
- MedForce Air
- Northwestern University
- Skyports Infrastructure
- St. Louis Bi-State Development
- St. Louis Downtown Airport (CPS)
- St. Louis East-West Gateway Council of Governments (EWGCOG)
- Thales
- United Airlines
- Vertiport Chicago

Figure 1.2: Role of PAC

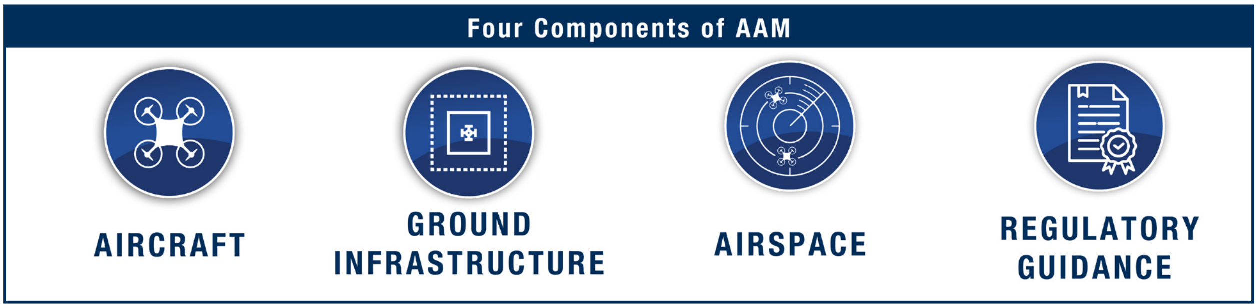


Source: Kimley-Horn

1.1.4. ILLINOIS AAM COMPONENTS

The Illinois AAM System Plan recognized four main components of AAM, shown in **Figure 1.3**: Aircraft, Ground Infrastructure, Airspace, and Regulatory Guidance (also referred to as policy).

Figure 1.3: Illinois' Four Components of AAM



Source: Kimley-Horn

Each component is integral to the growth of AAM in the coming years, both nationally and in Illinois. While these four components are documented and evaluated as part of this plan, the end user is also an important consideration for all aspects of AAM. The users, and their communities, must be considered during planning, design, and/or implementation.

The first component of AAM—aircraft—are a critical component of the system. However, this study cannot focus on making recommendations related to aircraft as IDOT cannot ultimately influence their development. The other components: ground infrastructure, airspace, and regulatory guidance are equally as critical in their support of the aircraft component and will play a large part in the rollout of AAM. The following section provides a brief introduction to existing and anticipated AAM aircraft technologies. Subsequent chapters of this plan provide additional information, analysis, and recommendations for the remaining three components for which IDOT can provide support and direction.

AIRCRAFT

Aircraft are the first and perhaps most critical components that will dictate how AAM evolves in Illinois and around the world. While traditional aircraft require long runways and large facilities, AAM operators aim to integrate air travel into local and regional communities to improve connectivity. The two primary technologies being employed to achieve this goal are electric propulsion systems and vertical takeoff and landing (VTOL) capable aircraft. Electric propulsion systems have been found to be quieter and less pollutive than their jet- or piston-engine counterparts, making them more attractive for operations in densely populated areas. Electric VTOL (eVTOL) aircraft have emerged as the preferred platform thus far for AAM aircraft, with companies including Joby, Wisk, Archer Aviation, and BETA Technologies developing prototypes.

These aircraft are currently powered by batteries and electric motors, designed to carry between one and five passengers and cargo distances of 40 to 250 miles (mi). In the future, new technologies such as hydrogen fuel cells may provide additional options for increased performance or sustainability. Electric short- (eSTOL) and conventional takeoff and landing (eCTOL) aircraft are likely to provide AAM connectivity over longer distances. eCTOL technologies such as the Eviation Alice are expected to carry between nine and 19 passengers 250 to 500 miles, providing air connectivity between destinations that cannot be viably served by today's conventional aircraft. **Figure 1.4** depicts a selection of existing or planned aircraft expected to compete in the AAM market.

Figure 1.4: AAM Aircraft Platforms in Development

Sources: Archer Aviation, BETA Technologies, Electra, Eviation, Joby, Lilium, Volocopter (2024)

GROUND INFRASTRUCTURE

While aircraft will be the primary focus of AAM developers and operators, ground infrastructure is equally necessary for enabling and supporting AAM. For the purposes of this study, ground infrastructure relates to four primary areas, shown in **Figure 1.5**: vertiports, energy infrastructure (for aircraft charging), navigational aids (NAVAIDs), and safety and security systems. Each component is critical to ensuring that the AAM network can operate and integrate safely within communities and the existing airspace system. In the near term, AAM will likely rely on existing aviation facilities (airports and heliports); however, it is anticipated that a network of ground infrastructure will eventually be needed to be developed specifically for AAM use. Other components of ground infrastructure may emerge as the industry evolves, which will require additional planning for integration into the conventional aviation system.

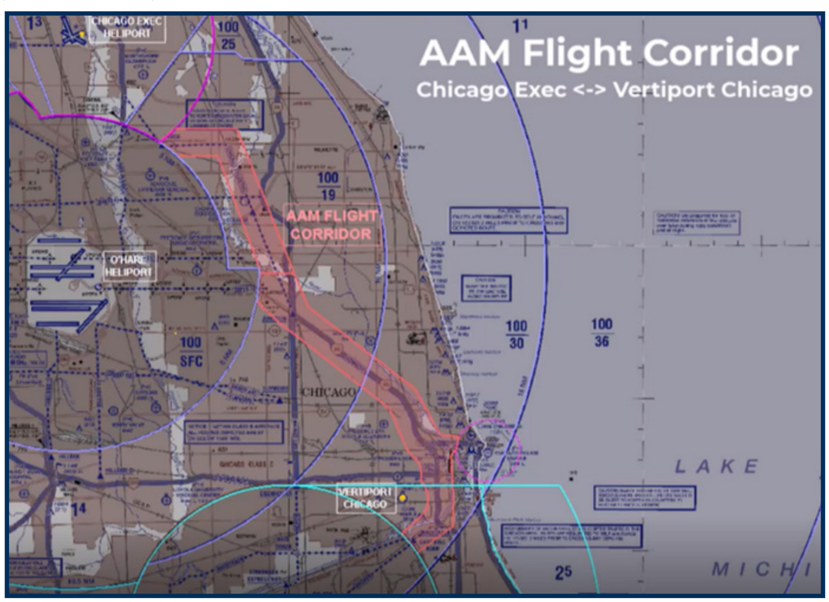
Figure 1.5: Primary Ground Infrastructure Components

Sources: Kimley-Horn, BETA Technologies

Vertiports are aviation facilities specifically designed for the landing and takeoff of VTOL aircraft. Early vertiports are likely to be shared with traditional helicopters, such as how Vertiport Chicago currently operates. A vast network of energy infrastructure will be needed to charge and operate battery-powered electric aircraft or refuel hydrogen or hybrid aircraft. NAVAIDs may be comprised of both ground-based and satellite-based systems that help guide autonomous or semiautonomous aircraft while in flight. NVAIDS are also likely to change as technologies evolve. Safety and security systems will be required to ensure AAM can integrate with the existing air transportation network without compromising safety standards currently in place. Subsequent sections of this plan evaluate Illinois' existing aviation infrastructure to identify facilities that may viably accommodate AAM operations in the near term.

AIRSPACE

The current National Airspace System (NAS) is primarily designed for conventional aircraft operations, which presents challenges when integrating AAM vehicles. Initially, AAM operations are likely to adhere to existing helicopter routes and traditional air traffic regulations. However, as technology matures and more AAM aircraft begin operating, modifications to airspace structures, regulations, standards, and procedures are likely needed to effectively accommodate the unique characteristics and capabilities of AAM vehicles. Many factors will have to be addressed when formulating this airspace, particularly the impacts of AAM (e.g., noise, safety, and privacy) on people and property on the ground near AAM corridors. Considerations for the impact of AAM vehicles on the NAS will become more prevalent as AAM technology evolves and vehicles are certified by the FAA. Subsequent sections of this plan further delve into Illinois' existing airspace and AAM's potential impacts on it.



Source: FAA

REGULATORY GUIDANCE

Understanding the regulatory context for the AAM industry is essential to effectively integrate this technology into the state and national transportation network. The innovative features of AAM do not "fit the mold" of existing regulations and policies related to aircraft manufacturing, testing, and operations. Consequently, stakeholders are faced with the challenge of developing technologies and creating markets within the boundaries of the current regulatory frameworks, potentially slowing innovation and development.

To overcome this challenge, various agencies are actively working to develop guidance that will better facilitate the development and operation of AAM aircraft, airspace, and infrastructure.

In the United States, the Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA) are leading efforts to establish technical guidance and regulations governing AAM aircraft design, airspace management, and overall safety. Additionally, governments at the federal, state, and local levels are working to develop legislation that will both promote the integration of AAM and its associated infrastructure within the national aviation system, while protecting communities and the surrounding environment. State governments, including IDOT, are among the primary bodies overseeing the development, licensure, and operation of vertiports and AAM operations, further emphasizing the need to be educated on the benefits and implications associated with these technologies. Subsequent sections of this plan include a review of existing statutes and requirements, and ultimately document considerations for IDOT to implement for the safe and efficient integration of AAM.

1.2. Illinois AAM: Vision and Goals

The first step in the AAM System Plan process was to create an overall project vision and corresponding set of goals. In the case of an emerging market, it is important to develop a vision that allows for flexibility as the industry continues to evolve. While performance measures are primarily used to quantify goals in planning documents, the AAM industry is still in its early stages and lacks a baseline from which to evaluate. As a result, the vision and goals for AAM provide broad guidance to IDOT and the state to foster successful AAM growth until the industry matures enough to establish quantifiable performance metrics.

1.2.1. A VISION FOR AAM IN ILLINOIS

The vision statement for AAM in Illinois was developed and curated through collaboration with the PAC, which provided diverse perspectives in an evolving industry and ever-changing social, political, and economic environment. While the vision for AAM is positive, there are inherent risks and threats associated with the technology. These are discussed in detail in **Chapter 3.** The PAC provided feedback on the State's AAM vision statement during their first in-person meeting. As shown in **Figure 1.6**, the collaborative effort resulted in the following comprehensive vision statement.

Figure 1.6: Illinois AAM Vision

> ***"Transform Illinois into a leader in advanced air mobility by safely integrating technologies with existing transportation systems and revolutionizing mobility through increased efficiency, enhanced economic growth, and improved quality of life for all residents."***

Sources: IDOT, Kimley-Horn

1.2.2. ILLINOIS AAM GOALS

While the vision statement provides a broad objective for IDOT and the state to progress towards, goals provide clear direction for how to develop and implement AAM in the state. Goals are established to guide future decision-making and resource allocation. As the AAM industry matures and a baseline is defined, these goals serve as a basis for measuring progress and success towards fulfilling the State's AAM vision. Developing metrics that align with these goals will allow for the evaluation of the plan's effectiveness over time, enabling necessary adjustments and improvements to be made. This ensures that the AAM system continues to meet the evolving needs and priorities of Illinois.

An aviation system plan's goals, as described in the FAA's Advisory Circular (AC) 150/5070-7, Change 1, *The Airport System Planning Process*, should parallel the State's LRTP goals to the greatest extent feasible. Alignment of goals promotes continuity between aviation/AAM and the greater multimodal system. The Illinois Aviation System Plan (IASP), which was completed in 2020, aligned its aviation system goals with Illinois' LRTP. Those goals, shown in **Figure 1.7**, were also adopted in the Illinois AAM System Plan, and are as follows:

Figure 1.7: LRTP, IASP, and AAM System Plan Goals

Illinois AAM System Plan Goals				
ECONOMY	**LIVABILITY**	**MOBILITY**	**RESILIENCY**	**STEWARDSHIP**
Improve Illinois' economy by providing transportation infrastructure that supports the efficient movement of people and goods.	Enhance the quality of life across the state by ensuring that transportation investments advance local goals, provide multimodal options, and preserve the environment.	Support all modes of transportation to improve accessibility and safety by improving connections.	Proactively assess, plan, and invest in the state's transportation system to ensure that our infrastructure is prepared to sustain and recover from extreme events and other disruptions.	Safeguard existing funding and increase revenues to support system maintenance, modernization, and strategic growth of Illinois' transportation system.

Sources: Illinois LRTP, IASP

The Illinois AAM System Plan vision and goals served as a guide for future decision-making within the plan. Future analyses within this plan, such as the Opportunities and Threats documented in **Chapter 4**, as well as the ultimate implementation and recommendation frameworks, were related to one or more of these overarching goals.

1.3. Definition of System

Illinois is home to nearly 700 aeronautical facilities, ranging from small, private-use airstrips to some of the busiest airports in the world. These facilities vary in their type, ownership, and accessibility, affecting the feasibility to support AAM.

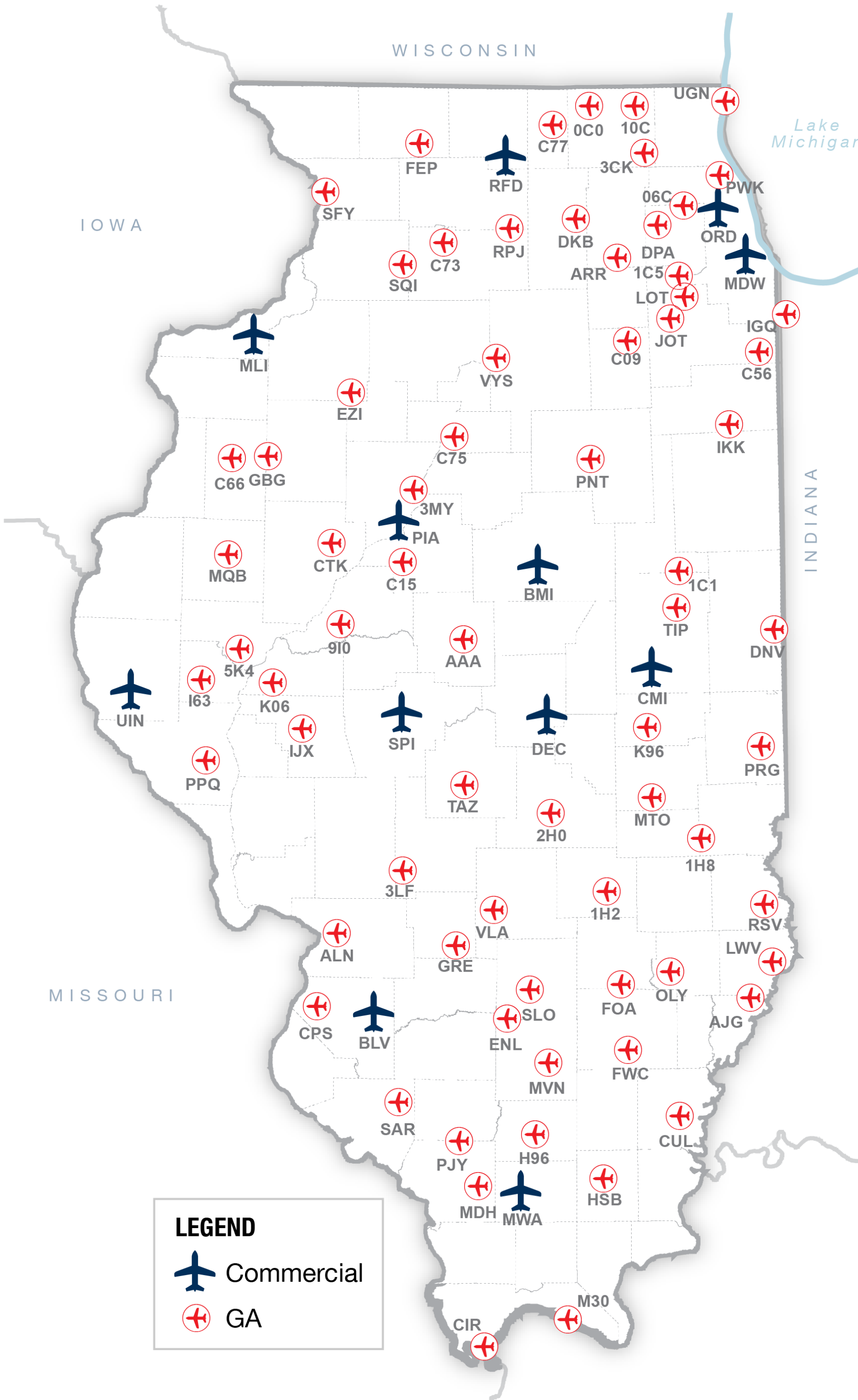
1.3.1. IASP SYSTEM

Illinois' network of aeronautical facilities are a mixture of public and private ownership and use, which influences their contributions to the NAS. The IASP identified 85 aeronautical facilities in the system that are, in part, overseen by IDOT. Being part of the IASP system indicates that these facilities are part of the State's strategic transportation plan and can receive state funding for enhancement if the funding allocation is deemed to advance appropriate transportation objectives.

The IASP categorizes airports into two types of facilities: General Aviation (GA) and Commercial Service. The FAA defines GA airports as public-use airports that either do not have scheduled service or have scheduled service with less than 2,500 passenger boardings (enplanements) per year. Commercial service airports are publicly owned airports that have at least 2,500 annual enplanements and scheduled air carrier service. IASP has two heliports, 12 commercial service airports, and 71 GA airports.[5] Commercial service airports typically experience higher transportation demand in their respective areas, while GA airports play a vital role in providing accessibility and connectivity to adjacent or outlying communities within the region. Both types of airports serve unique aeronautical uses and are critical to the efficacy of the overall system. As such, the IASP System, shown in **Figure 1.8** serves as the baseline for the AAM system.

[5] The IASP included two heliports: Schamburg Municipal Helistop (4H1) and Tinley Park Helistop (TF8)

Figure 1.8: Existing IASP System



Sources: Illinois Aviation System Plan, Kimley-Horn

1.3.2. ILLINOIS AAM SYSTEM

The IASP System accounts for 85 public-use airports and heliports in Illinois, however, an additional 267 facilities were identified that support aviation activity in the state. The total supporting facilities include 16 PR/PU and ten heliport facilities in the neighboring St. Louis area. These facilities accommodate a wide range of activity supporting hospitals, medical centers, correctional facilities, fire departments, and public agencies. These facilities are essential to serving many critical missions in Illinois and could be among the facilities that support AAM operations in the future. The Illinois AAM System was defined to include 352 facilities in total, as shown in **Table 1.1**.

Table 1.1: Illinois AAM System

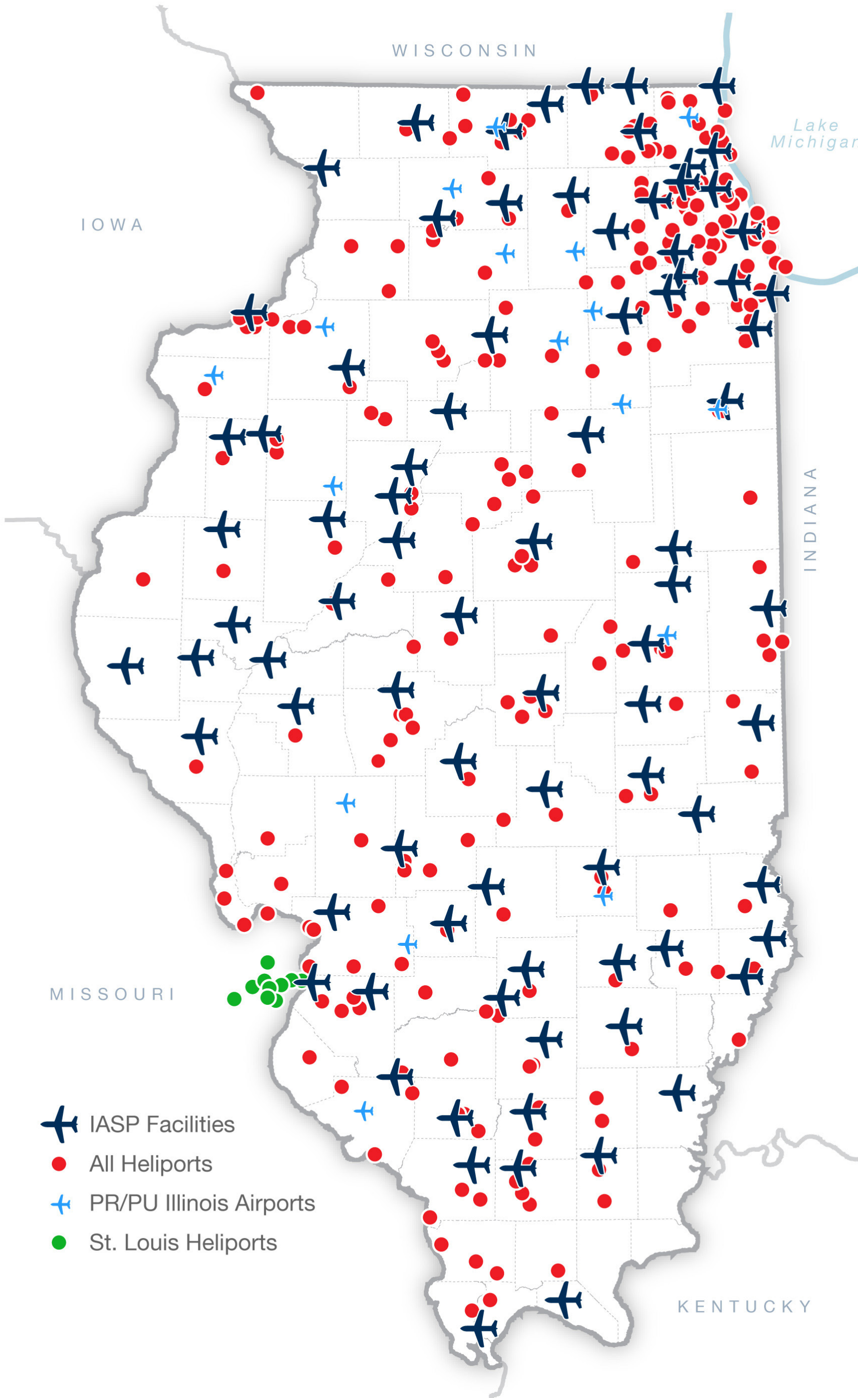
Facility Type	Number of Facilities
IASP Facilities	85
Illinois Heliports	241
PR/PU in Illinois*	16
St. Louis Heliports	10
TOTAL	**352**

*Notes: *Privately owned, public-use (PR/PU)*
Sources: FAA Airport Data and Information Portal (ADIP), Kimley-Horn

The 85 IASP facilities, paired with the additional 267 airport, heliport, and vertiport facilities, comprise the Illinois AAM system, as illustrated in **Figure 1.9**. Heliports in St. Louis were also included in this plan due to their proximity to Illinois and ability to impact demand and future operations in the state. The 352 aviation facilities in Illinois' AAM System have varying levels of activity. Activity levels for the 85 IASP facilities are documented in Chapter 7 of the IASP. Operational estimates for the remaining 267 facilities are reported in the **FAA's Airport Data and Information Portal (ADIP)**.

Notes: Chapter 7, and all other parts of the IASP, can be found online at the following website: **https://www.ilaviation.com/**

Figure 1.9: Illinois AAM System



Sources: FAA ADIP, Kimley-Horn

1.4. Summary

AAM in Illinois, as well as in the nation and even worldwide, will impact the Illinois aviation system in a variety of ways including airspace, infrastructure, as well as from a regulatory standpoint. Subsequent chapters in this plan evaluated these impacts and concludes with recommendations for the state to implement or monitor as the industry matures.

CHAPTER 2. AAM INDUSTRY FORECAST ANALYSIS

2.1. Introduction

Assessing the future demand and growth projections of Advanced Air Mobility (AAM) aviation initiatives, and how it relates to the State of Illinois, involves a comprehensive analysis of current forecasts that are based on the most reliable existing data available. Forecasts and data examined within this analysis predominantly serve as a benchmark for the industry's key focus area of crewed and uncrewed electric vertical takeoff and landing (eVTOL) aircraft and operations within the AAM industry. The evolution and progress of AAM technology in recent years, marked by successful test flights and preparations for Federal Aviation Administration (FAA) approvals, underscore its potential to revolutionize the aviation sector. Industry progress and the increasing number of participants in this emerging market offer valuable insights into its potential trajectory and prospects of this emerging technology. This forecast analysis utilized the latest original equipment manufacturer (OEM) and industry projections for AAM, focusing on forecasts established in 2023 and the first quarter of 2024, supplemented by relevant data from 2022. Given the rapidly evolving landscape of AAM regulatory approvals, this analysis prioritized the utilization of the most recent data for accurate and timely forecasting purposes. By evaluating the nature and scale of potential future AAM activity, this analysis aims to inform strategic planning efforts. Subsequent sections of specific use cases delve into existing relevant industry forecasts of AAM. The analysis acknowledges the inherent limitations and constraints associated with forecasting for the AAM industry given its developmental stage and the consequent scarcity of reliable data. Understanding these limitations allows for a more realistic approach to examining AAM activity and operational forecasting trends. Additionally, the timing for certification of AAM aircraft will be crucial to 2025 forecasted numbers researched in this analysis. At the time of this forecast analysis, September 2024, it is anticipated that certification and operations could begin as early as 2025.

2.2. Use Cases

Traditional transportation is currently serviced by cars, buses, trains, boats, and planes, where each mode of transportation serves its own clientele based on cost, travel distance, travel time, and items being transported. This system of travel typically requires transfers between modes to go from actual origin to destination, slowing the total point-to-point travel process. It seems that consumer preferences have shifted away from segregated travel modes as users look for a more streamlined and simple travel/transport experience using integrated bookings (multiple modes sold under one ticket) or single-mode transit options (e.g., taking a ride share to the airport rather than parking offsite and taking a shuttle). AAM is one of the emerging technologies that could potentially simplify the point-to-point travel process by supplementing use of one or more travel modes. Replacement of a traditional transport mode with AAM may increase the speed of the overall transport process, expediting the journey of people, goods, or services. Several early use cases have emerged for AAM that illustrate the potential replacement of one or more traditional transport nodes. The use cases below could be instrumental to the introduction and acceptance of the industry. These are not the only use cases that AAM may fulfill but are the ones with the greatest opportunity or interest from potential users in the state.

CARGO USE CASES

Metropolitan Chicago region is recognized as one of the most significant freight hubs in the US. Approximately 25 percent of all freight trains in the country pass through this area. Trucks make up roughly one in seven vehicles on Illinois' urban interstate highways, with some facilities in metropolitan Chicago handling over 30,000 trucks daily.[6] Given the extensive freight network and the high demand for cargo delivery, the state can position itself as a testbed for the viability of cargo delivery using AAM while also addressing the growing demand for sustainable cargo transportation. Short-distance, mid-mile cargo transport will be a primary use case for early AAM operations, as eVTOL aircraft could be used to transport cargo from large processing facilities (such as international airports or shipping ports) to smaller distribution centers, where uncrewed aerial systems (UAS) would perform first- and last-mile cargo delivery. Initial AAM cargo use can include drone package delivery from e-commerce websites such as Amazon as shown in **Figure 2.1**. AAM cargo missions may expand to a regional level as technology advances, particularly as longer-range aircraft are introduced and Beyond Visual Line of Sight (BVLOS) operations are approved.[7] Once BVLOS operations are approved, autonomous operations may expand, paving the way for an integrated network of uncrewed AAM and UAS vehicles providing mid- and last-mile cargo deliveries.

Figure 2.1: Amazon Drone Delivery

Source: Amazon

[6] "Maintain the Regions Status as North America's Freight Hub." CMAP, Chicago Metropolitan Agency for Planning, www.cmap.illinois.gov/2050/mobility/freight. Accessed May 28, 2024.

[7] Walsh, Amelia. "FAA Greenlights Amazon Drone Delivery Beyond Visual Line Of Sight". May 31, 2024. https://www.avweb.com/aviation-news/faa-greenlights-amazon-drone-delivery-beyond-visual-line-of-sight/

PASSENGER USE CASES

Passenger travel has emerged as another desired use case for early AAM operations. The initial intent is for AAM to provide transportation for people that currently use cars, taxis, rideshares, subways, trains, or short charter flights on intra-city trips in urban or suburban areas. These types of missions are collectively coined as "Urban Air Mobility" (UAM). One example of a UAM mission is the Archer Aviation and United Airlines eVTOL planned "taxi service" from Chicago O'Hare International Airport (ORD) to the Medical District of Downtown Chicago, set to launch in 2025. Archer and United believe the cost of the eVTOL service will be comparable to premium ground-based rideshare service, such as Uber Black. Initial AAM aircraft will be best suited to support these missions, as aircraft such as the Beta ALIA and Joby Aviation S4, shown in **Figure 2.2**, are planned to have maximum ranges of 100-250 miles and payloads of 1,000-1,500 lbs.[8] However, the trip is anticipated to take 10 minutes, roughly a quarter of the travel time of ground-based services.[9] Eventual use cases for passengers include suburban and city-to-city super commuters who may be able to use AAM at a regional level (referred to as Regional Air Mobility [RAM]). RAM passenger use cases could be specifically useful to communities separated by bodies of water, such as Lake Erie, where current modes of transportation across, such as ferries or boats, lack convenience and efficiency. However, these long-distance RAM operations may not be feasible until new aircraft and infrastructure are introduced. Similar to cargo uses, passenger AAM uses are expected to begin as crewed operations until appropriate technologies and regulations can safely facilitate autonomous operations.

Figure 2.2: AAM Passenger Aircraft

Sources: Kimley-Horn, BETA Technologies (Left), Joby Aviation (Right)

[8] Archer Aviation, "Aircraft", Archer Aviation, https://www.archer.com/aircraft, Accessed August 14, 2024; Electric VTOL News, "Beta Technologies ALIA-250", the Vertical Flight Society, https://evtol.news/beta-technologies-alia/, Accessed August 14, 2024.

[9] Vallamizar, Helwig. "Archer, United Airlines to Launch First EVTOL Air Shuttle." RSS, https://www.airwaysmag.com/legacy-posts/archer-united-first-evtol-air-shuttle#. Accessed May 27, 2024.

EMERGENCY RESPONSE USE CASES

AAM aircraft blend the attributes of fixed-wing aircraft and helicopters, offering additional flexibility that is critical in emergency response situations, particularly medical evacuations and firefighting. Emergency medical evacuations are a common activity at many airports in Illinois, as helicopters are used to quickly transport patients from accident sites or rural medical centers to larger hospitals. However, helicopters are limited in their speed and ability to operate in inclement (low visibility) weather. Use of AAM aircraft would enable faster transport to hospitals, and autonomous technologies could help aircraft land in zero- and low-visibility conditions using similar procedures as BVLOS systems as shown in **Figure 2.3**. In firefighting and natural disaster response operations, meanwhile, use of AAM aircraft for rapid personnel deployment and incident management/control could help make operations safer and more efficient, reducing impact to the public, emergency responders, the natural environment and manmade facilities.

Figure 2.3: JOUAV CW-15

Source: JOUAV Unmanned Aircraft Systems

MEDICAL USE CASES

Beyond emergency medical evacuation, AAM could support the healthcare system by supporting the rapid transport of equipment, personnel, and organs between facilities or communities. Historically, medical professionals have relied on a mix of helicopters, fixed-wing aircraft, and ground vehicles to transport organs and equipment between hospitals in distant communities. In these instances, fixed-wing aircraft are used to travel between communities while ground vehicles travel between the hospital and airport at both the origin and destination. AAM offers greater speed and flexibility as it provides a more streamlined connection between the field and hospital, saving time and increasing the likelihood of successful medical needs outcomes. For example, Valqari has partnered with Northwestern Medicine to create a drone transport system for patient labs. A depiction of this system is shown in **Figure 2.4**. AAM could also be used to transport doctors directly between hospitals in the same community or in outlying areas, offering a more integrated and efficient healthcare system across the state.

Figure 2.4: Valqari and Northwestern Medicine's Lab Trasport

Source: Valqari

MILITARY USE CASES

With three military bases, including Scott Air Force Base, Illinois has the potential to be one of the most practical test users of military AAM. In October 2023, the U.S. Air Force (USAF) took delivery of a Beta ALIA eCTOL aircraft, which is being evaluated through the AFWERX program to test the capabilities of the aircraft and its support infrastructure for military uses. The USAF intends to demonstrate the ALIA's use to transport passengers and support agile combat logistics (cargo) with a 1,000-pound payload capacity.[10] Other potential military use cases for AAM aircraft include unmanned air refueling efforts (example aircraft shown in **Figure 2.5**) surveillance, search and rescue, personnel training, and troop transport. The military installations in Illinois may ultimately play a pivotal role in the industry.

Figure 2.5: Boeing's MQ-25

Source: Boeing

AGRICULTURAL USE CASES

Agricultural missions including aerial product application and crop inspection are mostly performed using traditional fixed-wing aircraft and helicopters today. While these aircraft are often the most cost efficient and practical method for fulfilling their missions, they can represent a substantial portion of agricultural producers' total costs and carbon emissions. AAM provides the opportunity to make aerial agriculture missions more efficient by using autonomous aircraft that can evenly apply products and treatments to crops. This action is depicted in **Figure 2.6**. The use of electric aircraft would help reduce greenhouse gas (GHG) emissions, helping the state to achieve sustainability goals. UAS are already replacing crewed aircraft and ground vehicles for crop spraying in limited quantities around Illinois. With 75 percent of Illinois' land designated as farmland, there is high demand for more efficient and sustainable agricultural practices that may use UAS or AAM.[11]

Figure 2.6: TALOS Drones DJI Agras T50

Source: TALOS Drones

[10] Clouse, Matthew. "BETA's ALIA electric aircraft arrives at Eglin AFB". Air Force Research Laboratory Public Affairs. October 30, 2023. https://www.af.mil/News/Article-Display/Article/3571824/betas-alia-electric-aircraft-arrives-at-eglin-afb/.

[11] Illinois Department of Agriculture. "Facts about Illinois Agriculture."

2.3. Limitations in Forecasting AAM

Forecasting in general involves analysis of numerous variables over a specified duration to predict the potential outcomes or trends for certain activities at a future point in time. The complexity amplifies in emerging markets due to the scarcity of data, especially in the absence of fully approved AAM commercial service activities nationwide as the industry navigates through developmental and approval processes.

AAM OEMs have been swiftly advancing their development processes, consistently achieving milestone markers year after year. Concurrently, the FAA has been diligently working to establish the AAM aircraft approval process and ensure the seamless integration of AAM into the National Airspace System (NAS). Despite the FAA's efforts, delays have ensued in the approval process nationwide, resulting in developmental setbacks and an uncertain timeline for overall AAM implementation.

It is worth noting that despite these setbacks, AAM aircraft are progressing through the phases of the approval process with the FAA, and manufacturers anticipate beginning operations by 2026.[12]

2.4. AAM Forecast Summary

Advancements within AAM are rapidly occurring year over year; however, delays in FAA certification and approvals continue to push out the overall implementation schedule. Safety is of the highest priority for certification, and the groundwork must be first set for the aircraft to operate within the existing NAS. OEMs have prepared forecasts for AAM activity based on their desires for implementation. Companies within the industry, investment firms, and government regulators have also developed forecasts as to when AAM will achieve successful commercial operation certification and implementation. As documented in this section, OEMs have released several AAM demand projections, some bold in their predictions with others being more conservative. This Forecast Analysis chapter provides an examination of 2022, 2023, and early 2024 forecasts that are currently available to understand the projections anticipated based on the most recent data.

2.4.1. EXISTING NATIONAL AAM INDUSTRY FORECASTS

Current AAM industry forecasts, at the time of this writing, are represented below in **Sections 2.4.1.1** to **2.4.2.3**. Forecasts from previous years (2022 and 2023) and the first quarter of 2024 are summarized below, providing the most current data, market expectations, certification timeline, and implementation expectations. The near-term projections produced to date range from two to five years, while the mid-term presents anticipated demand over a decade. Long-term forecasting includes ranges beyond 10 years with 20-to-30-year horizons.

[12] Fowler, Mark. (2023). ACRP Synthesis 130: Airport -Centric Advanced Air Mobility Market Study (2023). ACRP. https://nap.nationalacademies.org/read/27326/chapter/1

2.4.1.1. OEM Forecasts

OEM forecasts are typically characterized by their assertiveness, as these companies are at the forefront of development, working diligently to obtain certification for their aircraft to begin operation. Their forecasts serve as a means to reassure investors of their progress and the realization of their ambitions. Forecasts such as these are typically more optimistic and align with ambitious targets for their desired progress. As such, OEM forecasts can vary significantly and are often tailored to their intended audience. Additionally, the AAM industry is a fast-paced and evolving market, resulting in information quickly becoming out of date as regulatory, development, and other changes affect the forecasts.

Particularly in the emerging stages of production for many of these aircraft, the operational forecasts tend to rely on OEM production capability numbers associated with plans for production facilities. At the time of this Forecast Analysis, no OEM has commenced full-scale production, meaning that the numbers presented often represent best-case scenarios with contingencies in place to accommodate additional facility construction if necessary.

Individual manufacturers have articulated company-specific objectives while engaging in fundraising efforts for facilities and capital. As of December 2023, over 400 companies were identified as existing or potential AAM OEMs, all in various stages of development. Several of these are further along in development and have available forecast rates of their anticipated production capabilities.[13] For instance, Lilium has expressed aspirations to establish production facilities capable of manufacturing 400 aircraft annually, with the potential to scale up production to 800 aircraft per year if market demand warrants.[14] Such ambitious goals underscore the confidence and vision of manufacturers like Lilium in their ability to meet their anticipated future demand and position themselves as key players in the AAM sector. BETA forecasts that it will begin full-scale production in 2025 with 300 aircraft per year, and also can double production with an expansion of its facility.[15] Archer Aviation estimates that it will start production with 250 aircraft by 2025, double the capacity to 500 aircraft per year through 2027, and ultimately produce 2,000 aircraft per year beginning in 2028.[16] Joby Aviation stated it estimates 350 aircraft in 2025 with a jump to 500 aircraft per year being produced from 2026 onward. More conservatively, Volocopter announced that its new production facility will produce 50 aircraft per year. Each of these future estimates of production are viewed as the maximum output that could be anticipated. None of these forecasts are tied to identified demand for the aircraft or consider that there may be multiple aircraft in the market from which buyers can acquire to meet their anticipated demand rates.

---

[13] Berckman, L., Chavali, A., Hardin, K., Dronamraju, T., & Sloane, M. (2023). Advanced air mobility: Achieving scale for value realization. Deloitte Research Center for Energy & Industries. https://www2.deloitte.com/us/en/insights/industry/aerospace-defense/advanced-air-mobility-evtol-aircraft.html

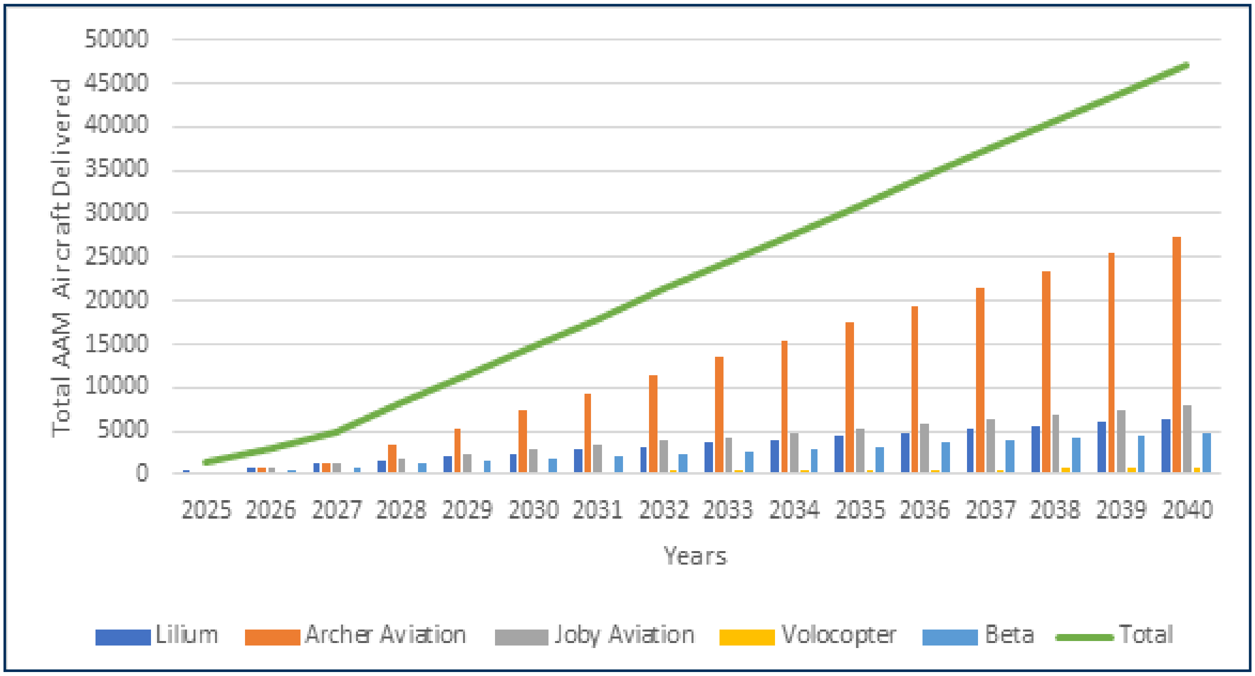
[14] Crumley, B., & Crumley, B. (2022, September 29). Lilium's annual 400 eVTOL air taxi production goal seeks new funding. DroneDJ. https://dronedj.com/2022/09/29/lilium-evtol-air-taxi/

[15] Warwick, G. (2023, October 02). Beta Opens Electric Aircraft Manufacturing Plant, Launches Production. Aviation Week Network. https://aviationweek.com/aerospace/advanced-air-mobility/beta-opens-electric-aircraft-manufacturing-plant-launches

[16] Nair, A. (2022, October 25). Archer Aviation plans to build 250 air taxis in 2025. Reuters. https://www.reuters.com/business/autos-transportation/archer-aviation-plans-build-250-air-taxis-2025-2022-10-24/

Figure 2.7 provides a sample projection of OEM aircraft delivery forecasts for each respective company by 2040. As shown, when combined, the five OEMs alone are projecting over 45,000 aircraft to be produced annually in 2040.

Figure 2.7: Sample OEM Cumulative Production Forecasts (2025-2040)



Sources: Lilium (DroneDJ article)[17], Archer Aviation (Reuters article)[18], Joby Aviation[19], Volocopter[20], Beta (Aviation Week Network Article)[21], Analysis by The Aviation Planning Group (2024)

It is evident that a consistent trajectory in production numbers is expected, with a notable increase projected after the industry attains the anticipated widespread certification and demand is realized. These projections do not consider actual market demand by the consumer and the life cycle of each aircraft and additional entrants into the market over time. With the sample below, it is not unreasonable to expect large numbers of aircraft and operations in the future, especially with additional companies not as outspoken about their forecasted production estimates.

[17] Crumley, B., & Crumley, B. (2022, September 29). Lilium's annual 400 eVTOL air taxi production goal seeks new funding. DroneDJ. https://dronedj.com/2022/09/29/lilium-evtol-air-taxi/

[18] Nair, A. (2022, October 25). Archer Aviation plans to build 250 air taxis in 2025. Reuters. https://www.reuters.com/business/autos-transportation/archer-aviation-plans-build-250-air-taxis-2025-2022-10-24/

[19] Joby. (2023, September 18). Joby Selects Dayton, Ohio, Birthplace of Aviation, for First Scaled Manufacturing Facility [Press release]. https://www.jobyaviation.com/news/joby-selects-dayton-ohio-first-scaled-manufacturing-facility/

[20] Volocopter. (2023, April 5). Volocopter Completes Production Setup for Electric Air Taxis [Press release]. https://www.volocopter.com/en/newsroom/volocopter-completes-production-setup

[21] Warwick, G. (2023, October 02). Beta Opens Electric Aircraft Manufacturing Plant, Launches Production. Aviation Week Network. https://aviationweek.com/aerospace/advanced-air-mobility/beta-opens-electric-aircraft-manufacturing-plant-launches

Certification and approval for commercial AAM aircraft and operations are being undertaken with safety as the key focus. This is an emerging market, and all facets of integration must be considered.

Certification will not occur quickly, and this consideration alone makes the forecasting process across the industry somewhat challenging.[22] OEMs are expending significant amounts of capital while navigating the certification process. Any company that ceases operations due to the inability to continue through the process will affect the market as it reduces production capacity and further dampens the commercial growth timeline.

2.4.1.2. Aviation Week Forecasts

The Aviation Week Network (or Aviation Week), an industry provider of data analytics and current information, forecasts 1,000 eVTOL aircraft will be operating around the globe by 2030, increasing to more than 10,000 eVTOL aircraft in operation by 2040, and continuing the rapid climb to almost 30,000 by 2050. These numbers are substantial, but consideration should be given to the lifecycle of aircraft. With technology advancing rapidly, expected high utilization rates, and rapid operations, the lifecycles will require higher fleet turnover and replacement than traditional aircraft operating today. The Aviation Week Fleet Data Team predicts that eVTOL aircraft will begin operating under a five-year replacement lifecycle and eventually settle into a 10-year lifecycle by 2050. This assumption would result in approximately 19,000 eVTOL aircraft in actual operation out of the total 30,000 eVTOL aircraft forecasted to be produced by 2050.[23]

As part of the Aviation Week forecast, the Fleet Data Team researched other forecasts and found the following:

- **Roland Berger**, an international management consultant firm based in Germany, predicts nearly 5,000 eVTOL aircraft will be produced by 2030, 50,000 by 2040, and nearly 160,000 by 2050.
- **Eve Air Mobility**, an AAM manufacturer that has yet to conduct its first test flight, forecasts a total industry-wide production of 100,000 eVTOL aircraft by 2040.[24]

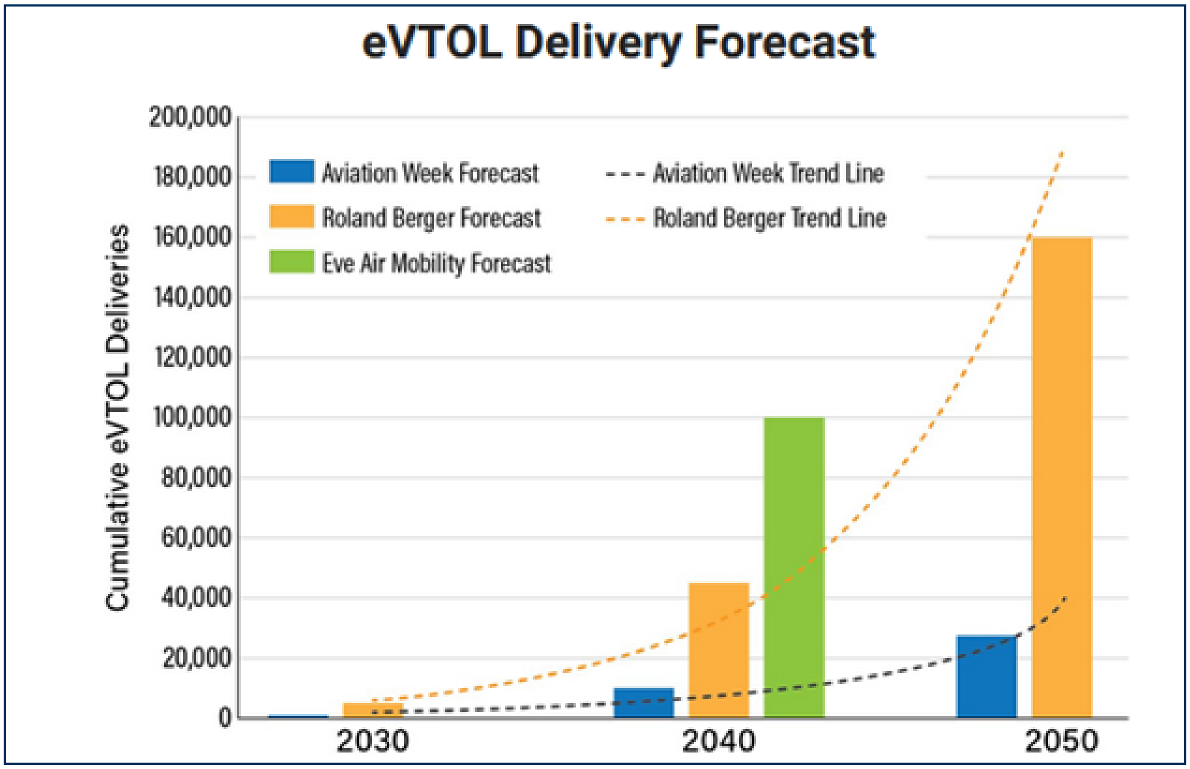
Figure 2.8, prepared by the Aviation Week Fleet Data Team, provides a cumulative eVTOL delivery forecast by each independent firm previously discussed in this section. The results indicate significant variation between each forecast projection.

[22] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

[23] Moore, D. W., Moore, D. W., & Moore, D. W. (2023, June 16). Aviation Week Forecasts 1,000 eVTOL Deliveries By 2030. Aviation Week Network. Retrieved February 1, 2024, from https://aviationweek.com/shownews/paris-air-show/aviation-week-forecasts-1000-evtol-deliveries-2030

[24] Moore, D. W., Moore, D. W., & Moore, D. W. (2023, June 16). Aviation Week Forecasts 1,000 eVTOL Deliveries By 2030. Aviation Week Network. Retrieved February 1, 2024, from https://aviationweek.com/shownews/paris-air-show/aviation-week-forecasts-1000-evtol-deliveries-2030

Figure 2.8: eVTOL Delivery Forecast



Source: Aviation Week Network (2023)[25]

2.4.1.3. FAA Aerospace Forecast - Fiscal Years 2023-2043

The FAA's annual Aerospace Forecasts offer insights into their expectations for the industry in the upcoming years. These forecasts provide statistical analyses of present and future trends, projecting anticipated demand across various facets such as operations, enplanements, and economic aspects. With over 6,000 hours of test flights conducted in recent years, the FAA acknowledges the AAM industry's rapid growth trajectory and goals for full operational and certified status.

The FAA's comprehensive examination of available industry studies aids in predicting the potential growth of AAM over their planning period (2023-2043) and establishing corresponding demand levels. This information serves as a foundation for setting timelines necessary for certification and regulatory processes within this emerging segment of the aviation industry.

[25] Moore, D. W., Moore, D. W., & Moore, D. W. (2023, June 16). Aviation Week Forecasts 1,000 eVTOL Deliveries By 2030. Aviation Week Network. Retrieved February 1, 2024, from https://aviationweek.com/shownews/paris-air-show/aviation-week-forecasts-1000-evtol-deliveries-2030

However, challenges arise when considering the currency of the data represented in the FAA Aerospace Forecast. Discrepancies between the publication date of referenced data and the FAA Aerospace Forecast's publication date highlight instances where the information may fall outside the realm of current relevance. Thus, there is a need to prioritize recent forecasts and trends to ensure the most pertinent and up-to-date information is utilized in strategic decision-making processes.

For example, quotes from the FAA Aerospace Forecast compared to the publication date of the referenced data shows how some of the information is outside of the range of what would be considered "current data" and may not be as relevant as recent forecasts and trends that are more recently published:

> *"Optimistic reports project the AAM passenger industry to have 23,000 aircraft with 740 million enplanements per year at a price of around $30 per trip by 2030."*
>
> — FAA Source: Urban Air Mobility (UAM) Market Study, Nov. 2018, NASA

> *"KPMG predicts 60.4 million enplanements by 2030 and a much smaller industry size."*
>
> — FAA Source: Getting Mobility Off the Ground, 2019, KPMG.

> *"AAM passenger services could have a daily demand of 82,000 passengers served by approximately 4,000 four to five-seater aircraft in the US."*
>
> — FAA Source: Goyal, Rohit et. al. (2021): Sustainability: AAM Demand Analysis. Advanced Air Mobility: Demand Analysis and Market Potential of the Airport Shuttle and Air Taxi Markets.

> *"The AAM market in the US is to reach approximately US $115 billion by 2035, equivalent to 30% of the present US commercial air transportation market."*
>
> FAA Source: Deloitte and the Aerospace Industries Association (AIA). (2021)[26]

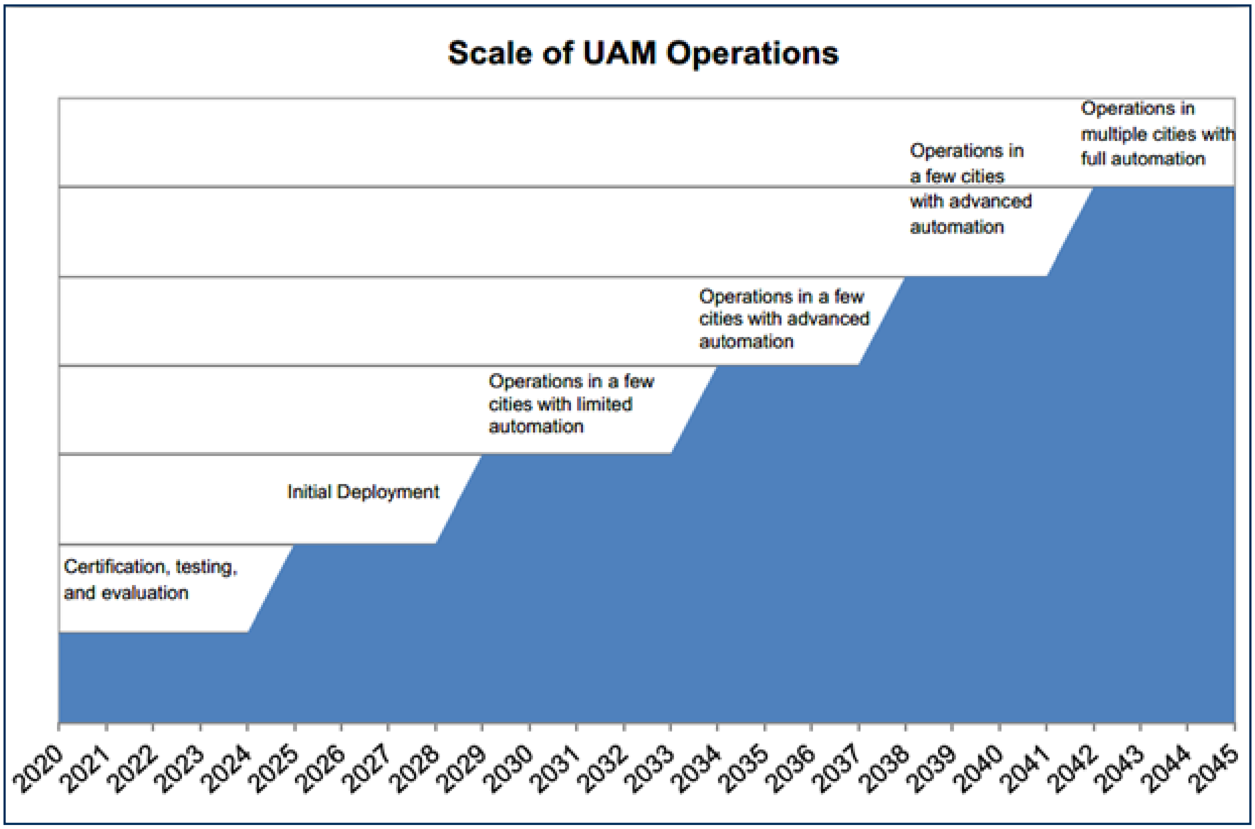
As mentioned throughout this analysis, AAM aircraft certification and initiation of commercial operations are dependent upon the FAA.

In addition to aircraft certification, the FAA has to certify the pilots, certify the vertiports and operating areas, and ensure the safety of operations within NAS. Assure, the FAA's Center of Excellence for UAS, also referenced as FAA Assure, anticipates that between 2,500 and 3,500 vertiports will need to be constructed in order for there to be a complete passenger network across the nation.[27] As shown in **Figure 2.9,** there are multiple steps anticipated over the coming years for operational integration and utilization of AAM and Urban Air Mobility (UAM).

[26] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

[27] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

Figure 2.9: FAA Forecast for UAM Operational Use



Source: FAA Aerospace Forecast Fiscal Years 2023-2043 (2023)

The FAA references a few key forecasts for market valuation of the AAM industry within the U.S.; these forecasts include:

- **FAA Assure:** A near-term market valuation for AAM within the U.S. is anticipated to be in the vicinity of $150 million in the initial deployment phase and grow to achieve $2.7 billion by 2030 as operations begin in a few cities.
- **NASA - Booz Allen:** The airport shuttle/air taxi market in the U.S. has a capacity of around $500 billion in market valuation and there are estimates that the AAM market will achieve $2.5 billion in the near term due to constraints of the emerging market.
- **Deloitte and the Aerospace Industries Association:** This forecast shows a passenger AAM U.S. Market valuation of $57 billion by 2035.[28]

The market valuation forecast potential is reliant on assumptions and predictions in a market that is full of uncertainties as the industry works through certifications, initial deployment, and establishing operations.

[28] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

2.4.1.4. ACRP Synthesis 130: Airport-Centric Advanced Air Mobility Market Study

The Airport Cooperative Research Program (ACRP) is a research program led by industry representatives. The program is sponsored by the FAA and managed by the Transportation Research Board (TRB). A recent synthesis (Synthesis 130: Airport-Centric Advanced Air Mobility Market Study) presented a key finding that manufacturers anticipate starting commercial operations with AAM aircraft in the U.S. sometime between 2024 and 2026. This research anticipates that airports will be the first focal point of operations, resulting in an airport-to-airport type of flight operation, similar to conventional aircraft today. Eventually, it is expected that AAM aircraft operations will expand beyond airports, justifying the development of certified vertiports that are located on rooftops, mobility hubs, and other accessible areas.

The ACRP synthesis's forecasts revealed that OEMs had a very near-term target of aircraft entry into service. As certification has not occurred for any AAM aircraft to date and full-scale production for aircraft has not started, it is unlikely that the forecasted timelines will be met for the targeted entry into service by the respective OEMs listed in **Table 2.1**.

Table 2.1: OEM AAM Aircraft Target Entry into Service Reported by ACRP Synthesis 130

Company	Aircraft	Type	Target Range (mi)	Target Entry into Service	Passenger Seats	Initial Operations
Archer	Midnight	Vectored thrust	100	Late 2024	4+1	Piloted
BETA	A250	Lift and cruise	250	Late 2024	5+1	Piloted
Joby	S4	Vectored thrust	150	2024	4+1	Piloted
Wisk	Generation 6	Vectored thrust	90	Date not set	4	Autonomous

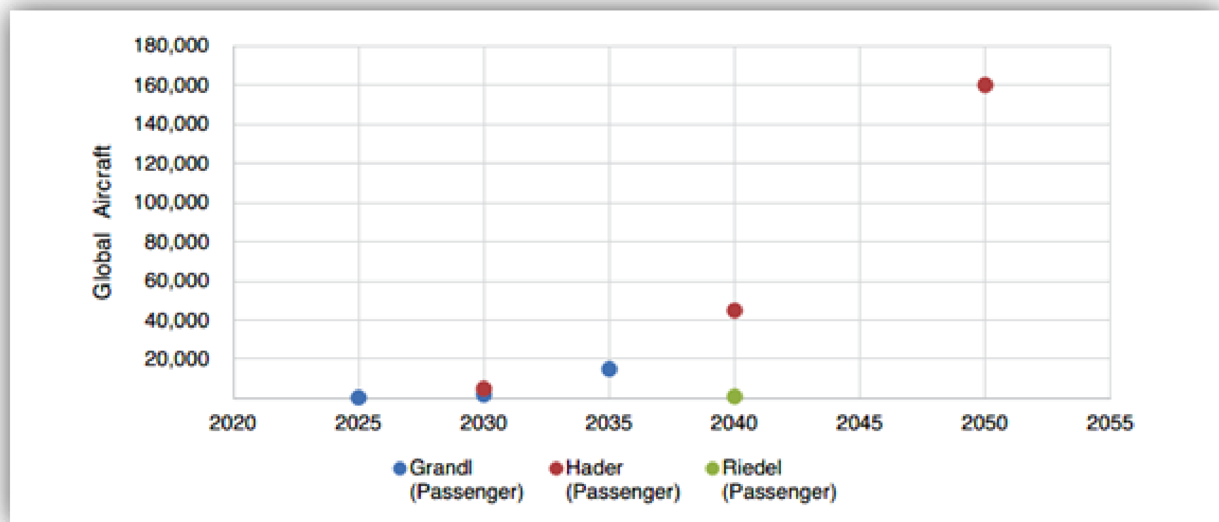
Note: As of August 2024, the BETA ALIA VTOL's entry into service was changed to 2026. Additionally, BETA's ALIA CTOL also changed its entry into service to 2025.
Sources: Kimley-Horn, ACRP Synthesis 130: Airport-Centric Advanced Air Mobility Market Study (2023)

The ACRP Synthesis 130 examined available existing data to formulate the market study. The findings show that the forecasts within the industry varied significantly yet had similarities in many cases. An excerpt from the Synthesis highlights the forecasting ranges:

> *"To highlight some of the forecast differences, a report by Porsche Consulting in 2018 estimates a global passenger market in 2025 of $1 billion with 500 aircraft, growing to $21 billion with 15,000 aircraft by 2035 (Grandl, et al. 2018). A report by McKinsey in 2022 estimates a global passenger market of $1.5 billion with 1,000 aircraft in 2040, substantially lower than the Porsche estimates for the period 5 years earlier (Riedel and Rozenkopf 2022). On the other hand, a report by Roland Berger estimates a global passenger market of $16 billion with 45,000 aircraft by 2040 (Hader, et al. 2020). In the United States market, two studies sponsored by NASA estimate between 30 million and 740 million trips per year by 2030, served by between 4,000 and 23,000 aircraft."*[29]
>
> — (ACRP Synthesis 130)

Figure 2.10 illustrates projected global AAM aircraft production from the synthesis regarding passenger aircraft.

Figure 2.10: ACRP Summary of Global AAM Aircraft Estimates

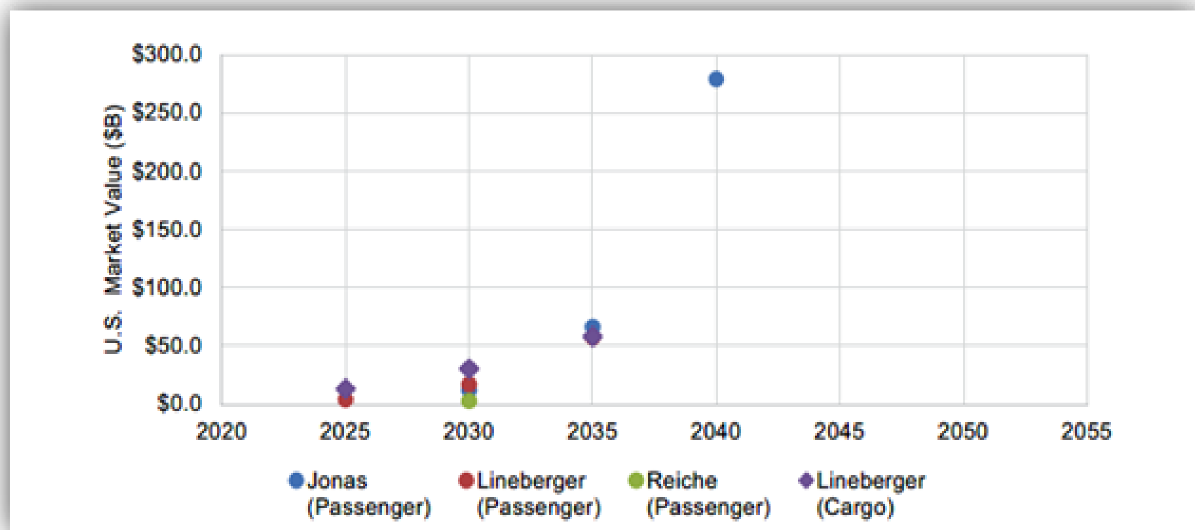


Sources: ACRP Synthesis 130: Airport-Centric Advanced Air Mobility Market Study (2023)

In addition to service entry forecasts, the ACRP Synthesis researched market value estimations for the U.S. It was found that the projections, listed by the author of their respective publications that were researched, are relatively similar throughout the planning period. **Figure 2.11** shows the estimated market valuation over time as observed in the forecast research of the study.

[29] Brown, Henig, Anderson, Wilkowski, Taylor, Labib, Taspinar, Reut-Gelbart, Dowgala, & Duncan. (2022). Aviation 2030: Passenger Use Cases in the Advanced Air Mobility Revolution. KPMG International Entities.

Figure 2.11: ACRP Summary of U.S. AAM Market Value Estimates

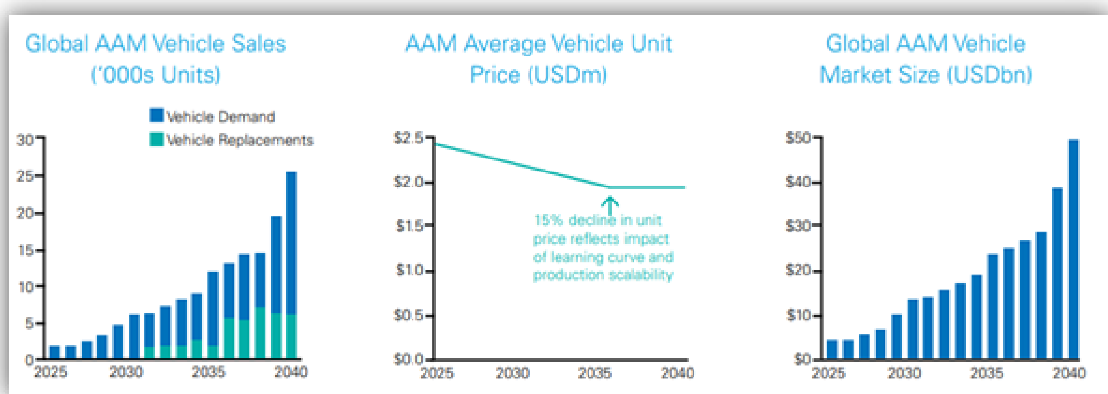


Note: Lineberger (Cargo) is for cargo-only compared to others that are passenger AAM
Source: ACRP Synthesis 130: Airport-Centric Advanced Air Mobility Market Study (2023)

2.4.1.5. Aviation 2030 (KPMG)

Aviation 2030 was written by KPMG International Entities and provides a synopsis of passenger use cases within AAM worldwide. KPMG predicts that by 2040 the AAM global market valuation will reach $120 billion. With such a large market sector, they believe that aircraft production will reach 25,000 AAM aircraft worldwide by 2040, growing at a compound annual growth rate of 18 percent between 2025 and 2040.[30] **Figure 2.12** provides the monetary metrics behind the forecasted growth in production.

Figure 2.12: AAM Aircraft Sales and Market Projections

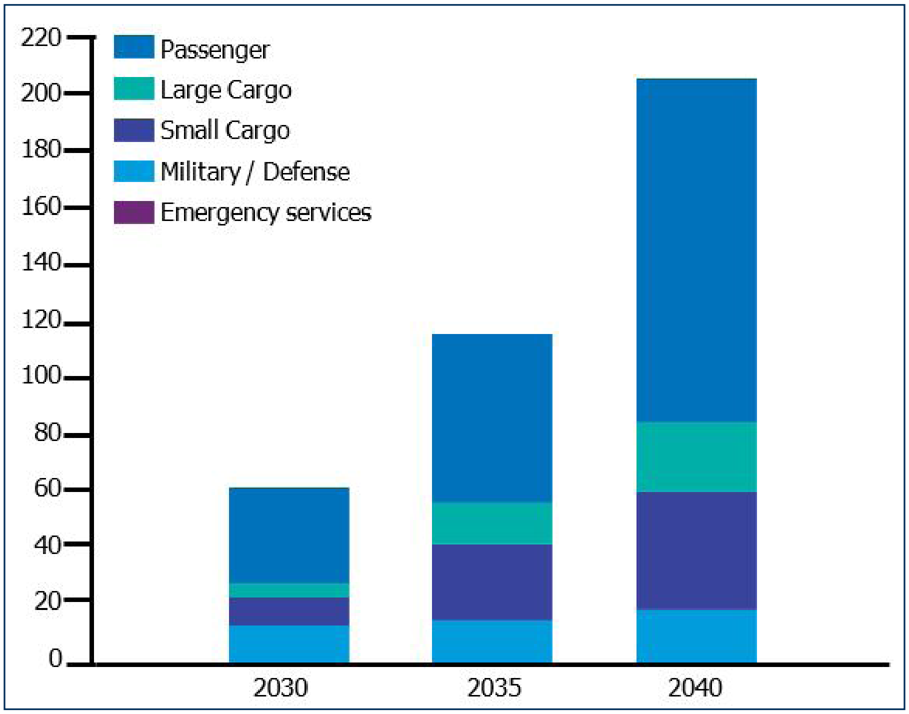


Sources: Aviation 2030: Passenger Use Cases in the Advanced Air Mobility Revolution, KPMG (2022)

[30] Brown, Henig, Anderson, Wilkowski, Taylor, Labib, Taspinar, Reut-Gelbart, Dowgala, & Duncan. (2022). Aviation 2030: Passenger Use Cases in the Advanced Air Mobility Revolution. KPMG International Entities.

KPMG's Aviation 2030 report focused on projected AAM market sector growth related to key use case areas such as passenger operations, cargo operations, military operations, and emergency services. **Figure 2.13** provides the growth forecasts for each market area or use case. Passenger activity is anticipated to lead the valuation projections year over year.

Figure 2.13: AAM Global Market Projections in ($ Billion)

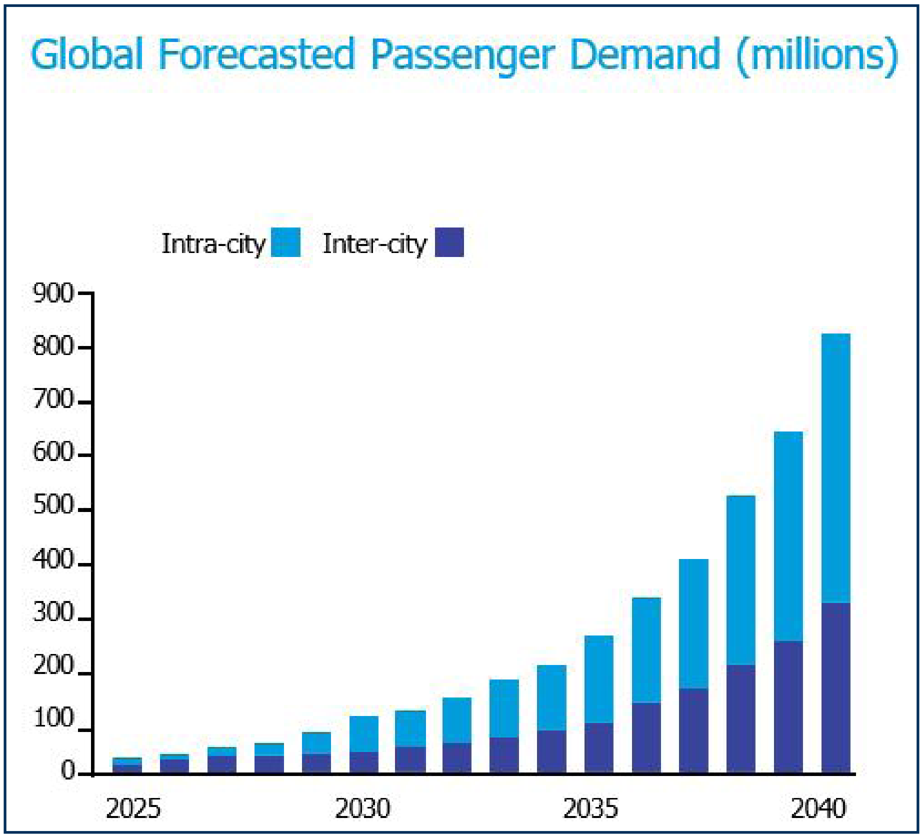


Sources: Aviation 2030: Passenger Use Cases in the Advanced Air Mobility Revolution, KPMG (2022)

The growth projections established in this forecast also examine the utilization trends that will be used by passengers worldwide. The projections continue to establish that the global AAM market is forecasted to exceed 100 million passengers annually by 2030. The total combined usage is categorized into: intra-city, also known as UAM, and inter-city commonly referenced as RAM. Once commercial operations commence globally in the projected year 2025, AAM aircraft passengers are anticipated to primarily use the services for city-to-city flights as a regional connector. Within the initial five years of commercial operations, it is estimated that global intra-city operations will begin to grow as a common mode of transportation within each city, similar to how one would use Uber or Lyft or other providers in major cities around the world. The direct point-to-point connectivity with the ability for quick operations and smaller passenger loads are expected to be contributors to the acceptance of inter-city connectivity which will grow this area of the market well beyond that of the intra-city passenger operations estimations as seen in **Figure 2.14.**[31]

[31] Brown, Henig, Anderson, Wilkowski, Taylor, Labib, Taspinar, Reut-Gelbart, Dowgala, & Duncan. (2022). Aviation 2030: Passenger Use Cases in the Advanced Air Mobility Revolution. KPMG International Entities.

Figure 2.14: AAM Global Forecasted Passenger Demand in Millions



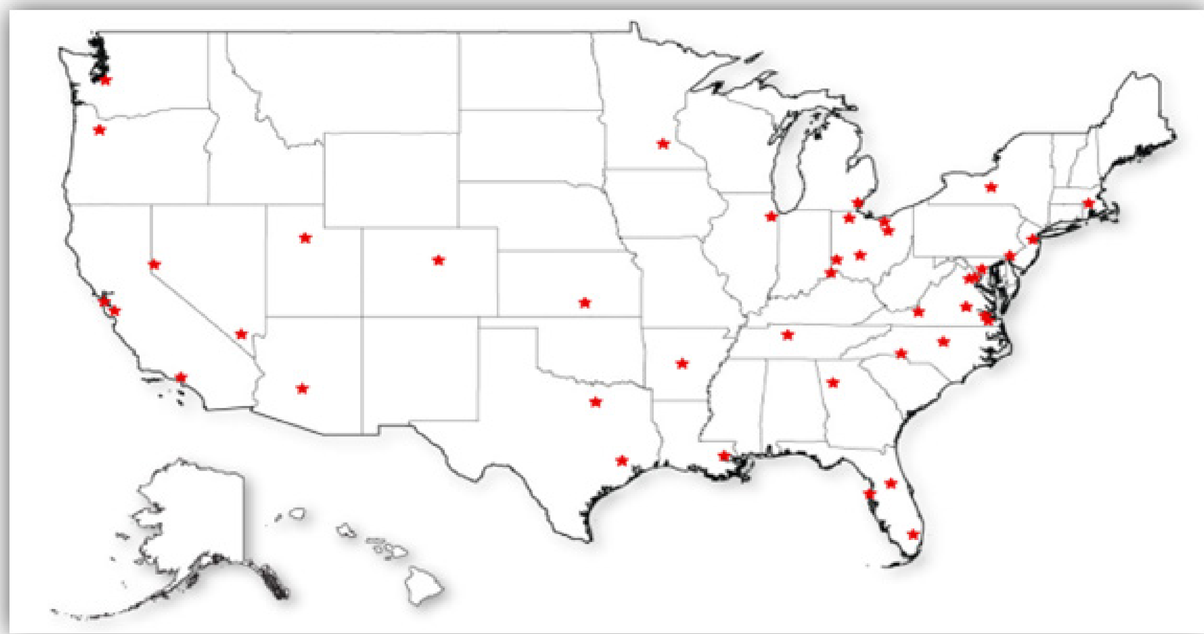
Sources: Aviation 2030: Passenger Use Cases in the Advanced Air Mobility Revolution, KPMG (2022)

2.4.1.6. Passenger Demand and Economic Impact: A Business Case for AAM Investment (UAM Geomatics, Inc.)

UAM Geomatics presented a forecast of AAM passenger numbers based on projected demand across the U.S., providing a comprehensive national snapshot of potential utilization. Though limited in detail, the forecast information indicates that there are 42 primary metropolitan statistical area (MSA) target markets for AAM to begin operations with a focus on UAM, or intra-city operations. Larger metropolitan areas within proximity to one another are expected to see shared operations, but the primary analysis indicates that urban transportation is a key market area within this specific forecast.[32] The 42 MSAs that UAM Geomatics prepared forecasts for are shown in **Figure 2.15**.

[32] Dyment, P. (2023, January). Passenger Demand and Economic Impact – A Business Case for AAM Investment [Presentation]. UAM Geomatics, Inc.

Figure 2.15: 42 Primary MSAs



Sources: Passenger Demand and Economic Impact, UAM Geomatics (2023)

Additionally, projected daily passenger loads across the 42 MSAs were forecasted and are presented in **Table 2.2**.

Table 2.2: Forecasted AAM Daily Passenger Utilization in the 42 MSAs

	2026-2030	2031-2035	2036-2040	2041-2045
Forecast Average AAM Passengers per Day	25,543	64,441	135,963	282,101
Forecast Percent of AAM to Airline Passengers for 42 MSAs	0.90%	2.30%	4.50%	8.70%

Sources: Passenger Demand and Economic Impact, UAM Geomatics (2023)

Growth in each MSA, and especially in the Chicago MSA for Illinois, is projected to grow year over year. The percentage of daily AAM passengers compared to daily airline passengers' ratio indicates that the growth will be substantial, eventually becoming a major mode of transportation. This study primarily focuses on UAM within each MSA, though certain metropolitan areas in proximity to one another will be able to venture into RAM.

2.4.1.7. Forecast Market Opportunities and Regional Air Mobility

A forecast published in the journal Technology Forecast & Social Change by Raj Bridgelall at North Dakota State University (NDSU) focused on market opportunities involving UAM and RAM. Based on the study's forecasted data, over 3,000 AAM aircraft are predicted to conduct over 7,000,000 annual trips, equating to approximately 19,000 daily trips across the nation beginning in 2030. These operational activity levels enable 28,470,000 annual enplanements, representing 78,000 daily enplanements in 2030. The study focused on the routes and infrastructure needs across the nation and determined that 4,214 vertiports must be in place to meet activity demands.[33]

2.4.2. EXISTING INDUSTRY FORECAST ANALYSIS

This section compares the above forecasts and identifies what is believed to represent the most realistic national outlook for the industry going forward. It should be noted that the existing industry forecast analysis is reporting the existing OEM and industry forecasts at the time of the research. Certification of AAM aircraft is needed prior to full production, which may affect forecast years, especially 2025.

2.4.2.1. AAM Aircraft Forecast

The range of previously presented AAM aircraft production forecasts is represented in **Figure 2.16**. The data has both conservative and optimistic projected outcomes in terms of projected AAM aircraft that may be produced globally once certified. The trend line represents an average of the forecasts, beginning with an average of over 2,000 AAM aircraft produced in 2025 and growing to 95,000 AAM aircraft by 2050. The majority of the forecasts have 2050 as the furthest horizon year. Given that the industry is in its early growth stages with limited information, the trend line appears to be more indicative of probable outcomes.

[33] Bridgelall, R., NDSU (2023). Forecasting Market Opportunities for Urban and Regional Air Mobility. Technological Forecasting & Social Change, 196. https://doi.org/122835

Figure 2.16: AAM Aircraft Forecast – Total Aircraft Produced Over Time (2025-2050)

Sources: Aviation Week Network[34], FAA Aerospace Forecast (23-43)[35], ACRP Synthesis 130[36] , NDSU - Bridgelall[37], KPMG[38], Analysis by The Aviation Planning Group (2024)

[34] Moore, D. W., Moore, D. W., & Moore, D. W. (2023, June 16). Aviation Week Forecasts 1,000 eVTOL Deliveries By 2030. Aviation Week Network. Retrieved February 1, 2024, from https://aviationweek.com/shownews/paris-air-show/aviation-week-forecasts-1000-evtol-deliveries-2030

[35] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

[36] Fowler, Mark. (2023). ACRP Synthesis 130: Airport-Centric Advanced Air Mobility Market Study (2023). ACRP. https://nap.nationalacademies.org/read/27326/chapter/1

[37] Bridgelall, R., NDSU (2023). Forecasting Market Opportunities for Urban and Regional Air Mobility. Technological Forecasting & Social Change, 196. https://doi.org/122835

[38] Brown, Henig, Anderson, Wilkowski, Taylor, Labib, Taspinar, Reut-Gelbart, Dowgala, & Duncan. (2022). Aviation 2030: Passenger Use Cases in the Advanced Air Mobility Revolution. KPMG International Entities.

Table 2.3 identifies the high, average, and low forecasts for AAM aircraft production identified in this analysis of forecasts. There is a wide range of forecast projections for each year, resulting in a non-linear forecast for the high and low results.

These results were averaged over time to show a more linear forecast of AAM aircraft production rates. The average of the forecasts and a comparison to the average to the projected production numbers of five OEMs (Lilium, BETA, Archer, Joby, and Volocopter) is shown in **Figure 2.17**. The comparison provides an indication of the limited yet optimistic data available from OEMs compared to the average developed from reviewing the various production forecasts of others.

Table 2.3: AAM Aircraft Production Forecasts Analysis

	2025	2030	2035	2040	2050
Number of Forecasts	3	7	2	5	2
High	4,000	23,000	15,000*	100,000	160,000
Average	2,167	7,432	13,500	37,200	95,000
Low	500	1,000	12,000	1,000*	30,000

Note: Data points involve multiple forecasts that do not report every benchmark year. The out-of-trend line numbers are indicated by the (*). The 2040 Low is reporting the low numbers reported in the McKinsey-Reidel Forecast, which only provided a forecast for 2040. The 2035 High is reporting from two data sources, KPMG and also ACRP referencing Porsche Consulting.
Sources: Aviation Week Network[39], FAA Aerospace Forecast (23-43)[40], ACRP Synthesis 130[41], NDSU - Bridgelall[42], KPMG[43], Analysis by The Aviation Planning Group (2024)

[39] Moore, D. W., Moore, D. W., & Moore, D. W. (2023, June 16). Aviation Week Forecasts 1,000 eVTOL Deliveries By 2030. Aviation Week Network. Retrieved February 1, 2024, from https://aviationweek.com/shownews/paris-air-show/aviation-week-forecasts-1000-evtol-deliveries-2030

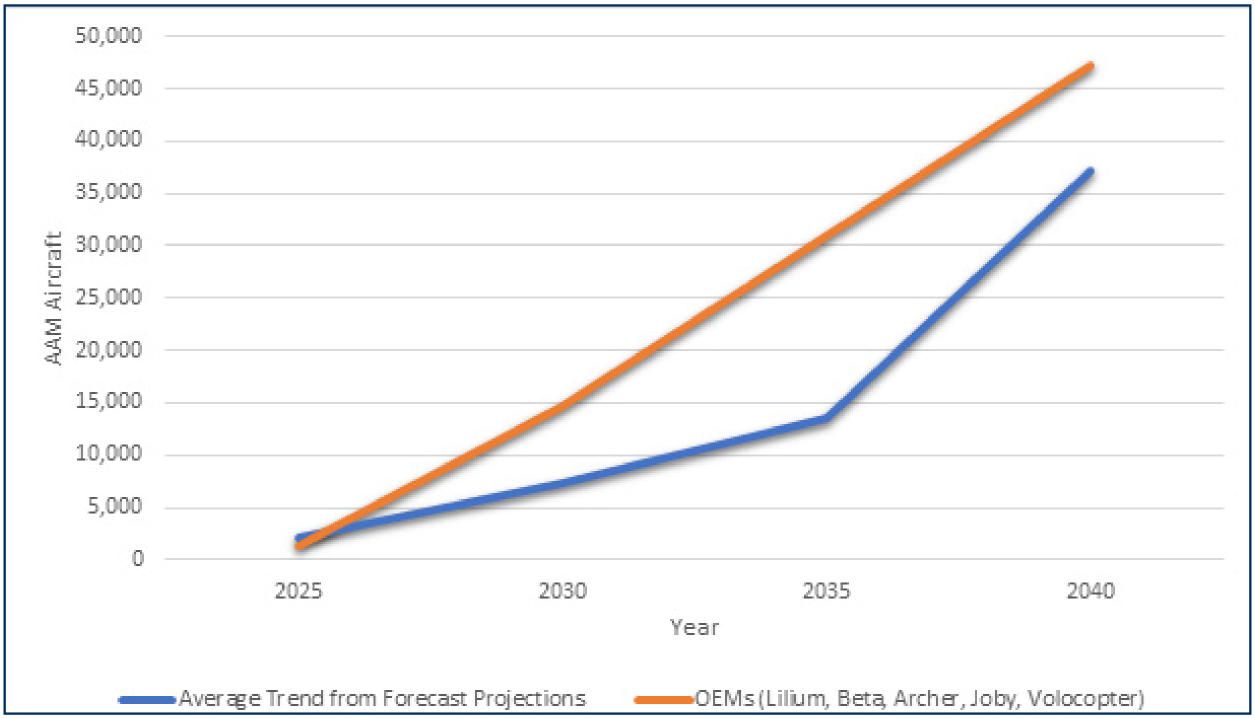
[40] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

[41] Fowler, Mark. (2023). ACRP Synthesis 130: Airport-Centric Advanced Air Mobility Market Study (2023). ACRP. https://nap.nationalacademies.org/read/27326/chapter/1

[42] Bridgelall, R., NDSU (2023). Forecasting Market Opportunities for Urban and Regional Air Mobility. Technological Forecasting & Social Change, 196. https://doi.org/122835

[43] Brown, Henig, Anderson, Wilkowski, Taylor, Labib, Taspinar, Reut-Gelbart, Dowgala, & Duncan. (2022). Aviation 2030: Passenger Use Cases in the Advanced Air Mobility Revolution. KPMG International Entities.

Figure 2.17: AAM Aircraft Forecast Analysis Compared to OEM Production Forecasts (2025-2040)



Sources: Lilium (DroneDJ article)[44], BETA (Aviation Week Network Article)[45], Archer Aviation (Reuters article)[46], Joby Aviation[47], Volocopter[48], Analysis by The Aviation Planning Group (2024)

Although the OEMs' forecasts are straight-lined, it is anticipated that a curved forecast is more likely. This average forecast assumes development, integration, and demand increase exponentially as more aircraft are certified by the FAA, a workforce is developed, and AAM becomes more widely used and accepted by the public.

[44] Crumley, B., & Crumley, B. (2022, September 29). Lilium's annual 400 eVTOL air taxi production goal seeks new funding. DroneDJ. https://dronedj.com/2022/09/29/lilium-evtol-air-taxi/

[45] Warwick, G. (2023, October 02). Beta Opens Electric Aircraft Manufacturing Plant, Launches Production. Aviation Week Network. https://aviationweek.com/aerospace/advanced-air-mobility/beta-opens-electric-aircraft-manufacturing-plant-launches

[46] Nair, A. (2022, October 25). Archer Aviation plans to build 250 air taxis in 2025. Reuters. https://www.reuters.com/business/autos-transportation/archer-aviation-plans-build-250-air-taxis-2025-2022-10-24/

[47] Joby. (2023, September 18). Joby Selects Dayton, Ohio, Birthplace of Aviation, for First Scaled Manufacturing Facility [Press release]. https://www.jobyaviation.com/news/joby-selects-dayton-ohio-first-scaled-manufacturing-facility/

[48] Volocopter. (2023, April 5). Volocopter Completes Production Setup for Electric Air Taxis [Press release]. https://www.volocopter.com/en/newsroom/volocopter-completes-production-setup

2.4.2.2. AAM Enplanement Forecast

Four sources provided AAM enplanement forecasts. These four forecasts are presented in terms of the high and low forecasts, which were then used to develop an average for annual AAM enplanements (see **Table 2.4**). The average annual enplanement forecasts on AAM aircraft in the U.S. indicate almost 900,000 annual enplanements on AAM aircraft in 2025, growing to nearly 50 million enplanements by 2040 (see **Figure 2.18**). It is important to note that only one forecast datapoint for forecast years 2025, 2035, and 2040 which is assumed to be the average given the lack of other available data.

Table 2.4: AAM U.S. Enplanement Forecasts Analysis

Annual U.S. AAM Enplanements	2025	2030	2035	2040
Number of Forecasts	1	4	1	1
High	886,590	29,930,000	23,520,965	49,626,495
Average	886,590	19,842,096	23,520,965	49,626,495
Low	886,590	9,323,165	23,520,965	49,626,495

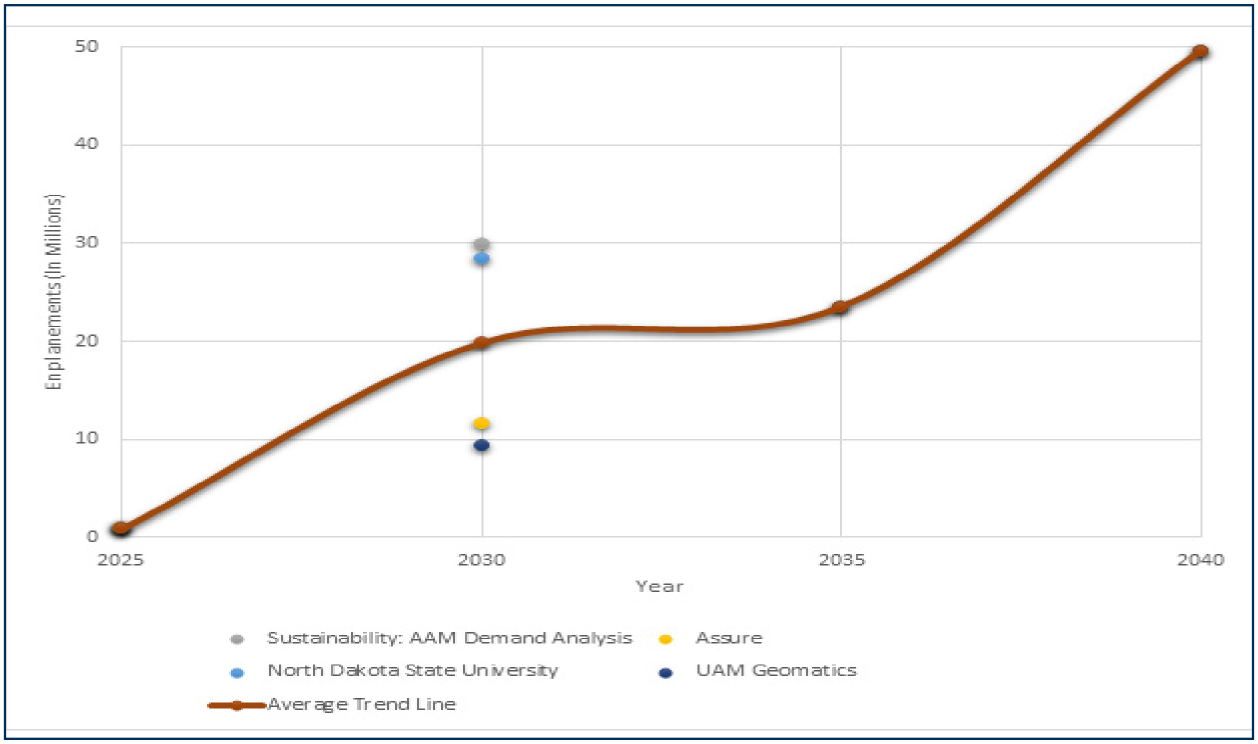
Note: 2025, 2035, and 2040 only had one forecast data point available from the sampling of forecasts
Sources: FAA Aerospace Forecast (23-43)[49], ACRP Synthesis 130[50], NDSU - Bridgelall[51], Analysis by the Aviation Planning Group (2024)

[49] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

[50] Fowler, Mark. (2023). ACRP Synthesis 130: Airport -Centric Advanced Air Mobility Market Study (2023). ACRP. https://nap.nationalacademies.org/read/27326/chapter/1

[51] Bridgelall, R.. NDSU (2023). Forecasting Market Opportunities for Urban and Regional Air Mobility. Technological Forecasting & Social Change, 196. https://doi.org/122835

Figure 2.18: Annual AAM U.S. Forecast Passenger Enplanements (2025-2040)



Note: KPMG is not included in the summary chart illustration as it is a global study.
Sources: FAA Aerospace Forecast (23-43)[52], ACRP Synthesis 130[53], NDSU - Bridgelall[54], Analysis by the Aviation Planning Group (2024)

Annually the numbers look quite large, but when observed at a daily level, the projections become more palatable. The average daily enplanement forecasts for the U.S. indicate almost 2,500 daily enplanements in 2025 and growing to over 135,000 daily enplanements by 2040.

Table 2.5 identifies the high, average, and low forecasts for daily enplanements observed in this analysis of forecasts, while **Figure 2.19** shows the average daily U.S. enplanement forecasts on AAM aircraft. Beginning modestly at nearly 2,500 daily enplanements in 2025, AAM forecasts expect an increase to over 135,000 daily enplanements by 2040.

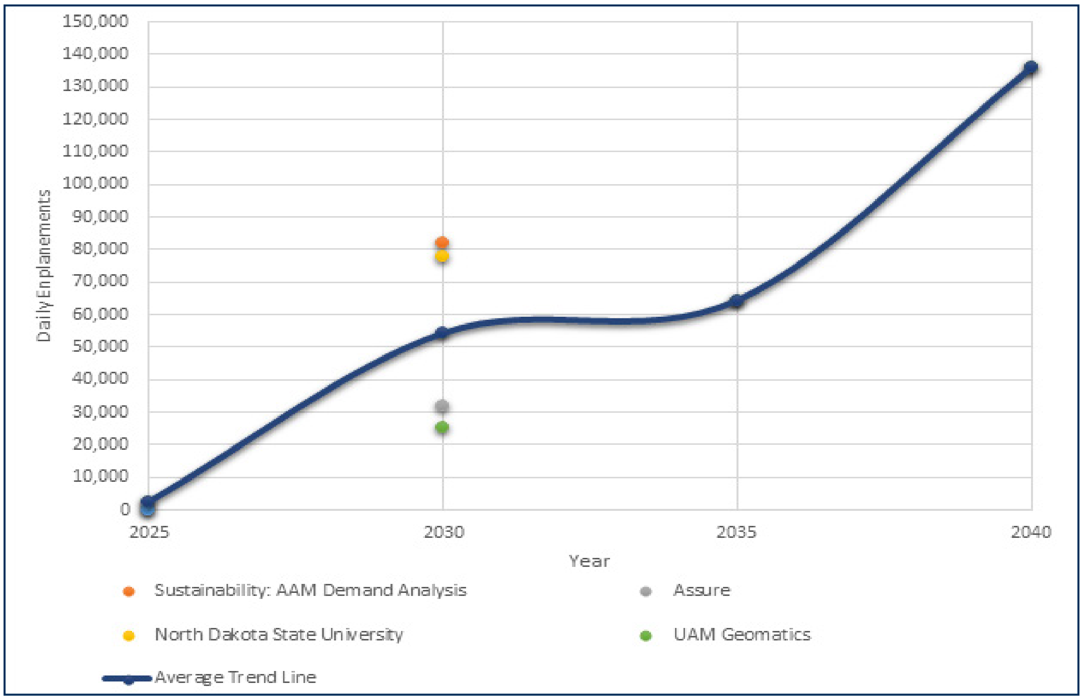
[52] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf
[53] Fowler, Mark. (2023). ACRP Synthesis 130: Airport -Centric Advanced Air Mobility Market Study (2023). ACRP. https://nap.nationalacademies.org/read/27326/chapter/1
[54] Bridgelall, R. NDSU (2023). Forecasting Market Opportunities for Urban and Regional Air Mobility. Technological Forecasting & Social Change, 196. https://doi.org/122835

Table 2.5: AAM Daily Enplanement Forecasts Analysis

Daily U.S. AAM Enplanements	2025	2030	2035	2040
Number of Forecasts	1	4	1	1
High	2,429	82,000	64,441	135,963
Average	2,429	54,362	64,441	135,963
Low	2,429	25,543	64,441	135,963

Note: 2025, 2035, and 2040 only had one forecast data point available from the sampling of forecasts
Sources: FAA Aerospace Forecast (23-43)[55], ACRP Synthesis 130[56], NDSU - Bridgelall[57], Analysis by the Aviation Planning Group (2024)

Figure 2.19: Daily AAM U.S. Forecasted Passenger Enplanements (2025-2040)



Note: KPMG not included in the summary chart illustration as it is a global study.
Sources: FAA Aerospace Forecast (23-43)[58], ACRP Synthesis 130[59], NDSU - Bridgelall[60], Analysis by The Aviation Planning Group (2024)

[55] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

[56] Fowler, Mark. (2023). ACRP Synthesis 130: Airport -Centric Advanced Air Mobility Market Study (2023). ACRP. https://nap.nationalacademies.org/read/27326/chapter/1

[57] Bridgelall, R.. NDSU (2023). Forecasting Market Opportunities for Urban and Regional Air Mobility. Technological Forecasting & Social Change, 196. https://doi.org/122835

[58] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

[59] Fowler, Mark. (2023). ACRP Synthesis 130: Airport -Centric Advanced Air Mobility Market Study (2023). ACRP. https://nap.nationalacademies.org/read/27326/chapter/1

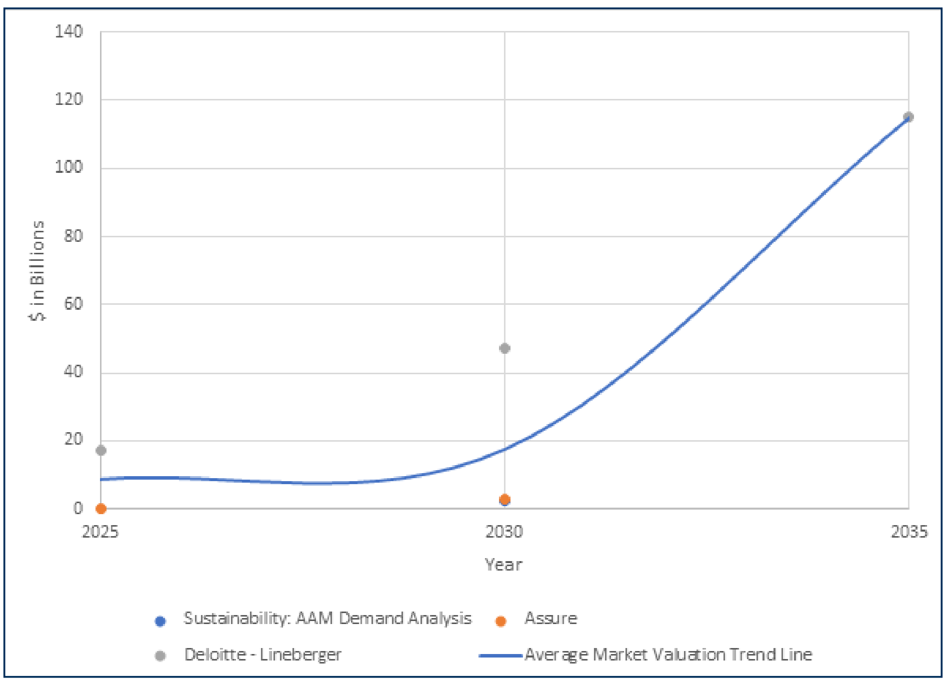
[60] Bridgelall, R., NDSU (2023). Forecasting Market Opportunities for Urban and Regional Air Mobility. Technological Forecasting & Social Change, 196. https://doi.org/122835

Passenger demand will depend heavily on the availability of infrastructure forming the network to allow for growth and utilization among the general public. Assure, the FAA's Center of Excellence for UAS Research, expects a total of 2,500 - 3,500 vertiports[61] across the national market while the North Dakota State University research proposes a slightly higher number of 4,214 vertiports[62] based on route calculations and opportunities observed through the research. These numbers are similar enough to expect nearly 4,000 vertiports are needed in the future to accommodate the demand and network of vertiports required for full operations across the nation based on the forecasts of passenger demand utilizing AAM aircraft.

2.4.2.3. AAM Market Valuation Forecast

As the AAM market is an emerging industry, the valuation ranges vary significantly from forecast to forecast. **Figure 2.20** provides data on the three valuations observed in the analysis of the previously presented forecasts, as well as the average of these. It is important to note that only one forecast has data for 2035 which is assumed to be the average given the lack of other available data.

Figure 2.20: AAM U.S. Forecasted Market Valuation (2025-2035)



Sources: FAA Aerospace Forecast (23-43)[63], ACRP Synthesis 130[64], (2024), Analysis by The Aviation Planning Group

[61] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

[62] Bridgelall, R., NDSU (2023). Forecasting Market Opportunities for Urban and Regional Air Mobility. Technological Forecasting & Social Change, 196. https://doi.org/122835

[63] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf

[64] Fowler, Mark. (2023). ACRP Synthesis 130: Airport -Centric Advanced Air Mobility Market Study (2023). ACRP. https://nap.nationalacademies.org/read/27326/chapter/1

Table 2.6 identifies the high, average, and low forecasts of the AAM market valuations observed in this analysis of forecasts.

As depicted in the market valuation average projections there are conservative and optimistic results. This aspect is more pronounced with the limited data available for forecasting national projections by 2035 and beyond. As the industry develops and eventually establishes operations, data will become more certain, and forecasting will become more accurate.

Table 2.6: AAM U.S. Market Valuation Forecasts Analysis ($ Billions)

AAM U.S. Market Valuation Forecasts	2025	2030	2035
Number of Forecasts	2	3	1
High	17	47	115
Average	8.58	17.40	115
Low	0.15	2.5	115

Note: Forecasts are respective of individual forecasts, with some only having individual year forecasts
Sources: FAA Aerospace Forecast (23-43)[65], ACRP Synthesis 130[66], (2024), Analysis by The Aviation Planning Group

2.4.3. ADVANCED AIR MOBILITY IN ILLINOIS (ILLINOIS CENTER FOR TRANSPORTATION)

A study conducted by the McCormick School of Engineering at Northwestern University for the Illinois Center for Transportation (ICT) examined demand estimations for the State concerning passenger flights, emergency services, cargo, and agriculture use cases of AAM aircraft. Passenger uses within AAM are projected to be utilized for primary travel methods as an air taxi or incorporated into traditional travel sequences. AAM could offer a function of travel to the airport, where the passenger then boards a traditional aircraft for their primary journey. Similarly, when the passenger returns, they would board an AAM aircraft to travel back to their destination airport, rather than taking a vehicle or train. This utilization would expand current travel options to and from the existing airports for traditional flights. **Table 2.7** provides the study's estimations of the market share of passengers that would utilize AAM aircraft daily in the State of Illinois at the beginning and end of their trips commuting to and from the respective airports along with the correlation of how many daily trips that would represent.

Table 2.7: Illinois Forecasted Daily AAM Utilization

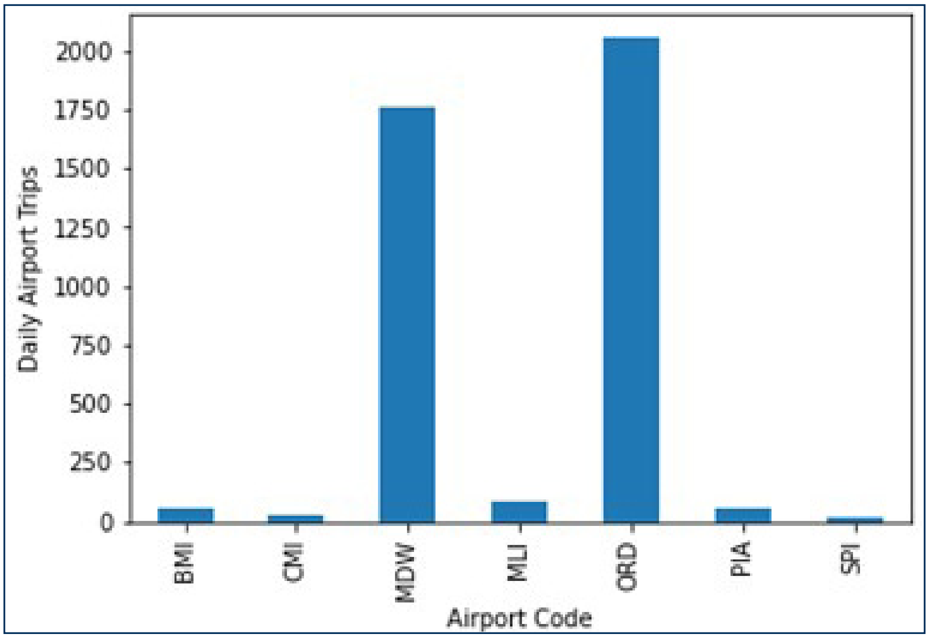
Scenario	Market Share of Commuters	Unconstrained Daily Trips Estimate
Worst-Case	1.11%	1,500
Middle-Case	3.06%	4,100
Best-Case	10.26%	13,600

Source: ICT – Mahmassani et al. (2024)

[65] Federal Aviation Administration. (2023). FAA Aerospace Forecast Fiscal Years 2023-2043. Federal Aviation Administration. https://www.faa.gov/sites/faa.gov/files/FY%202023-2043%20Full%20Forecast%20Document%20and%20Tables_0.pdf
[66] Fowler, Mark. (2023). ACRP Synthesis 130: Airport -Centric Advanced Air Mobility Market Study (2023). ACRP. https://nap.nationalacademies.org/read/27326/chapter/1

The ICT reports passenger utilization forecasts are unknown with a wide range of documented possibilities. This is due to consideration given to adoption rates of the new technology, convenience, and the economics associated with the value of the AAM flight. The middle-case scenario, shown below in **Figure 2.21**, provides a utilization breakdown by Illinois airport for passengers commuting for a traditional flight.

Figure 2.21: Middle-Case Scenario of Passenger Utilization to Illinois Airports



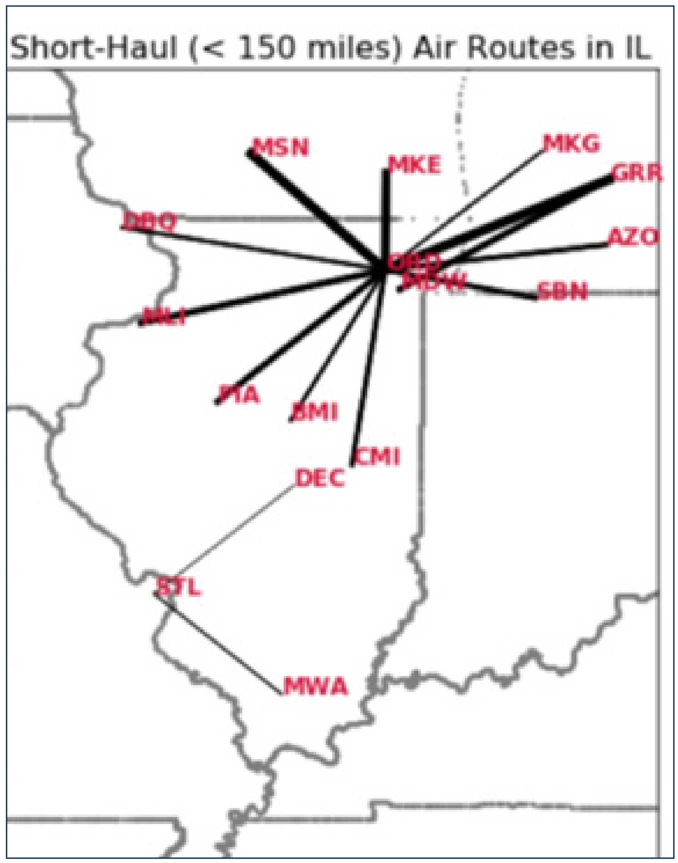
Source: ICT– Mahmassani et al. (2024)

The largest airports in the state per daily trips, Chicago O'Hare International Airport (ORD) and Chicago Midway International Airport (MDW), are projected to realize the highest concentration of passenger use, while the smaller commercial service airports are expected to experience minimal utilization, although still providing a network for AAM opportunities.

As previously mentioned, AAM aircraft can be used as an air taxi service as a point-to-point mode of transportation, whether in UAM or RAM use cases. This ICT forecast studied the introduction of air taxi service to the State of Illinois and compared it to all current modes of travel. The ICT study estimated that 53 percent of all future AAM trips (i.e., UAM and RAM), will serve business travelers while the remaining 47 percent will serve non-work activities. Higher potential business utilization for AAM air taxi service is indicated, as currently only 24 percent of all travel is work-related.[67]

The ICT study also evaluated regional demand and projects Chicago to have the highest uses for day-to-day air taxi services in Illinois. AAM services within the state are categorized into travel in three distinct areas (Chicago, St. Louis, and Central Illinois) where the first air taxi trips are expected to occur. The study's projections indicate that 87.6 percent of the trips would be around Chicago, while 2.4 percent would be trips around St. Louis, and 10 percent would occur in central Illinois. **Figure 2.22** demonstrates the forecasted utilization by route with thicker lines between each point for higher trip volume. Utilization within the Chicago area is expected to be higher than in the Illinois suburbs of St. Louis, MO, and around central Illinois as compared to the overall total trips and travel that occur in these areas through traditional road travel methods. (Total Trips: Chicago – 68.5 percent, St. Louis – 6.6 percent, Central IL – 24.9 percent). The current lack of short-haul air routes of less than 150 miles in Illinois provides an opportunity for an introduction of AAM aircraft to fill an important need through RAM.[68]

Figure 2.22: Potential AAM Air Routes in Illinois



Source: ICT – Mahmassani et al. (2024)

[67] Mahmassani, H., Cummings, C., Volakakis, V., Audenaerd, L., Del La Paz, J. (2024, February). Advancing Air Mobility in Illinois. Illinois Center for Transportation. https://rosap.ntl.bts.gov/view/dot/73552

[68] Mahmassani, H., Cummings, C., Volakakis, V., Audenaerd, L., Del La Paz, J. (2024, February). Advancing Air Mobility in Illinois. Illinois Center for Transportation. https://rosap.ntl.bts.gov/view/dot/73552

In addition to passenger utilization, cargo deliveries are also expected to hold a large share of operations within Illinois' AAM market. The ICT report indicates in 2022 over 43 million packages were shipped daily across the U.S., with FedEx being responsible for shipping six million daily packages nationwide (14.4 percent). The study showed that nearly half of the daily packages shipped would be of a weight capable of being delivered by Uncrewed Aerial Vehicles (UAVs). UAVs are a component of AAM, and this report focused on smaller UAVs for cargo and not for passenger travel. With weight being a significant limitation for UAV deliveries, consideration must also be given to distance, weather, and daylight, as UAVs must be operated with a clear line of sight.[69]

2.5. Summary

Illinois is very centrally located in the nation with a major metropolitan hub in the north. The state is expected to realize AAM operations in the near term. Key areas of success include the OEM's that have been working through their respective certifications, and legacy air carriers planning to incorporate AAM into their future business models. The State of Illinois is at the forefront of the AAM integration with partnerships between United Airlines and Archer for deployment in Chicago for AAM flights from downtown to ORD. As AAM deploys across the nation, it will be drawn to the major metropolitan areas, and Chicago will be the forecasted launching point for AAM when operations begin for the State of Illinois.

Progress at the dawn of an emerging industry does not come without its challenges. Constraints to the AAM market include regulatory hurdles, certification timelines, infrastructure development, public acceptance, and many more challenges to the industry prior to becoming fully operational and contending as a transportation option. Though expectations are high, the projected demand documented in the aforementioned studies throughout this Forecast Analysis may not be realized for many years.

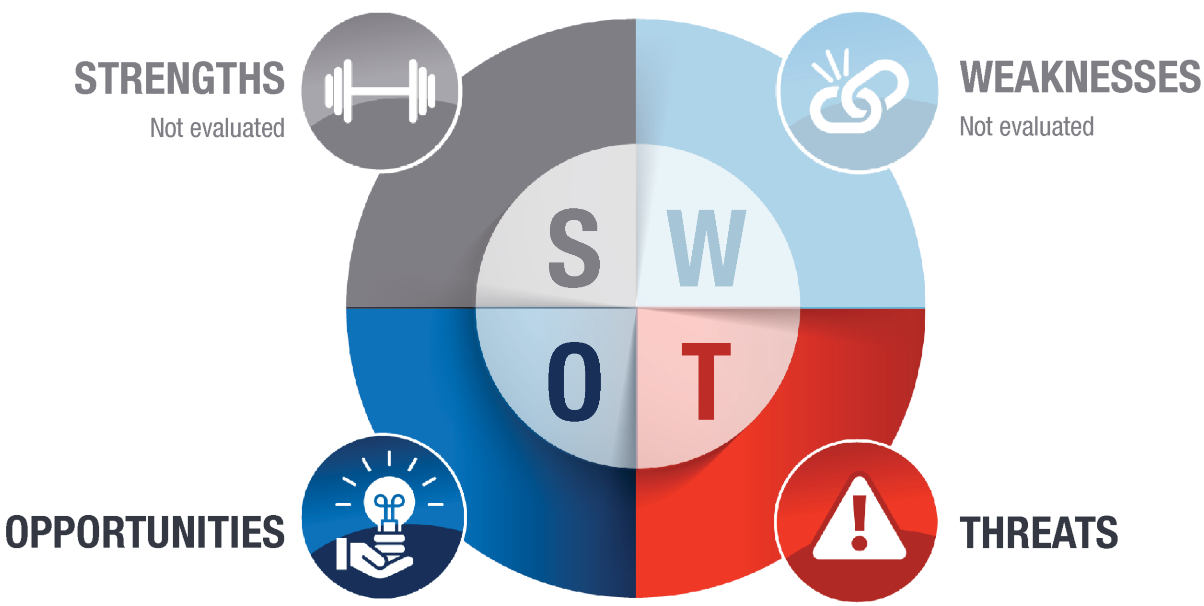
[69] McCormick School of Engineering. (2023, October 25). Advanced Air Mobility in Illinois: Project Summary, Key Findings, and Recommendations. Northwestern University.

CHAPTER 3. ILLINOIS AAM OPPORTUNITIES AND THREATS

3.1. Introduction

Advanced Air Mobility's (AAM) implementation will be influenced by a number of factors. Prior to proposing recommendations regarding the integration of AAM in Illinois, a baseline understanding of these factors is needed. Baselines can be developed through a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, as shown in **Figure 3.1**. The SWOT process examines both internal (strengths and weaknesses) and external (opportunities and threats) factors. AAM, however, is an emerging field with limited existing or determinable strengths and weaknesses, making a full SWOT analysis difficult. Conversely, there are a number o external factors, by way of opportunities and threats, that could affect how AAM evolves nationally and within Illinois over the near-, mid-, and long-term planning horizons. Given the importance of identifying a baseline of recommendations this chapter, as part of the Illinois Aviation AAM System Plan, explains both the opportunities and threats identified for this study based on the use cases identified in **Chapter 2**. The identified opportunities and threats are considered in the development of the recommendations that are provided in **Chapter 5**. Identification of opportunities and threats is a critical first step before developing actionable plans to foster or leverage opportunities and mitigate threats.

Figure 3.1: Illinois AAM SWOT Methodology



Source: Kimley-Horn

3.1.1. ILLINOIS AAM OPPORTUNITIES AND THREATS

Through close collaboration with Illinois Department of Transportation (IDOT) and the Project Action Committee (PAC) , the project team identified a series of opportunities and threats, shown in **Figure 3.2**, that may have the greatest influence on the integration of AAM in Illinois. It's important to note that certain categories, such as equity, were viewed as an opportunity rather than a threat. The list of opportunities and threats is primarily opinion based and relies upon the overall view of the stakeholders involved. **Sections 3.2** and **3.3** explain the benefits associated with the opportunities and risks associated with the threats, respectively. It should be noted that the list of opportunities and threats illustrated in **Figure 3.2** is unlikely to capture all potential scenarios or variables in the State. Additionally, the number of threats exceed the number of opportunities, indicating the various challenges and obstacles associated with full-scale implementation of AAM.

Figure 3.2: Illinois AAM Opportunities and Threats

Sources: IDOT, PAC Members and Kimley-Horn (2024)

3.1.2. RELATIONSHIP TO GOALS AND RECOMMENDATIONS

In addition to providing detail around each identified opportunity and threat, the following sections also document the multiple linkages to each aviation system goal category (i.e., goals that are achieved or promoted by leveraging opportunities and goals that may not be achieved if external threats are not mitigated). Understanding these relationships is crucial to provide context surrounding the system and serves as a foundation for future discussions. The five goals of the Illinois AAM System Plan are presented and defined in **Figure 3.3**.

Figure 3.3: Illinois AAM System Goals

ECONOMY	Improve Illinois' economy by providing transportation infrastructure that supports the efficient movement of people and goods.
LIVABILITY	Enhance the quality of life across the state by ensuring that transportation investments advance local goals, provide multimodal options, and preserve the environment.
MOBILITY	Support all modes of transportation to improve accessibility and safety by improving connections between all modes of transportation.
RESILIENCY	Proactively assess, plan, and invest in the state's transportation system to ensure our infrastructure is prepared to sustain and recover from extreme events and other disruptions.
STEWARDSHIP	Safeguard existing funding and increase revenues to support system maintenance, modernization, and strategic growth of Illinois' transportation system.

Sources: IDOT, Kimley-Horn (2024)

This Illinois AAM System Plan concludes with various recommendations and policy considerations for IDOT to consider implementing to ultimately promote the viability of AAM in Illinois. To most effectively relate the opportunities and threats to the AAM system goals and ultimate recommendations, each of the following sections is presented with two primary components.

RELATIONSHIP TO ILLINOIS AAM SYSTEM PLAN GOALS

Each opportunity and threat is presented with a graphic highlighting the related statewide transportation goals. Some opportunities and threats relate to all five goals, while others only relate to some goals. The depictions use full color for the applicable goals while those that are not applicable are blurred or shaded. Additional information on goal linkages is provided in each opportunity or threat's associated summary.

BENEFIT AND RISK DISCUSSIONS

The opportunities and threats are further evaluated by discussing the benefits that could emerge if the opportunity is leveraged, or the risks that may arise if threats are not mitigated. These discussion bullets are not comprehensive to each opportunity and threat but provide an overview of potential considerations for the system.

3.2. Illinois AAM Opportunities

While Illinois may have numerous opportunities to leverage AAM in the future, this section highlights five opportunities that were identified by the PAC to have the greatest importance to Illinois. As previously discussed, each opportunity's ability to address the statewide goals established for the Illinois AAM System Plan are highlighted, indicating how the opportunity helps the State meet its goals. The benefits of leveraging each opportunity are also highlighted. The five Illinois AAM opportunities documented in this section include:

- **Existing Aviation Infrastructure**
- **Workforce Development**
- **Partnerships with Academia**
- **De-carbonization and Sustainability Initiatives**
- **Funding and Incentive Programs**

3.2.1. EXISTING AVIATION INFRASTRUCTURE

As discussed in **Chapter 1**, AAM will require several different components of ground infrastructure to safely accommodate operations. Chief among these is vertiports, which are facilities designed to allow aircraft to take-off and land vertically. As the AAM sector matures, it is anticipated a network of vertiports may need to be established in urban, suburban, and rural areas for AAM aircraft to operate. This may require dedicated infrastructure for aircraft charging, passenger screening, cargo handling, and others depending on the use case. The Illinois AAM System consists of 352 private- and public-use facilities which include airports, heliports, and an established vertiport**.** By capitalizing on existing aviation infrastructure before developing new, AAM-dedicated facilities there are many near- and long-term benefits for airports, AAM users, and the State.

Some of the benefits that can be leveraged regarding existing aviation infrastructure are as follows:

- **Established Regulatory Framework –** The existing aviation facilities in Illinois' AAM system have established procedures and practices in place that would allow AAM to operate in an environment with airspace protection, existing land use controls, and certified aeronautical facilities. This reducesx the need for new landing sites and airspace to be reviewed and approved by the FAA or other authorities, streamlining the initial integration of AAM.
- **Cost Effectiveness –** Preserving space at Illinois' airports and/or heliports for AAM may be more cost-effective relative to designing and constructing new vertiports. Some modifications would need to occur such as installing electric aircraft chargers or marking or constructing designated vertiports, but the associated costs would be minimal compared to the construction of new facilities. The retrofitting of existing airports and heliports to accommodate electric vertical or conventional take-off and landing (eVTOL or eCTOL, respectively) operations offers an opportunity for early entrants to operate commercially once the aircraft are certified by the FAA without additional considerable investment.
- **Reduced Environmental Impact –** Utilizing existing aviation facilities limits the need for new vertiports to be constructed on undeveloped land, reducing the impact on communities and the natural environment from new development. It also promotes AAM operations in locations where surrounding land uses should be compatible with aviation operations (e.g., industrial, commercial, or open space), reducing some of the initial community impacts of AAM operations. Use of existing infrastructure may limit the scope of additional environmental review from the State and federal government for approval, expediting AAM activity in the near-term.

3.2.2. WORKFORCE DEVELOPMENT

According to the results of a 2021 industry survey, the AAM market is expected to create approximately 234,000 new domestic jobs and 46,000 international jobs by 2035.[70] These jobs will encompass various roles such as pilots, technicians, software engineers, and dispatchers. Filling these positions will be a primary objective for the AAM sector, particularly if the existing workforce shortage of pilots, mechanics, air traffic controllers, and support staff in the aviation industry persists. Illinois has a workforce of 6.4 million people and is in the top ten when it comes to the most concentrated locations of transportation related workforces by state.. These data suggest Illinois may be positioned to provide the needed labor if a portion of the 234,000 anticipated domestic jobs can be sourced in the State.[71] Workforce integration may be limited at first, given the likely concentration of AAM activity and operations in large urban areas such as Chicago. However, as the sector expands, workforce engagement will likely extend to less traditional populations outside of the typical transportation industry and areas.. This aligns well with Illinois' established Climate and Equitable Jobs Act (CEJA) Hubs, 14 training hubs receiving an annual state investment of $180 million to reach and upskill underserved populations for new, clean tech jobs. This could enhance AAM opportunities for rural economies to integrate with markets that are not yet easily accessible with the current transportation system, distributing the workforce more evenly statewide.

Some of the benefits that can be leveraged regarding workforce development are as follows:

- **Leverage Existing Workforce –** The Illinois Aviation System currently supports approximately 500,000 jobs, including over 337,000 jobs directly associated with the State's airport system. This existing workforce could provide an initial source of laborers for the AAM sector.[72,73] This group, including security staff, ground crew, maintenance personnel, and other essential aviation workers, have familiarity with aviation procedures and regulations that can be leveraged as AAM demand is realized. Additionally, the existing workforce is comprised of personnel from a diverse range of backgrounds and skillsets, which, when infused into the relatively narrow AAM sector, may bring new viewpoints that spur further innovation in technological advancement, airspace integration, and public engagement. The State also has a successful track record of investing in aviation training programs at private companies, four-year universities and two year community colleges.

---

[70] Aijaz Hussain and David Silver; "Advanced Air Mobility" Deloitte Insights, Jan 26, 2021, https://www2.deloitte.com/us/en/insights/industry/aerospace-defense/advanced-air-mobility.html

[71] Illinois Intersect, "Talent and Workforce." Intersect Illinois, https://www.intersectillinois.org/why-illinois/workforce/. Accessed May 27, 2024.

[72] Illinois Department of Transportation. "Airport System." Accessed May 28, 2024. https://idot.illinois.gov/transportation-system/network-overview/airport-system.html

[73] Illinois Department of Transportation. "Illinois Aviation System." Assessed August 27, 2024 https://idot.illinois.gov/transportation-system/transportation-management/transportation-improvement-programs/airport-improvement-program/illinois-aviation-system.html

- **Rural Economic Development –** In recent history, population and demographic shifts have created an economic disparity between urban and rural areas, with some rural regions experiencing economic stagnation or decline compared to their urban counterparts. As AAM expands at a regional mobility level, it may offer the opportunity to enhance access and the flow of goods between rural and urban communities, allowing for workers and customers to connect to denser urban environments more easily. This could result in the dispersal of the highly skilled and educated workforce into rural and suburban communities, boosting local economies. Easier transport of goods and products may encourage companies to establish production facilities in rural areas, enhancing economic growth in historically under-served areas of the State.

3.2.3. PARTNERSHIPS WITH ACADEMIA

As with any new technology, a significant amount of research and innovation is needed to develop technologies and procedures for AAM. While private industry is leading the development of AAM aircraft and systems, many academic institutions are researching various issues, considerations, and potential impacts of AAM.[74] Partnership between the State, the private sector, and academia provides a juncture where AAM technologies and issues can be approached from multiple viewpoints to produce the best possible solutions.

Partnerships between the State and academia are already occurring including at Illinois Center of Transportation (ICT) at the University of Illinois. The ICT established a cooperative agreement with IDOT for contract research in 2005. Through this partnership, ICT researched potential AAM advancements in Illinois and published its findings regarding the advancement and possible integration of AAM.[75] Other opportunities for academic partnerships may include the University of Illinois (Urbana-Champaign) Aerospace Engineering program's research regarding electric aircraft propulsion, Southern Illinois University's Flight Training Program, Lewis University's Airport Management Program, and Northwestern University's work on aviation market analytics.

[74] Mahmassani, Hani S., et al. "Advancing Air Mobility." Illinois Center for Transportation, Feb. 2024, https://doi.org/10.36501/0197-9191/24-006.
[75] Mahmassani, Hani S., et al. "Advancing Air Mobility." Illinois Center for Transportation, Feb. 2024, https://doi.org/10.36501/0197-9191/24-006.

Some of the benefits that can be leveraged regarding partnerships with academia are as follows:

- **Research and Development –** Illinois is a hub for technology companies and aerospace original equipment manufacturers (OEMs) that have partnered with academic institutions to conduct research and development (R&D) for new aviation and aerospace technologies. Existing partnerships, between institutions such as Southern Illinois University (SIU) and companies such as Boeing and Collins Aerospace could be expanded to include players in the AAM sector. Promotion of R&D at a State level would not only allow Illinois to emerge as a leader in the AAM sector but also incentivize collaboration between industry experts and upcoming AAM professionals. It also creates and encourages public interaction by increasing opportunities for AAM training and education at public universities.
- **Knowledge Sharing –** Academic partnership encourages discussion among leaders from different backgrounds, disciplines, and perspectives, creating community and collective wisdom. Sharing this knowledge with the future AAM workforce can shape the community and integrate individuals into the system. A coordinated collaboration between the AAM sector and the State's academic institutions provides the opportunity to reduce costs by preventing repetitiveness. Once information is shared by a university or research firm, that data can be used and built upon by others.
- **Expand Funding Sources –** By working with academic partners, the State can leverage more federal funding. For example, in May 2023, the Illinois Innovation Network (IIN), a system of connected university community-industry-based hubs throughout the State, was awarded one of the first ever National Science Foundation's Regional Innovation Engines (NSF Engines) awards to lead an Advancing Smart Logistics (ASL) team in a two-year effort to lay the foundation to make Illinois one of the nation's most advanced transportation and logistics hubs, including deployment of drones and evTOL.

3.2.4. DE-CARBONIZATION AND SUSTAINABILITY INITIATIVES

The transportation sector in Illinois accounts for roughly 32 percent of the State's total greenhouse gas (GHG) emissions. While aviation accounts for just five percent of transportation emissions in Illinois (one percent of total), there are still significant efforts to reduce the industry's environmental impact.[76] The State of Illinois codified its goal to achieve zero carbon emissions by 2050 in the Climate and Equitable Jobs Act passed in 2021,The Illinois Department of Natural Resources' (IDNR) Climate Action Plan set a goal to achieve zero carbon emissions by 2050, underscoring the importance of reducing GHG emissions in transportation.[77]

Given that AAM is proposing a carbon-neutral operation to replace existing transportation demands across many aviation and non-aviation use cases, integrating AAM into Illinois' transportation system aligns with the State's initiative to become carbon neutral by 2050. Collaboration between AAM operators and the State may help to fulfill sustainability initiatives. One example could be the use of AAM for law enforcement where eVTOL aircraft could replace traditional turbine helicopters that burn fossil fuels, reducing GHG emissions. In this case, the State could provide justification for the Illinois State Police and local departments for the purchase of eVTOL aircraft to meet these goals. The Illinois Environmental Protection Agency has administered several rebate programs for passenger EVs and electric school buses. In addition, several sustainability initiatives have already shown promise in the aviation industry, such as the Sustainable Aviation Fuel Purchase Credit, which provides a $1.50 per gallon credit for air carriers purchasing Sustainable Aviation Fuel (SAF). This credit is valid through 2032 to promote use of SAF to reduce net carbon emissions as SAF production increases.[78] Similar initiatives could be provided for AAM operators and users to reduce GHG emissions and generate positive public perception.

[76] Chicago Metropolitan Agency for Planning, "Understanding our emissions is the first step to take climate action", Accessed August 22, 2024, https://cmap.illinois.gov/data/environmental/greenhouse-gas-emissions/.

[77] Illinois Department of Agriculture. "Facts about Illinois Agriculture." (Springfield, Illinois) .https://agr.illinois.gov/about/facts-about-illinois-agriculture.html .

[78] Mahmassani, Hani S., et al. "Advancing Air Mobility." Illinois Center for Transportation, Feb. 2024, https://doi.org/10.36501/0197-9191/24-006.

Some of the benefits that can be leveraged regarding de-carbonization and sustainability initiatives are as follows:

- **Reduced Greenhouse Gas Emissions –** Most early AAM platforms are expected to have electric propulsion systems, meaning they have zero tailpipe GHG emissions. AAM provides an opportunity to achieve the State's goal of zero carbon emissions. However, this will only be achievable if associated infrastructure and equipment – including chargers, energy suppliers, and support vehicles – also achieve carbon neutrality. Use of renewable energy and alternative power sources such as hydrogen fuel cells will be critical to achieving this goal. As noted, road transportation still contributes the largest amount of transportation GHG emissions. AAM could provide some options to replace cars and trucks, so noticeable positive impacts to total GHG emissions would not be realized until the AAM sector has fully matured.
- **Positive Public Perception –** Positive public-perception is essential to changing current transportation usage trends. Presenting AAM as a sustainable replacement or supplement to existing modes could help boost the public perception of AAM. This strategy, along with faster travel times, could make it more appealing to the average commuter, increasing usage and expanding the role of AAM in achieving sustainability goals. Beyond achieving State and industry sustainability goals, sustainable practices in AAM could provide financial benefits, particularly if energy costs rise as demand increases.

3.2.5. FUNDING AND INCENTIVE PROGRAM

AAM, like many other facets of aviation, requires substantial capital to successfully develop aircraft, ground infrastructure, and support facilities. Currently, most existing public aviation funding programs are not oriented toward supporting nascent technologies. Similarly, Illinois' current airport funding structures do not support the type of infrastructure required for AAM vehicles and may not explicitly apply to AAM implementation at this time.[79] However, the State has a wide range of other programs that can fund various transportation projects including transit, rail, and ports. IDOT's multi-year program for fiscal years (FY) 2024-2029 shows an allocation of nearly $14 billion over six years to support the development and maintenance of 60 transit providers, 80 public airports, seven major railroads, and 19 public ports.[80] The objective of these programs is

[79] Illinois Department of Transportation, "Airport Improvement Program" (Illinois) https://idot.illinois.gov/transportation-system/transportation-management/transportation-improvement-programs/airport-improvement-program/airport-improvement-program.html.

[80] Illinois Department of Transportation. "Multi-Year Program: Highway and Multimodal." Illinois Department of Transportation, Accessed May 28, 2024, idot.illinois.gov/transportation-system/transportation-management/transportation-improvement-programs/myp.html.

to provide a safe, accessible, sustainable, and environmentally conscious transportation system for Illinois residents, businesses, and visitors. Leveraging additional funding for AAM would accelerate innovation and development. Potential uses of public funding for AAM infrastructure include development of publicly owned vertiports, improvements to energy generation, storage, and transmission infrastructure, and implementation of public education and communication channels between AAM manufacturers, operators, users, and the public. Additionally, use of public funding or incentives could translate into public-private partnerships (P3s), allowing the State to have a stake in the AAM industry and influence a more sustainable and equitable mode of transportation.

Regarding incentives for AAM manufacturers, Illinois launched the Reimagining Energy and Vehicles Act (REV Act) in 2021, an ambitious incentives program to attract clean tech manufacturing and create jobs and investment across the State. Benefits for companies in this multi-pronged program include retained payroll withholding, tax credits, exemptions and grants. In the spring 2024 legislative session, the State added language to the REV Act that made it clearer that eligible companies include "an entity engaged in research, development, or manufacturing of eVTOL aircraft or hybrid-electric or fully electric propulsion systems for airliners."

Some of the benefits that can be leveraged regarding funding and incentive programs are as follows:

- **Accelerated Innovation & Development –** Like many new industries, the speed at which AAM advances is dependent upon the resources dedicated to it. Providing public funding or incentives to airports, consumers, and OEMs would offer the opportunity for Illinois to accelerate development of AAM infrastructure and technology. Incentives such as energy credits and tax subsidies are a common method to promote the acceleration of development for sustainable technologies. For example, SAF credits offered by the federal government, in part, helped consumption of SAF increase fivefold between 2021 and 2023.[81] Illinois currently has programs incentivizing the use electric road vehicles and charging stations through rebates and grants.[82] Similar programs could be expanded to electric aircraft and charging infrastructure to help AAM manufacturers and operators establish a viable operation in Illinois, prompting additional innovation and growth in the sector.

[81] U.S. Department of Energy. "Sustainable Aviation Fuels." Accessed June 2, 2024, https://afdc.energy.gov/fuels/sustainable-aviation-fuel.

[82] Alternative Fuels Data Center, "Illinois Laws and Incentives." U.S. Department of Energy, Accessed August 23, 2024. https://afdc.energy.gov/laws/all?state=IL.

- **Public-Private Partnerships (P3s) –** Agreements between public agencies and the private sector to utilize both public and private resources may be integral in growing AAM. Existing revenue and funding structures are not oriented towards funding nontraditional technologies like AAM while many private AAM stakeholders do not have the resources to adequately finance infrastructure, making it difficult for any single party to complete AAM development projects. Even if public funding is available, it may have limited applicability (i.e. only able to be used publicly owned infrastructure) which AAM OEMs and operators may find unattractive. With stiff competition for private capital funding, AAM companies may seek public funding to advance their work. P3s could bridge the gap between the technical expertise of the private AAM sector and the resources of public agencies, such as IDOT. P3s may also give public entities a stake in an AAM sector that is largely privatized at this early stage, allowing the State to influence its development direction. P3s may also utilize private funds to develop public-use infrastructure in instances where public funding may not be available, helping to expand the AAM sector.
- **Economic Growth & Job Creation –** Providing funding and incentives for AAM development could catalyze growth of the sector in Illinois. As mentioned, the AAM sector is expected to generate more than 280,000 jobs over the next decade.[83] "By providing funding and incentives, such as workforce development programs, the State can aim to attract AAM companies, bringing with them jobs and economic activities potential successful example of this in another state is Joby Aviation's recently commitment to build a manufacturing facility that will produce roughly 500 aircraft per year in Dayton, Ohio.

3.2.6. SUMMARY OF OPPORTUNITIES

Figure 3.4 summarizes each opportunity and its relationship with each goal category. All opportunities identified relate to IDOT's Livability and Stewardship goals, underscoring the importance for the AAM sector to improve the quality of life in Illinois through the strategic growth and modernization of the transportation system. IDOT's Economy goal is equally related, as a majority of opportunities promote economic growth through more efficient movement of people and goods. AAM is moderately connected to the Resiliency goal, with the use of existing aviation infrastructure, promotion of workforce development, and implementation of de-carbonization and sustainability initiatives. However, it is likely that the AAM system will become robust and therefore resilient as the sector matures. While only two of the opportunities identified directly relate to the Illinois Mobility goal, they all support the advancement of AAM which, as a new form of transportation, is aimed toward improving the mobility of people and goods.

[83] Aijaz Hussain and David Silver; "Advanced Air Mobility", Accessed May 2024, https://www.deloitte.com/us/en/insights/industry/aerospace-defense/advanced-air-mobility.html

Figure 3.4: Summary of Potentially Achieved Statewide Transportation Goals

OPPORTUNITIES	GOALS: ECONOMY	LIVABILITY	MOBILITY	RESILIENCY	STEWARDSHIP
Existing Aviation Infrastructure	✓	✓	✓	✓	✓
Workforce Development	✓	✓		✓	✓
Partnerships with Academia		✓			✓
De-carbonization and Sustainability Initiatives	✓	✓		✓	✓
Funding and Incentive Programs	✓	✓	✓		✓

Sources: IDOT, PAC Members, Kimley-Horn (2024)

The growth of AAM presents a multitude of opportunities for Illinois to become a technological and economic leader in this emerging sector. The State's existing infrastructure, workforce, and academic base already provide a foundation for AAM to grow, while a strategic implementation of AAM will help the State achieve regulatory, environmental, economic, and social goals now and in the future. Each of the opportunities discussed in this section is considered as recommendations are made in subsequent sections that may influence the implementation of AAM in Illinois.

3.3. Illinois AAM Threats

While Illinois has many opportunities to grow and capitalize on AAM, several external factors threaten the successful implementation and integration of the technology. This section highlights the threats that face Illinois AAM today or may do so in the future. Like the opportunities, each threat is related to the five statewide goals. However, instead of identifying how each factor could help the State achieve the goals, this section identifies which threats may jeopardize the State's ability to achieve each goal. The threats and their potential impacts are discussed in the following sections.

The nine Illinois AAM threats in this section include:

- Incompatible Land Use
- Airspace Use
- Technological Limitations
- Battery Waste
- Equitable Access
- Reduced Aviation Funding
- Lack of Regulatory Guidance
- Electrification and Energy Capacity/Scaling
- Public Acceptance and Expectations

3.3.1. INCOMPATIBLE LAND USE

Incompatible land use may jeopardize the success of AAM before it can be implemented, given recent trends in the aviation industry. AAM operations may have potential impacts such as noise, privacy infringement, and visual pollution to the public, particularly as the sector reaches matures. As such, it will be crucial to locate AAM infrastructure and conduct operations where impacts can be minimized. A key step in mitigating these impacts is protecting land uses that are more sensitive and vulnerable to the effect of AAM advancement. Factors associated with AAM and land use in Illinois are provided below.

Some of the threats that can be mitigated regarding incompatible land use are as follows:

- **Zoning and Land Availability –** With most AAM use cases being planned for operations in urban or suburban areas, lack of available land may restrict where vertiports or other AAM facilities may be developed. Urban areas are already densely populated, emphasizing the need for compatible land use to avoid impacting existing populations. Conversely, if vertiports are constructed in undeveloped areas, appropriate zoning measures should be implemented at the state and local levels to prevent incompatible uses, such as residential and schools, from being developed adjacent to AAM operating areas. Beyond the immediate vicinity of vertiports, AAM routes and zoning need to be coordinated to align low-altitude AAM routes with the most compatible land uses to minimize community impacts of enroute AAM operations.

- **Noise Impacts –** After acoustic testing, Joby Aviation's eVTOL aircraft registered "45.2 dBA from an altitude if 1,640 ft at 115 mph." At this sound level, the aircraft will barely be perceptible over the noise produced by cities. Additional testing was conducted during takeoff and landing where noise levels were comparable to "normal conversation."[84] the a Although AAM aircraft anticipated to be much quieter than legacy aircraft that are powered by combustion engines, they still can generate noise that may be considered disruptive to surrounding communities. Initially, vertiports are likely to be in urban areas to provide convenient access. AAM designers have proposed to design and construct vertiports on existing building tops and parking garages in already developed and inhabited areas. However, this may cause conflicts with noise-sensitive land uses such as residential buildings, schools, and places of worship. Considerations must be made in the siting of vertiports, design of AAM corridors, and zoning of surrounding areas to limit the impacts of aircraft noise on the most vulnerable uses and populations. As the sector matures and AAM aircraft become more common, it may not be possible to confine operations to a few narrow corridors. Instead, a network of AAM routes that pass over many communities may be required. In this case, state and federal agencies, local municipalities, and private companies may need to collaborate to implement operating regulations, land use compatibility strategies, and building codes that collectively reduce the impacts of aircraft noise for those below while meeting the operational needs of AAM users and aircraft.
- **Visual Impacts –** Like airports, vertiports may range from simple landing pads to prominent structures with onsite passenger, cargo, and maintenance facilities. Vertiports may contain lighting or equipment that extends beyond the property boundary, creating visual impacts for the surrounding community. The visual impacts of AAM may vary based on the operating procedures, vertiport type, and characteristics of the surrounding area. Vertiport facilities and AAM procedures may need to be designed in such a way to limit the visual impacts of vertiports and aircraft on the surrounding community. Such considerations may include constructing walls or barriers around the vertiport (outside of appropriate safety zones), directional lighting, or pilot- or autonomously controlled lighting that limits community exposure to light emissions.
- **Privacy Infringement –** AAM aircraft are likely to be equipped with cameras and sensors that have the potential to capture images and data of individuals on the ground without their consent. AAM operators are likely to collect data related to flight patterns, passenger information, consumer trends, and performance. If data is not properly protected or shared without consent, it may infringe on individuals' privacy rights. AAM operators may have to address how data is collected, used, and maintained, while regulators will likely have to create and enforce policies that ensure data are not inappropriately used or shared.

[84] *Ben Sampson, "Joby and NASA test noise levels of its eVTOL aircraft," Aerospace Testing International, May 13, 2022, https://www.aerospacetestinginternational.com/news/drones-air-taxis/joby-and-nasa-test-noise-levels-of-its-evtol-aircraft.html.*

- **Traffic and Transportation Infrastructure –** Vertiports situated in developed areas could affect local traffic, necessitating ground transportation and transit options to ensure first-and last-mile connectivity. If roadways are not suited to handle this increase in traffic, and if other transit modes are not available, congestion may increase, adversely impacting the adjacent community. Municipal planners, developers, and AAM operators must consider ground transportation needs, including parking, when planning for AAM infrastructure.

3.3.2. AIRSPACE USE

Safety, both for aeronautical users and the public on the ground, is paramount for the AAM. The proliferation of AAM results in increased airspace use and congestion which may jeopardize already congested existing airspace, especially around Chicagoland. In certain instances, particularly in metropolitan areas, existing aviation infrastructure and surrounding airspace is already operating at or near maximum capacity. Addressing this constraint will primarily be the responsibility of the FAA. Congestion and capacity issues not only pertain to the theoretical limitations of airspace, but also to the personnel who safely manage traffic and control the physical movement within that space. While the FAA has conducted several studies, including on safety and efficiency, to evaluate potential impacts and solutions for AAM implementation, private AAM stakeholders are making advancements at a rapid pace that could have substantial impact on airspace design and operations. Therefore, it will be essential for the FAA to coordinate with other stakeholders to ensure appropriate considerations are made for emerging technologies. It should be noted that this section provides a brief overview of the primary risks related to airspace use from the perspective of the five AAM System Plan goals, while **Chapter 4: Airspace Analysis** provides a more in-depth evaluation of airspace implications for AAM's integration into the national airspace system (NAS).

Some of the threats that can be mitigated regarding airspace use are as follows:

- **Limited Airspace Capacity –** Given existing procedural and separation requirements, the NAS is limited in how many aircraft are allowed to operate within a certain sector at a given time. Although this restriction helps ensure that aircraft can traverse the airspace safely, it significantly limits the ability to accommodate the additional traffic generated by a mature AAM system. Congested airspace is becoming an issue in many areas near large airports (such as Chicago O'Hare International [ORD] and Chicago Midway International [MDW]). Designing new airspace procedures will be a key challenge as the AAM sector matures and eVTOL operations increase.

- **Lack of Modernization –** Much of the NAS currently operates using technologies designed in the 1960s and 1970s. While technologies and initiatives such as Global Positioning Systems (GPS), Automated Dependent Surveillance - Broadcast (ADS-B), and NextGen are helping to modernize the system, most airspace procedures and regulations are still oriented towards serving traditional aircraft. Modernizing this system will require not only major technological updates, but also a potential overhaul of NAS regulations.
- **Regional Variation –** Although the NAS has standardized rules, regional variation exists in airspace design and procedures based on physical characteristics, air traffic density, and available technology. Densely structured airspace over urban areas often has different airspace classifications, routes, and procedures from their rural counterparts, which can make it more complex for pilots and air traffic controllers to navigate and manage air traffic. AAM systems may have to be designed to follow the same or similar airspace classification guidance as traditional aircraft, adding complexity to these systems which will likely delay their implementation.
- **Air Traffic Controller Workforce –** The growing shortage of qualified air traffic controllers make it difficult to support existing air traffic demand. Traditional air traffic continues to increase and, given that early AAM operations are expected to communicate with air traffic control (ATC), additional controller capacity will likely be needed. Unless the ATC workforce is expanded, additional load will be placed on existing controllers, potentially compromising the safety of all aircraft operating in their airspace. Therefore, ATC workforce development must be a key focus for the AAM sector, as well as innovation of new ATC technologies to maximize controller efficiency.
- **Communication with Autonomous Vehicles –** The current ATC system primarily relies on voice communication between pilots and air traffic controllers (using radar or visual siting) to safely guide and separate aircraft. It is assumed that autonomous vehicles will not use voice commands, necessitating the use of new technologies or procedures to communicate regarding ATC instructions. Potential solutions could include the use of artificial intelligence (AI) or text-based commands; however, any technology will require extensive development and testing. This development and certification process could delay autonomous AAM deployment considerably, slowing the maturation of the AAM system.

3.3.3. TECHNOLOGICAL LIMITATIONS

The emergence of AAM has the potential to be the biggest single advancement in civil aviation since the introduction of the jumbo jet. As such, many technological limitations still exist that should be acknowledged by stakeholders. One of the primary limitations facing AAM is supplying the necessary ground infrastructure needed to operate effectively and efficiently. This includes the lack of vertiports and battery charging infrastructure needed to support AAM. Additionally, integrating a new technology such as AAM into the existing airspace poses a large challenge. Traditional airspace and infrastructure will have to be prepared to handle and adapt to the rapid advances in the technology.

Some of the threats that can be mitigated regarding technological limitations are as follows:

- **Vehicle Performance and Reliability –** Air travel is currently among the safest modes of transportation available. AAM will have to prove similar performance if it is to be widely accepted. Therefore, AAM aircraft will need to be designed and tested to meet stringent safety standards. Many of the technologies, particularly those associated with the unique propulsion systems of eVTOLs, are relatively unproven in aviation use. AAM platforms must provide more proof of reliability and performance than traditional aircraft systems, increasing time to implementation.
- **Battery Technology –** Many AAM aircraft in development rely on electric propulsion systems, which require advanced battery technology. Working towards advancing battery technology is the Argonne Battery Lab and the Collins Research and Development Center, which is hosted by Illinois. Although battery technology has improved significantly, it still has a long way to go before large-scale electrification becomes a reality. Fossil fuels still have an energy density 20 times higher than that of the most advanced batteries in use today, meaning electric aircraft cannot fly as far or carry as much weight as their traditional counterparts. Additionally, battery charging times are considerably longer than refueling times for jet or piston aircraft, requiring more time on the ground between flights. Both shortcomings may need to be improved for AAM to compete in urban or regional aviation markets. Another factor, as previously mentioned, is the weight of AAM batteries exceeds the weight of any existing batteries used in current EV. Testing of existing infrastructure will likely be necessary to ensure that current pavement and other facilities will be able to withstand landing procedures of AAM aircraft.

- **Cybersecurity and Electronic Communications –** Although initial operations intend to be piloted by most operators, the threat related to limitations of technology seeking to prevent interception, or interruption, of communication between autonomous aircraft and an operator is still posed. This vulnerability presents the need for robust encryption protocols and continuous monitoring, similar to current ATC operations, to safeguard against any potential cyber threats. Additionally, collaboration between regulatory bodies and developers is essential to understanding the level of regulations needed to establish comprehensive security standards.

3.3.4. BATTERY WASTE

Like the electric vehicles currently on the market, many AAM producers are proposing the use of lithium-ion (Li-ion) batteries in their aircraft. At the time of this writing, Li-ion batteries are the most cost effective, efficient, and long-lasting batteries available to use in vehicles, making them the desired choice for AAM aircraft. However, Li-ion batteries contain many substances than can be harmful to the environment and pose a hazard to handlers in the event of an incident or at the end of their useful life. Even as new technologies such as solid state and sodium-ion batteries proliferate, special considerations will need to be made to ensure AAM batteries do not contribute to environmental degradation, resource depletion, or hazards during the recycling process. Illinois communities, as well as communities across the country, will not be responsible for handling battery waste from AAM operations. The responsibility for managing and disposing of battery waste lies with the OEMs and operators of the AAM vehicles.

Some of the threats that can be mitigated regarding battery waste are as follows:

- **Environmental Impact –** Li-ion batteries must be properly disposed of to prevent toxic chemicals being released into the environment. The chemical composition of these batteries includes heavy metals which can contaminate soil, water, and air; adversely impact ecosystems; and pose health risks, particularly in areas where crop production is prevalent.
- **Resource Depletion –** Li-ion batteries contain valuable resources such as lithium, cobalt, and nickel that are both difficult to source and finite in availability. Even if batteries are properly recycled, not all the materials can be salvaged for reuse. The increase in demand for electronics and electric vehicles has created the issue of resource depletion, environmental damage, and human exploitation caused by mining. Better recycling methods, more efficient batteries, or alternate materials may need to be identified to avoid resource depletion in the future.

- **Fire and Explosions –** Li-ion batteries can be volatile if mishandled or damaged. While most aircraft now use more fire-resistant Li-ion batteries, improper operation, handling, or disposal of batteries can still lead to accidental ignition or explosion. This poses safety risks to those who are part of the disposal process and can be a major hazard for landfills or other disposal facilities. Those potential safety risks during accidents and disposal incidents will require new trainings and equipment for the firefighters and emergency personnel tasked with responding to the situation
- **Lack of Recycling Infrastructure –** A key effort to mitigate the hazards of battery waste is through recycling, which can help repurpose spent batteries for other uses or reuse raw materials for new batteries. The State's REV incentives include battery recycling companies and its ability to attract this type of industry has increased with the announcement of EV battery producers in the state. Currently though, development of recycling infrastructure lags far behind battery production and disposal, as only five percent of Li-ion batteries are recycled in the U.S. as of 2022.[85] Most unrecycled Li-ion batteries end up in landfills and other non-dedicated disposal sites. The introduction of electric ground vehicles and aircraft are only expected to increase this cache of un-recycled batteries, increasing the risks of fire or environmental contamination.

3.3.5. EQUITABLE ACCESS

Equity, in the context of AAM, refers to the fair and just distribution of benefits from emerging AAM transportation technology, including economic and social prosperity as a result of AAM access to all groups. Initial AAM services may be priced high as manufacturers try to offset early R&D costs. These costs may be passed on to the end users, restricting AAM usage to either luxury passenger use cases or subsidized operations. Perception of AAM as a niche market for the rich will hamper public acceptance, potentially increasing opposition to AAM integration. As such, it is imperative that AAM stakeholders work to promote affordable use cases and inclusive infrastructure planning to promote equitable access. If AAM services are not made equitable, it could lead to disparities in the broader transportation system, as funding would be stretched thinner across an increasing number of transportation modes. In addition, stakeholders should continue to promote all use cases of AAM and restrict refrain from exorbitant advertising of passenger use cases. Public perception will likely continue to take shape as more use cases are introduced. Even as the sector matures, it will be critical to address potential disparities to ensure that individuals and communities, regardless of their location or socioeconomic status, can benefit from and/or participate in this new technology.

---

[85] *Seltzer, Molly, "A Better Way to Recycle Lithium Batteries is Coming Soon from this Princeton Startup", Princeton University Andlinger Center for Energy and the Environment, March 2022, https://princeton.edu/news/2022/03/01/better-way-recycle-lithium-batteries-coming-soon-princeton-startup.*

Some of the threats that can be mitigated regarding equitable access are as follows:

- **Affordable Use Cases –** While early passenger AAM operations are expected to be expensive compared to other forms of transportation, it will be critical for affordable use cases to be established to prevent passenger AAM uses from becoming a niche market. In Illinois, the average salary for an entry level employee is $68,083/year, with the average commute costing workers $3,000 annually, roughly four percent of annual income.[86,87] If early AAM passenger operations are priced like airline tickets or even premium ride-share services (such as Uber Black), a large portion of the population will be excluded from the market. In addition, AAM will likely be a more affordable option as compared to other regional air transportation but will struggle to compete with modes such as bus or rail. Historical lessons from the airline industry show that scaling will help lower the per-unit cost of the technology, but the challenge will be to grow AAM to the point where it can compete with other modes of transportation. While potential solutions could include incentives or subsidies, each solution has associated drawbacks, namely, the risk of hampering the free market and inadvertently hindering public acceptance and support. Equity issues in AAM are often associated with passenger use cases. However, other use cases like cargo and medical services are likely to enter the market first. Addressing equity through these non-passengers use cases could help increase overall equity as AAM matures in Illinois.
- **Inclusive Infrastructure Planning –** Historically, aviation has disproportionately negative impact on populations living near airports, which are often low-income and underprivileged. The industry has made strides in recent years to improve infrastructure planning to promote inclusivity. Similarly, AAM may require development of vertiports both on existing airports and at new standalone facilities, broadening the potential community impacts of AAM operations. It will be critical for underprivileged populations to be included throughout the infrastructure planning process to ensure their input is reflected in planning outcomes. Failure to do so may hinder public support and open the sector to liabilities that would threaten its existence and success. Inclusive infrastructure planning may also need to extend to an individual level to create accessible AAM transportation options for people with disabilities.

[86] ERI Economic Research Institute, “Average Salary in Illinois, United States.” Salary Expert, Accessed May 28, 2024, www.salaryexpert.com/salary/area/united-states/illinois.
[87] Perino, Marissa. “Here’s What the Average Person Spends on Their Commute Annually in Every State.”, Business Insider, Accessed May 28, 2024. www.businessinsider.com/average-spending-on-commute-how-much-money-2019-7#illinois-304170-29.

3.3.6. REDUCED AVIATION FUNDING

For many airports in Illinois, fuel flowage fees and sales taxes imposed on users generate revenue for the planning, construction, and maintenance of the airport system. Beyond airports, state and federal agencies rely on fuel and usage charges to support initiatives, maintain infrastructure, and provide ATC services. Introduction of electric aircraft and replacement of traditional aircraft may present a challenge to generate the same types of revenues, creating challenges to maintain the Illinois Aviation System. As such, alternative tax and funding methods may need to be implemented such as electric aircraft registration or landing fees to partially offset these losses.

Some of the threats that can be mitigated regarding reduced aviation funding are as follows:

- **Decreased Airport and Fixed-Base Operator (FBO) Revenues –** Fuel sales often represent the biggest revenue source for airports and FBOs, particularly at general aviation (GA) facilities. With the introduction of electric aircraft (both eVTOL and eCTOL aircraft), airports may see a decline in direct fuel sales revenues (if the airport sells the fuel itself) or from fuel flowage fees (if the FBO or another entity sells fuel). Alternative revenue sources such as energy consumption fees or landing fees may need to be imposed to recoup lost revenues.
- **Decreased Grant Funding –** The tax rate for aviation fuel sales varies depending on the county within Illinois, but typically is 6.25 percent of the total sale price.[88] However, only 1.25 percent of fuel tax goes to public-use airports in Illinois while the remaining 5 percent tax is diverted to the general fund. Aviation fuel taxes are one of the primary funding sources for the Illinois Aviation Fund which supports IDOT's Annual Proposed Airport Improvement Program, the main funding mechanism for State airport projects. Decreased fuel sales tax revenues would shrink the fund, making it more difficult for IDOT to support airport development projects. New tax structures may need to be considered to offset these losses.

[88] Illinois Department of Revenue. "Aviation Fuel Sales and Use Tax." *State of Illinois*, Accessed May 30, 2024, tax.illinois.gov/research/taxinformation/sales/aviation-fuel.html.

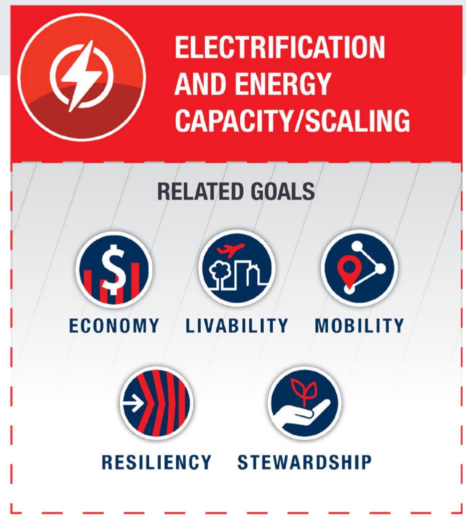
3.3.7. LACK OF REGULATORY GUIDANCE

Advancements in AAM technologies, such as electric aircraft and autonomous Beyond Visual Line of Service (BVLOS) operations, do not conform to the existing rules and regulations of traditional aircraft design, development, and operations within the NAS. The regulatory system that governs airports and heliports is geared towards existing technologies, procedures, and infrastructure rather than vertiports needed for AAM. As a result, stakeholders are faced with the challenge of adapting these technologies and creating markets within the confines of current regulatory frameworks. Confining AAM development to the existing regulatory framework will not only delay certification and introduction of AAM systems and infrastructure but will also limit the benefits that this technology can generate. Therefore, it is crucial for the State to acknowledge this challenge and proactively collaborate with various stakeholders, both within the private technology sector and at the federal level, to develop regulations specifically tailored to the components of the AAM industry. However, safety standards must not be compromised, necessitating a balance between accelerating development and rigorously testing technologies to ensure safety, reliability, and minimal impact on surrounding communities.

Some of the threats that can be mitigated regarding lack of regulatory guidance are as follows:

- **Delayed Economic Growth –** As mentioned, the AAM sector has grown rapidly in recent years and is expected to support an additional 280,000 jobs globally in the next decade. Much of this growth will be dependent on the successful certification, deployment, and operation of AAM vehicles and infrastructure. If federal regulations are not adapted to address the intricacies of AAM, advancement may be constrained, slowing economic growth of the sector. At state and local levels, regulations that limit AAM operations (incompatible zoning, noise and overflight restrictions, etc.) could constrain the ability of the industry to grow and generate economic activity in Illinois.
- **Lack of Stakeholder Participation –** Development of AAM regulations requires a balanced approach that considers the views of multiple stakeholders, especially those of AAM OEMs, potential operators and users, and local municipalities. If a balanced approach is not achieved, regulations may skew too far in favor or against AAM. If regulations concentrate on allowing unrestricted AAM operations, local communities and municipalities may experience adverse impacts from noise and other effects of AAM operations. Conversely, if AAM manufacturers and other stakeholder viewpoints are not considered when creating the regulations, they may obstruct the ability to certify and maintain aircraft, certify pilots and control systems, or operate as needed (at night, in certain weather conditions, etc.), all of which would inhibit the viability of the AAM system.

3.3.8. ELECTRIFICATION AND ENERGY CAPACITY/SCALING



The existing energy infrastructure at airports in Illinois and nationwide is not sufficient as AAM is expected to substantially increase demand as it matures. Accommodating electric aircraft will not be as simple as installing chargers on aprons. As airports become increasingly electrified, a complete overhaul of the State's energy system may be required. Both airports and communities hoping to serve AAM will have to evaluate their electrical capacity to ensure the increase in electrical demand will not overload the existing grid. Beyond addressing capacity issues, energy sourcing must be considered to ensure the use of electric aircraft, vehicles, ground equipment, and facilities does not jeopardize the industry and State's abilities to meet their carbon emissions goals.

Some of the threats that can be mitigated regarding electrification and energy capacity/scaling are as follows:

- **Electrical Grid Capacity –** Even modest electric aircraft operations may require a charging capacity in excess of one megawatt (MW), exceeding the capabilities of many small airports today.[89] Airport energy transmission systems and local grids will likely need to be improved to effectively serve AAM charging needs at existing airports and future stand-alone facilities. Alternative solutions such as microgrids may be required, however, these technologies require additional resources and funding that is not available to all airports. A concerted effort could be made to match battery storage companies in the business development pipeline with potential projects at airports throughout the State. The States utilities could include AAM in their Beneficial Electrification Plans which are mandated by CEJA.
- **Statewide Capacity –** The added demand for electricity at airports or vertiports will similarly increase the demand on regional and statewide power grids. Coordinated, large-scale infrastructure improvements may be needed for Illinois to establish an AAM network with adequate charging capabilities. It will be key to plan for these improvements while considering the increased electricity needs of eVTOL aircraft in relation to the electrification of other technologies such as electric vehicles, ground support equipment, household appliances, and industrial machinery.

[89] Amy Schwab et al. "Electrification of Aircraft: Challenges, Barriers, and Potential Impacts". National Renewable Energy Laboratory, October 2021, https://www.nrel.gov/docs/fy22osti/80220.pdf.

3.3.9. PUBLIC ACCEPTANCE AND EXPECTATIONS

The limited public knowledge surrounding AAM may hinder public acceptance of the technology, jeopardizing its successful integration into the transportation system. As such, public agencies and AAM operators will need to actively engage the public to understand the specific needs of users and local communities. A deliberate and proactive public engagement strategy may involve open house meetings, educational seminars, and focus groups. Thoughtful public engagement throughout the planning and development process can facilitate the implementation of an AAM transportation system that is widely accepted within the community. However, the most important strategy for AAM acceptance will be a safe, efficient, and relatively smooth roll-out of one or more uses cases to demonstrate AAM is a viable and competitive mode of transportation.

Some of the threats that can be mitigated regarding public acceptance and expectations are as follows:

- **Regulatory Hurdles –** Lack of public support may increase opposition of legislation or regulations that guide AAM growth. This could create delays and challenges for AAM operators or users working to get necessary approvals and permits for vertiport development or AAM operations.
- **Market Viability –** Without the support of the public and surrounding community, viable use cases may be limited, restricting AAM to niche markets and missions. Public acceptance will be critical for the growth of passenger use cases given they will likely be the most high-profile of early AAM operations. If public acceptance is not achieved, potential demand for AAM will be dampened, restricting its growth and sustainability as a system.
- **Public Perception and Reputation –** Public perception plays a crucial role in shaping the reputation of AAM. Negative public sentiment can lead to decreased support from stakeholders such as investors and policymakers, who will influence the growth (or lack thereof) of AAM.

3.3.10. SUMMARY OF THREATS

Each of the threats discussed in this analysis is presented with its relation to the five Illinois AAM System Plan goals in **Figure 3.5**. The technological, economic, social, and political environment in which AAM develops will greatly influence its success, as demonstrated by these threats and their impact on the State's ability to meet the goals of this System Plan. The four threats that impact all five goals, Incompatible Land Use, Equitable Access, Reduced Aviation Funding, and Electrification and Energy Capacity/Scaling, all connect to AAM's relationship with communities that may or may not use AAM in the future. This connection illustrates how important it is that AAM is developed with appropriate input from all stakeholders, not just those with a vested interest in AAM's proliferation. Risks associated with Airspace Use, Battery Waste, and Lack of Regulatory Guidance fall mostly under the purview of federal agencies, such as the FAA, and therefore have less direct impacts on the AAM System's goals but are equally important to the short- and long-term maturation of the sector. Finally, risks associated with Public Acceptance and Expectations are likely the end result of other threats and factors, which, if mitigated, may improve the public's perception of AAM.

Figure 3.5: Summary of Potentially Jeopardized Statewide Transportation Goals

	ECONOMY	LIVABILITY	MOBILITY	RESILIENCY	STEWARDSHIP
Incompatible Land Use	X	X	X	X	X
Airspace Use	X	X	X		X
Technological Limitations	X		X	X	
Battery Waste	X	X			X
Equitable Access	X	X	X	X	X
Reduced Aviation Funding	X	X	X	X	X
Lack of Regulatory Guidance	X				X
Electrification and Energy Capacity/Scaling	X	X	X	X	X
Public Acceptance and Expectations	X	X			X

Sources: IDOT, PAC Members, Kimley-Horn (2024)

The threats mentioned in this section describe some of the key hazards that may affect AAM and the State's ability to achieve its goals for the future transportation system. These risks will need to be mitigated through technological advancements, regulatory changes, infrastructure improvement, and community engagement to ensure AAM technologies can be as effective as possible as the sector matures.

3.4. Summary

AAM sits at a crucial juncture in its development, as many external opportunities and threats exist that could greatly impact how the sector emerges and evolves in the coming years. Understanding these opportunities and threats and how they can be leveraged or mitigated is critical in developing a framework for implementing AAM in Illinois. With an established focus on the opportunities and threats mentioned throughout this chapter, subsequent sections of this analysis document recommendations for IDOT to consider with the ultimate goal of AAM viability in Illinois.

CHAPTER 4. AIRSPACE INTEGRATION

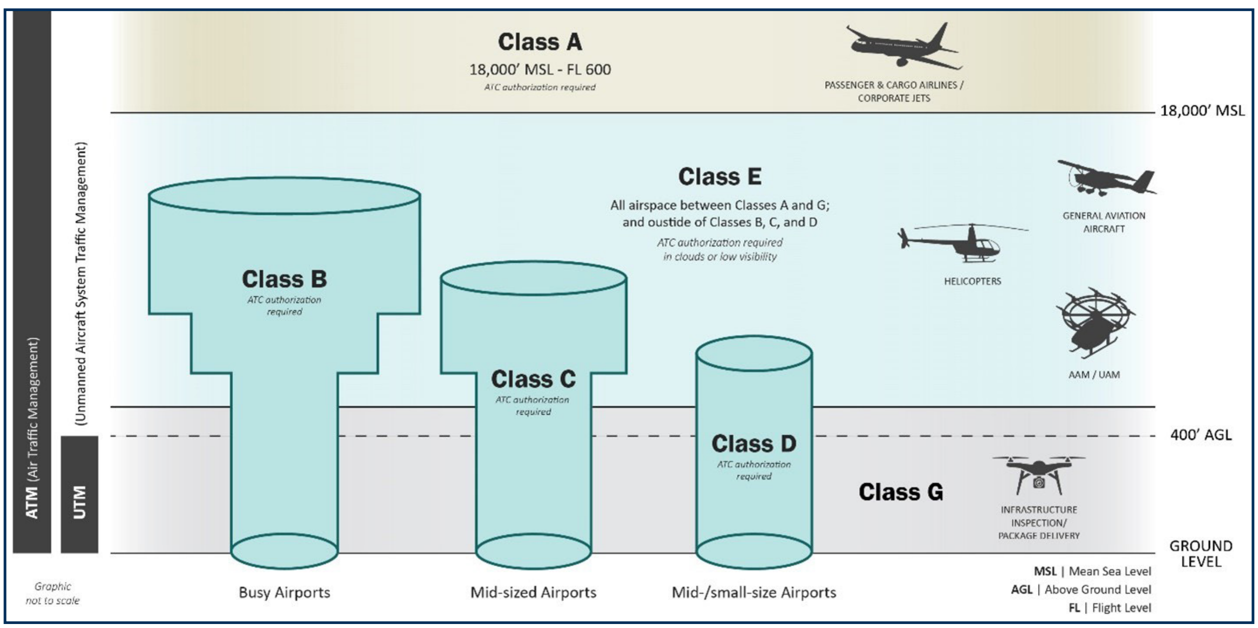
4.1. Airspace Structure Overview

Airspace is structured in three-dimensional volumes, organized and regulated by the Federal Aviation Administration (FAA). The National Airspace System (NAS) is a network of airspace and aviation facilities connected by a series of navigation systems. Air Traffic Control (ATC) assists in upholding the rules and regulations that govern the vast system to promote and ensure safety and efficiency amongst users in the U.S.

Regulations involving specific instrument equipment on board an aircraft, visibility, weather conditions, and communication procedures can govern the type of flight carried out by the pilot-in-command of an aircraft within the NAS. Therefore, pilots are required to operate using either visual flight rules (VFR), when applicable, or instrument flight rules (IFR), which require aircraft be equipped with advanced reporting systems that can communicate obstruction and separational data in low visibility situations.

Airspace includes three primary categorizations: controlled, uncontrolled, and special use. These categories help organize the NAS to operate at maximum levels of safety and efficiency. **Figure 4.1** illustrates the airspace structures within the NAS. Categories of airspace, as well as their order and specific rulings are outlined in the following section.

Figure 4.1: Proposed National Airspace Structure with AAM Corridors



Sources: FAA; Kimley-Horn, 2025

4.1.1. CONTROLLED AIRSPACE

Controlled airspace (Classes A, B, C, D, and E) refers to airspace where ATC services are provided. These "classes" are associated with the airspace above airports and are determined by the frequency and scale of operations taking place at that airport. It is likely that AAM operations will interfere with all classes of airspace except Class A. Classes of controlled airspace are further outlined below.

CLASS A AIRSPACE

Class A airspace is not shown on aeronautical charts. It begins at 18,000 feet above mean sea level (MSL) and extends up to and including 60,000 feet. Only pilots flying IFR can enter this airspace and prior permission from ATC is required. This airspace is usually controlled by the Air Route Traffic Control Centers (ARTCC) as these controllers handle en route traffic at higher cruising altitudes. ***It is likely that AAM operations will remain clear of this airspace as eVTOLs and commercial uncrewed aircraft systems (UAS) are not expected to operate at such high altitudes.***

CLASS B AIRSPACE

Class B airspace is found around the most highly trafficked airports in the U.S. Pilots must receive permission to enter Class B airspace from the controlling agency, typically the Terminal Radar Approach Control (TRACON) facility associated with the airport and region, as well as have a two-way radio and transponder with altitude reporting capability.
Once an aircraft is below a predetermined and designated altitude, the aircraft will be handed off the to the individual airport's tower controller who will clear that aircraft to land.

Starting at the surface, Class B airspace most often resembles a stack of non-uniform, horizontally flattened cylinders. These cylinders, when viewed in concept, get larger in width as the altitude increases, showing an almost inverse conic shape but with noticeable differences between each layer. These airspaces are stacked with no gaps, designed to protect the airport's departure and approach path.

Class B airspace in the State of Illinois primarily supports the following airports:

- Chicago O'Hare International (ORD)
- St. Louis Lambert International (STL)

CLASS C AIRSPACE

Class C airspace usually begins at the surface of the airport and consists of an inner cylinder with a five-mile radius and an outer cylinder with a 10-mile radius that extend from 1,200 feet to 4,000 feet above the airport's elevation. An aircraft must establish two-way radio communication with the controlling agency prior to entering and operating within the airspace. The airspace still handles a substantial volume of incoming and outgoing flights.

Class C airspace in the State of Illinois primarily supports the following airports:

- University of Illinois–Willard (CMI)
- Chicago Midway International (MDW)
- Quad Cities International (MLI)
- General Wayne A. Downing Peoria International (PIA)
- Abraham Lincoln Capital (SPI)

CLASS D AIRSPACE

Class D airspace exists at any airport with an operating air traffic control tower where Class B or Class C airspace does not exist. In turn, the shape of Class D airspace is less standard than Class B or C airspace and is based on the airport reference point (ARP). Pilots must establish two-way radio communication with the controlling agency before entering and operating within the airspace. Class D airports that are towered may have a part time control tower (less than 24-hour coverage) in which case the airspace may revert to Class E or Class G airspace when the tower is not in use.

Class D airspace in the State of Illinois primarily supports the following airports:

- St. Louis Regional (ALN)
- MidAmerica St. Louis (BLV)
- Central Illinois Regional Airport at Bloomington-Normal (BMI)
- St. Louis Downtown (CPS)
- Southern Illinois (MDH)
- Waukegan National (UGN)
- Aurora Municipal (ARR)
- Chicago Executive (PWK)
- Dupage (DPA)
- Decatur (DEC)
- Veterans Airport of Southern Illinois (MWA)
- Chicago/Rockford International (RFD)

CLASS E AIRSPACE

Class E airspace encompasses all other controlled airspace that is not Class A, B, C or D. It allows ATC to manage IFR aircraft outside of an airport's airspace. Class E airspace typically surrounds airports having instrument approaches and encompasses portions of the instrument approach paths. Typically, Class E will start at 1,200 ft above ground level (AGL). However, different circumstances, such as a control tower closing at night, will result in Class E airspace reaching the surface. Additionally, airports without a control tower may have a "transition area" surrounding them that begins at 700 ft AGL to offer ATC services to aircraft arriving or departing. In other cases, such as operating over a military operations area (MOA), Class E airspace will begin at 14,500 MSL. All Class E airspace extends up to but does not include Class A airspace. When the ceiling of Class A airspace ends at 60,000 ft MSL, Class E resumes and extends up to the edge of the atmosphere.

4.1.2. UNCONTROLLED AIRSPACE

Uncontrolled airspace, also called Class G airspace, encompasses all airspace that is otherwise not a part of Class A, B, C, D, or E. It is possible that as AAM aircraft are integrated into the NAS, previously uncontrolled airspace may require control by different centers or technologies to ensure the safety of passengers of AAM aircraft.

CLASS G AIRSPACE

Within Class G airspace, sometimes referred to as "ground airspace," ATC services are not offered and there are no entry requirements. However, if you are transitioning from Class G to any form of controlled airspace, the appropriate contact and requirements must be met prior to entering. You will not find class G depicted on sectional charts as it exists at the ground and extends upward until it meets controlled airspace.

4.1.3. SPECIAL USE AIRSPACE

Special use airspace designates airspace for specific operations where limitations must be imposed to ensure the safety of other aircraft. Individual special use airspace can involve controlled and uncontrolled airspace. In most cases, it is best practice to contact the controlling agency to understand the specifics of each area. The different types of special use airspace are further outlined below.

RESTRICTED AREAS

Restricted areas contain operations of aircraft that may be hazardous to other aircraft during hours of operation. This can include military operations such as artillery firing, aerial gunnery, or guided missile testing. Penetration of restricted areas during their hours of operation may be extremely hazardous to the aircraft and its occupants. Hours of operation and specific altitudes can vary by location.

PROHIBITED AREAS

Prohibited areas are sections of airspace that unauthorized aircraft are prohibited from using.

WARNING AREAS

Warning areas are typically over bodies of water and extend out, away from U.S. coastline. Warning areas are issued when the U.S. does not have full authority over operations, but hazards may be present. Due to Illinois' minimal coastline and inland location, it is unlikely to find Warning Areas within the state.

ALERT AREAS

Alert areas are depicted on aeronautical charts to inform pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots should be particularly alert when flying in these areas. All activity within an alert area shall be conducted in accordance with the Code of Federal Regulations (CFRs), without waiver, and pilots of participating aircraft as well as pilots transiting the areas shall be equally responsible for collision avoidance.

MILITARY OPERATION AREAS

Military operation areas (MOAs) consist of airspace established for the purpose of separating certain military training activities from other aviation traffic. Whenever a MOA is in use, civil traffic may be cleared through the MOA if separation can be provided by ATC.

4.2. AAM Airspace

Understanding the intricacies of non-traditional airways is crucial for the future of AAM.

This section delves into the definitions and implications of various airspace conditions, including:

- Existing Helicopter Routes in Illinois
- UTM and BVLOS
- AAM Airspace Corridors

These non-traditional airways could be leveraged to support and enhance AAM initiatives. Through a comprehensive examination, this document seeks to identify opportunities for integrating these airspace conditions into a cohesive framework that ensures safe, efficient, and scalable AAM operations.

4.2.1. EXISTING HELICOPTER ROUTES IN ILLINOIS

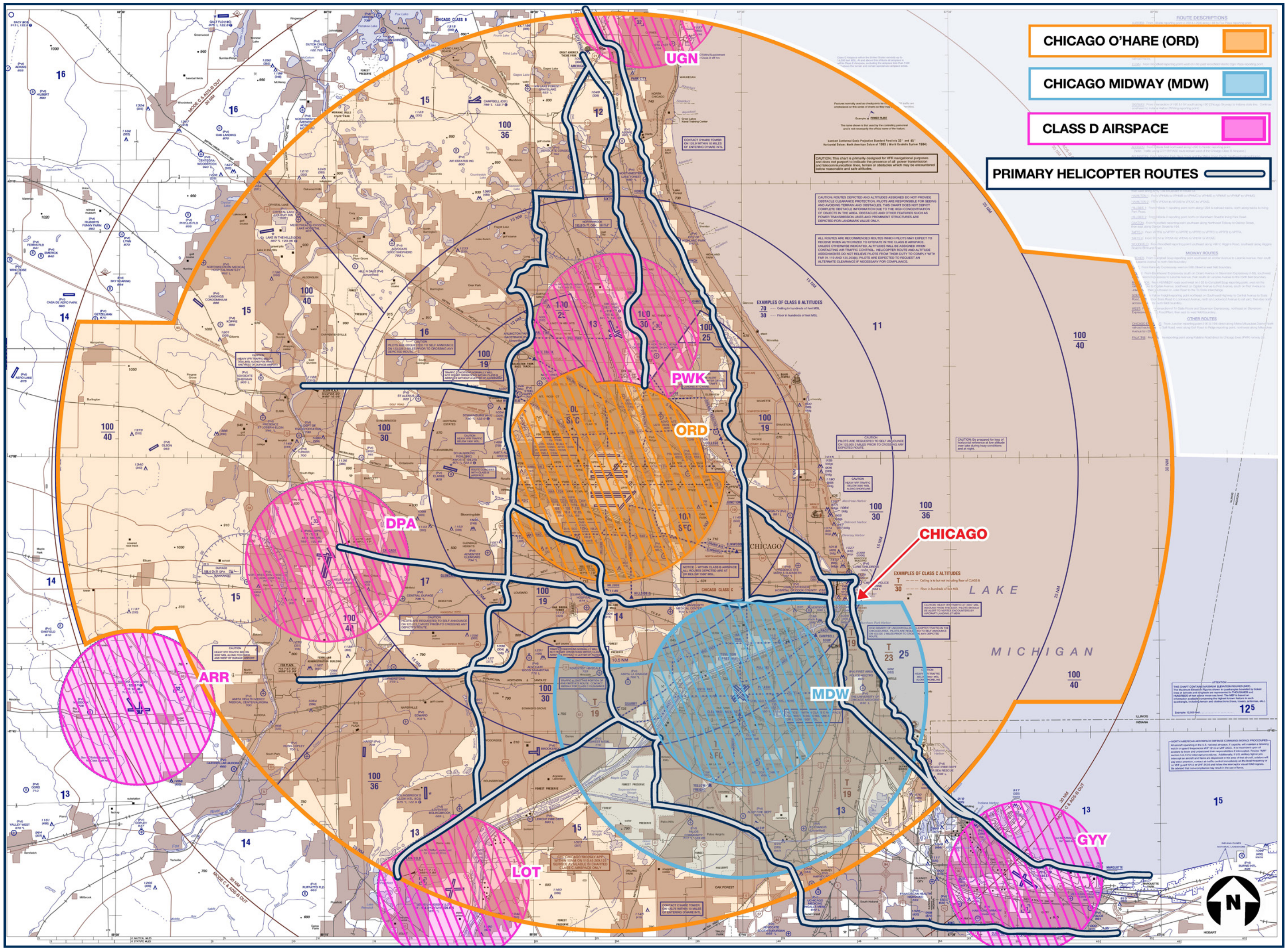
Helicopter routes, as defined by the FAA, are specific airspace pathways designed to facilitate helicopter navigation in areas with high concentrations of helicopter activity. These routes are depicted on the FAA's Helicopter Route Charts, which provide essential aeronautical information, including routes, heliports, navigational aids (NAVAIDs), and obstructions. Key features of these routes include designated pathways to help helicopters navigate safely through busy airspace, information on heliports and their communication frequencies, and marked obstructions and landmarks to aid visual navigation. While adherence to charted routes and recommended altitudes is generally voluntary, controllers may assign specific routes and altitudes when necessary for safety or traffic management. These routes can pass through various airspace classes, including controlled (Class B, C, D, E) and uncontrolled (Class G), and are designed to avoid restricted or military airspace that requires prior authorization. In some cases, local law enforcement may request restrictions within designated operating zones, which controllers can enforce if it does not adversely affect other aircraft operations. These regulations ensure that helicopter operations are conducted safely and efficiently, minimizing the risk of mid-air collisions and other hazards.

There may be an opportunity for AAM aircraft to utilize a variety of existing helicopter routes, procedures (Part 91 VFR), and infrastructure (helicopter routes, helipads, ATC services). Part 91 VFR, for example, could provide a baseline for requirements and guidelines on how future AAM pilots would operate aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going. While challenges are expected in adapting helicopter VFR routes to function also as AAM routes, such as increased congestion of existing helicopter routes, these routes could serve as a foundation for AAM corridors, especially during the initial stages of implementation.

In the U.S. there are currently eight published helicopter charts. Chicago, as a major metropolitan area, has FAA charts that include primary helicopter routes. These routes align with the outer portions of the controlled airspace around ORD and MDW. Additionally, there are transition routes connecting the primary helicopter routes to the airports' centers. Most of these routes follow existing roadway infrastructure or water features (river/canal) for visual reference and to minimize impact on non-participants and routes over residential areas.

Figure 4.2 presents an overlay of primary helicopter routes in Chicago. As AAM corridors are developed, it is important to evaluate the potential confluence of traditional helicopter routes and any new AAM routes that could be established.

Figure 4.2: Overlay of Primary Helicopter Routes in Chicago



Sources: FAA, Kimley-Horn

4.2.2. UNMANNED AIRCRAFT SYSTEM TRAFFIC MANAGEMENT (UTM)

UTM is a system designed to manage the traffic of drones (or UAS) flying at low altitudes, typically below 400 feet AGL. The goal of UTM is to safely integrate drones into the airspace without interfering with crewed aircraft, helicopters, or other drones. It involves a cooperative interaction between drone operators, service providers, and the FAA. The system uses digital communication and automated systems to share flight details and ensure real-time situational awareness for all airspace users. UTM is designed for UAS use cases such as lightweight cargo delivery, agriculture, and infrastructure inspection. The operations within UTM airspace often referred to as "low altitude airspace" and could also exist in controlled airspace, including Class B, C, D, or E airspace, or in uncontrolled Class G airspace.

4.2.2.1. Beyond Visual Line of Sight (BVLOS)

A crucial aspect of UTM is the ability to conduct BVLOS operations. BVLOS allows drones to fly beyond the direct line of sight of the pilot, enabling a wide range of commercial and public safety applications, including package delivery, infrastructure inspection, and search and rescue missions.

For BVLOS operations to be successful within the UTM framework, several advanced technologies and systems are required:

- **Automated Systems –** These systems facilitate the sharing of flight details and maintain real-time situational awareness.
- **Data Exchange –** Digital communication protocols enable drone operators to share their planned flight routes and receive real-time updates on airspace status.
- **Detection and Avoidance –**Technologies that detect and avoid other aircraft, obstacles, and hazards are critical for the safety of BVLOS operations.
- **Regulatory Framework –** Regulatory bodies, such as the Federal Aviation Administration (FAA), are working to establish rules and standards that authorize and ensure the safety of BVLOS operations.

By integrating BVLOS capabilities into UTM, the goal is to create a safe, scalable, and efficient environment for routine drone operations in low-altitude airspace. The combination of UTM and BVLOS is expected to revolutionize industries and enhance public safety, paving the way for a future where drones coexist harmoniously with crewed aircraft.

UTM is still under development for BVLOS operations of uncrewed aerial systems (UAS) by the FAA, the National Aeronautics and Space Administration (NASA), other federal partner agencies, and industry professionals.

4.2.3. AAM AIRSPACE CORRIDORS

Air traffic in the US, specifically around major metropolitan areas, is extremely congested. Due to increased air traffic demand, ATC staffing shortages, and a projected increase in air traffic operations by AAM vehicles, the NAS may be updated to include specific conditions for controlling AAM aircraft. This includes developing specific routes for AAM operations that would relieve workload from ATC and assist in standardizing operations across the NAS. The AAM corridors would primarily be used as an airway to accommodate safe RAM operations.

An AAM corridor is a specific airspace route designed for eVTOL aircraft. These corridors aim to facilitate the transportation of people and cargo in locations with varying amounts of population. As of February 2025, no AAM corridors are fully operational. According to the FAA, the development of AAM corridors will progress alongside the growth of the AAM industry, with eVTOLs expected to use existing helicopter routes and follow traditional VFR and IFR operations like conventional aircraft in the near term. These corridors will function as procedural routes without ATC separation services, operating with defined vertical and lateral dimensions. The AAM corridors will feature directional tracks that can be spaced laterally and/or stacked vertically, depending on the corridor's dimensions and procedural designs.

Although AAM corridors may pass through various FAA airspace classes, they are considered performance-based airspace structures with their own rules for access and operations.[90] However, traditional cruising altitude rules may still apply. These rules require that VFR aircraft flying above 3,000 ft above the surface fly specific altitudes based on their magnetic course. Additionally, IFR aircraft below 18,000 feet MSL must fly at odd thousand-foot altitudes when flying a heading of 0 to 179 degrees and even thousand-foot altitudes when flying a heading of 180 to 359 degrees. How these AAM flights, if automated in the future, will navigate around existing traffic, rules, and controlled airspaces in the NAS remains to be determined.

It is assumed that cruising AAM aircraft will operate within these corridors above 4,000 feet.[91] These AAM airspace corridors will have specific rules and requirements, with typical flight distances ranging from a few miles to several dozen miles. As technology and deployment advances, aircraft operations are expected to become more precise, quieter, and more weather-tolerant, allowing for denser corridor operations in populated areas. Consequently, the density of AAM corridors, the number of vertiports, and the frequency of AAM flights are expected to increase.

[90] Performance-based airspace structures are designed to manage airspace based on the performance capabilities of aircraft and their systems, rather than strictly on predefined routes or fixed airspace boundaries.

[91] Federal Aviation Administration, "FAA Issues Implementation Plan Outlining Steps to Usher in Advance Air Mobility," 18 July 2023.

4.2.4. AIRSPACE INTEGRATION CHALLENGES

Integrating AAM traffic into Illinois presents several challenges. While these challenges are not immediately pressing when eVTOLs adhere to existing flight rules and airspace regulations, they become more pronounced as AAM operations scale and incorporate autonomous technology. Although autonomy is the end goal for AAM operations, early stages of these operations will be crewed. The exact timeline for full-scale implementation remains uncertain, in the near term, the number of AAM operations and the technology itself likely won't strain Illinois' existing airspace. However, as AAM matures in Illinois, many challenges may present themselves, including:

→ LIMITED AIRSPACE CAPACITY

The existing NAS has restrictions on how many aircraft can operate within a given sector at a time.[92] While the goal is to ensure safety, it limits the ability to accommodate additional demand such as AAM. Congested airspaces near major airports, such as ORD and MDW, exacerbate this challenge.

→ LACK OF MODERNIZATION

NAS relies on outdated ground-based navigation systems. To integrate AAM effectively, the NAS needs both technological updates and an overhaul of regulations to enable simultaneous autonomous AAM operations.[93]

→ REGIONAL VARIATION

Different airspace rules exist based on geographical characteristics, air traffic density, and technology. AAM systems must be equipped to navigate the variations of controlled airspace, such as transitioning from Class E to Class B in and around Chicago.

→ ATC WORKFORCE

A shortage of qualified controllers affects the ability to accommodate increased demand. Expanding the ATC workforce is crucial for safe AAM operations.

→ COMMUNICATION WITH AUTONOMOUS VEHICLES

AAM systems will require new communication methods beyond voice commands, potentially involving AI or text-based instructions. Developing and certifying these technologies will take time, delaying large scale AAM deployments.

→ GROUND IMPACTS

Existing AAM technologies strive to produce less noise than traditional aircraft however the impacts to areas located below AAM corridors is still a critical issue. To safeguard vulnerable communities of noise generation from low flying aircraft, communities may consider developing zoning restrictions to reduce flight over residential areas.

[92] An airspace sector is a designated area of airspace controlled by air traffic controllers, defined by geographic boundaries and altitudes. They vary in size and shape depending on a variety of factors, including geographic location, traffic volume, and complexity of the airspace.
[93] More information on FAA and IDOT policies impacting AAM are provided in Chapter 5.

4.3. AAM Corridor Modeling – Case Studies

This section details two case studies within the Chicago region, focusing on developing a conceptual AAM corridor. The purpose is to demonstrate what RAM may look like in an area of Illinois that is most ripe for the industry. There are substantive hurdles the industry, both private and public, must overcome to achieve such a goal, especially near Chicago. The case studies detail the reasons behind corridor placement and highlight a variety of challenges that exist, such as airspace conflicts, incompatible land uses, noise concerns, among others. These case studies aim to provide stakeholders with an initial perspective on how an AAM corridor could integrate with the existing airspace early on. It also presents considerations for integration that could guide future discussions with the FAA, should the development of AAM corridors be warranted.

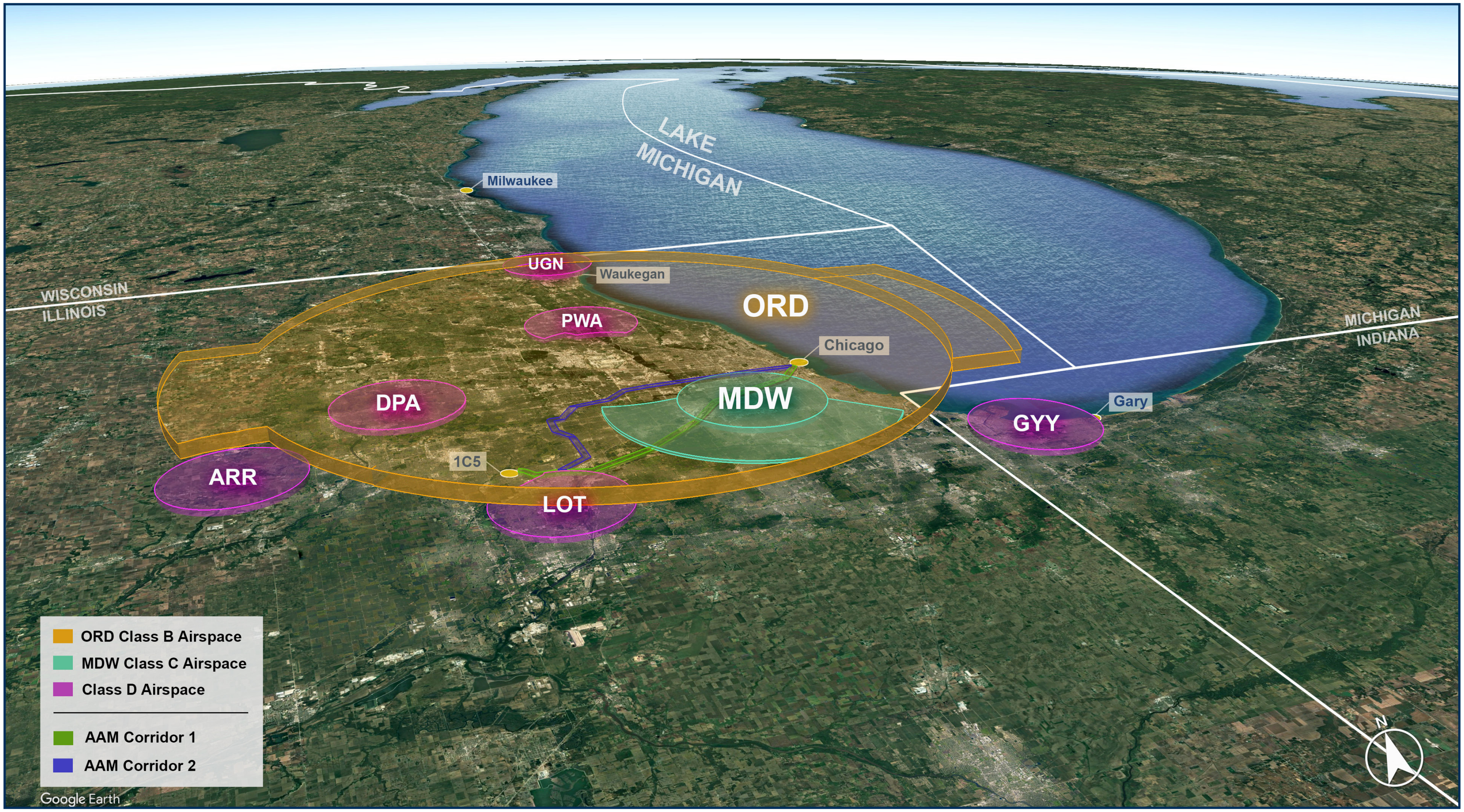
The FAA holds the responsibility and authority to develop AAM corridors, ensuring their safe integration into the NAS. The illustrative corridor design included in these case studies is based on industry-wide recommendations for mitigating AAM impacts on non-participants at ground level, similar to existing helicopter routes. This conceptual visualization effort envisions future AAM corridors, providing a framework for future development and integration of AAM in the Chicago region.

Figure 4.3 presents an overview of the two case study corridors; the first (RAM Airspace Case Study – Scenario 1) is depicted in green and the second (RAM Airspace Case Study – Scenario 2) is depicted in blue.

Both scenarios connect the same two conceptual vertiport locations: Bolingbrook's Clow International Airport (1C5) and downtown Chicago near Union Station. 1C5 was chosen as the origin to showcase the use of an existing airport. Additionally, its suburban location and proximity to downtown Chicago is a realistic opportunity and use case for RAM. The driving distance between 1C5 and downtown Chicago is approximately 31 miles, which can take over 1 hour and 30 minutes during typical commuting hours.

The FAA is solely responsible for the safe and efficient use of the NAS, including the research, analysis, and development of future AAM corridors. The case studies presented below are a conceptual modeling effort for stakeholders to understand the possibilities of a future AAM corridor, including the magnitude of challenges the industry must overcome before RAM becomes a reality. The illustrations below are for conversation purposes only and are not an indication or recommendation from IDOT that they should be developed.

Figure 4.3: RAM Case Studies Overview

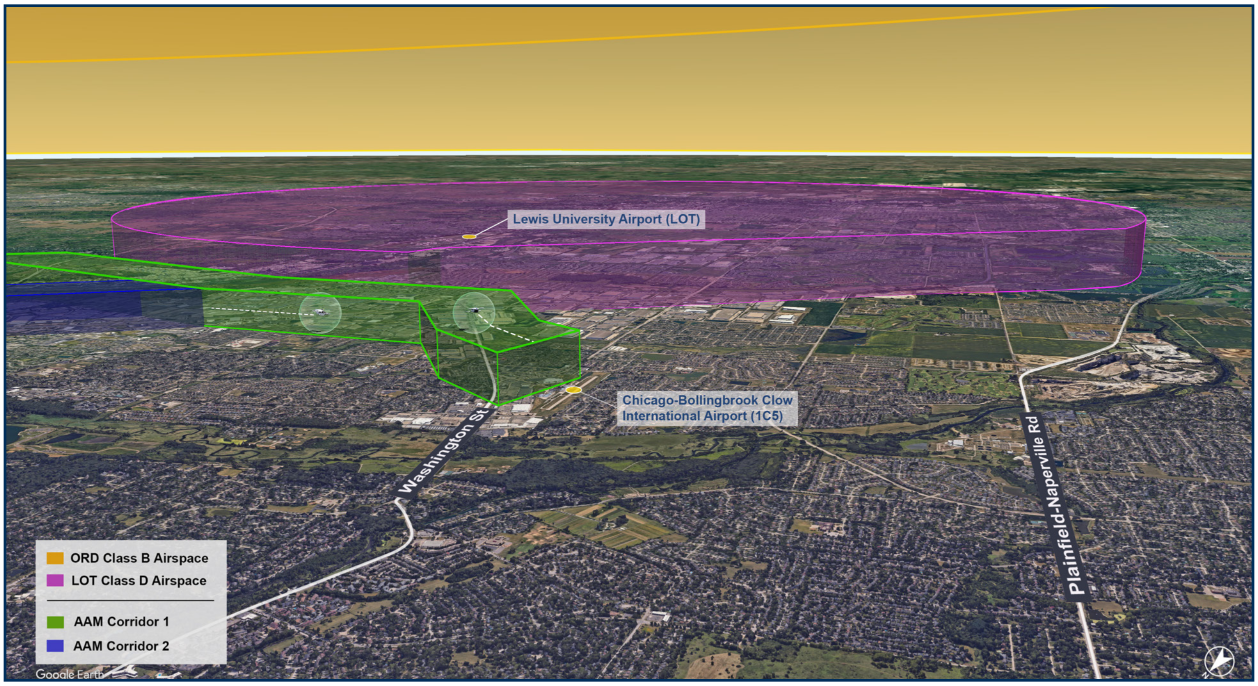


Source: Kimley-Horn, 2024

4.3.1. RAM CORRIDOR CASE STUDY - SCENARIO 1 (GREEN CORRIDOR)

Scenario 1 traverses Chicago airspace in a direct, point-to-point route. As shown in **Figure 4.4**, the route departs from 1C5 and enters the corridor traveling to the east and climbs to and maintains the desired altitude. Class E airspace is present beginning at 700 feet, and ATC services are offered to IFR aircraft. The route purposely avoids Lewis University Airport's (LOT) Class D airspace, a busy area with significant air traffic particularly due to heavy flight training activity. The total length of Scenario 1 is expected to be roughly 27 nautical miles.

Figure 4.4: RAM Corridor Scenario 1; Section 1



Source: Kimley-Horn, 2024

The route continues east, eventually intersecting the Chicago Sanitary and Ship Canal. Some benefits and issues associated with this example include:

Benefits

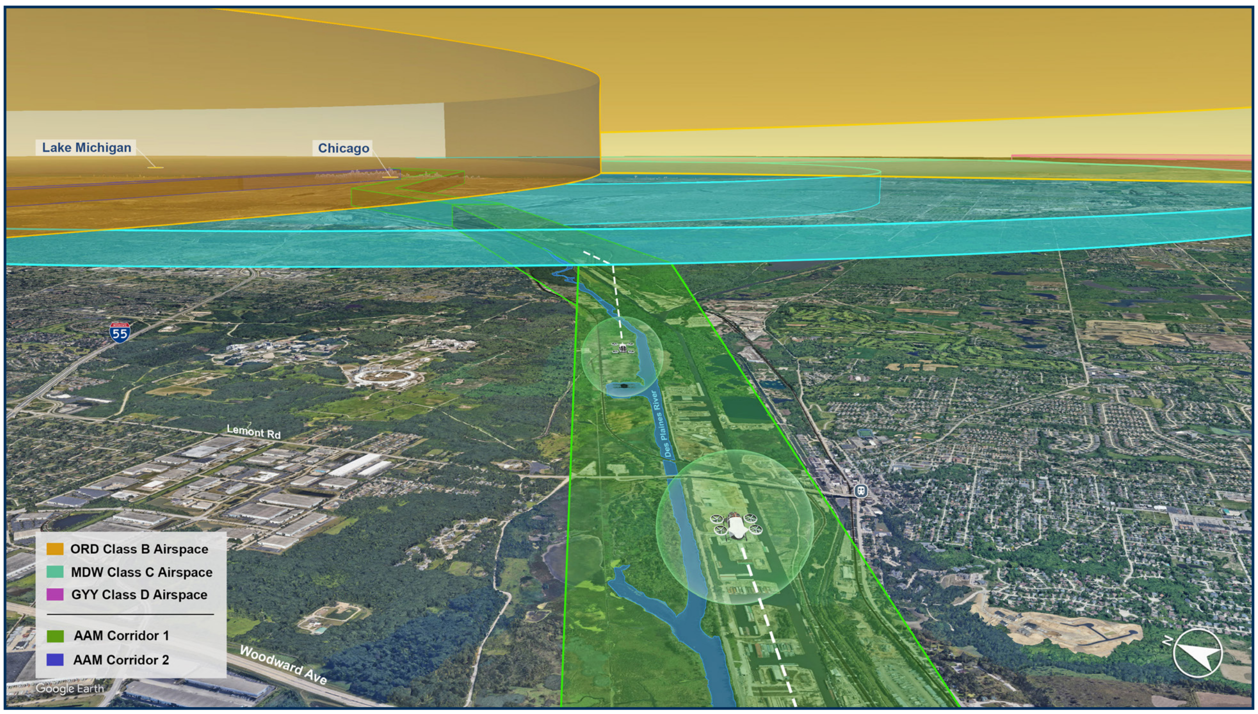
- Avoid LOT's Class D airspace.
- Originates from an existing airport with established airspace protections and support facilities.
- Primarily travels over Washington Street, a major surface road, avoiding residential and commercial land uses below.

Issues

- Still within proximity of LOT's Class D airspace, likely causing increased congestion around flight training traffic.
- While mostly over a main arterial roadway, likely creates noise and visual pollution.

Continuing toward downtown Chicago, the route travels east, aligning with the Chicago Sanitary and Shipping Canal, limiting overflight of more sensitive land uses, infrastructure and development. **Figure 4.5** also depicts two AAM aircraft traversing in opposite directions. It is assumed that these aircraft would be vertically separated, traveling at specific altitudes depending on their direction of travel while avoiding ORD's Class B airspace and MDW's Class C airspace. The floor of ORD's Class B airspace begins at 3,600 feet and MDW's Class C airspace, in this case, begins at 1,900 ft MSL. Additionally, **Figure 4.5** shows that the corridor travels under the outer tier of MDW's Class C airspace and then transitions into the Class C airspace. This is a major conflict as MDW handles a substantial volume of incoming and outgoing commercial air travel.

Figure 4.5: RAM Corridor Scenario 1; Section 2



Source: Kimley-Horn, 2024

Benefits

- Travels over the Chicago Sanitary and Shipping Canal, avoiding residential land uses, mitigating negative safety and noise impacts.
- Travels under and avoids ORD's Class B airspace.
- Initially travels under and avoids the outer tier of MDW's Class C airspace.

Issues

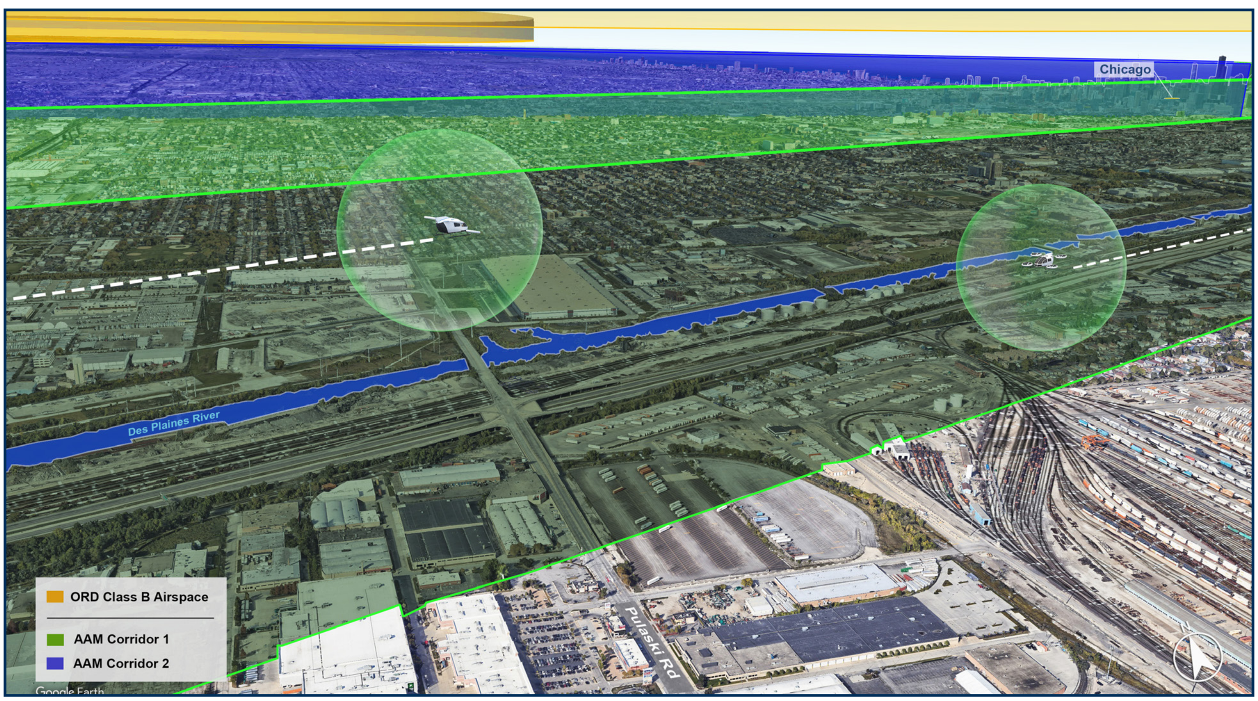
- Due to the density of the surrounding Class B and Class C airspace, eVTOL's will have limited altitude available for vertical separation of aircraft traveling in opposite directions throughout this section of the corridor.
- Conflicts with MDW's core Class C airspace, requiring two-way communications before entering - potentially creating congestion in the corridor.

Figure 4.6 depicts two eVTOL aircraft traveling through the AAM corridor within the core of MDW's Class C airspace. Due to the proximity to MDW, prior to entering this airspace, pilots will have had to communicate with MDW ATC. MDW is equipped with four runways, with the longest being Runway 13C/31C. This runway measures 6,522 feet in length and 150 feet in width and can accommodate commercial aircraft such as the Boeing 757. The track of this route over the canal puts the corridor's center roughly 1.5 nautical miles away from the touchdown point of traffic arriving via Runway 13C.

Placing an AAM corridor along the canal provides an effective visual reference point for pilots operating within Class C airspace, enhancing their positional awareness while navigating around the corridor. This approach, similar to the VFR Waypoint Chart Program, could help enhance safety and provide navigation aids for pilots unfamiliar with the area.[94] Although it is likely rare that eVTOL aircraft and aircraft operating in the center of MDW airspace will operate under VFR, operating over the canal could help all reduce pilot deviation and enhance awareness of those operating VFR by providing another positional marker. Additionally, this path is more direct and traverses a shorter distance as opposed to the second corridor.

It should be noted that this analysis is based on existing arrival and departure procedures out of MDW. Arrival and departure procedures are subject to change which could negatively or further constrain the ability of eVTOLs to navigate this airspace.

Figure 4.6: RAM Corridor Scenario 1; Section 3



Source: Kimley-Horn, 2024.

[94] The VFR Waypoint Chart Program is a supplemental tool used by VFR pilots to assist in position awareness and navigation in unfamiliar area in or around Class B and Class C airspace.

Benefits

- Travel over the Chicago Sanitary and Shipping Canal can provide visual aid to those navigating within busy Class C airspace, reducing pilot deviation and creating spatial awareness.
- Direct path to downtown Chicago, requiring fewer turns and less power consumption.

Issues

- Conflicts with MDW's core Class C airspace, putting AAM operations extremely close to MDW operations, necessitating extensive coordination with MDW ATC to ensure safe separation.
- Increased ATC workload and potential stress on the system.

4.3.1.1. Scenario 1 Summary

RAM Corridor Scenario 1 was developed to demonstrate the most direct route from 1C5 to downtown Chicago. Direct routes are an important factor for RAM as they promote time savings and reduce energy consumption. Scenario 1 navigates primarily over a waterway, which enhances safety for those on the ground and promotes land use compatibility. However, a major conflict arises when an eVTOL traverses MDW airspace, creating significant challenges with ATC and arriving and departing aircraft operations.

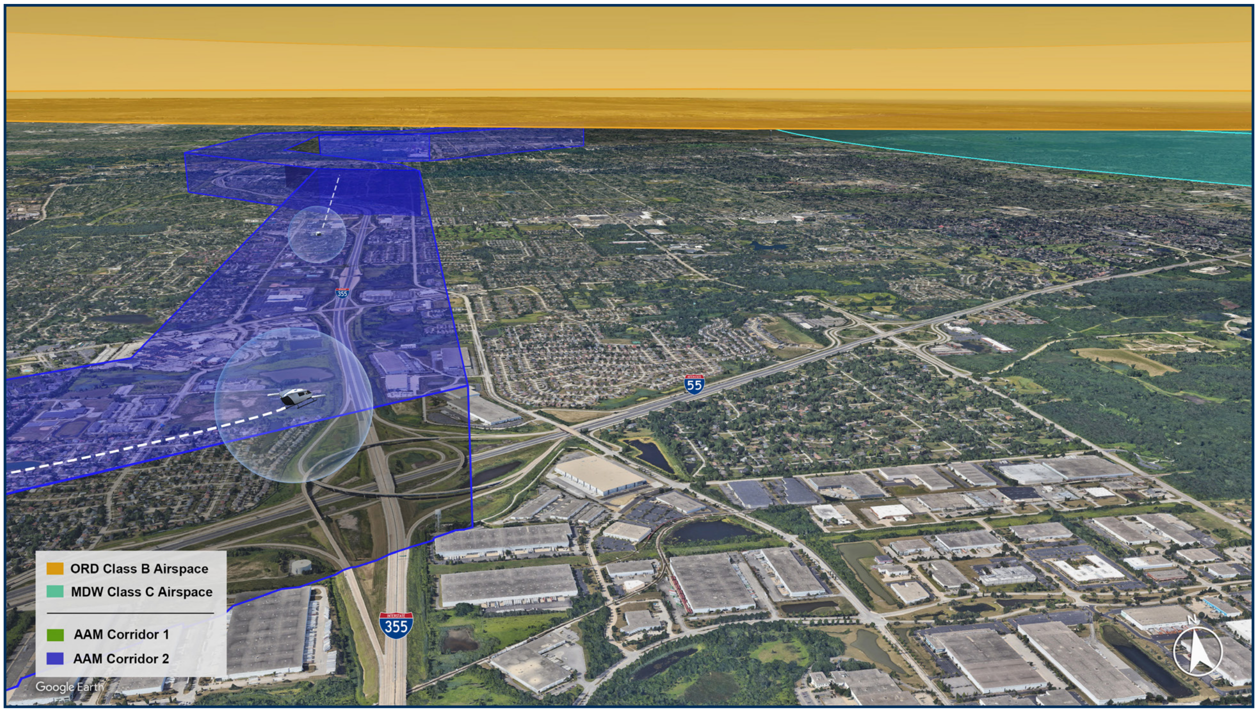
ATC is already at capacity in many ways, from workforce shortages to congested skies, so additional aircraft control and monitoring will likely overly stress the existing system. While the AAM corridor illustrated in Scenario 1 uses best practices for flight corridors, the complexities of this airspace prove the feasibility of Scenario 1 is extremely low.

4.3.2. RAM AIRSPACE CASE STUDY - SCENARIO 2 (BLUE CORRIDOR)

Scenario 2, depicted in blue in **Figure 4.7**, adopts a different strategy by following major arterial roads and highways to minimize impacts. Overall, Scenario 2's route is longer in time and in distance but effectively avoids ORD and MDW airspace.

After taking off from 1C5 using the same initial path as Scenario 1, Scenario 2 then splits to the east along Interstate 55 (I-55) until it intersects I-355. The conceptual corridor utilizes I-355 to shield noise-sensitive areas such as parks, schools, and residential neighborhoods from additional noise exposure. Similar to Scenario 1, the highway also provides a sense of security protecting the airspace above from being interfered with by ground structures. Additionally, this corridor remains clear of all Class B, C, and D airspace in its entirety and remains in Class E airspace throughout. This corridor's route is longer and will result in a longer flight time.

Figure 4.7: RAM Corridor Scenario 2; Section 1



Source: Kimley-Horn, 2024

Benefits

- Travel over arterial highways can aid in reducing noise impacts to surrounding communities.
- Avoids Class B, C, and D airspace.

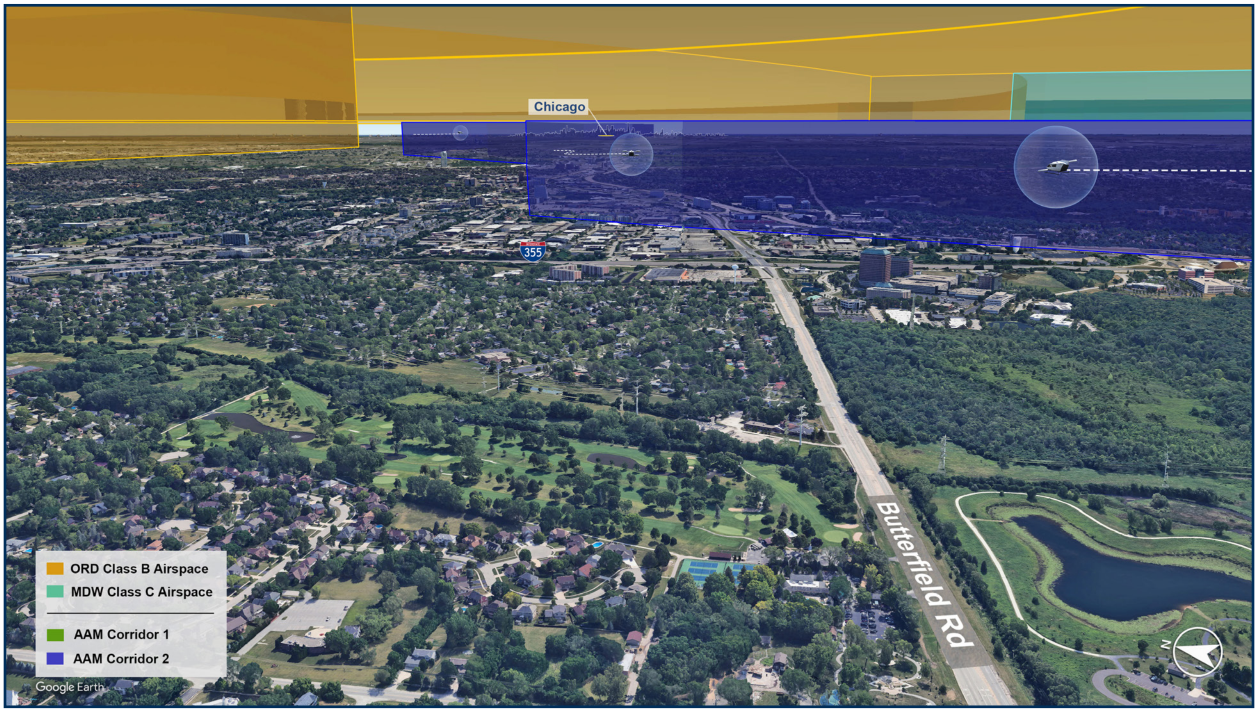
Issues

- Longer en route flight time.
- Requires additional turns, increasing power consumption.
- Comes within proximity to noise-sensitive areas.

Illustrated in **Figure 4.8**, this AAM corridor navigates below ORD Class B airspace as well as between ORD Class B airspace and the core of MDW Class C airspace. As a result, aircraft navigating the corridor will need to change headings roughly 10 times from beginning to end of the corridor. In turn, this route will likely be less efficient in terms of energy conservation and time spent en route. Additionally, this creates more room for pilot deviation or error. The path of the corridor from point A to point B spans roughly 32 NM.

AAM aircraft within this corridor will not be subject to the restrictions or clearances of Class B or C as it does not intersect either of these airspaces and remains in Class E airspace. However, to remain clear of ORD and MDW airspace, an eVTOL will need to travel through the corridor at a height of 1,899 ft MSL or lower. This will allow the aircraft to travel below the second tier of ORD airspace.

Figure 4.8: RAM Corridor Scenario 2; Section 2



Source: Kimley-Horn, 2024

Benefits

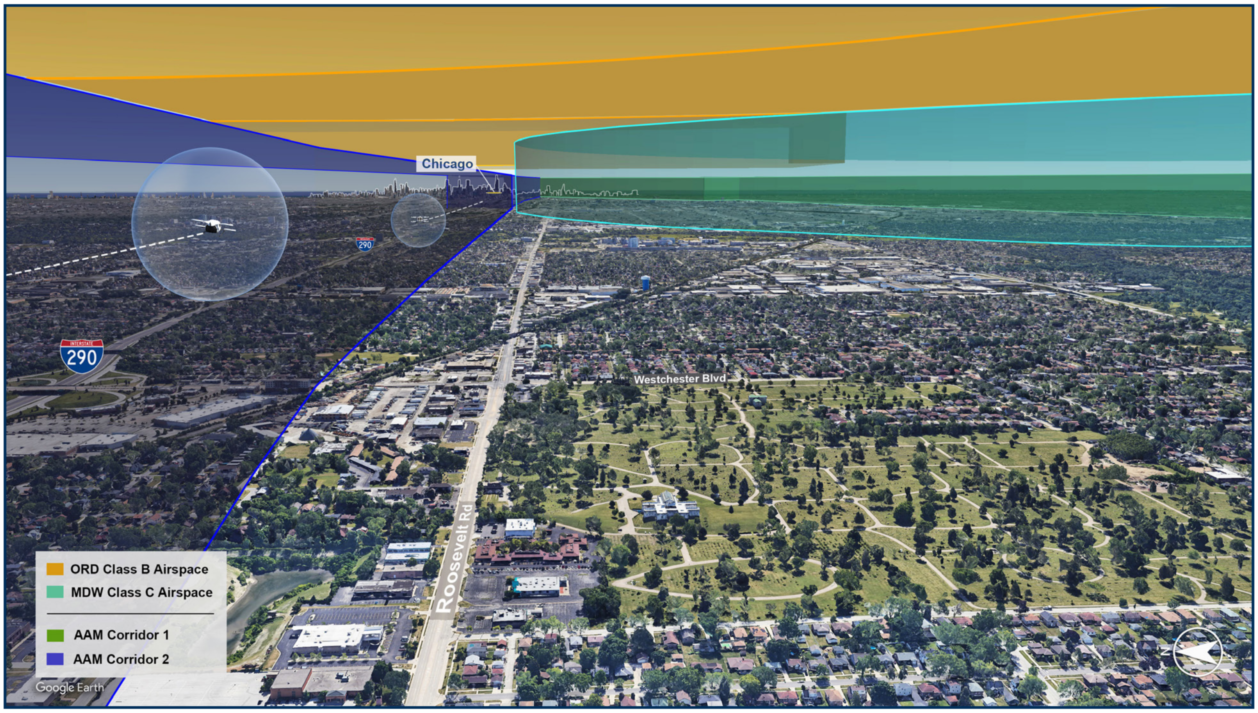
- Travel over arterial highways can aid in reducing noise impacts to the surrounding communities.
- Highway naturally protects corridor from future non-compatible development.
- Avoids conflicts with ORD Class B and MDW Class C airspace.

Issues

- Changes direction approximately 10 times throughout the corridor, increasing energy consumption.
- Increased flight duration.
- Navigational challenges, requiring skilled pilot and/or navigational equipment.
- Height restrictions of 1,899 feet or lower are in place that will reduce the availability for vertical separation between eVTOL aircraft.

The corridor then intersects with Interstate 290, an auxiliary highway that provides direct access to the city. As illustrated in **Figure 4.9**, the corridor remains just outside of Class C airspace. However, it travels directly over residential and commercial land uses. This proximity could produce a negative public reaction to the corridor resulting in a longer approval process and complexities between the many local jurisdictions and ordinances. It could also lead to significant noise and visual pollution which can typically be mitigated with increased altitudes. However, ORD and MDW airspace limit that ability.

Figure 4.9: RAM Corridor Scenario 2; Section 3



Source: Kimley-Horn, 2024

Benefits

- After intersecting Interstate 290, eVTOL would be on a direct path to downtown Chicago.
- Avoids conflicts with ORD Class B and MDW Class C airspace.

Issues

- Traverses over residential and commercial land uses.

4.3.2.1. Scenario 2 Summary

RAM Corridor Scenario 2 was developed to demonstrate a route that avoids ORD Class B and MDW Class C airspace. Scenario 2 navigates primarily over main arterials and state highways, which enhances safety for those on the ground and can positively impact land use compatibility. However, to avoid airspace conflicts, the route requires significant navigation to the north and east. This increased navigation requires additional turns and altitude changes compared to Scenario 1, increasing fuel consumption and reducing profitability for the operator. Additionally, the route of Scenario 2 would require a highly skilled pilot familiar with Chicago airspace.

While the AAM corridor illustrated in Scenario 2 uses best practices for flight corridors, the complexities of this airspace prove the feasibility of Scenario 2 is also extremely low.

It should be noted that other routes may exist. The scenarios shown in this chapter highlight a couple of options, and AAM corridors will be developed based on need and demand. A route to the south was also evaluated, navigating over Lake Michigan and avoiding complex airspace and land use concerns. However, the length and time required for this route would increase substantially, which is not ideal due to assumed operator cost concerns.

4.4. Summary

The NAS is inherently complex, requiring clear guidelines for operation. The emerging technology of AAM is not yet included in these guidelines, so the integration process is still developing and demands extensive planning to address challenges on local, national, and global scales.

Integrating RAM traffic into Illinois' already busy airspace presents unique challenges, especially with the goal of operations shifting from crewed to autonomous.

The case studies in this chapter focused on issues associated with safety and land use, but there are many other crucial aspects that the industry must evaluate, including:

- Limited airspace capacity
- Outdated NAS technology
- Regional variations in airspace rules
- ATC workload concerns
- Operating in poor weather conditions
- Emergency landing locations
- Local jurisdictions and ordinances on noise, flight times, and frequency
- The need for a robust infrastructure network to handle increased AAM flights, encompassing vertiports, NAVAIDS, and other necessary instruments

RAM is a use case within AAM that has garnered considerable attention and anticipation. However, it is crucial for the industry and IDOT to focus on more tangible use cases in the near term. Emphasizing a "methodical and incremental" approach, it is vital to prioritize decisions that focus on UAS and developing ground infrastructure in the near-term, to support RAM operations in the mid-to-long-term future.

By addressing these foundational elements first, the industry can ensure a solid groundwork is laid for the integration of RAM. This approach will not only help in managing the complexities of the NAS but also provide a smoother transition as new technologies and use cases emerge.

CHAPTER 5. RECOMMENDATIONS FRAMEWORK

5.1. Introduction

The Illinois Department of Transportation (IDOT) is committed to building a forward-looking, multimodal transportation system that embraces innovation, sustainability, and equity. As part of this vision, the integration of Advanced Air Mobility (AAM) represents a transformative opportunity to enhance connectivity, reduce congestion, and support economic development across the state.

This chapter presents a comprehensive framework of recommendations developed through a collaborative planning process involving key stakeholders from across the aviation, transportation, academic, and public sectors. Guided by input from the Project Advisory Committee (PAC), these recommendations are designed to support the safe, efficient, and equitable deployment of AAM technologies in Illinois.

While these recommendations provide a strategic foundation, their success depends on thoughtful execution and alignment with evolving regulatory frameworks. The sections that follow outline a detailed Implementation Strategy to guide phased deployment and coordination across agencies, as well as a comprehensive overview of federal, state, and local regulatory guidance.

Together, these components form a cohesive roadmap for transforming Illinois into a national leader in next-generation air mobility.

This chapter includes the following sections:

- Recommendations
- Implementation Strategy
- Regulatory Guidance

5.2. Recommendations

IDOT facilitated three targeted and purposeful PAC meetings to support the integration of AAM into Illinois' transportation system. These meetings created a collaborative forum where key industry stakeholders could share insights, raise concerns, and develop actionable recommendations.

Participants represented a diverse cross-section of critical sectors, identified through a collaborative process involving IDOT, the consultant team, and interested parties. Each meeting was designed to foster in-depth, multi-perspective discussions that identified essential steps for successful AAM integration. To maximize participation, the first two meetings offered both in-person and virtual attendance options, while the third was held virtually. In-person attendance was strongly encouraged when available to enhance engagement and collaboration.

Meeting objectives were clearly defined in advance, and small group discussions were facilitated to promote thoughtful dialogue and meaningful contributions. Recommendations were developed in close coordination with PAC members during the in-person sessions. Participants represented organizations such as original equipment manufacturers (OEMs), academic institutions, the FAA, state and regional transportation agencies, as well as airport, heliport, and vertiport sponsors in both Illinois and the St. Louis region.

Unlike previous statewide reports that relied on performance metrics, the recommendations from this initiative are organized into broader thematic categories (see **Figure 5.1**). This approach reflects the emerging nature of the AAM industry, where specific data points are limited and evolving. As such, the recommendations are aligned with overarching AAM-related objectives rather than narrowly defined metrics.

Figure 5.1: Recommendation Categories

Source: Kimley-Horn

5.2.1. AAM INFRASTRUCTURE AND ZONING RECOMMENDATIONS

Three recommendations were identified under the AAM Infrastructure and Zoning Recommendations category. These include improving aviation facility electrification, developing a statewide land use plan that includes zoning and ordinance guidelines for local governments, and evaluating and amending project prioritization. Further details on each recommendation are provided below.

5.2.1.1. Improve Aviation Facility Electrification

All airports rely on electricity to support daily operations and aviation services. However, the electrification of airports and aircraft related to AAM introduces new challenges in both power demand and grid capacity.

Source: Brian Jenkins/Beta Technologies

Charging fully electric aircraft is expected to significantly increase electricity consumption. While installing charging infrastructure is the ultimate goal, proactive steps are needed to ensure that the utility systems can accommodate this development.

IDOT should identify a strategic network of Illinois airports and heliports that are prepared, or close to being prepared, for electric aircraft operations. The findings of this study will inform future infrastructure improvements across Illinois' aviation system.

The study should focus on the following key components to strengthen the electrical capabilities of Illinois' aviation facilities:

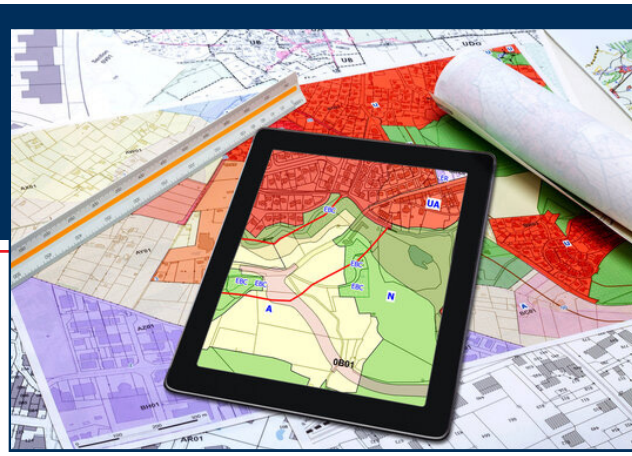
- **Infrastructure and Technology Assessment –** Evaluate existing electrical infrastructure, coordinate with utility providers, assess feasibility for three-phase power upgrades, and explore emerging technologies such as renewable energy and battery storage.
- **Operational and Environmental Impact –** Analyze energy demand, fleet electrification potential, and environmental benefits such as carbon emission reductions.
- **Economic and Policy Considerations –** Assess costs, funding sources, financial feasibility, and regulatory frameworks that influence electrification adoption.
- **Implementation and Stakeholder Engagement –** Develop phased deployment strategies, pilot projects, and stakeholder collaboration plans to ensure successful statewide implementation.

Coordinated evaluation and implementation of these activities will support the expansion of electric aircraft, AAM aircraft, and ground support equipment. Future efforts should build on the success of initial projects. If early metrics indicate positive outcomes, IDOT should explore broader electrical upgrades across the aviation system, ensuring funding alignment and technological advancements, including electric vertical takeoff and landing (eVTOL) integration.

5.2.1.2. Develop a Statewide Land Use Plan that includes Zoning and Ordinance Guidance and Best Practices for Local Governments

AAM is reshaping aviation, enabling eVTOL aircraft to integrate into urban, suburban, and regional transportation networks. As AAM technologies evolve, there is a critical need for a comprehensive statewide land use plan to ensure coordinated, consistent and safe implementation.

Local governments must establish clear zoning guidelines to facilitate the integration of AAM infrastructure into preexisting local development frameworks.



These guidelines should address the unique operational requirements of AAM, including vertiports, flight corridors, and noise mitigation strategies. Without proper regulatory direction, municipalities may struggle to accommodate AAM technologies, potentially delaying their adoption.

IDOT can lead this effort by:

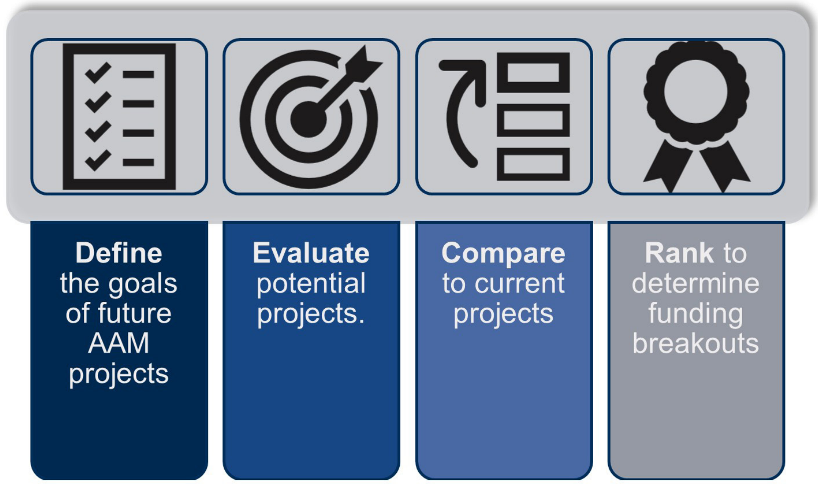
- **Engaging communities** through public forums to secure stakeholder input and ensure public support.
- **Publishing statewide zoning guidance and best practices** for local governments to reference and implement.
- **Providing technical guidance** to help municipalities update their planning and zoning ordinances.
- **Illustrating approval processes** to streamline development and permitting for AAM infrastructure.

A structured statewide AAM land use plan should prioritize education, expert training, and policy alignment across jurisdictions. Additionally, future implementation strategies should consider funding, community engagement, and emerging AAM technologies such as eVTOL advancements.

5.2.1.3. Evaluate and Revise Project Prioritization Criteria to Reflect Evolving Transportation Needs

IDOT Aeronautics administers the statewide Airport Capital Improvement Plan (ACIP) using federal and state funds to support airport improvement projects. This program, also known as Transportation Improvement Programming (TIP) is reviewed annually through TIP meetings, which include participation in the FAA's State Block Grant Program (SBGP). As part of SBGP, IDOT Aeronautics manages FAA Airport Improvement Program (AIP) grants to non-primary airports across the state. For federally funded projects, IDOT follows the FAA's project prioritization system. However, for non-federally funded projects, or projects funded only by a state and/or local grant, the FAA's National Priority Rating (NPR) is not used. The project selection criteria for these state and local funded programs are developed to favor the identified aviation needs at the time of the program development.

To fully integrate AAM into Illinois' aviation system, AAM infrastructure projects must become eligible for grant funding. Currently, airports, heliports, and vertiports cannot request funds from the FAA or IDOT for AAM planning, design, or construction. As AAM adoption accelerates, requests for these projects are expected to increase, requiring proactive funding solutions.



Source: Kimley-Horn

Updating the Illinois Aviation System Plan to incorporate AAM-related priorities would promote a seamless transition for future funding opportunities. IDOT should evaluate existing projects, assess their alignment with AAM objectives, and determine valid funding scenarios for vertiports, and other critical AAM infrastructure.

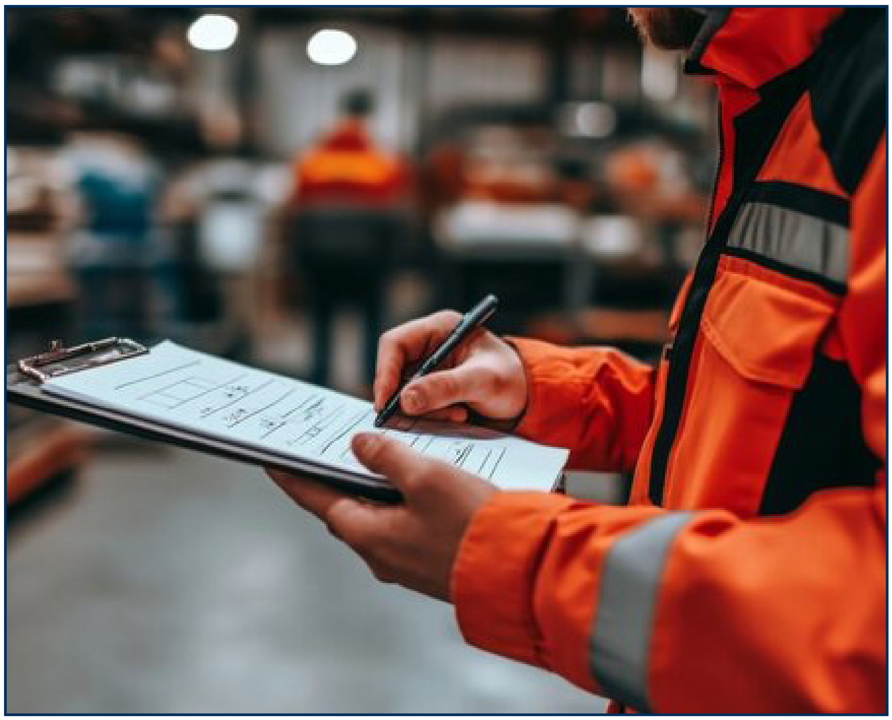
By expanding state funding eligibility for AAM infrastructure, Illinois can establish a modern, efficient, and sustainable transportation network that supports long-term mobility innovation. An updated project prioritization framework should reflect technological advancements, regulatory requirements, and community considerations to ensure effective funding allocation.

To enhance financial oversight, the framework could incorporate a project management tool that provides real-time tracking of anticipated funding needs. This tool could feature categorization toggles, enabling clear distinctions between project types and improving budget forecasting and strategic planning.

5.2.2. AIRSPACE AND SAFETY RECOMMENDATIONS

Three recommendations were identified under the Airspace and Safety Recommendations category. These include: coordinate with local first responders on fire safety to account for electric aircraft, conduct an Illinois statewide review of non-aviation public assets, and develop a statewide obstruction study. Each recommendation is provided in more detail below.

5.2.2.1. Coordinate with Local First Responders on Fire Safety to Account for Electric Aircraft



Aircraft Rescue and Fire Fighting (ARFF) services are required at airports that hold a Part 139 certificate from the FAA. These airports must provide ARFF services during air carrier operations.

There are 17 airports that provide ARFF services in Illinois. Conversely, there are almost 80 additional airports in Illinois that do not have ARFF on-site, requiring their local first responders to be familiar with the local airport to act effectively during a fire emergency. Electrification at aviation facilities, including airports, heliports, and vertiports, adds another layer of complexity as it relates to fire suppression and safety. Electric aircraft pose unique fire safety challenges due to their high-voltage electrical systems and large lithium-ion batteries. While initial vertiports are unlikely to maintain a FAA Part 139 certificate or on-site ARFF, their associated first responders must be aware of the vertiport as well as its potential for electric fires.

As the demand for fire safety and responsiveness to electric fires grows, it is imperative for IDOT to inform and educate local first responders across all localities in Illinois.

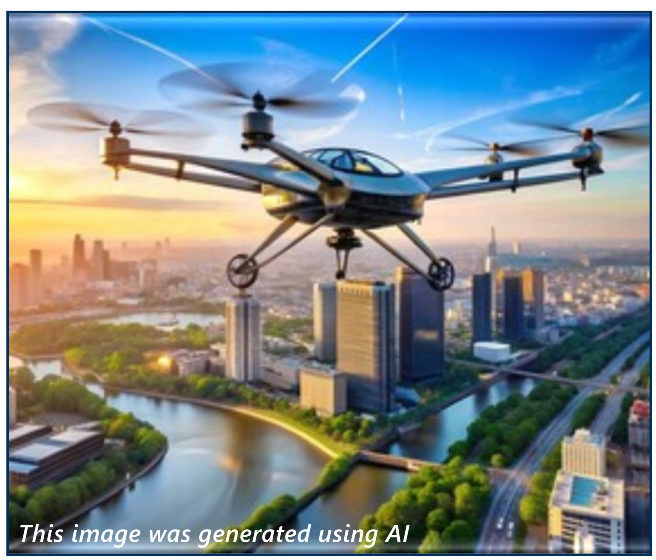
IDOT should consider the following as it relates to enhanced preparedness and effectiveness of first responders handling electric fires at airports, heliports, and vertiports in the state:

- **Develop Educational Materials –** Develop detailed guides and manuals for first responders with essential information on handling electrical fires. The information could include safety protocols, equipment usage, and emergency response procedures. Online resources, including training modules and webinars, could also be made available.
- **Conduct Training Programs –** IDOT could facilitate workshops and seminars across the state. These workshops could also include a variety of industry partners including airport sponsors, eVTOL OEMs, and first responders.
- **Provide Funding and Resources –** To support local fire departments and aviation facilities, IDOT could allocate grants and financial aid to aviation facilities, similar to the traditional aviation facility capital improvement program (CIP) and grants process. These funds could be used for fire suppression equipment, protective gear, and infrastructure to mitigate electric fires.

While new resources are important, Illinois does not need to start from scratch. The State Fire Marshall, in collaboration with the International Association of Fire Chiefs, has already developed technical guidance, training materials, and outreach initiatives to help local jurisdictions address the unique hazards of lithium-ion battery incidents. Although aviation applications of this technology introduce distinct challenges, Illinois benefits from a solid foundation of interagency partnerships and established best practices. By leveraging this groundwork and implementing a comprehensive communication and education strategy, IDOT can effectively equip local first responders to meet the growing demand for fire safety and preparedness in response to electric fires.

5.2.2.2. Conduct a Statewide Review of Non-Aviation Public Assets that could Support AAM

To effectively integrate AAM into Illinois' urban planning framework, a comprehensive review of non-aviation public assets is essential. These assets will play a critical role in AAM expansion, providing viable locations for vertiports, infrastructure development, and emergency landing sites.


This image was generated using AI

The initial review should focus on identifying potential vertiport locations, prioritizing assets that are strategically positioned for integration into the AAM system. Early stakeholder engagement, including collaboration with local governments and community leaders, will help gather input and ensure public support. Additionally, conducting risk assessments and safety evaluations will be vital for addressing operational hazards and compliance requirements.

Understanding the economic and social implications of utilizing non-aviation public assets will provide deeper insights into the benefits and challenges of this approach.

To advance this review, IDOT could implement the following actions:

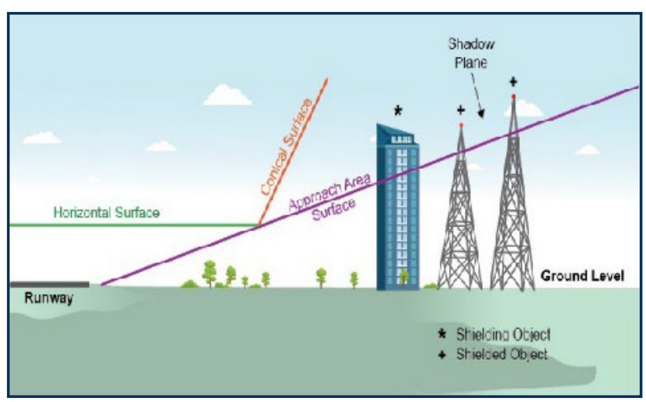
- **Comprehensive Asset Inventory –** Conduct a statewide inventory of non-aviation public assets, including parking garages, rooftops, highway rest areas, vacant industrial sites, and public transportation hubs.
- **Statewide Land Use Plan –** Incorporate guidance on non-aviation public assets into the statewide land-use plan, outlining how these sites could be leveraged in partnership with AAM initiatives.

This strategic review will optimize the placement of vertiports, flight corridors, and supporting infrastructure, ensuring seamless integration with existing transportation networks and urban planning efforts. By focusing on efficient land use and resource allocation, the plan will support the safe, scalable, and sustainable growth of AAM technologies statewide, reinforcing Illinois' commitment to mobility innovation and environmental sustainability.

5.2.2.3. Develop a Statewide Obstruction Study

Airport planning has traditionally focused on identifying and mitigating obstructions within the airport environment. A common method for airspace preservation is the use of Part 77 surfaces, which include the runway's primary surface, approach surface, transitional surface, conical surface, and horizontal surface. These surfaces are essential tools for maintaining safe airspace and minimizing obstruction-related hazards.

In 2020, the Illinois Aviation System Plan found that 27 percent of its primary runways were negatively impacted by obstructions, primarily from vegetation growth. While these obstructions do not directly compromise safety—thanks to mitigation measures such as increased approach minimums—they highlight the widespread nature of obstructions and their impact on aviation efficiency.



Source: FAA

With the rise of AAM operations, the scope of obstruction concerns extends far beyond traditional airport boundaries. The increased number of heliports and vertiports, along with the anticipated low-altitude operations of Uncrewed Aircraft Systems (UAS), calls for a more comprehensive statewide obstruction study to proactively identify and address potential hazards. This study would focus on mapping and analyzing physical obstructions such as tall buildings, towers, and natural terrain that could interfere with flight paths and vertiport locations.

Obstruction studies are critical for aviation safety, ensuring that both natural and man-made obstacles are properly identified and mitigated. For AAM operations, these studies take on even greater importance, as eVTOL aircraft will operate at lower altitudes, often in densely populated urban environments where obstacles are more prevalent.

To ensure safe and efficient aviation operations statewide, IDOT should conduct an aviation obstruction study encompassing:

- **Data Collection & Mapping –** Identifying and mapping existing structures (buildings, towers, wind turbines, antennas, etc.), natural features (mountains, trees), and temporary obstructions (construction cranes) that could interfere with air navigation.
- **Airport & Airspace Analysis –** Evaluating obstructions near airports, heliports, and air traffic corridors to determine their impact on approach, departure, and en-route safety.
- **Risk Assessment & Mitigation Strategies –** Identifying high-risk areas where obstructions pose significant hazards and proposing solutions such as structure height limits, marking and lighting requirements, or adjustments to flight paths.
- **Future Planning & Development Guidelines –** Providing recommendations for urban development, infrastructure projects, and zoning regulations to prevent new hazards.

By conducting this obstruction study, IDOT can proactively enhance aviation safety, support the growth of AAM, and ensure responsible airspace management. A well-executed study will not only mitigate risks but also pave the way for a safe, efficient, and community-supported implementation of AAM.

5.2.3. PUBLIC EDUCATION AND COMMUNITY ENGAGEMENT RECOMMENDATIONS

Two recommendations were identified under the category of Public Education and Community Engagement Recommendations category. Those include developing an Illinois AAM public education and acceptance guidebook and evaluating and identifying additional Illinois AAM use cases. Further details on each recommendation are provided below.

5.2.3.1. Develop and Illinois AAM Public Education and Acceptance Guidebook

Successful implementation of AAM technologies requires broad public understanding, acceptance, and policy alignment to ensure smooth integration into urban and regional transportation systems. Without early education and community engagement, regulatory challenges and public resistance could delay AAM adoption, impacting funding availability, infrastructure development, and overall public trust. Educating the public ensures that AAM infrastructure is built thoughtfully, safely, and with long-term community buy-in. By fostering early and transparent communication, Illinois can proactively address concerns surrounding safety, noise management, economic impact, and operational feasibility, ensuring that AAM delivers tangible benefits while securing public confidence in its future expansion.

The recommendation aims to develop a comprehensive guidebook to educate the public and foster acceptance of AAM technologies in Illinois. The guidebook will support local governments, policy makers, utility providers, fire departments, airport sponsors, transportation agencies, and residents, helping them communicate the importance of long-range planning for AAM and the evaluation of vertiports statewide.

Effective public education and engagement will be essential for IDOT's successful implementation of AAM. Involving citizens, industry leaders, and municipal stakeholders in discussions about technology, safety, and infrastructure will build trust and prevent misinformation. Without clear, transparent communication, AAM adoption may face public opposition that could slow its development.

IDOT should develop an Illinois AAM public education and acceptance guidebook that includes the following:

- **AAM Frequently Asked Questions (FAQ) Document –** Developing an FAQ sheet would address common concerns, including noise impact, safety protocols, and operational timelines. This document can be distributed at meetings and online to ensure widespread access to key information.
- **AAM Brochure –** IDOT could prepare a public-facing brochure providing AAM overview and benefit information; quick facts on topics such as noise and safety, infrastructure, and use cases; and FAQs.
- **Website and Digital Resources –** Continue to update IDOT's ilaviation.com website to include the FAQs, AAM Brochure, and other Illinois AAM information and deliverables for public access.

By addressing common concerns and misconceptions, the guidebook will help build public trust and support for AAM initiatives, ensuring a smooth integration of these technologies into everyday life.

5.2.3.2. Evaluate and Identify Additional Illinois AAM Use Cases

The Illinois AAM System Plan identified a shortlist of key use cases for AAM, referencing several well-developed applications, including cargo operations, passenger travel, emergency response, military support, and agricultural services. However, a variety of additional use cases exist and should be further researched to determine their feasibility within Illinois' aviation system. A deeper analysis of real-world AAM operators will provide valuable insights into emerging technologies and operational needs.

Source: Valqari

For example, Valqari, a UAS operator in its development stage, seeks to provide point-to-point medical supply transfers between hospitals—a critical service that highlights AAM's potential in healthcare logistics. Similarly, passenger eVTOL companies such as Archer and Joby, are advancing urban and regional air mobility solutions that could transform short-distance travel. Archer, in partnership with United Airlines, is preparing to launch the first commercial electric air taxi route in Chicago, connecting Chicago O'Hare International Airport (ORD) to Vertiport Chicago—North America's largest vertical aircraft takeoff and landing facility. BETA Technologies, another key player in the AAM ecosystem, is developing electric aircraft and charging infrastructure with a strong focus on regional connectivity and sustainability. Their work with both civilian and military partners underscores the importance of interoperable systems and scalable infrastructure. These examples illustrate the diverse applications of AAM. Additional use cases include: more efficient cargo transport, emergency response and disaster relief, medical and organ delivery, military logistics, and agricultural operations. Understanding the operational requirements, infrastructure needs, and broader societal impacts of these varied use cases will be essential for shaping Illinois' long-term AAM strategy.

Beyond improving IDOT's knowledge base, these insights will also support the development of the public education and acceptance guidebook recommended in earlier planning efforts. Ensuring that stakeholders, policymakers, and residents have a clear understanding of AAM's expanding role will be crucial in building trust, supporting regulatory updates, and guiding infrastructure investments. Given the rapid evolution of AAM technologies, IDOT should continue to evaluate and integrate a wide range of use cases into its planning framework.

5.2.4. SYSTEM PLANNING AND ACCESS RECOMMENDATIONS

Two recommendations were identified under the System Planning and Access Recommendations category. Those include updating the state aviation fund revenues to include tax revenues from electrical utilities and incorporating AAM into Illinois' Long Range Transportation Plan (LRTP). Each recommendation is provided in more detail below.

5.2.4.1. Update State Aviation Fund Revenue Sources to include Tax Revenue from Electrical Utilities

Source: National Aviation Academy

As the aviation industry evolves, so too must the funding mechanisms that support it. With the anticipated decline in aviation fuel tax revenues due to electrification, Illinois has an opportunity to explore alternative, future-oriented revenue sources. One potential avenue is evaluating the feasibility of incorporating tax revenues from electric utilities used for aviation purposes, such as eVTOL charging. This approach could help ensure a sustainable funding stream for the development and maintenance of AAM infrastructure and operations.

Recognizing that the aviation-electrification industry is still in its early stages, IDOT is well-positioned to proactively assess how future funding models might evolve. Exploring taxation mechanisms for aviation-related electric charging—similar in concept to the current fuel tax—could offer a long-term solution to maintain revenue continuity. However, any such approach must be carefully studied and justified.

To support this exploration, IDOT should consider the following:

- **Determine Feasibility –** It is essential to assess the legal and regulatory landscape before pursuing any new funding mechanism. IDOT should collaborate with state legal experts and the Illinois Public Airports Association (IPAA) to identify any limitations or risks associated with taxing aviation-electric charging utilities.
- **Conduct Economic Research –** Further economic analysis will be necessary to understand the potential impacts and benefits of such a tax. This research would help determine whether a utility-based funding model is economically viable and equitable.

By initiating this exploratory process, Illinois can begin to prepare for a future where aviation is increasingly electric, ensuring that funding mechanisms evolve alongside technological advancements, without compromising the state's broader transportation electrification goals.

5.2.4.2. Incorporate AAM considerations into Illinois' Long Range Transportation Plan (LRTP)

Integration of AAM technologies and infrastructure into Illinois' Long Range Transportation Plan (LRTP) represents a critical step toward embedding AAM within the broader multimodal transportation system. The LRTP serves as a comprehensive and strategic roadmap that outlines the state's transportation goals, objectives, and planned investments over an extended timeframe. Typically updated every five years, the 2024 LRTP is currently being revised from the previous 2019 edition. **Figure 5.2**. shows the full suite of programs that the 2024 LRTP is planning to address.

Figure 5.2: 2024 LRPT Suite of Programs

Source: IDOT 2024 LRTP

Several unique transportation programs and modal strategies referenced in the 2024 LRTP could support the inclusion of AAM. These include the Aviation System Plan, Carbon Reduction Strategy, National Electric Vehicle Infrastructure (NEVI) Deployment Plan, and Connected and Autonomous Vehicle (CAV) Planning components. Each of these areas retains relevance to AAM and could serve as foundational elements for its integration.

Including AAM in the LRTP would signal formal recognition of the technology and underscore the state's commitment to its future development. IDOT could pursue the following actions:

- **Inclusion in the 2024 LRTP –** IDOT could consider incorporating AAM in the current update. While the scope may initially be limited, establishing early guidance would be beneficial. This inclusion would likely necessitate at least one public workshop to gather stakeholder input and raise awareness.
- **Goals for 2029 –** To prepare for more comprehensive integration in the 2029 LRTP, IDOT could begin developing performance metrics and planning frameworks. These would help shape future language, expectations, and investment strategies related to AAM.

This initiative ensures that AAM is considered in Illinois' long-term transportation strategy, addressing the evolving needs of urban and regional mobility. By incorporating AAM, the LRTP can support the development of vertiports and other AAM-critical infrastructure—promoting efficient, sustainable, and equitable transportation solutions across the state.

5.2.5. WORKFORCE DEVELOPMENT RECOMMENDATIONS

Two recommendations were identified under the Workforce Development Recommendations category. Those include establishing or encouraging education programs that can support AAM and creating an AAM Manager position within IDOT. Further details on each recommendation are provided below.

5.2.5.1. Establish or Encourage Education Programs that can Support AAM

As discussed in **Chapter 3**, academic institutions across Illinois are actively engaged in research and development related to AAM. These efforts, while already contributing valuable insights, also highlight the potential for deeper collaboration between IDOT, academia, and private industry.

Building on that foundation, the following recommendations are proposed to guide IDOT in leveraging academic partnerships to support the advancement and integration of AAM technologies across the state.

- **Formalize and Expand Academic Partnerships -** IDOT should build upon its existing relationship with the Illinois Center for Transportation (ICT) and establish formal partnerships with other key academic programs across the state.

- **Promote State-Supported Research and Development (R&D) -** IDOT should incentivize R&D initiatives that bring together academia, private industry, and public agencies. This could include supporting research with universities and aerospace OEMs as well as providing funding support for AAM pilot projects.

Strengthening partnerships with academic institutions will help IDOT stay current with emerging technologies, support thoughtful planning, and ensure Illinois is prepared to integrate AAM in a way that aligns with its transportation goals.

5.2.5.2. Create an AAM Manager Position within IDOT

To support the thoughtful integration of AAM in Illinois, it is recommended that IDOT establish a dedicated AAM Manager position within the Aeronautics Division. This role would provide the agency with in-house expertise necessary to guide the implementation of AAM initiatives and ensure coordination across stakeholders.

The AAM Manager would focus exclusively on AAM-related responsibilities, including community outreach, stakeholder engagement, planning document development, interagency coordination, and participation in workshops and industry forums. This dedicated position would help IDOT stay informed and responsive as AAM technologies evolve.

Several states—including Virginia, Georgia, Minnesota, and Utah—have already created permanent AAM roles or departments to manage similar responsibilities. In Illinois, this individual could also be tasked with:

- Developing statewide AAM planning and development standards
- Reviewing proposed vertiport projects
- Educating internal staff and local jurisdictions on AAM trends and regulatory considerations
- Participation in Illinois' multi-agency Electric Vehicle (EV) and AAM Working Group

The position could be filled by an existing staff member with access to AAM training resources or through a new employee with prior experience in AAM or emerging aviation technologies.

As the demand for AAM technologies and services grows, this role will be crucial in coordinating efforts across various stakeholders, ensuring regulatory compliance, and driving the strategic development of AAM infrastructure and operations within the state.

5.3. Implementation Strategy for Illinois AAM System Plan Recommendations

The recommendations outlined in this plan should not be implemented in isolation. Many are interconnected and can be grouped into broader initiatives to maximize efficiency and impact.

These recommendations can be pursued through three primary avenues:

- Conduct an Illinois AAM System Plan (Phase II)
- Update the Illinois Aviation System Plan
- IDOT-Specific Actions

This section outlines the components of each.

5.3.1. ILLINOIS AAM SYSTEM PLAN (PHASE II)

The initial Illinois AAM System Plan was developed to prepare IDOT for the anticipated growth of AAM and addressed several foundational elements, including:

- Established an overall AAM vision and goals
- Established an Advisory Committee to provide feedback on overall direction
- Identified the AAM System of aviation facilities
- Forecasted AAM activity in Illinois
- Identified high-level opportunities to be leveraged as well as threats to be mitigated
- Evaluated the efficacy of AAM vehicles within Illinois airspace
- Developed actionable recommendations for next steps

Given the rapidly evolving AAM landscape—both globally and within Illinois—IDOT should remain proactive by incorporating lessons learned from this process, including input from the PAC and peer states.

Phase II of the Illinois AAM System Plan could include the following components.

- Improve aviation facility electrification
- Develop a statewide land use plan that includes zoning and ordinance guidance and best practices for local governments
- Develop a statewide obstruction study
- Develop an Illinois AAM Public Acceptance Guidebook
- Evaluate and identify additional AAM use cases

5.3.2. ILLINOIS AVIATION SYSTEM PLAN UPDATE

In 2020, IDOT completed the Illinois Aviation System Plan (IASP), a foundational document designed to support program management, funding allocation, and project development across the state's aviation network. The IASP serves as a critical tool for guiding the distribution of both state and federal funding to system airports.

Several recommendations from Section 5.2 could be integrated into the next IASP update to ensure the plan remains responsive to emerging trends and technologies, including AAM. These include:

- Updating state aviation fund revenue sources to include tax revenue from electrical utilities
- Conducting a statewide review of non-aviation public assets that could support AAM
- Evaluating and revising project prioritization criteria to reflect evolving transportation needs
- Incorporating AAM considerations into Illinois' LRTP

5.3.3. IDOT-SPECIFIC ACTIONS

While many of the recommendations outlined in this chapter can be addressed through broader statewide aviation initiatives, several require direct action by IDOT.

These agency-specific efforts are essential to supporting the successful integration of AAM into Illinois' transportation ecosystem. Key actions include:

- Create an AAM Manager position within IDOT Aeronautics
- Establish or encourage education programs that can support AAM
- Coordinate with local first responders on fire safety to account for electric aircraft

5.4. Regulatory Guidance

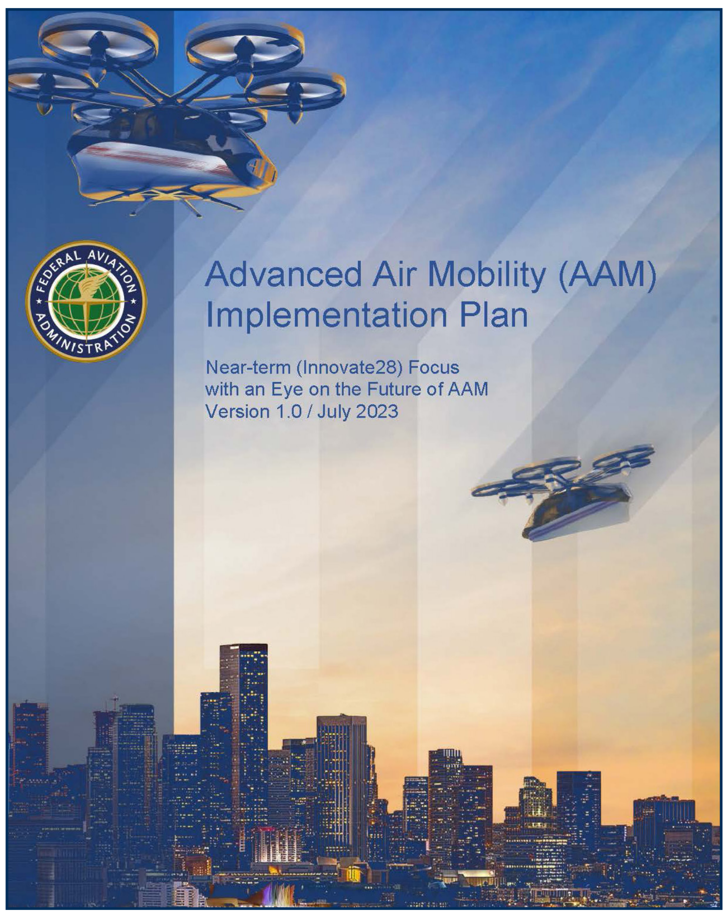
Understanding AAM's regulatory framework is essential to effectively integrate this technology into Illinois' transportation network. The innovative features of AAM, such as automation, alternative power sources, and Beyond Visual Line of Sight (BVLOS) operations, do not align with the existing rules and regulations of the National Airspace System (NAS). Consequently, stakeholders are faced with the challenge of developing technologies and creating markets within the boundaries of the current regulatory frameworks. To overcome this challenge, various agencies are actively working on developing regulations specifically tailored to the different components of AAM, including aircraft, airspace, operations, and infrastructure.

5.4.1. FEDERAL GUIDANCE AND PLANNING DOCUMENTS

The FAA and The National Aeronautics and Space Administration (NASA) are leading efforts in the United States to establish technical guidance and regulations governing aircraft design, airspace management, and overall safety. The following sections detail some of the most significant documentation and policies at the federal level in the last five years.

5.4.1.1. FAA Advanced Air Mobility (AAM) Implementation Plan

In July 2023, the FAA released the AAM Implementation plan. While other guidelines summarized in this section provide guidance on a specific component of AAM, the *FAA AAM Implementation Plan* is a comprehensive document that serves as the agency's roadmap for the near-term implementation of AAM technology in the NAS. The plan has a near term focus on various components such as the regulatory framework, stakeholder engagements, aircraft certification, infrastructure, environment, safety, security, and more. An important subset of this document is the *Innovate28* initiative which serves as a vehicle to actualize the strategies identified in this document. This initiative aims to achieve integrated AAM operations with OEMs and/or operators flying between multiple

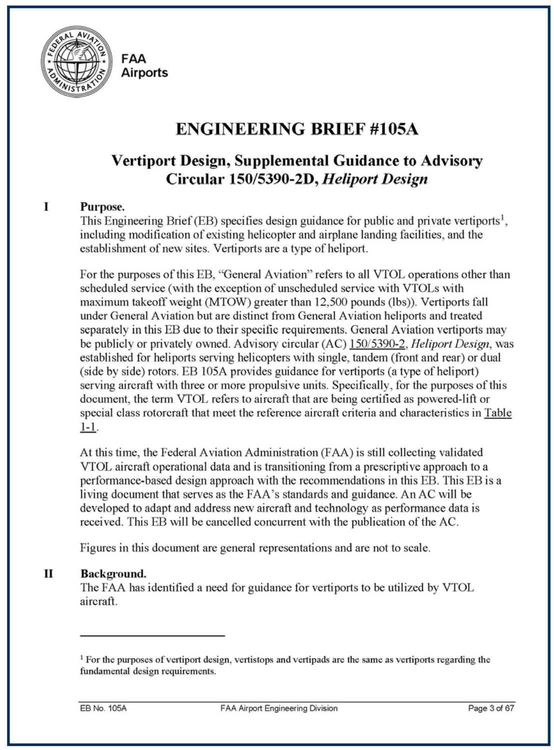


Source: FAA

origins and destinations at one or more locations in the U.S. by 2028. Innovate28 is a significant milestone in the evolution of AAM and the path towards full integration and operations at scale across the NAS. Through public-private partnerships, Innovate28 will identify key locations and use cases of interest to AAM industry stakeholders, ensuring the necessary steps are taken to enable these operations. The goal is to leave behind processes, infrastructure, procedures, and local knowledge at the key site(s), while also gaining valuable experience to support expanded operations in other areas of the country. In the context of the IDOT, it is important to consider how the agency can effectively serve as an integral stakeholder and position the state within the scheme of the Innovate28 initiative; ultimately, to promote development and deployment of AAM in the State of Illinois.

5.4.1.2. FAA Engineering Brief 105 & 105A, Vertiport Design

In September 2022, the FAA released Engineering Brief (EB) 105. EB 105 provides guidance specifically on the infrastructure (vertiport) component of AAM. This guidance includes design elements for AAM vehicle use, standards for electric and charging infrastructure, and safety considerations for vertiport siting. EB 105 specifically applies to eVTOL aircraft with maximum takeoff weights (MTOW) of 12,500 pounds or less and aims to provide guidance on the development of initial infrastructure for AAM operations.



FAA
Airports

ENGINEERING BRIEF #105A

Vertiport Design, Supplemental Guidance to Advisory Circular 150/5390-2D, *Heliport Design*

I Purpose.
This Engineering Brief (EB) specifies design guidance for public and private vertiports[1], including modification of existing helicopter and airplane landing facilities, and the establishment of new sites. Vertiports are a type of heliport.

For the purposes of this EB, "General Aviation" refers to all VTOL operations other than scheduled service (with the exception of unscheduled service with VTOLs with maximum takeoff weight (MTOW) greater than 12,500 pounds (lbs)). Vertiports fall under General Aviation but are distinct from General Aviation heliports and treated separately in this EB due to their specific requirements. General Aviation vertiports may be publicly or privately owned. Advisory circular (AC) 150/5390-2, *Heliport Design*, was established for heliports serving helicopters with single, tandem (front and rear) or dual (side by side) rotors. EB 105A provides guidance for vertiports (a type of heliport) serving aircraft with three or more propulsive units. Specifically, for the purposes of this document, the term VTOL refers to aircraft that are being certified as powered-lift or special class rotorcraft that meet the reference aircraft criteria and characteristics in Table 1-1.

At this time, the Federal Aviation Administration (FAA) is still collecting validated VTOL aircraft operational data and is transitioning from a prescriptive approach to a performance-based design approach with the recommendations in this EB. This EB is a living document that serves as the FAA's standards and guidance. An AC will be developed to adapt and address new aircraft and technology as performance data is received. This EB will be cancelled concurrent with the publication of the AC.

Figures in this document are general representations and are not to scale.

II Background.
The FAA has identified a need for guidance for vertiports to be utilized by VTOL aircraft.

[1] For the purposes of vertiport design, vertistops and vertipads are the same as vertiports regarding the fundamental design requirements.

EB No. 105A FAA Airport Engineering Division Page 3 of 67

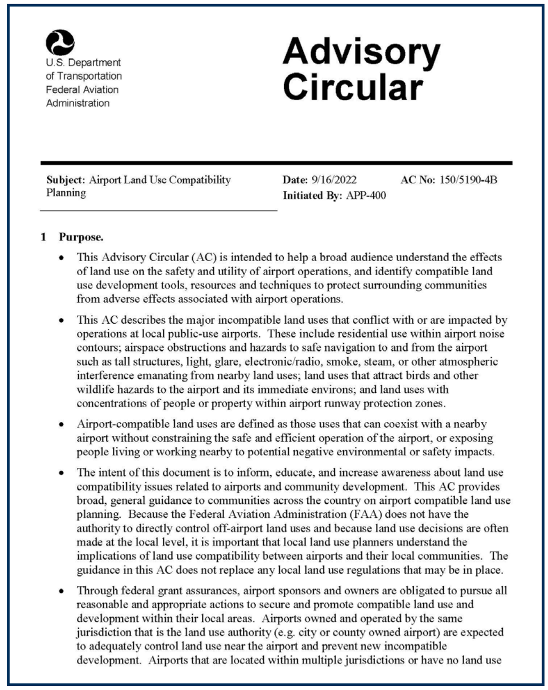
Source: FAA

Following the initial adoption of EB 105, an addendum was drafted and released in December of 2024 under the designation EB 105A. Functionally, the core purpose of EB 105 remains the same through EB 105A as the addendum was primarily a revision to includes adjustments to the infrastructure classification, landing area geometry, markings, the addition of a section on parking, and the creation of a downwash and outwash protection area.[95] The FAA considers EB 105A, as an update to EB 105, to be interim guidance. This is because there is a current a lack of demonstrated eVTOL aircraft performance data. As new data becomes available, the guidance will be periodically updated. The FAA expects to develop a comprehensive performance-based advisory circular (AC) in the future, which will cover vertiport considerations for different design criteria, aircraft characteristics, frequent operations, and autonomous operations. In the meantime, EB 105A establishes acceptable levels of safety and performance for vertiport development in the U.S and serves a baseline guidance for IDOT to establish vertiport certification requirements within the state.

[95] ENGINEERING BRIEF #105A Vertiport Design, Supplemental Guidance to Advisory Circular 150/5390-2D, Heliport Design

5.4.1.3. FAA Advisory Circular 150/5190-4B, Airport Land Use Compatibility Planning

In September 2022, the FAA released AC 150/5190-4B to provide comprehensive guidance on land use in relation to airport safety and operations. The purpose of the AC is to identify compatible land uses for airport operations and offer resources and tools to protect airport-adjacent land and surrounding communities from negative impacts associated with airport operations. Incompatible land uses include tall buildings, antennas, and wildlife attractants like waste landfills, as they can pose hazards to aircraft operations and compromise the safety of people on the ground. Residential and noise-sensitive land uses such as schools, churches, and hospitals near airports can also adversely affect the well-being and safety of residents. Although this AC is specifically for airport-adjacent land uses, same principle can be applied to AAM network and vertiport siting. As AAM aircraft are expected to operate frequently in densely populated areas, land use compatibility is crucial in planning and developing an interconnected AAM network. In the absence of AAM-specific land use guidance, IDOT and the stakeholders should refer to the existing guidance on land use compatibility for establishing an initial AAM network.


U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Airport Land Use Compatibility Planning
Date: 9/16/2022
AC No: 150/5190-4B
Initiated By: APP-400

1 Purpose.

- This Advisory Circular (AC) is intended to help a broad audience understand the effects of land use on the safety and utility of airport operations, and identify compatible land use development tools, resources and techniques to protect surrounding communities from adverse effects associated with airport operations.
- This AC describes the major incompatible land uses that conflict with or are impacted by operations at local public-use airports. These include residential use within airport noise contours; airspace obstructions and hazards to safe navigation to and from the airport such as tall structures, light, glare, electronic/radio, smoke, steam, or other atmospheric interference emanating from nearby land uses; land uses that attract birds and other wildlife hazards to the airport and its immediate environs; and land uses with concentrations of people or property within airport runway protection zones.
- Airport-compatible land uses are defined as those uses that can coexist with a nearby airport without constraining the safe and efficient operation of the airport, or exposing people living or working nearby to potential negative environmental or safety impacts.
- The intent of this document is to inform, educate, and increase awareness about land use compatibility issues related to airports and community development. This AC provides broad, general guidance to communities across the country on airport compatible land use planning. Because the Federal Aviation Administration (FAA) does not have the authority to directly control off-airport land uses and because land use decisions are often made at the local level, it is important that local land use planners understand the implications of land use compatibility between airports and their local communities. The guidance in this AC does not replace any local land use regulations that may be in place.
- Through federal grant assurances, airport sponsors and owners are obligated to pursue all reasonable and appropriate actions to secure and promote compatible land use and development within their local areas. Airports owned and operated by the same jurisdiction that is the land use authority (e.g. city or county owned airport) are expected to adequately control land use near the airport and prevent new incompatible development. Airports that are located within multiple jurisdictions or have no land use

Source: FAA

5.4.1.4. FAA Reauthorization Act of 2024 (2024 Act)

The FAA submitted the FAA Reauthorization Act of 2024 (Public Law 118-63) to congress and was signed into law in May of 2024. The act's intent is to communicate the priorities of the agency to congress in order to continue the FAA's mission of providing a safe and efficient aerospace system. The congressional authorization of this act runs through Fiscal Year 2028 and represents nearly $105 billion in appropriations over the length of the reauthorization.

> **"… [Reauthorization Act of 2024] speaks to everything from FAA's organizational structure, ways to bolster many of the agency's oversight processes, and where to invest resources to support safety and efficiency for both conventional users and new entrants. Much of this legislation aligns with the agency's existing priorities and approaches but tells us where Congress is most interested in seeing adjustments to resources and timelines for various activities[96]."**

[96] https://www.faa.gov/about/reauthorization

Following the signing of the 2024 Act, the FAA released a set of Reauthorization Program Guidance Letter (R-PGL) memorandums in May of 2025 designed to explain and implement the provisions of the 2024 Act. Of the three approved R-PGLs, the most significant to AAM was *R-PGL 25-02 AIP Discretionary Set Aside* which modified the eligibility of programs and projects under the new AIP Discretionary Set Aside (previously known as the Noise and Environmental Set Aside). Changes were targeted towards the Voluntary Airport Low Emissions (VALE) Program, the Airport Zero Emissions Vehicle (ZEV) Program, the Environmental Mitigation Pilot Program (EMPP), new fueling infrastructure projects, and energy supply and redundancy projects.

AAM stands to benefit from the updated guidance, which expands the scope of eligible projects under the AIP Discretionary Set Aside. The updated guidance supports infrastructure critical to AAM, such as electric charging stations, hydrogen fueling systems, and microgrids, aligning with the clean energy needs of eVTOL and other emerging aircraft. Programs such as VALE and ZEV now offer broader support for low-emission technologies; while planning and pilot programs can help airports prepare for AAM integration. This is especially advantageous for small airports, which are expected to play a key role in AAM operations.

The American Association of Airport Executives (AAAE) met and released a guide on the expected impacts of the 2024 Act, noting possible topics of interest for the FAA and the timelines for implementation. **Table 5.1** shows a portion of the guide specific to AAM and vertiport facilities. The status and comments column notes additional feedback provided by the AAAE during the breakout and summarization of the legislation.

Table 5.1: FAA Reauthorization Act of 2024 Guide

Topic	Summary	Implementation of Timeframe	Status and Comments, if any
FAA Guidance on Vertiports	FAA must publish an update to Engineering Brief (EB) No. 105, "Vertiport Design," which was originally released in September 2022, and a performance-based vertiport design advisory circular (AC). (Section 958(a))	FAA must publish the EB update by December 31, 2024, and the draft AC by December 31, 2025.	In December 2024, FAA released Engineering Brief No. 105A, "Vertiport Design, Supplemental Guidance to Advisory Circular 150/5390-2D, Heliport Design," which includes updated standards for the development of heliports that serve VTOL aircraft at federally obligated airports. FAA held an "industry day" on January 14, 2025, to provide an overview of the updated guidance and allow stakeholders to ask questions.
	FAA must begin the work necessary to update FAA AC 150/5390 on heliport design in order to provide performance-based guidance, including the use of alternative fuel and propulsion mechanisms. (Section 958(a))	No timeline	
	FAA must establish a mechanism by which airports can safely accommodate, or file a notice to accommodate, powered-lift aircraft if such infrastructure meets the FAA's safety requirements or guidance for such aircraft. (Section 958(c))	No timeline	
NEPA Reviews for On-Airport Vertiport Projects	FAA must consult with the CEQ and take steps to establish additional CATEXs, as appropriate, for vertiport projects at an airport. (Section 953)	No timeline	

Topic	Summary	Implementation of Timeframe	Status and Comments, if any
AAM Infrastructure Pilot Program	In the FY23 omnibus spending bill, DOT was required to establish a pilot program to provide grants to eligible entities, including airports, for the development of "comprehensive plans" that will assist these entities with planning for the development of infrastructure necessary to facilitate AAM operations. Congress authorized $12.5 million for the program for FY23 and FY24, but no appropriations were provided to fund the program for either year. In the FAA Reauthorization Act of 2024, FAA received $50 million in authorized funding to carry out the grant program for four fiscal years (or $12.5 million authorized each fiscal year). FAA is authorized to use the funding from its operations budget that Congress makes available to the agency. (Section 960)	Authorization effective for FY23 through FY28.	In May 2025, the FAA released a Program Guidance Letter (PGL) for the Pilot Program outlining steps airports can take to ensure they are eligible.
Rules for Operation of Powered-Lift Aircraft	FAA must publish a final rule for the "Special Federal Aviation Regulation" (SFAR) that outlines procedures for certifying pilots of powered-lift aircraft and providing operational rules for their use, including transporting passengers and cargo. FAA must also form a Powered-Lift Aircraft ARC and promulgate long-term regulations that provide for the certification of pilots and operating rules. (Section 955)	FAA must publish the final rule by December 16, 2024. If not published by September 16, 2025, then a specific set of rules laid out by Congress will apply until such rule is published.	On October 22, 2024, FAA released a final rule for the SFAR, which went into effect on January 21, 2025.
ATC Policies for Powered-Lift Aircraft	FAA must update its air traffic orders and policies to address ATC system challenges and allow powered-lift aircraft to use existing air traffic procedures, where appropriate. This includes developing powered lift specific procedures for airports, heliports, and vertiports, if necessary. (Section 957)	FAA must update its air traffic orders and policies by September 16, 2027.	
Low-Altitude Routes for Powered-Lift Aircraft	FAA must initiate a rulemaking process to establish or update low-altitude routes and flight procedures to ensure safe rotorcraft and powered-lift aircraft operations in the NAS. FAA must consult with airports as part of the rulemaking process. (Section 627(b))	FAA must initiate the rulemaking by May 16, 2027.	

Topic	Summary	Implementation of Timeframe	Status and Comments, if any
AAM Interagency Working Group (IWG)	In the Advanced Air Mobility Coordination and Leadership Act, which was signed into law in October 2022, Congress directed DOT to create an AAM IWG that would be tasked with developing a national strategy and recommendations for federal investments and actions to support the AAM industry.	The DOT IWG received an extension to complete its report by 6 months from August 2024 to February 2025.	The DOT IWG was expected to publicly release its report before President Biden left office on January 20; however, the report has yet to be published.
Improved Federal Efficiency	In the FAA Reauthorization Act of 2024, Congress made two major changes to the law governing the IWG. First, Congress directed the IWG to examine programs that can be leveraged to improve the efficiency of federal reviews required for infrastructure development, including for electrical capacity projects, and provide recommendations on sharing expertise and data on long-term electrification requirements and the needs of cities to enable the deployment of AAM. Second, Congress extended the deadline for the AAM IWG to complete its strategy and recommendations. (Section 954)	No timeline	
Advanced Aviation Technology and Innovation Steering Committee	FAA must establish an "Advanced Aviation Technology and Innovation Steering Committee" to assist FAA in planning for and integrating advanced aviation technologies. The committee is to consist of senior FAA leaders (associate and assistant administrators) only; no industry members are designated participants. (Section 229)	FAA must establish the steering committee by November 12, 2024.	
Advanced Aviation Advisory Committee (AAAC)	DOT is prohibited from renewing the charter for the AAAC, which must be terminated. (Section 915)	The current AAAC charter expired June 10, 2024.	FAA has cancelled all future meetings for the AAAC and its task groups and indicated they will not be rescheduled. As of June 10, 2024, the AAAC no longer exists.
Additional Provisions	Additional provisions relating to AAM and supporting infrastructure are summarized in other sections of this document. Refer to: » Energy Power Demands Program (Section 742) » Electric Aircraft Infrastructure Pilot Program (Section 745)		

Source: AAAE Overview of FAA Reauthorization Act of 2024

In addition to the FAA Reauthorization Act, President Trump issued two executive orders on June 6, 2025—"Unleashing American Drone Dominance" and "Restoring American Airspace Sovereignty." These directives reinforce national priorities around AAM and UAS by accelerating FAA rulemaking for routine BVLOS operations, enhancing enforcement against unauthorized drone activity, and promoting domestic drone manufacturing. While separate from the legislative reauthorization, these executive actions align with its objectives and signal a strong federal commitment to advancing UAS integration and airspace security.

5.4.1.5. Airworthiness and Operation Certifications

In order to offer commercial services to the public, eVTOL aircraft must obtain airworthiness certification from the FAA, as well as operation certification for carrying passengers or goods. Airworthiness certification ensures the safety of the aircraft by setting requirements for design, manufacturing, performance, failure response, and maintenance. However, the current airworthiness regulations were created for traditional aircraft and may not fully address the unique challenges posed by AAM technology, such as advanced flight controls, alternative propulsion, autonomy, and low-altitude operations in urban environments.

In the interim, OEMs are pursuing airworthiness certification for eVTOL aircraft through the "special class" process outlined in Part 21, Section 17(b) of Title 14 of the Code of Federal Regulations (CFR). However, this process may not be adequate for future mass production of eVTOL aircraft. To address this, the FAA has announced plans to update its certification process for eVTOL aircraft through industry collaboration.

Additionally, AAM operators in the U.S. who wish to perform non-scheduled operations for compensation need to attain an FAA Air Carrier and Operator Certificate under 14 CFR Part 135. This certification is necessary for both passenger and cargo operations. While the certification processes may introduce complexities and delays, they also ensure high safety standards, providing reassurance to local governments and the public.

In summary, the FAA is updating its regulations to accommodate the unique features and technology of AAM to support its development and adoption. It is recommended that IDOT closely monitor the progress of OEMs and their certification process for their AAM models to verify the proposed entry date of these vehicles into the market

5.4.2. STATE GUIDANCE AND PLANNING DOCUMENTS

State legislation and policy are important factors in the integration of AAM. While federal regulations provide a nationwide framework for AAM operations, states also have the power to establish their own legislation, policies, or best practices that impact the industry within their borders.

Where the State primarily plays a significant role is in the approval and licensing of vertiport infrastructure. The state DOT has the authority to grant permits and licenses to vertiports seeking to establish AAM operations within their jurisdiction. This ultimately means that states can set specific requirements, such as safety standards, operational guidelines, and environmental considerations, that must be met by AAM operators and vertiport owners before they can operate within the state.

5.4.2.1. Illinois Compiled Statues 620, Illinois Aeronautics Acts

The Illinois Aeronautics Act is a comprehensive law designed to regulate and promote aeronautics within the state of Illinois. It aims to ensure safety and uniformity in aeronautical operations, covering aspects such as aircraft operation, construction, repair, and maintenance. The Act also includes provisions for noise monitoring at airports and defines key terms related to aeronautics. By establishing these regulations, the Illinois Aeronautics Act supports the development of aeronautical infrastructure and services, contributing to the state's overall transportation system and economic growth.

The Illinois Aeronautics Act includes several key regulations aimed at ensuring the safe and efficient operation of aeronautical activities within the state. The main regulations include:

- **Aircraft Operations –** Defining "aircraft" and setting standards for their operation, construction, repair, and maintenance
- **Airport Development –** Regulating the design, establishment, construction, extension, operation, improvement, repair, and maintenance of airports and other air navigation facilities
- **Public Aircraft –** Specifies the use of public aircraft, which is used exclusively in the service of any government or political subdivision
- **Noise Monitoring –** Provides provisions for noise monitoring at airports, including criteria for permanent noise monitoring reports and noise contour maps
- **Uncrewed Aircraft Systems –** Sets forth regulations for unmanned aircraft systems, as it defines "critical infrastructure" and outlines the state's exclusive power to regulate these systems

5.4.2.2. National Association of State Aviation Officials (NASAO) Multi-state Collaborative


Source: NASAO

The NASAO collaborative consists of twenty-seven state government agencies and the NASAO association. The group works towards establishing a consensus on future AAM policy issues. Specifically, the collaborative aims to support state governments through the eventual roll out of AAM by serving as a support mechanism and foundation alongside the FAA as the industry develops.

The collaborative meets twice a year to exchange lessons learned among each state and add input to topic papers designed to clarify the role and scope of states in AAM. A shared approach between agencies provides states with opportunities to engage with and seek input from AAM industry leaders and OEMs on concepts that broadly support the development of the industry. Shared technical resources and experiences allows each agency to lean on its partners in different ways to ensure that eventual implementation of AAM across the United States can be expected to be consistent between states and complimentary of federal policy. By having an IDOT representative attend these meetings, the state could remain informed and benefit from collaboration with other industry professionals.

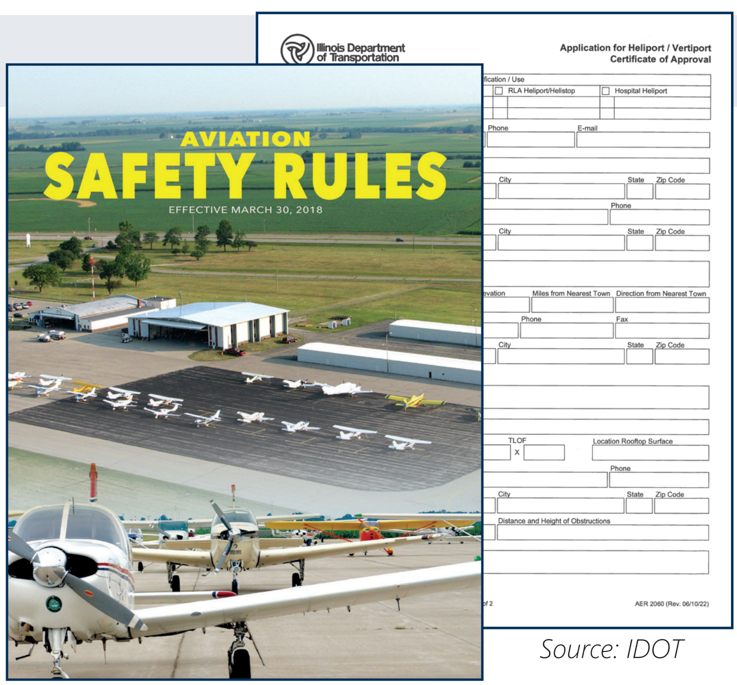
In 2024, the NASAO Multi-State Collaborative presented the AAM topic papers at the NASAO Annual Convention & Tradeshow and plans to publish the topic papers. For future implementation of AAM across the state of Illinois, it will be important for the state to follow the consensus guidance of the collaborative to be most effective.

5.4.2.3. Proposed Policy Updates / Additions

IDOT reviews and approves the licensing and registration of heliports through the Bureau of Safety and Education (BSE). The application process was amended to include vertiports. BSE, through their updates, has emphasized that the certificate of approval review process can begin on vertiports whenever guidance is available. It should be noted, approval reviews are guided by the Title 92 *Aviation Safety Rules*, which was published in March of 2018. The rules and guidelines that have been used do not further the advancement of the eVTOL technology infrastructure, beyond what could be considered parallel to a typical heliport. As such, Title 92 *Aviation Safety Rules* will require updates.

5.4.3. LOCAL GUIDANCE AND PLANNING DOCUMENTS

Local government bodies will also need to be prepared for the possible development of AAM infrastructure or vertiports on land within their organization limits. It will require municipalities, counties, and metropolitan planning organizations to enact ordinances aimed at covering compatible land uses, practical zoning, and the building permit process. To support the overall vision of AAM, local guidance would ultimately be required to include designating specific areas where



Source: IDOT

operations are allowed, noise abatement requirements, and providing zoning codes to guide the placement of vertiports. Without oversight, public benefits may be compromised by incompatible land uses and poor integration of vertiports into the surrounding area.

Local Ordinances are essential to safeguard airspace around vertiports and mitigate the impact to communities. Although no such ordinances exist today in Illinois, there are some notable examples of cities in the U.S. that have expressed interest in being early advocates for the local government's involvement in the implementation of AAM. As guidance from a state and federal level becomes more fleshed out, local governments will need to keep pace to have input in the overall design, layout, and locations of vertiports.

NASA Advanced Air Mobility Mission – Space Act Agreement

In 2022, the City of Orlando, Florida signed an agreement with the National Air and Space Agency (NASA) to meet for a number of workshops meant to determine how emerging cargo-carrying drone and passenger-carrying air taxi services can best be included in civic transportation plans. No ordinances were officially established, however the foundational steps for terminology, vertiport location criteria, and practices for public engagement were laid out for future use.

National League of Cities (NLC) Aviation Advisory Forum on Air Mobility

In 2024, the NLC launched the Aviation Advisory Forum on Air Mobility and Drone Integration as part of an effort to prepare cities for the future use of air taxis and drones. The forum includes a number of cities, including the City of Orlando and the City of Wichita which have both voiced the importance of being adaptable to new technology and the role local governments will play in the implementation of AAM.

5.5. Summary

The recommendations outlined in this chapter represent a proactive and strategic approach to preparing Illinois for the integration of AAM. Developed through extensive stakeholder engagement and grounded in emerging industry trends, these recommendations address the infrastructure, policy, safety, education, and workforce needs essential for a successful statewide rollout.

However, recommendations alone are not enough. Their effectiveness depends on coordinated implementation, sustained investment, and alignment with evolving regulatory frameworks. This chapter provided a roadmap for action—detailing how IDOT and its partners can phase, fund, and govern AAM initiatives while navigating the complex regulatory landscape at the federal, state, and local levels.

ILLINOIS AVIATION

ADVANCED AIR MOBILITY SYSTEM PLAN

Illinois Department of Transportation

Kimley»Horn

Expect More. Experience Better.

www.ilaviation.com

In association with

The Aviation Planning Group

Published 2025