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.

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:

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.

- 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

Source: Archer Aviation

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.

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 center transportation, also known as "trunk" routes. Once these trunk routes are established, their

[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.

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

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.

Source: Vertiport Chicago

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.

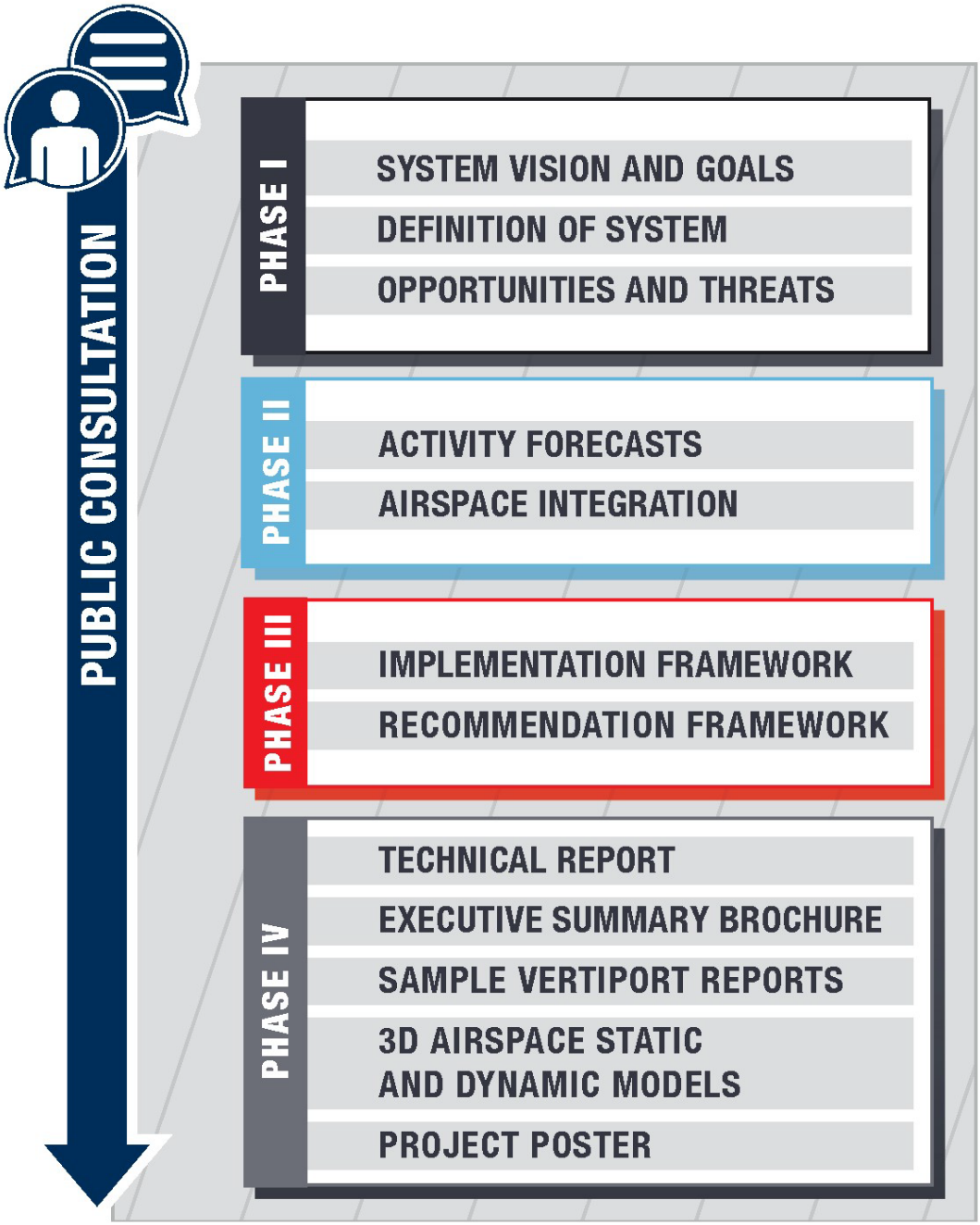
United Airlines’ partnership with Archer Aviation, as well as the existence of Vertiport Chicago, are existing and tangible opportunities for AAM in Illinois. Along with other examples, these opportunities will continuously be referenced and evaluated throughout the Illinois AAM System Plan.

[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**. 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

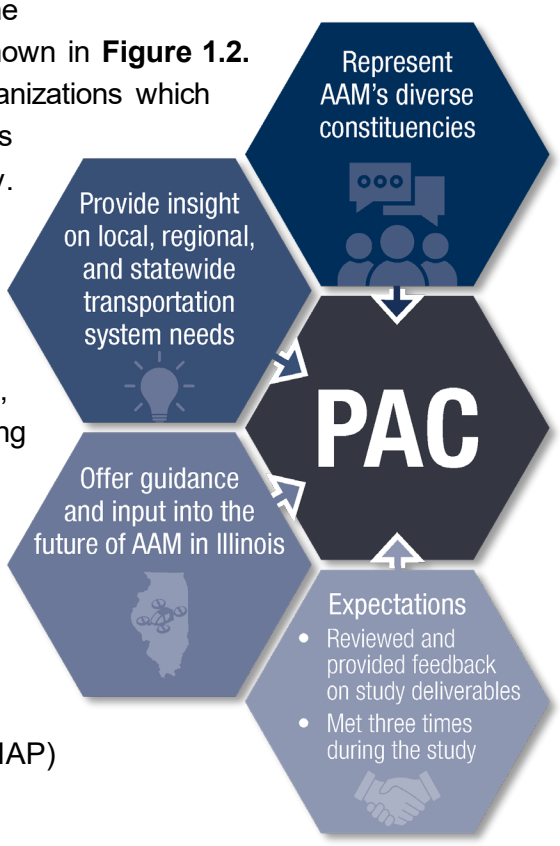


Source: Kimley-Horn

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:

Figure 1.2: Role of PAC



Source: Kimley-Horn

- 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

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

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: Primary 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 AAM Ground Infrastructure Components

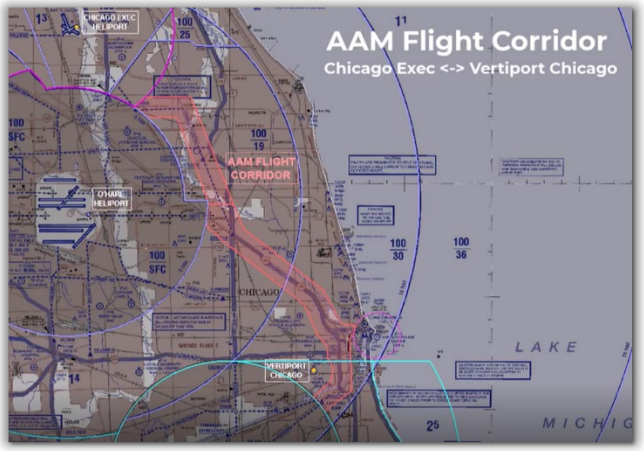
Sources: Kimley-Horn, BETA Technologies

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.



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

Sources: Kimley-Horn, IDOT, Illinois AAM System Plan PAC

1.2.2. Illinois AAM Goals

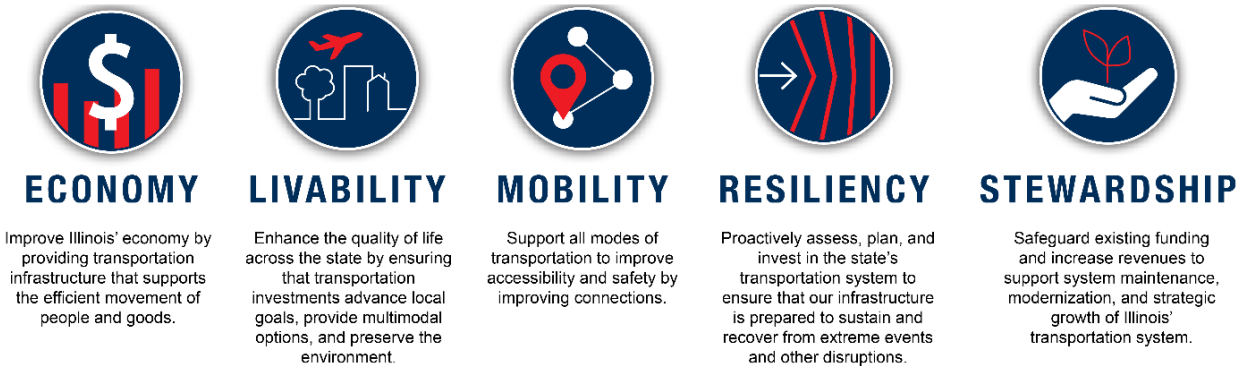
While the vision statement provides a broad objective for IDOT and the state to progress towards, goals provide clear direction for how to develop and implement AAM in the state. Goals are established to guide future decision-making and resource allocation. As the AAM industry matures and a baseline 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.

March 2024 PAC Meeting

Source: Kimley-Horn

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



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.

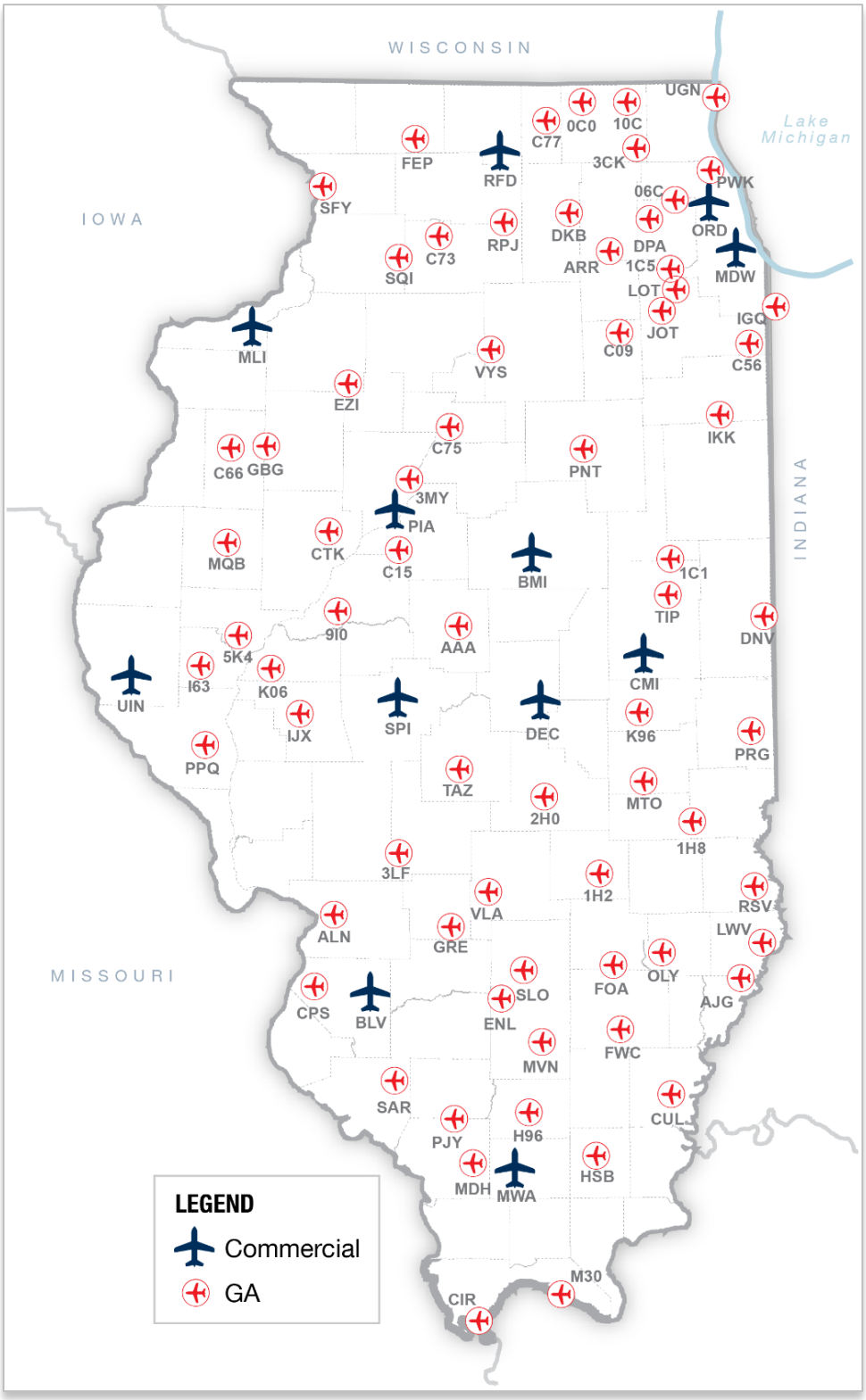
1.3.1. IASP System

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 the publicly owned, 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.[6] 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**

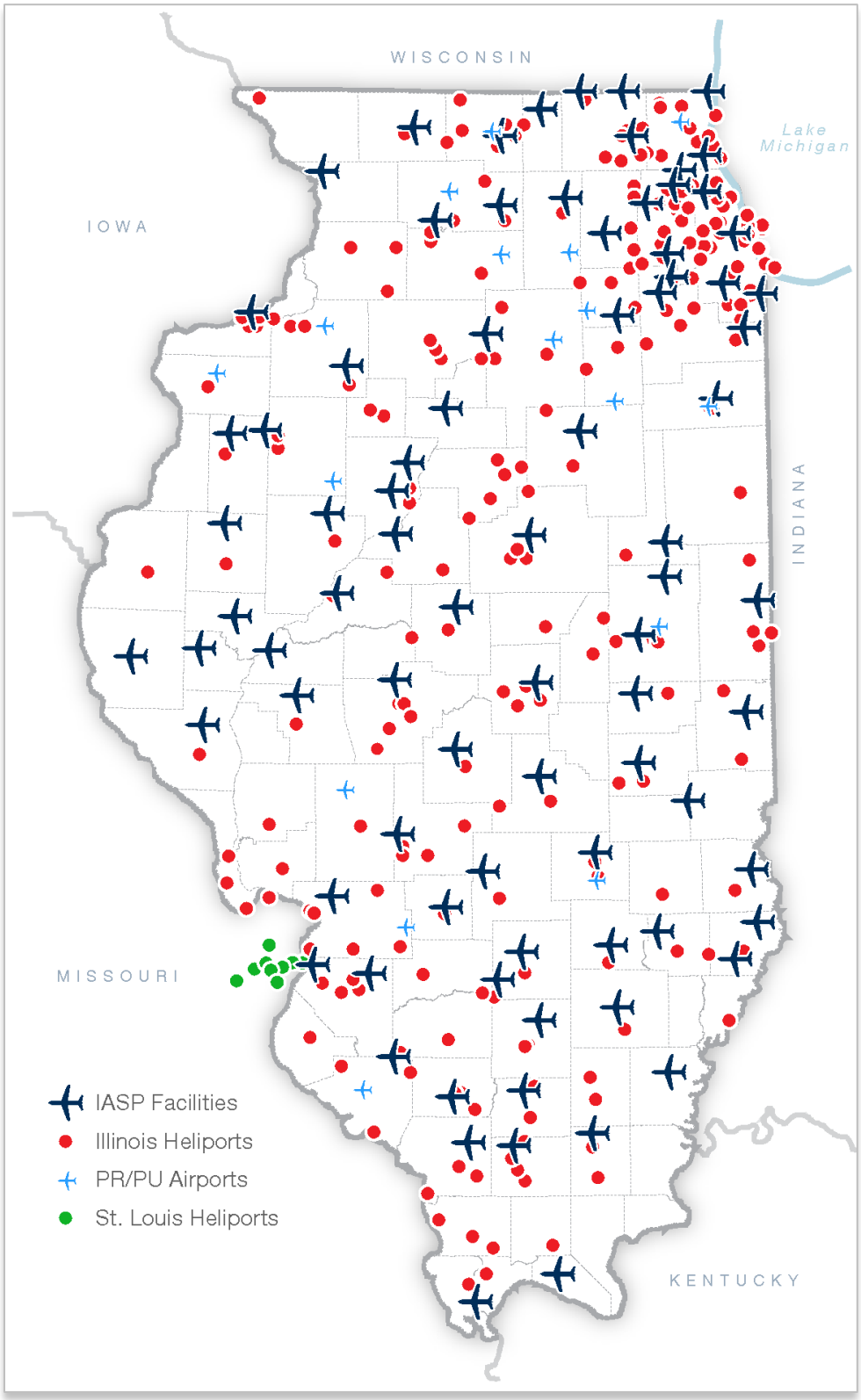
*Notes: *Privately owned, public-use (PR/PU)*
Sources: FAA Airport Data and Information Portal (ADIP), Kimley-Horn

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/

[6] *The 251 identified heliports include 10 facilities in St. Louis, Missouri, based on their proximity to the Illinois-Missouri State line and their contributions to the Illinois aviation system.*

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.