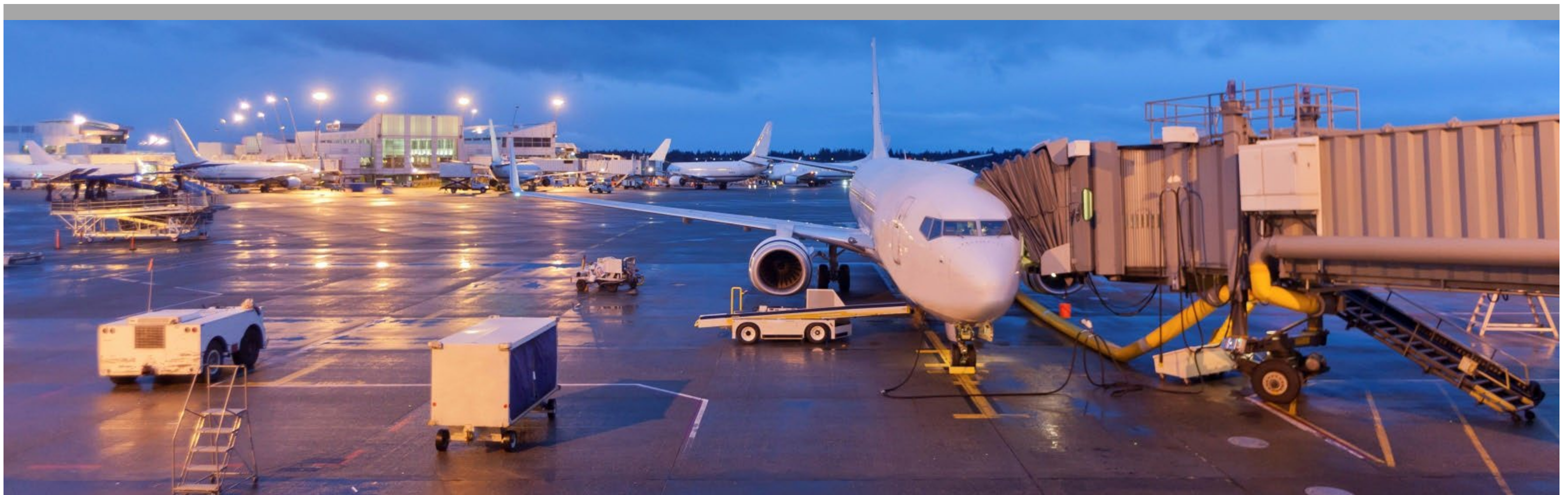
PARAS PROGRAM FOR APPLIED RESEARCH IN AIRPORT SECURITY



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Security Considerations for Advanced Air Mobility (AAM) Operations at Airports

National Safe Skies Alliance, Inc.

Sponsored by the Federal Aviation Administration

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National Safe Skies Alliance (Safe Skies) is a non-profit organization that works with airports, government, and industry to maintain a safe and effective aviation security system. Safe Skies' core services focus on helping airport operators make informed decisions about their perimeter and access control security.

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The results of PARAS projects are available to the industry at no charge. All deliverables are electronic, and most can be accessed directly at www.sskies.org/paras.

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CONTENTS

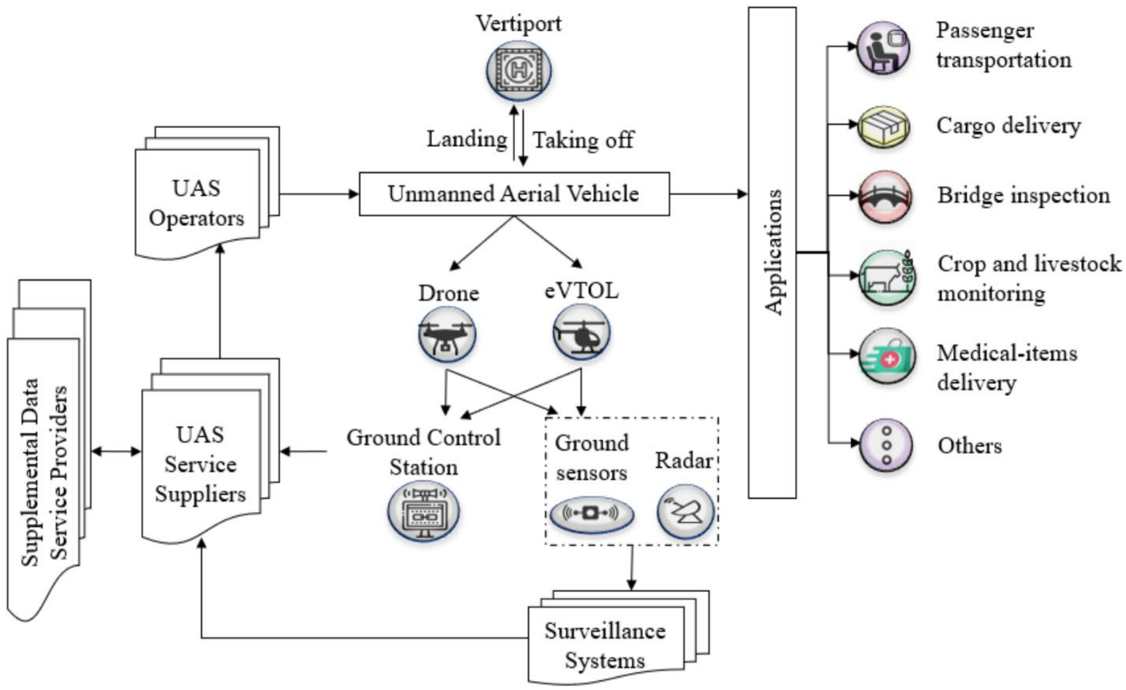
TABLES & FIGURES

EXECUTIVE SUMMARY

Understanding the evolution of Advanced Air Mobility (AAM) technology will enable airports to be better prepared to integrate this new technology into existing security processes and protocols.

Figure 1 illustrates the relationships of the various stakeholders and elements of AAM.

Figure 1. Notional Advanced Air Mobility Architecture



Source: [Applied Sciences]

With the significant expansion of AAM vehicles anticipated, the first logical consideration is departure and arrival locations for vehicles. This research has shown that the first AAM use cases will likely include cargo and medical transport services, with flights focusing on intracity locations (established heliport to heliport). As flights expand to include passenger transport, the business model will rely on arrival and departure points at larger airports in order to move passengers from a city location to the airport, reducing the reliance on surface vehicles and greatly reducing transportation time.

However, many questions must be answered for this model to be successful. For example, where and what is the arrival location at the airport? What role does the airport play in this AAM arrival/departure location? What is the ideal passenger experience?

The ultimate goal is a seamless passenger experience, where passengers are screened before departure on the AAM and then transported directly to the Sterile Area of the airport. While this goal may be ten or more years away, airports and airport developers should be considering this new mode of transportation now as part of larger airport master planning projects.

As of this document's publication, specific security regulatory guidance and requirements for AAM operations has not yet been developed. This document provides potential operational models for AAM and relevant security considerations.

PARAS ACRONYMS

ACRP	Airport Cooperative Research Program
AIP	Airport Improvement Program
AOA	Air Operations Area
ARFF	Aircraft Rescue & Firefighting
CCTV	Closed Circuit Television
CFR	Code of Federal Regulations
DHS	Department of Homeland Security
DOT	Department of Transportation
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FSD	Federal Security Director
GPS	Global Positioning System
IED	Improvised Explosive Device
IT	Information Technology
MOU	Memorandum of Understanding
RFP	Request for Proposals
ROI	Return on Investment
SIDA	Security Identification Display Area
SOP	Standard Operating Procedure
SSI	Sensitive Security Information
TSA	Transportation Security Administration

ABBREVIATIONS, ACRONYMS, INITIALISMS, AND SYMBOLS

AAM	Advanced Air Mobility
ASP	Airport Security Program
ATM	Air Traffic Management
ATM-X	Air Traffic Management eXplotation
CISA	Cybersecurity Infrastructure Security Agency
eVTOL	Electric Vertical Take-Off and Landing
eSTOL	Electric Short Take-Off and Landing
FBO	Fixed Based Operator
GA	General Aviation
MTOW	Maximum Takeoff Weight
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NIST	National Institute of Standards and Technology
OEM	Original Equipment Manufacturer
SPAC	Special Purpose Acquisition Company
SPP	Screening Partnership Program
TFSSP	Twelve Five Standard Security Program
UAM	Urban Air Mobility
UAS	Unmanned Aircraft System

SECTION 1: INTRODUCTION

The concept of personal aerial vehicles has been explored since the early days of flight. The early personal aerial vehicles were often challenged by the technology limitations at the time, whether power source, material weight, seating configurations, or consistent safe flight operations.

With the advent of electric propulsion, new composite materials, and significantly improved safety records, Advanced Air Mobility (AAM) has emerged as the next viable mode of aerial transportation. As AAM technology becomes more readily accepted and developed, it is important to address the security concerns and potential disruption this new mode of transportation presents. Planning for both physical and cybersecurity concerns will assist in mitigating risks as these new aircraft and their supporting infrastructure are deployed.

As AAM adoption increases, there will be more reliance on airports to facilitate access to the infrastructure needed to support these operations, including operational space and electrical infrastructure. Currently, AAM manufacturers are driving these infrastructure requirements by establishing their own vertiports specific to their operation, primarily as proof of concept.

Initial discussions with airport stakeholders indicate varying levels of understanding and awareness of AAM. For some, this emerging technology is seen as inevitable and welcomed with a keen interest in playing a part in its evolution and integration into the airport environment. There is active discussion with OEMs on potential operations and facility planning. Other airport stakeholders seem aware of AAM, but may not consider it a priority due to additional clarity needed on regulatory impacts, realistic locations of supporting infrastructure (airside or landside), and initial scale of operations compared to current passenger service. Lastly, some airport stakeholders are skeptical of AAM deployment due to what they see as enormous challenges (e.g., air traffic management and FAA certification) that may slow the progression of AAM implementation and potentially force AAM operations off airport property.

This document is intended to provide planning considerations for potential security impacts of AAM operations at airports. The research team has conducted numerous interviews with airport stakeholders, government agencies, aircraft manufacturers, and vertiport designers to capture the security concerns that are paramount in the incorporation of AAM operations into airports. Common themes include physical security of AAM equipment and facilities, cybersecurity, and security screening for both passengers and employees.

As of this document's publication, there are no published security requirements, standards, or guidelines for the protection of the AAM ecosystem. This guidance is not intended to supersede any future published requirements, standards or guidelines issued.

SECTION 2: AAM MARKET OVERVIEW

Through research and review of articles, studies and reports, whitepapers, and other publications, the research team has seen a significant amount of evidence of the viability of AAM, including its sub-markets of Urban Air Mobility (UAM) and Regional Air Mobility (RAM). AAM utilizes electric aircraft such as electric Vertical Take-Off and Landing (eVTOL), electric Short Take-Off and Landing (eSTOL), electric Conventional Take-Off and Landing, and hybrid aircraft. Figure 2 illustrates the various ways eVTOL aircraft are categorized in the industry.

Figure 2. Global eVTOL Aircraft Market Segmentation

Source: MarkNtel Advisors

Original Equipment Manufacturers (OEM) continue to set target years for operations that are quickly approaching. Several special purpose acquisition companies (SPAC) have formed over the past two years to support investment in the development and certification of these aircraft. The following market studies estimate the potential of AAM:

- 2017–2018 UAM market studies commissioned by NASA, conducted independently by Crown Consulting Inc. (with McKinsey & Company and other partners)[1] and Booz Allen Hamilton[2]
    - First major studies of UAM, informed and supported NASA's Aeronautics Research Mission Directorate in their strategy, planning, and research and development
    - Airport shuttle and air taxi markets estimated to have a $500 billion market value in the best-case scenario
- NEXA Capital Partners, LLC subsidiary UAM Geomatics[3]
    - Total global 84 city opportunity of $1.15 trillion
    - Five services and four global supply chains
- Roland Berger[4]

[1] **NASA UAM Market Study (March 2018):** https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20190002046.pdf
[2] **NASA UAM Market Study (November 2018):** https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20190001472.pdf
[3] **NEXA UAM Geomatics:** https://static1.squarespace.com/static/586be5262994caa37cd4d217/t/60f9e353ef7e6a0ba57354c6/1626989396156/WP+23-1+UAM+Geomatics+White+Paper+Economics+2021-07-03.pdf
[4] **Roland Berger:** https://www.rolandberger.com/en/Insights/Publications/The-high-flying-industry-Urban-Air-Mobility-takes-off.html

  - First study in 2018 and then updated in 2020
  - Initially estimated there would be 100,000 eVTOL air taxis flying by 2050, resulting in $80 billion market
  - Updated to 160,000 vehicles in 2050, resulting in $90 billion market (starting from $1 billion in 2030)
- Morgan Stanley[5]
  - First study in December 2018 and then updated in 2021
  - Initially estimated global total addressable market for eVTOL aircraft in 2040 of $1.5 trillion
  - Updated estimate cut by a third to $1 trillion, but expected to rise to $9 trillion by 2050
- Aerospace Industries of America (AIA) / Deloitte[6]
  - Released in January 2021
  - United States market estimated at $115 billion annually by 2035, potentially creating more than 280,000 jobs

Aircraft manufacturers (e.g., Boeing, Airbus, Embraer), airlines (e.g., American Airlines and United Airlines), automakers (e.g., Toyota, Hyundai, Honda), as well as the Department of Defense continue to invest in this market. In addition, there have been significant investments by other industries, such as healthcare where AAM is seen as a critical potential component to increasing accessible and affordable healthcare services. The architecture and engineering industry has also taken steps in investing in AAM through joint ventures with OEMs in the design and development of vertiports to support eVTOL operations.

DRIVERS AND BENEFITS

AAM harnesses and integrates several technological advances, including distributed electric propulsion,[7] automation, sensors (e.g., detect-and-avoid navigation and surveillance), simplified electronic controls, and cloud-based data collection, processing, and analysis, including artificial intelligence and machine learning.

The benefits of AAM have been outlined in many publications. For example, NASA states that AAM will move "people and cargo between places previously not served or underserved by aviation – local, regional, intraregional, urban."[8]

LEK Consulting states:

> The two biggest markets are passenger travel, for commuting, tourism, major events and sightseeing; and freight transport, for urban and regional package delivery. But there are a variety of other beneficial use cases: medical transport for both patients and critical supplies; offshore rig supply and agricultural crop protection; non-passenger recreation such as hobby use and for photography; infrastructure inspection and mapping for power grid, rail and other assets;

[5] **Morgan Stanley:** https://assets.verticalmag.com/wp-content/uploads/2021/05/Morgan-Stanley-URBAN_20210506_0000.pdf
[6] **Deloitte Insights:** https://www2.deloitte.com/us/en/insights/industry/aerospace-defense/advanced-air-mobility.html
[7] **Distributed electric propulsion:** several battery-powered rotors or jets spread throughout the wing and/or airframe, rather than one or two large rotors that are commonly used in helicopters.
[8] **NASA:** https://www.nasa.gov/aam/overview/

emergency services use for search and rescue and firefighting; and military and civil defense applications such as bushfire management and post-disaster assistance.[9]

Finally, Deloitte states:

> With its electric propulsion technology and new green fleet, AAM can advance progress toward zero-emission aerospace, enabling the United States and its aerospace and aviation industries to lead in the creation of a more sustainable mode of transport. Six in ten industry leaders believe that AAM will be a more sustainable and environmentally friendly solution to transportation compared to the current modes of aerial mobility.[10]

2.1 eVTOL Technology Overview

The general vehicle type associated with AAM is eVTOL. Several design configurations are being pursued, but they typically fall into the categories of Vectored Thrust, Lift and Cruise, and Wingless/Multicopter, as described in Figure 3 and below.

Figure 3. eVTOL Categories

MULTICOPTER: Lifting rotors are arrayed around the circumference and spokes of a carbon fiber ring.

LIFT AND CRUISE: One group of vertical rotors lift the aircraft and another set provides forward thrust; wings boost cruise energy efficiency.

VECTORED THRUST: Tilting propulsors transition the aircraft from liftoff thrust to forward thrust; wings boost cruise efficiency.

MULTIPROPULSOR DUCTED FANS: Multiple, vectorable, electric fans, enclosed in ducts, reduce noise; wings boost cruise efficiency.

Source: Aerospace America Research; Lilium

- **Vectored Thrust:** An eVTOL aircraft that uses <u>any</u> of its thrusters for lift <u>and</u> cruise
  - Includes tilt wings, tilt rotors, and tilt nacelles
  - Advantages include not carrying around thrusters that are idle during certain flight phases and the ability to achieve good speeds
  - Disadvantages include that tilting mechanisms add complexity and thrusters are oversized for cruise because of power requirements for lift off
  - Examples include Airbus Vahana, Archer Midnight, Joby S4, Lilium Jet, Overair Butterfly, Supernal S-A1, and Vertical Aerospace VA-X4
- **Lift and Cruise:** An eVTOL aircraft that uses independent thrusters for cruise versus for lift without any thrust vectoring
  - Advantages include typically being very efficient in generating lift, being able to achieve good speeds, and having less complexity due to lack of tilting mechanisms
  - Disadvantages include having to carry idle lift thrusters during cruise

[9] **LEK Insights:** https://www.lek.com/insights/ei/advanced-air-mobility-cost-economics-and-potential
[10] **Deloitte Insights:** https://www2.deloitte.com/us/en/insights/industry/aerospace-defense/advanced-air-mobility.html

  - Examples include Airbus CityAirbus NextGen, Beta Technologies Alia, Elroy Air Chapparal, Eve Air Mobility Eve, and Wisk Cora
- **Wingless/Multicopter:** An eVTOL aircraft that is wingless; no thruster for cruise, only for lift
  - Akin to taking a small unmanned aircraft system (UAS; "drone"), scaling it up, and putting people or cargo inside
  - Advantages include being more efficient at getting off the ground
  - Disadvantages include usually being range-limited, relatively slow, and not having a wing being detrimental to cruise efficiency
  - Examples include Airbus CityAirbus, Alaka'i Technologies Skai, Ehang 216, Moog SureFly, and Volocopter VoloCity

While eVTOL aircraft are most commonly associated with AAM, additional aircraft configurations include eSTOL and electric Conventional Take-Off and Landing. Both aircraft types require runways to take off and land. Some eSTOL aircraft use the concept of augmented or blown lift, which directs the airflow generated by distributed propulsion over the wing to create lift at low ground speeds, thus allowing for significantly shorter takeoffs. Examples of such aircraft are the Eviation Alice, the Bye Aerospace eFlyer 4, and a vehicle being developed by Electra.aero.

2.2 Development and Service Timeline

There is general agreement in industry that cargo operations will be seen in the near-term. Based on early discussions with cargo operators and organizations, initial operations are expected to be between operator facilities and not directly to the airport.

Airports and OEMs expect initial passenger service operations to center around General Aviation (GA) airports and Fixed Based Operators (FBO), since existing security programs at GA airports and FBOs meet the requirements of planned operations for piloted eVTOL aircraft.

One of the challenges for FBOs and AAM adoption is the potential impact to the typical FBO business model, which is based on bundling fuel sales and aircraft maintenance. As AAMs are electric and require a specialized maintenance team, there is a question of sustainability in using FBOs for AAM operations under current business models.

The eVTOL manufacturers are proceeding as fast as possible in developing their aircraft. Many prototypes have been constructed, and thousands of test flights have been flown. Many OEMs are targeting entry into service as soon as 2025. However, FAA certification is likely to be the longest critical path.

SECTION 3: POLICY AND OVERSIGHT

In the growing AAM industry, oversight is key for safety and security of airspace, passengers, and infrastructure. Federal agencies play a significant role in enabling a safe and efficient aviation system through policy and rulemaking, oversight of industry operations, and research and development. The FAA and TSA continue to adjust to support the nascent AAM industry from a regulatory perspective.

3.1 FAA Regulations

The FAA is the regulator of all U.S. civil aviation activities, and is including AAM in their planning efforts organized around five areas of activity: aircraft, airspace, operations, infrastructure, and community. These planning efforts include research, industry collaboration, and internal analysis to inform regulatory development and updates to integrate AAM into the national airspace system (NAS). As the primary regulator of the NAS, the FAA issues and maintains rules and minimum standards that cover manufacturing, operating, and maintaining aircraft. Additionally, the FAA certifies pilots and airports that serve air carriers.[11] The FAA also supports interagency research activities and programs, such as the NASA Advanced Air Mobility National Campaign.[12]

Preliminary regulation and certification of AAM vehicles by the FAA is still evolving, but existing approaches leverage and strongly imitate traditional aviation regulations. The applicable regulations for AAM include 14 CFR §§ 1, 21, 23, 119, 121, and 135. While these regulations are often detailed and nuanced, brief descriptions of their relevance to AAM are provided below.[13]

- **Part 1 –** Defines many general terms including the definition of "large aircraft" (>12,500 lb) and "small aircraft" (<12,500 lb). Most AAM vehicles are likely to fall under the definition of small aircraft, which are not subject to some of the security requirements for large aircraft.
- **Part 21/23 –** Governs certification procedures (Part 21) and airworthiness standards for the issuance of type certificates for normal category airplanes (Part 23). The executive director of the FAA UAS office shared that these two Parts will be followed for certification of AAM aircraft, but will incorporate knowledge from type certification of UAS.[14] Performance and risk-based standards will likely come into play for AAM as well.
- **Part 119 –** Applies to each person operating civil aircraft as an air carrier, commercial or otherwise, and prescribes air carrier and operating certificates. Certification via Part 119 must be met to operate under Part 121 or Part 135, and is necessary for AAM operators.
- **Part 121 –** Details the rules for scheduled air carriers (airlines with at least five round trips per week on at least one route). Requires two pilots onboard as well as other safety considerations. This rule may not apply to AAM initially but will likely become applicable once operations scale.
- **Part 135 –** Details the rules for air carriers for commuter and on-demand operations (charters). This part often covers private jets, small turbo-propeller aircraft, and commercial helicopters, hence the applicability to small AAM aircraft.[15]

[11] **FAA:** https://www.faa.gov/about/mission/activities
[12] **NASA:** https://www.nasa.gov/aamnationalcampaign
[13] This list includes regulations that are highly relevant to AAM vehicles, but CFR 14 also includes regulations around pilots, maintenance, supply chain, etc.
[14] **Aviation Today:** https://www.aviationtoday.com/2021/01/26/first-faa-type-certification-advanced-air-mobility-aircraft-come-year/
[15] **Pilot Institute:** https://pilotinstitute.com/part-91-vs-121-vs-135/

These regulations, including operations specifications determined by an FAA Principal Operations Inspector, can further restrict an air carrier's operations. The FAA is largely responsible for the rules that will keep future AAM operations safe, and may also help develop new regulations to ensure AAM security.

In May 2022, the FAA announced that it will modify its regulatory approach for the type certification of powered-lift operations leveraging the "special class" process under 14 CFR § 21.17(b). Specifically, this will change the requirements for training pilots, as these vehicles often transition from vertical lift to airplane mode. However, they will continue using performance-based airworthiness standards included in Part 23 covering the regulations for certificating airplanes weighing 19,000 pounds or less. Both the FAA and AAM companies have indicated that these changes should not seriously impact the development timelines for AAM vehicles, but will ensure the type certification processes for AAM maintain relevancy as well as safety standards.[16]

Also in May 2022, Joby Aviation, Inc., a leading AAM manufacturer, received a Part 135 air carrier certificate for commercial operation. While Joby plans on initially using conventional aircraft to test their services, they aim to use eVTOL by 2024.[17] The Part 135 air carrier certificate and type and production certificates are required to operate commercial AAM flights. Industry and regulators are still refining the processes associated with these certificates, but Joby and other companies are helping define the requirements through close coordination with the FAA.

In addition to certification, AAM-specific infrastructure design and security regulations are beginning to be developed. Takeoff and landing areas (i.e., vertiports) will likely be one of the major passenger access points to AAM vehicles. In June 2022, the FAA released "Engineering Brief No. 105, Vertiport Design,"[18] which discusses the numerous related considerations. This brief is intended as interim guidance while the FAA develops a more comprehensive Advisory Circular for vertiport design. This engineering brief shows how the FAA is actively preparing for AAM and will allow industry to continue to design and consider infrastructure for AAM vehicles.

In the future, it is possible that the TSA and other entities, including state and local governments, may play a role in the regulation of AAM vehicles. Once initial vehicle certification is accomplished and testing and demonstration begins, the adaptation of the regulatory environment will likely continue to maintain safety of the NAS. This includes considerations for air traffic coordination, and various other challenges including infrastructure, noise, and costs of managing and supporting this new flight vehicle within the NAS. Continued collaboration between AAM vehicle manufacturers and regulatory agencies is key as all parties are dealing with new challenges to support the growing industry.

3.2 TSA Regulations

The TSA ensures the security of air travel through various measures. They impose "security requirements on airport proprietors, including security fencing and access controls as well as passenger, baggage, and cargo screening." In addition, they conduct intelligence gathering and analysis, as well as passenger vetting. The TSA's responsibility for AAM security is yet to be determined. However, the industry anticipates that they will have some responsibility or oversight in ensuring a secure AAM passenger and cargo system.

[16] **Avionics International:** https://www.aviationtoday.com/2022/05/26/powered-lift-faa/
[17] **Joby Aviation:** https://www.jobyaviation.com/news/joby-receives-part-135-air-carrier-certificate/
[18] **FAA Engineering Brief No. 105, Vertiport Design:** https://www.faa.gov/sites/faa.gov/files/2022-09/eb-105-vertiports.pdf

Historically, the TSA's role at GA airports and FBOs has been limited, but this may change in the future. It is foreseeable that if the anticipated exponential growth of AAM is realized, a new regulatory framework may be developed.

TSA also regulates the Screening Partnership Program (SPP), which is an alternative staffing option for passenger and baggage screening. This program contracts security screening services at commercial airports to qualified private companies. The contracted companies operate screening operations under TSA oversight and must comply with all TSA security screening procedures.

The overarching assumption is that the initial entrance of AAM into airports will consist of AAM operations at FBOs and non-regulated areas. At a minimum, 49 CFR § 1542 – Airport Security[19] and §1540 – Civil Aviation Security: General Rules[20] will apply.

Requirements of AAM operations at airports regulated under 49 CFR § 1542 will differ based on whether the airport has a Complete, Supporting, or Partial Airport Security Program (ASP), as defined in 49 CFR §1542.103 – Content. Refer to Appendix B for additional information on the different security program measures.

At TSA-regulated airports, security-restricted areas include the Secured Area, AOA, SIDA, Sterile Area, and areas under an Airport Tenant Security Program or Exclusive Area Agreement. Although screening is necessary to prevent unauthorized individuals, prohibited items, and contraband from entering a Sterile Area, additional regulations govern access to a Secured Area, SIDA, and AOA. Importantly, AAM flight access to the airside of an airport presents a wide array of applicability to current security regulations and requires conformance with these policies and procedures if access to a security-restricted area is desired.

It is important to recognize that in the early phase of AAM operations, most AAM aircraft are intended to operate in the same manner as GA aircraft, as their weight is below the regulatory threshold weight of 12,500 pounds. Aircraft with a maximum takeoff weight above 12,500 pounds are governed by the Twelve-Five Standard Security Program (TFSSP).[21] Presently, no AAM aircraft exceed this weight. If future AAM aircraft exceed the 12,500-pound threshold, they would be subject to the TFSSP or other governing security programs. It is possible that the TSA may define AAM under a different program, but the research team believes that following the TFSSP requirements is currently the best approach.

Even though eVTOLs are under the 12,500-pound threshold, TSA is collaborating with OEMs on potential voluntary security programs and passenger vetting, a sign that OEMs are also being proactive in addressing potential security requirements. TSA has also set up a GA Subcommittee under its Aviation Security Advisory Committee (ASAC), which includes OEMs and other industry leaders in AAM.

The largest challenge from a regulatory perspective is applying standards developed for a specific type of aircraft operation to a new type of aircraft and operations. While these set a good baseline of expectations, new AAM-specific security regulations will likely be developed due to the unique flight operations.

[19] **49 CFR § 1542:** https://www.ecfr.gov/current/title-49/subtitle-B/chapter-XII/subchapter-C/part-1542
[20] **49 CFR § 1540:** https://www.ecfr.gov/current/title-49/part-1540
[21] **TFSSP – CFR 49 § 1544.10:** https://www.ecfr.gov/current/title-49/subtitle-B/chapter-XII/subchapter-C/part-1544/subpart-B/section-1544.101

3.3 International Perspective

The approach to AAM internationally is similar to the US approach, with focus on airworthiness and obtaining certifications for flight. Ensuring that the introduction of AAM operations does not present new security risks to airports also emerged as a consistent theme.

Latin America presents a very favorable regulatory environment for the introduction of AAM, and specifically for deployments in Sao Paulo, Brazil, which has 200 helipads with over 40 in daily operation. This is a stark comparison to New York City, which has four, and San Francisco, which has one. Because AAM presents opportunities for significant cost savings and reducing environmental impacts such as noise and carbon emissions, the Civil Aviation Agency of Brazil has fast-tracked multiple certification approvals, but specific security requirements and guidance has not been developed.

When looking at the global AAM market, Latin America appears to be leading the charge of AAM operations, primarily because of existing heliport infrastructure, public acceptance, and wealthy individuals looking for immediate alternatives to congested roadways.

3.3.1 ACI World

ACI World issued the "Advanced Air Mobility: Integration into the Airport Environment Policy Brief," which states: "For the most part, regulation for this domain will not be a simple adaptation of existing airport and ATM [air traffic management] rules. It will most likely need a full set of regulatory material to provide the appropriate structure for the development of AAM activities both on and off airports. The growth of this sector of activity will in part come from the development of new vertiports in urban and suburban areas. The regulatory framework must harmonize these infrastructure developments and accommodate for the seamless integration of traffic into existing air traffic flows."

ACI World has developed a series of Policy Statements (PS) that present recommendations on several topics to airport operators, regulators, and organizations developing AAM aircraft. The following statements are relevant to security:

- PS3 – AAM aircraft should be conceived to operate to the highest safety standards applicable at airports.
- PS4 – AAM operations should not bring new aviation security risks to airports.
- PS5 – Airport operators should take into consideration the potential security risks of AAM operations at airports, including cybersecurity.
- PS15 – Airport operators and AAM operators should seek to create seamless multimodal interfaces between ground and air transportation systems.

PS3–PS5 are security- and risk-specific recommendations. PS15 presents an additional security challenge in that the ultimate goal is "seamless multimodal interfaces." This implies that passengers at departure locations should follow the security screening protocols defined by the local regulatory authority to enable seamless interface from vertiport to airport. While this document does not provide prescriptive guidance, the policy statements do provide considerations that need to be addressed before the implementation of AAM at an airport.

3.3.2 European Union

The European Union Aviation Safety Agency (EASA) proposed new regulatory framework that includes the operational requirements applicable to crewed eVTOL-capable aircraft. For security aspects of vertiports, the Notice of Proposed Amendment 2022-06 states that "Vertiports may benefit from alternative security measures established and approved at national level in line with the Regulation (EU) 1254/2009 with security measures tailored to the nature of operations taking place at a specific vertiport and its location. EASA will ensure appropriate support to the European Commission in order to develop an appropriate strategic regulatory work to enable the development of this aviation sector."[22]

[22] **EASA 2022-06:** https://www.easa.europa.eu/en/downloads/136705/en

SECTION 4: AAM SECURITY CONSIDERATIONS

This section will provide an overview of the security considerations that need to be addressed for potential AAM operating models. Based on interviews, discussions, and industry outreach conducted for this research, the following security considerations were identified for AAM operations:

- Employee vetting – There is no standard for vetting employees not operating in or accessing a regulated area of an airport. This novel mode of air transport may entice an insider who has intent to perform a hostile act through access to the aircraft, software, or hardware.
- Passenger vetting – If the OEM or operator does not have an approved TSA security program (which does not exist today for AAM), they cannot vet passengers using Secure Flight.
- Electrical infrastructure and batteries – Greater electrical power needs may require expansion of existing central utility plants or creation of alternate power sources (microgrid, solar, etc.). The electrical infrastructure, including battery storage, presents a potential target for sabotage, compromise, or negligence.
- Screening – If the AAM's departing location is not regulated to require screening of persons or accessible baggage, security threats may be introduced onboard (e.g., weapons or explosives). Passengers and baggage arriving from an unregulated vertiport must be screened before entering a Sterile Area.
- Unruly Passengers – The number of unruly passenger incidents onboard aircraft has been increasing annually. Both physical and operational protections are in place to respond on commercial flights and must be considered for AAM flights.
- Cybersecurity – As eVTOLs integrate with airports, and as the level of autonomy increases in aircraft, the number of networks and the amount of data to be transmitted through and stored on airport networks will increase. These increases could provide more opportunities for cyber attackers and hackers to exploit vulnerabilities. See Section 4.3 for further discussion.

Most of these considerations remain in a state of flux and must continue to be discussed as the AAM industry and potential operations evolve. Some are addressed in more detail below.

4.1 Potential AAM Operating Models

AAM operations are not synonymous with airline operations, and in most cases they are mutually exclusive. AAM operations inherently invoke a separate set of use cases that should be studied individually to meet the security requirements of the airport and specific deployment/vertiport location.

Arrival and departure locations for AAM at an airport will be either in public, non-regulated areas or in secure, airside areas. For example, a potential landside location is on the top of the public parking garage. While this is not the only potential landside location, interviews with stakeholders noted that parking garages provide a viable initial entry for AAM operations at airports. However, they do present challenges with respect to utility requirements and structural support to account for the weight and takeoff thrust of AAM vehicles.

Potential regulated/airside areas include the FBO and cargo/mail facility. Project research showed that cargo will presumably be the initial entry of AAM operations at airports, and will have different security impacts than passenger movement at an FBO.

Though this research project focused on airports, the expectation is that AAM operations will occur between vertiports that are not located at airports. Therefore, the following sections cover both location types. Both passenger and cargo transport scenarios are discussed below, using the terms regulated and non-regulated, with the latter referring to locations not under an ASP.

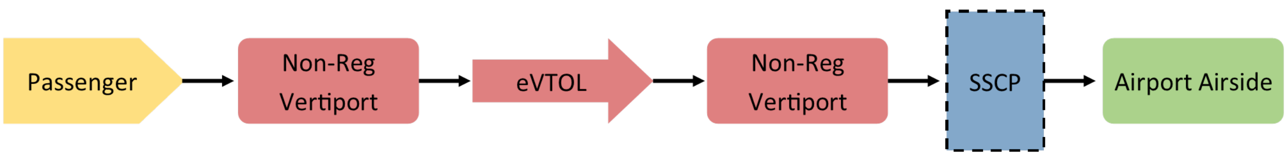
4.1.1 Non-Regulated Departure and Arrival

Although it is not anticipated that transport between non-regulated vertiports will be controlled by TSA (based on current regulations), local security protocols should still be considered, as the potential for domestic terrorism or crime such as vandalism or theft could affect the integrity of travel operations. Local government statutes and policies regarding AAM operation could be the residing restrictive protocols controlling access to and through non-federally regulated vertiports. Non-regulated vertiport operators will have the responsibility to maintain security and allow safe travel between vertiports.

A commercial contract security company may be used to provide vertiport security operations, to include supplemental screening of passengers and cargo. Their training should be consistent with the requirements established for the SPP.

Because an eVTOL aircraft departing from a non-regulated vertiport will not have been screened through TSA, to maintain the integrity of established TSA Sterile Area boundaries, the eVTOL should not be allowed to land airside at an airport. Upon arrival at an airport location, the passengers continuing on to a commercial flight will still be required to process through an established TSA security screening checkpoint (SSCP) to access the Sterile Area.

This scenario is illustrated below. An eVTOL departs from a non-regulated vertiport with passengers and lands at an airport landside landing area (e.g., parking garage or established public-area vertiport). The passengers are then screened at the TSA screening checkpoint and proceed to a commercial flight.

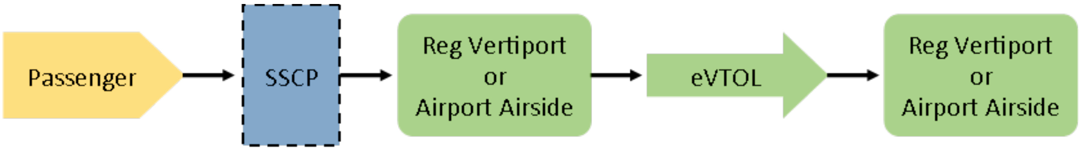


4.1.2 Regulated Departure and Arrival

Because eVTOL travel is intended to be continuous and contiguous between vertiports, the secure status of the eVTOL, passengers, and baggage/cargo will be determined at the departing vertiport, and will not typically be changed until it arrives at its destination. Travel from a regulated vertiport means that the eVTOL passengers and baggage have been screened through a TSA regulated checkpoint, and the aircraft is cleared to land at an airside vertiport.

However, a regulated vertiport may or may not be located on the airside of the airport; it may be a secure landside vertiport adjacent to the terminal building. A separate TSA screening checkpoint may be developed for a regulated landside vertiport.

In the scenario below, the eVTOL's passengers are screened at a TSA-approved SSCP, and the aircraft departs from a regulated vertiport or airside. The eVTOL lands at an airside landing area at an airport or other regulated vertiport, where no additional screening is necessary as long as the flight from the regulated departure point was continuous and contiguous.



CONTROLLED EMERGENCY LANDING

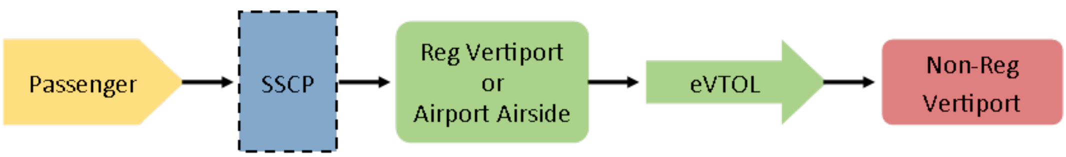
eVTOL flight paths should always be continuous and contiguous between vertiports. However, the aircraft may encounter trouble enroute that would require an emergency landing.

If the emergency landing occurs between two regulated vertiports, the integrity of the security screening process is compromised unless the landing area is within an established TSA contingency area. An emergency landing event does not always lend itself to a controlled landing inside a secure area, so contingency planning should include potential recovery and rescreening of passengers and baggage/cargo.

4.1.3 Regulated Departure to Non-Regulated Arrival

Travel between a regulated vertiport and a non-regulated vertiport does not require TSA control of the departing eVTOL and passengers, since higher level security is not required when arriving at a non-regulated vertiport. However, non-regulated vertiports may require security consistent with their policies and procedures for any arrivals. See Section 4.1.1 above for further information.

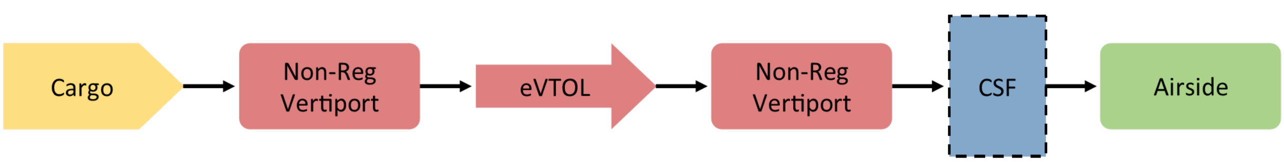
In this scenario, the eVTOL's passengers are screened at a TSA-approved checkpoint, and the aircraft departs from a regulated vertiport or airside and lands at a non-regulated vertiport.



4.1.4 Goods Transport Scenarios

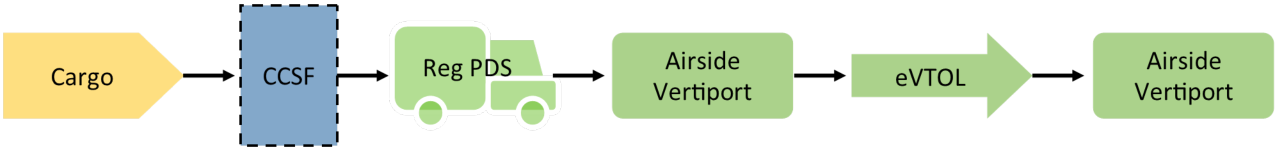
DELIVERY COMPANY TO NON-REGULATED LANDSIDE DEPARTURE

In this scenario, cargo is delivered to a non-regulated vertiport via a delivery truck. The cargo is loaded into an eVTOL and flown to another non-regulated vertiport. The cargo is screened at a regulated cargo screening facility (CSF) and processed to an airside holding area to be loaded onto a commercial aircraft for transport.



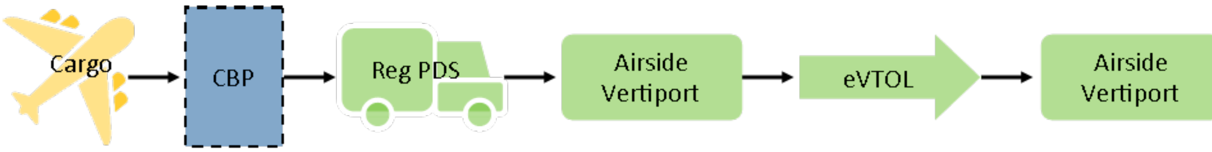
DELIVERY COMPANY TO AIRSIDE DEPARTURE

In this scenario, cargo that has been pre-screened at a certified CSF (CCSF) is delivered to an airside departure point via a regulated package delivery service (PDS). The cargo is then transported via eVTOL to another airport's airside vertiport.



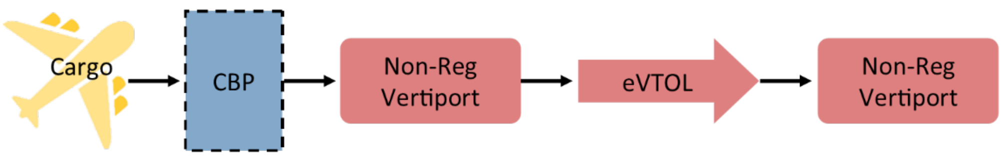
INTERNATIONAL ARRIVING CARGO TO AIRSIDE DEPARTURE

In this scenario, cargo from an international flight arrives at a commercial airport and is screened by CBP. The cargo is then delivered via a regulated PDS to an airside eVTOL departure point, and is then flown via eVTOL to another commercial airport.



INTERNATIONAL ARRIVING CARGO TO LANDSIDE DEPARTURE

In this scenario, cargo from an international flight arrives at a commercial airport and is screened by CBP. The cargo is then processed to an onsite non-regulated landside vertiport before being transported via eVTOL to its destination non-regulated vertiport.



4.2 Similar Security Operations

TSA is aware that OEMs are discussing remote screening as a potential option for AAM operators, in addition to other requests such as access to Secure Flight/vetting programs to verify passengers prior to boarding an AAM flight.

The model used by The Landline Company[23] is a TSA-approved solution used by several airports in the US for sports team charter operations. The sports charter model requires that a Ground Service Coordinator from the airline be present to oversee the security operation, including remaining on the bus during transit and ensuring doors and windows remain closed. For these sports charter operations, the driver and passengers are screened offsite, and the driver is a SIDA badge holder. The bus accesses the AOA via the vehicle gate and is subject to undercarriage and other exterior inspections in accordance with federal security regulations.

A CAT X airport has a similar service where an airport-approved security agent enters the bus to ensure that the passenger numbers and other details match the charter operation notice, and that there are no anomalies. The bus and passengers are considered sterile after undergoing a screening process similar to The Landline Company's. If for some reason the passengers had to transfer or the bus became inoperable, a contingency plan would need to be approved by TSA. The plan would involve rescreening the passengers if the sterile procedures were compromised, the passengers comingled with unscreened individuals, or an unauthorized unscreened individual gained access to the bus.

Typically, the two operational concepts listed above require TSA approval, and could be considered an Alternative Measure in the ASP.

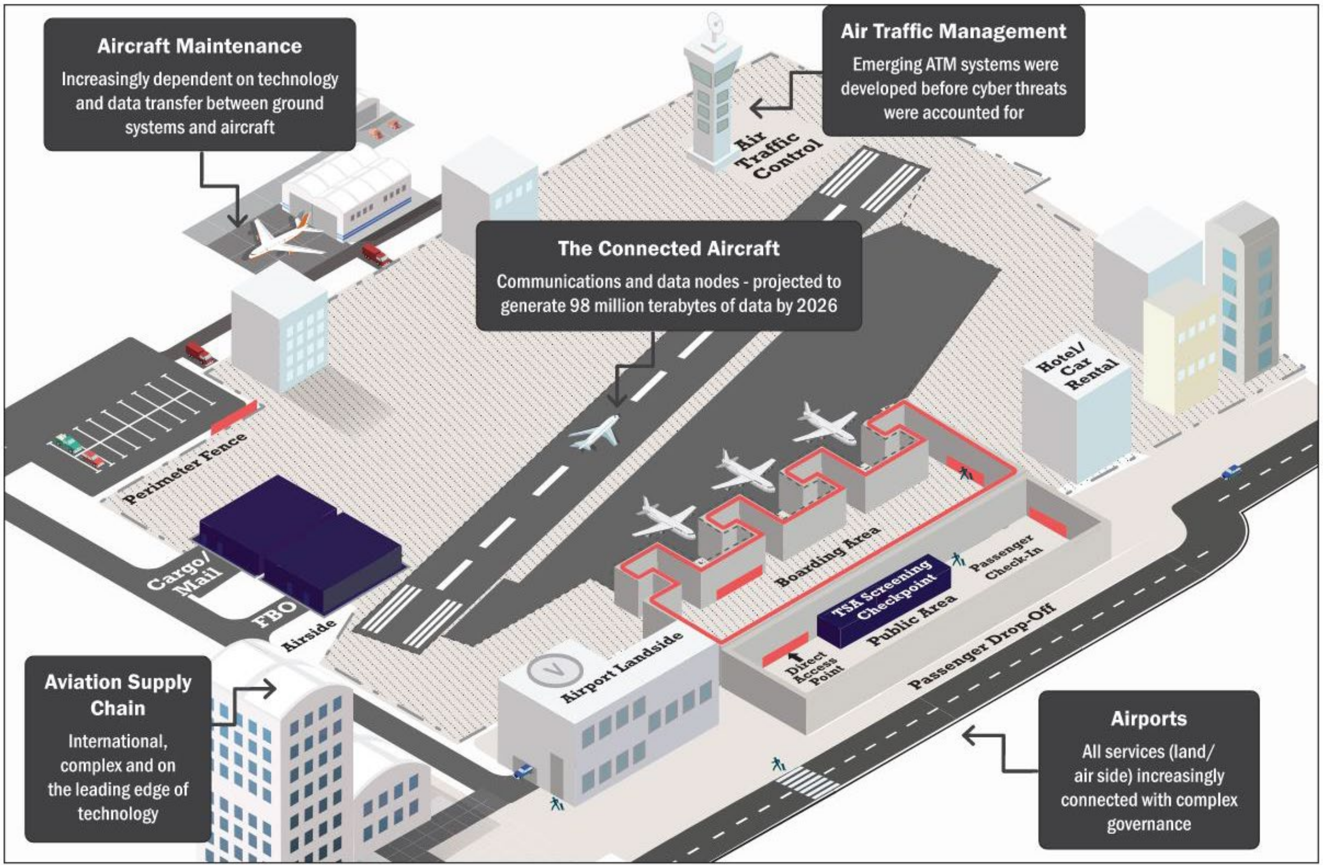
[23] **The Landline Company:** https://www.landline.com/

4.3 Cybersecurity

Cybersecurity risks continue to grow as airports adopt more technology and become increasingly connected. Airports have very complex cyberattack surfaces due to the sheer number of potential access points for hackers as well as the diversity of individuals and organizations that pass through airports regularly. The integration of eVTOLs with airports represents a key cybersecurity challenge and an increase in cyber vulnerabilities.

Figure 4 illustrates a complex, five-pronged aviation ecosystem threat surface, encompassing the aviation supply chain, air traffic management, aircraft maintenance, aircraft, and airports.

Figure 4. High-Level Airport Threat Map



Source: Burns Engineering

AIRCRAFT MAINTENANCE

The aircraft maintenance, repair, and overhaul industry is a cyberattack target due to their access to air carriers, aerospace OEMs, and airplane part suppliers. Hackers targeting one of these other entities could route an attack through an aircraft maintenance operator.

CONNECTED AND INCREASINGLY AUTONOMOUS AIRCRAFT

As aircraft grow in connectivity, cyber threats grow in number and intricacy as well. The increased number of wireless and wired networks, bandwidth of communications, and digitization of their communication systems provides more opportunities for cyberattackers to exploit vulnerabilities.

Also, with increasingly autonomous aircraft, the number of networks and cyberattack vectors, and the amount of data that is transmitted and stored rises.

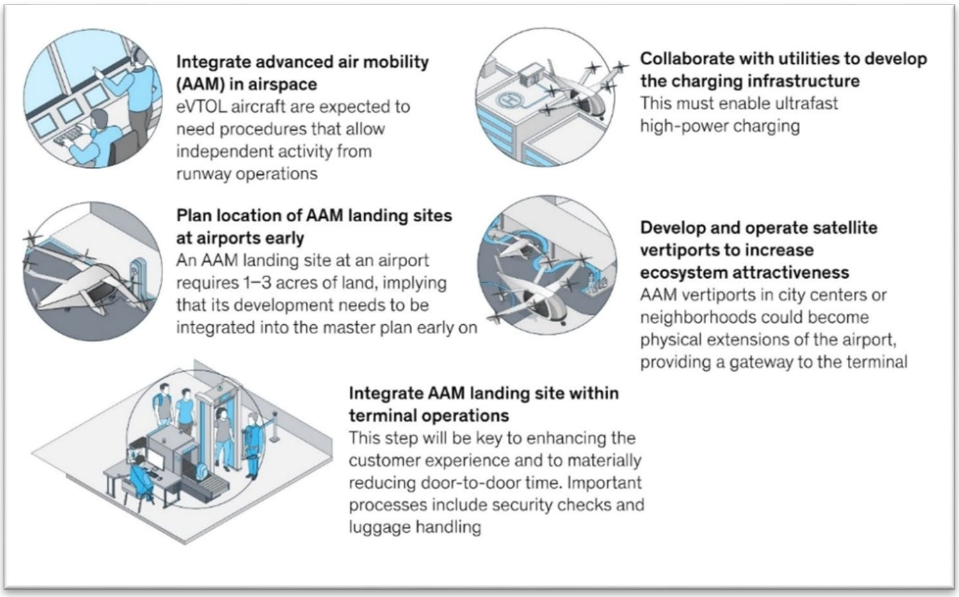
The research indicates that the cybersecurity risk differences between the different AAM scenarios covered in this report are minimal. However, there may be different risks that arise depending on what the eVTOL is carrying and the amount of bandwidth that the eVTOL uses. For example, if the aircraft has a high density of onboard communication networks and devices, it will be more susceptible to cyberattack.

SECTION 5: POSITIONING AIRPORTS FOR SUCCESS

5.1 Airport Operations

The current state of approvals for AAM provides airports with the ability to proactively prepare for the security and operational needs of this new mode of transportation. Figure 5 illustrates the various factors that should be considered when planning to integrate AAM into airport operations

Figure 5. Integrating AAM into Airport Master Plans



Source: McKinsey & Company

Depending on the AAM propulsion type, the average estimated surface footprint for a single vertiport landing/departure position is 350 square feet, which accounts for landing area, passenger loading, walkways, and maintenance/clearance areas. While it is expected that multiple AAM landing locations will be required, the total required area is not anticipated to increase linearly with the number of aircraft.

The FAA's "Engineering Brief No. 105, Vertiport Design,"[24] which provides guidance for the design of vertiports, advises that these requirements are subject to change as AAM operations continue to develop.

LOCATIONS

In the near term, airports can begin to identify viable locations for vertiports on the airport campus. For each location, a risk assessment should be completed while looking at the surrounding infrastructure, including utilities, facilities and critical operations.

POWER

Charging infrastructure for AAM batteries is one of the operational requirements for AAM. As demand increases for electrical power to support ground service vehicles (baggage tugs, aircraft tugs, etc.), passenger vehicle charging stations, and future AAM operations, airports are focusing supporting these new power loads by expanding existing utility plants or installing new power sources (i.e., microgrid, solar, etc.). These current projects will result in new assets that will need to be protected by the airport.

In addition to new power load requirements, AAMs will require battery storage at the vertiports. When AAM flights arrive, the vehicle batteries are replaced before the departure flight in order to ensure a full charge.

[24] **FAA Engineering Brief No. 105, Vertiport Design:** https://www.faa.gov/sites/faa.gov/files/2022-09/eb-105-vertiports.pdf

PERIMETER SECURITY

Controlling vertiport access and keeping operational areas clear of people, animals, equipment, debris, and vehicles is important for safety and security. The FAA Engineering Brief focuses on the following measures:

- Safety barrier in the form of a fence or wall around the operational area of the eVTOL aircraft.
- Security barrier outside the safety barrier zone. This security barrier should present a positive deterrent to persons from entering the area. Typically, this would match the minimum construction of the airport perimeter fencing.
- Control access to the airport's restricted areas with security measures as required by the TSA.

SECTION 6: GOVERNMENT AND STAKEHOLDER INITIATIVES

Industry participation in AAM conferences, discussions, working groups, and forums with OEMs, operators, and federal agencies is essential to bridge the knowledge gap, foster communication, garner financial resources, and perform critical infrastructure changes. The support of the airport community, stakeholders, and regulators is essential to enable industry to successfully integrate AAM operations into airports and establish vertiports.

GOVERNMENT/PRIVATE SECTOR WORKING GROUPS

The TSA ASAC[25] GA Subcommittee has established an AAM/eVTOL Working Group composed of TSA representatives and key stakeholders, including OEMs and industry associations, to explore operational security considerations, impacts, and needs as this new industry evolves.

This working group meets regularly and identifies issues requiring further study to facilitate the emergence of AAM. Presentations by OEMs and open dialogue between TSA and Working Group members on regulatory requirements, security considerations, infrastructure needs, vertiport design, and the passenger experience are topics of discussion that serve to transfer knowledge through this public-private partnership. This enables the parties to better understand AAM models and operations, engage in strategic planning, and make informed decisions to stay current with this rapidly evolving mode of transportation.

NASA

NASA supports research and development across the aviation and space industries, and has developed an AAM Mission to help emerging aviation markets safely develop a new air transportation system for people and cargo.[26] Through the Aeronautics Research Mission Directorate, NASA works directly with industry to assist with identifying and addressing roadblocks and technical challenges facing AAM.[27] This effort includes working closely with other agencies and organizations to conduct research, testing, public outreach, and more.

UNITED STATES AIR FORCE

AFWERX, a Technology Directorate of the Air Force Research Laboratory focused on innovation, has accelerated electric air taxi technologies and recently awarded over $100 million in contracts in order to achieve military airworthiness. Military use of AAM for medical support, small package transport, and potential drone support are the driving applications.

[25] **TSA ASAC:** https://www.tsa.gov/for-industry/aviation-security
[26] **NASA AAM:** https://www.nasa.gov/aam
[27] **NASA Aeronautics Research Mission Directorate:** https://www.nasa.gov/aeroresearch

SECTION 7: FUTURE RESEARCH PROBLEM STATEMENTS

Security considerations for AAM implementation was the focus of the research and stakeholder outreach for this project. However, there were a number of topics repeatedly identified by stakeholders that did not fit within this research scope but may be considered for future problem statements.

- AAM cargo operations at airports
    - How will cargo be screened if the departure location is not a regulated airport/screening facility?
    - How will the security integrity of departing screened cargo be maintained/verified when arriving at a regulated airport area?
- Integration of new airport security technologies into AAM operations
    - How will perimeter intrusion detection systems differentiate an AAM from a drone?
    - Should ramp and/or security operations monitor AAM movement within regulated areas via automated CCTV cameras and video analytics?
    - Will baggage handling systems need to have induction points at vertiport locations, similar to curbside drop off?
- Longer term airport security design to accommodate AAM operations
    - What will the requirements be for vertiports areas in either landside or restricted areas?
- AAM emergency response operations at airports
- Vertiport design and location at airports
    - How will the introduction of additional power and assets at the airport result in additional risks?

APPENDIX A: DEFINITIONS

The following definitions provide additional clarity for terms that are not already defined within the respective section where initially referenced in this guidance document.

Landside

Landside represents all public areas on the airport prior to the Security Screening Checkpoint (SSCP) or a perimeter control point leading to the Secured Area/AOA. It includes the terminal areas prior to the SSCP, patron and other public parking areas, walkways, public access roadways, rental car facilities, taxi and ground transportation staging areas, and any on-airport hotel facilities. Since the landside includes all non-airside areas other than the terminal(s), its location is determined by the airside and perimeter boundary.

Airside

Airside represents the areas of the airport with aircraft movement and ground services that support the aircraft (e.g., baggage, fuel, catering). Airside typically starts at the Sterile Area side of the SSCP and extends to the perimeter fence/boundary of the airport.

AOA

An AOA is a portion of an airport, specified in the ASP, in which the security measures stipulated in 49 CFR § 1542 are carried out. This area includes aircraft movement areas, aircraft parking areas, loading ramps, and safety areas used by aircraft regulated under 49 CFR §§ 1544 and 1546, and any adjacent areas (such as GA and cargo areas) that are not separated by adequate security systems, measures, or procedures. This area does not include the Secured Area.

Secured Area

A Secured Area is a portion of an airport, specified in the ASP, in which certain security measures specified in 49 CFR § 1542 are carried out. This area is where aircraft operators and foreign air carriers that have a security program under 49 CFR § 1544 or 1546 enplane and deplane passengers, and sort and load baggage. It includes any adjacent areas that are not separated by adequate security measures

SIDA

A SIDA is a portion of an airport, specified in the ASP, in which security measures outlined in 49 CFR § 1542 are carried out. Specifically, it is an area requiring display of an authorized ID media.

Regulations do not require a SIDA to have access controls, so it cannot, by itself, be a Secured Area. However, a Secured Area requires ID display, so it is always a SIDA. SIDAs may also lie within AOAs. Generally, the airport operator has the responsibility to secure SIDAs and prevent or respond immediately to access by unauthorized persons and vehicles.

Sterile Area

At an airport with a security program under 49 CFR § 1542, the Sterile Area of the terminal typically refers to the area between the SSCP and the loading bridge and/or hold room door leading to the aircraft. The Sterile Area is controlled by inspecting persons and property in accordance with TSA screening protocols and a TSA-approved ASP. The primary objective of a Sterile Area is to provide a passenger containment area, preventing persons in it from gaining access to weapons or contraband after having passed through the SSCP and prior to boarding an aircraft.

Exclusive Use Area

An exclusive use area is any portion of a Secured Area, AOA, or SIDA, including individual access points, for which an aircraft operator or foreign air carrier that has a security program under 49 CFR § 1544 or 1546, or has assumed responsibility for security as required under 49 CFR § 1542.111.

Within the exclusive use area, the responsible signatory aircraft operator or foreign air carrier must perform security control requirements described in the Exclusive Area Agreement. The aircraft operator, not the airport, may control access and movement within the exclusive area.

Airport Tenant Security Program (ATSP) Area

An ATSP area is an area specified in an agreement between the airport operator and an airport tenant that stipulates the measures by which the tenant will perform stated security functions, authorized by the TSA, under 49 CFR § 1542.113. ATSPs are similar to exclusive use areas, except that tenants are not regulated parties.

APPENDIX B: 49 CFR §1542.103 SECURITY PROGRAMS

Title 49 CFR §1542.103 identifies three levels of security programs that encompass a variety of security measures, including:

COMPLETE PROGRAM

- Responsible contact name, means of contact, duties, and training requirements of the ASC required under § 1542.3.
- A description of the secured areas or AOA, including—
  - A description and map detailing boundaries and pertinent features;
  - Each activity or entity on, or adjacent to, a secured area that affects security;
  - Measures used to perform the access control functions required under § 1542.201(b)(1);
  - Procedures to control movement within the secured area, including identification media required under § 1542.201(b)(3); and
  - A description of the notification signs required under § 1542.201(b)(6).
- A description of the SIDA including:
  - A description and map detailing boundaries and pertinent features; and
  - Each activity or entity on, or adjacent to, a SIDA.
- A description of the sterile areas, including -
  - A diagram with dimensions detailing boundaries and pertinent features.
  - Access controls to be used when the passenger-screening checkpoint is non-operational and the entity responsible for that access control; and
  - Measures used to control access as specified in § 1542.207.
- Procedures used to comply with § 1542.209 regarding fingerprint-based criminal history records checks.
- A description of the personnel identification systems as described in § 1542.211.
- Escort procedures in accordance with § 1542.211(e).
- Challenge procedures in accordance with § 1542.211(d).
- Training programs required under §§ 1542.213 and 1542.217(c)(2), if applicable.
- A description of law enforcement support used to comply with § 1542.215(a).
- A system for maintaining the records described in § 1542.221.
- The procedures and a description of facilities and equipment used to support TSA inspection of individuals and property, and aircraft operator or foreign air carrier screening functions of parts 1544 and 1546 of this chapter.
- A contingency plan required under § 1542.301.
- Procedures for the distribution, storage, and disposal of security programs, Security Directives, Information Circulars, implementing instructions, and as appropriate, classified information.
- Procedures for posting of public advisories as specified in § 1542.305.
- Incident management procedures used to comply with § 1542.307.
- Alternate security procedures, if any, that the airport operator intends to use in the event of natural disasters, and other emergency or unusual conditions.
- Each exclusive area agreement as specified in § 1542.111.

- Each airport tenant security program as specified in § 1542.113.

SUPPORTING PROGRAM

- Responsible contact name, means of contact, duties, and training requirements of the ASC, as required under § 1542.3.
- A description of the law enforcement support used to comply with § 1542.215(a).
- Training program for law enforcement personnel required under § 1542.217(c)(2), if applicable.
- A system for maintaining the records described in § 1542.221.
- The contingency plan required under § 1542.301.
- Procedures for the distribution, storage, and disposal of security programs, Security Directives,
- Information Circulars, implementing instructions, and as appropriate, classified information.
- Procedures for public advisories as specified in § 1542.305.
- Incident management procedures used to comply with § 1542.307.

PARTIAL PROGRAM

- Responsible contact name, means of contact, duties, and training requirements of the ASC as required under § 1542.3.
- A description of the law enforcement support used to comply with § 1542.215(b).
- Training program for law enforcement personnel required under § 1542.217(c)(2), if applicable.
- A system for maintaining the records described in § 1542.221.
- Procedures for the distribution, storage, and disposal of security programs, Security Directives, Information Circulars, implementing instructions, and as appropriate, classified information.
- Procedures for public advisories as specified in § 1542.305.
- Incident management procedures used to comply with § 1542.307.

APPENDIX C: LITERATURE REVIEW

SECURITY DOCUMENTS

Document Name	Issue Date	Version	Issued By	Website	Availability
PARAS 0002 – Companion Design Guide to US Customs and Border Protection's Airport Technical Design Standards	5/1/2017	1st Edition	Safe Skies	https://www.sskies.org/images/uploads/subpage/PARAS_0002.CBPATDSCompanionGuide.FinalReport.pdf	Public
PARAS 0007 – Quick Guide for Airport Cybersecurity	1/1/2018	1st Edition	Safe Skies	https://www.sskies.org/images/uploads/subpage/PARAS_0007.CybersecurityQuickGuide.FinalReport.pdf	Public
PARAS 0010 – Guidance for Protecting Access to Vital Systems Impacting Airport Security	10/1/2017	1st Edition	Safe Skies	https://www.sskies.org/images/uploads/subpage/PARAS_0010.SecuritySystemsAccess.FinalReport.pdf	Public
PARAS 0011 – Guidance for Airport Security Master Planning	1/1/2019	1st Edition	Safe Skies	https://www.sskies.org/images/uploads/subpage/PARAS_0011.SecurityMasterPlanning.FinalReport.pdf	Public
PARAS 0015 – Guidance for Airport Perimeter Security	12/1/2018	1st Edition	Safe Skies	https://www.sskies.org/images/uploads/subpage/PARAS_0015.AirportPerimeterSecurity.FinalReport.pdf	Public
PARAS 0016 – Airport Security Vulnerability Assessments	6/1/2020	1st Edition	Safe Skies	https://www.sskies.org/images/uploads/subpage/PARAS_0016.SVAGuidebook__.Final__.pdf	Public
PARAS 0028 – Recommended Security Guidelines for Airport Planning, Design, and Construction	2/1/2021	1st Edition	Safe Skies	https://www.sskies.org/images/uploads/subpage/PARAS_0028.Recommended_Security_Guidelines_.FinalReport_.pdf	Public
ACRP 03-42 Airports and UAS (Volumes 1–3)	7/1/2020	1st Edition	ACRP	https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4240	Public
Airports Council International - Landside Security Handbook	7/1/2005	First Edition	ACI	https://store.aci.aero/product/landside-security-handbook-first-edition-2018/	For Purchase
Checkpoint Requirements and Planning Guide	12/1/2018	Version 0	TSA	https://beta.sam.gov/opp/6d618178938d8fa31d64fc097587bcbb/view	Public
e-CFR Aircraft Operator Security	9/1/2019	Part 1544	e-CFR	https://www.ecfr.gov/cgi-bin/text-idx?SID=5a1b08bbf0c88da7072c6659eb56b91f&mc=true&node=pt49.9.1544&rgn=div5	Public
e-CFR Airport emergency plan	9/1/2019	Subpart D → §139.325	e-CFR	https://www.ecfr.gov/cgi-bin/text-idx?SID=23094eb7dfd7c239453269a275e57bd9&mc=true&node=se14.3.139_1325&rgn=div8	Public
e-CFR Airport Security	9/1/2019	Part 1542	e-CFR	https://www.ecfr.gov/cgi-bin/text-idx?SID=5a1b08bbf0c88da7072c6659eb56b91f&mc=true&node=pt49.9.1542&rgn=div5	Public

Document Name	Issue Date	Version	Issued By	Website	Availability
e-CFR Aviation and Transportation Security Act (ATSA). Public Law 107-71 49 CFR Subchapter C: Civil Aviation Security	9/1/2019	0.0	e-CFR	https://www.ecfr.gov/cgi-bin/text-idx?SID=64c8cd132dcd0e5ea413bb5c59dde720&mc=true&tpl=/ecfrbrowse/Title49/49CXIIsubchapC.tpl	Public
e-CFR Certification and Operations: Land Airports	9/1/2019	Part 139	e-CFR	https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title14/14cfr139_main_02.tpl	Public
e-CFR Foreign Air Carrier Security	9/1/2019	Part 1546	e-CFR	https://www.ecfr.gov/cgi-bin/text-idx?SID=5a1b08bbf0c88da7072c6659eb56b91f&mc=true&node=pt49.9.1546&rgn=div5	Public
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