



ADVANCED MOBILITY NC

Zoning Framework

2026



Table of Contents

1.0 Introduction	2
2.0 Federal, State and Local Roles in Land Use Planning and Regulation	2
2.1 Role of the Federal Government.....	2
2.2 Role of the State Government	3
2.3 Role of the Local Government	4
3.0 Types of Vertiplace, Infrastructure Requirements, and Ownership	4
3.1 Vertiplace Categories	4
3.2 Infrastructure Requirements.....	6
3.3 Vertiplace Use Cases and Ownership.....	7
3.4 Federal and State Guidance on Vertiplace Development	8
3.4.1 Existing Federal Guidance	8
3.4.2 State Permitting Process	9
4.0 Comprehensive Planning Considerations.....	10
4.1 Opportunities vs. Drawbacks	10
4.2 Community Considerations.....	12
4.3 Sub-Area Planning.....	12
4.4 Coordination Best Practices	13
5.0 Zoning	14
5.1 Conventional Zoning Considerations.....	14
5.2 Overlay District Considerations.....	17
5.3 Conditional Zoning Considerations	18
5.4 Special Use Permits.....	18
6.0 Conclusions	19
7.0 Resources.....	19

1.0 Introduction

As communities prepare to address the opportunities and challenges associated with Advanced Air Mobility (AAM) capabilities, elected officials, land use planners and a broader range of stakeholders must identify potential benefits these technologies may offer and how they can be integrated into North Carolina communities. North Carolina Department of Transportation (NCDOT) endeavors to promote local zoning codes and land use decisions that will permit the development of supporting infrastructure while ensuring safety, providing adequate protection of existing aviation assets, and fostering a consistent statewide approach. Recognizing safety as paramount, particularly for the scalability of AAM, North Carolina looks to establish a framework for holistic development that not only accounts for current aviation assets but incorporates AAM infrastructure into local communities. Seeking to establish a consistent process across jurisdictions, NCDOT has prepared this document to identify important considerations in comprehensive land use planning and zoning decisions that will help propel North Carolina into this new era of travel and firmly establish the State as a leader of innovative transportation solutions.

It is the community's responsibility to appropriately balance the benefits of AAM with the infrastructure needs and potential effects on nearby land uses. Like existing airports and heliports, the ground infrastructure that will support AAM operations requires consideration of the compatibility of nearby land uses. These considerations include:

- **Tall structures/Obstructions to navigation**
- **Wildlife attractants**
- **Environmental concerns, including noise and visual impacts**

This document provides an overview of land use regulations, definitions of key infrastructure, and a framework to guide local jurisdictions when seeking to integrate AAM into existing land use planning considerations. It is designed to provide uniform guidance and considerations in the establishment of zoning ordinances. While zoning is controlled by local jurisdictions, there is overlap between the decisions of the State and local municipalities which will drive the need for close communication between the two.

2.0 Federal, State and Local Roles in Land Use Planning and Regulation

2.1 Role of the Federal Government

The Federal Aviation Administration (FAA), as the controller of all airspace inside their airspace boundaries, provides direction and guidance on how AAM is regulated and integrated into the National Airspace System. The FAA does not have the authority to directly control land usage. However, airport owners and operators who receive federal funding are obligated through the issuance of grant assurances to promote compatible land uses. Additionally, the FAA plays a critical role in airport inspections to regulate and oversee airport operations ensuring compliance with safety standards and aviation regulations.

AAM is in its infancy. The FAA, US Department of Transportation, NASA, and research institutions across the country are engaged in research and activities for the development of the policy and regulatory environment. The FAA has provided an AAM implementation plan (Innovate28) outlining the FAA's expectation of how AAM aircraft will operate in the near term. The plan has been developed as a "living document" that will be updated periodically as technology advances, aircraft reach full certification, and AAM progresses past this nascent stage.

2.2 Role of the State Government

Zoning in North Carolina is primarily the responsibility of local governments, where local governing bodies determine potential future land use patterns and establish zoning ordinances to regulate land use within jurisdictions. The State plays a key role in establishing the framework and guidelines for local government's implementation of zoning and land use laws and procedures. Effective January 2021, North Carolina General Statutes Chapter 160D consolidated county and city authority for zoning that was previously separated under different statutes. Notably, Article 5 (effective July 2022), required local governments to institute a comprehensive plan to invoke zoning. Land use patterns and decisions around permitted uses related to AAM will be largely a locally driven process.

Article 4, Section 63.31 of North Carolina law provides the authority of a political subdivision to adopt, administer, and enforce airport zoning regulations. The statute states:

Every political subdivision may adopt, administer, and enforce, under the police power or as a land development regulation under Chapter 160D of the General Statutes, airport zoning regulations, which regulations shall divide the area surrounding any airport within the jurisdiction of said political subdivision into zones, and, within such zones, specify the land uses permitted, and regulate and restrict the height to which structures and trees may be erected or allowed to grow. In adopting or revising any such zoning regulations, the political subdivision shall consider, among other things, the character of the flying operations expected to be conducted at the airport, the nature of the terrain, the height of existing structures and trees above the level of the airport, the possibility of lowering or removing existing obstructions, and the views of the agency of the federal government charged with the fostering of civil aeronautics, as to the aerial approaches necessary to safe flying operations at the airport.

Recently, in December 2024, the North Carolina Legislature overrode Governor Cooper's veto of Senate Bill (S.B.) 382. While focused mostly on hurricane relief funding, S.B. 382 removed a local government's ability to tighten zoning restrictions on a property unless express written permission is granted by the property owner. Found on the final page of the law, the government lost the ability to "down-zone" or further restrict land usage from what was previously allowed, and the government may not create a "nonconforming" use of a lot or structure. Retroactive to 180 days prior to being effective, this law has sparked controversy and debate but is considered one of the strongest property rights protections in the country.¹

¹ [North Carolina passes sweeping surprise ban on 'downzoning'](#)

2.3 Role of the Local Government

The local government is empowered by the State to make local zoning decisions that are consistent with their comprehensive plan to design and implement land use. Local governments use several strategies to ensure compatible land uses around airports, often working with airport authorities and focusing on safety, noise, and environmental impacts. These measures typically include zoning regulations specific to aviation assets, including height restrictions and the adoption of noise exposure contours prepared by airports. Local communities also strive to encourage community engagement in the land use planning process. Local jurisdictions, with their role in comprehensive land use planning and zoning, play a key role in defining where AAM operations will occur.

3.0 Types of Vertiplace, Infrastructure Requirements, and Ownership

3.1 Vertiplace Categories

A key challenge for AAM deployment is the development and placement of the supporting infrastructure required to accommodate operations, including “vertiplaces”—various types of takeoff and landing facilities with differing capabilities and footprints.²

The industry expects short-term implementation to occur on existing aviation assets (airports and heliports retrofitted to accommodate AAM), but longer-term implementation will require new, purpose-built facilities. It should be noted that the range and types of vertiplaces are largely still conceptual, as few have been planned or constructed. However, many potential operators are considering how ground infrastructure can connect the movement of people and goods, and the facilities needed to do so. This document assumes AAM operations on existing aviation facilities are sufficiently addressed through existing zoning ordinances.

While still in the conceptual stage, it is important to recognize these differences and the implications for land use and zoning considerations. The following are broad definitions of the categories of vertiplaces.³

² [Microsoft Word - NASA Vertiport Trade Study 20210119_FINAL \(FOR DELIVERY\).docx](#)

³ [NASA, Advanced Air Mobility \(AAM\) Vertiport Automation Trade Study, https://ntrs.nasa.gov/api/citations/20210009757/downloads/20210009757_MAJohnson_VertiportTradeStudy_final.pdf, November 2020.](https://ntrs.nasa.gov/api/citations/20210009757/downloads/20210009757_MAJohnson_VertiportTradeStudy_final.pdf)

Vertihub: As the name implies, vertihubs will serve as hubs of AAM activity, thus likely the largest facilities with multiple takeoff and landing areas, a higher frequency of operations, multiple operators, and the largest demand on the power grid (for those aircraft powered by batteries). Vertihubs are likely to have high-capacity charging capabilities, passenger and parking accommodations, and maintenance, repair, and overhaul (MRO) facilities. Vertihubs may offer the opportunity for multimodal connections with ample parking, overnight aircraft storage, and passenger screening.

Vertiport: Vertiports are identifiable ground or elevated areas, including buildings or facilities thereon, used for vertical takeoff and landing of multiple aircraft. Vertiports may be located in congested urban areas and serve heavy passenger traffic and cargo loading and unloading. A typical vertiport is not expected to have robust MRO facilities but will most likely include facilities for charging and basic maintenance. Vertiports are expected to have battery swapping or quick charging capability and basic passenger support facilities.

Vertistop: Vertistops, the facility with the smallest footprint, are expected to primarily serve suburban and rural areas, most likely connecting passengers to larger urban and suburban areas. Vertistops are minimally developed vertiport facilities used for passenger/cargo loading and unloading but are not expected to have the capability for fueling/charging, maintenance and repair operations, or storage.

Figure 1. NASA Depiction of Vertiplaces

Ground infrastructure (vertiplaces):
Vertihubs, vertiports, and vertistops



3.2 Infrastructure Requirements

As indicated, vertiplaces may require varying degrees of supporting infrastructure that may be relevant to community decisions surrounding land use planning and zoning. These will vary based on the types of use cases they support (e.g. movement of cargo, passengers or emergency services), charging/refueling capabilities, parking, maintenance, and other supporting infrastructure.

Charging/Refueling: While many original equipment manufacturers (OEMs) are exploring electric battery power, others are exploring hydrogen, hybrid, and sustainable aviation fuel propulsion. Vertiplace design should consider charging/refueling options including fixed charging equipment, mobile charging systems, battery swapping and battery/hydrogen storage. Vertiplace planning and development will require close coordination with local utility providers to verify capacity prior to permitting. Developers of vertiports with electric charging may desire the ability to submeter charging utilities for cost/fee recovery. It's important to note that these refueling/charging considerations have secondary and tertiary implications for local emergency response. A letter of assurance (LOA) may be needed to exist between the vertiplace and local emergency response and may require additional certification or training to be conducted.

Passenger Support: Facilities that support the movement of passengers will need to accommodate support capabilities, needs of the population, and facilities to elevate the passenger experience. Recognized as crucial to AAM scalability, the passenger experience should account for climate-controlled, covered, waiting areas for passengers, restroom facilities, and depending on the scale and number of operations, retail, and food options. The desired number of these facilities will drive the overall facility footprint. Depending on use cases and locations, future iterations may want to consider passenger security screening for follow-on airport terminal connections and expediency.

Parking: Vertiplaces will have differing requirements for parking based on density, use cases, and hours of operation. Vertihubs may require sufficient parking and passenger loading facilities to accommodate multi-modal connections and longer-term travel to include electric vehicle charging. Vertistops may only need minimal parking options and since they only require a basic support structure could potentially be co-located with existing parking lots. Vertiports located in heavily congested urban areas can rely on already existing city parking in the vicinity and should not require stand-alone parking facilities depending on capacity. Vertiplaces being used at cargo facilities will require parking for the loading and unloading of cargo. These facilities will most likely be in places prioritizing quick highway access for the expediency of cargo movement. Other vertiplace located in industrial sites may not require dedicated parking for operations as trucks won't remain on site after loading and unloading of cargo.

Ground Support & Maintenance, Overhaul, and Repair: Vertiplaces will have differing levels of support and dedicated maintenance depending on use case, density of operations, and functions. Vertihubs may have significant maintenance, overhaul, and repair (MRO) capability and full-service ground handling and support, while it is expected that vertiport MRO service will be limited. Vertistops are expected to have minimal ground handling personnel and equipment and are not expected to have maintenance capability for routine operations.

Weather Observing Instrumentation: Understanding visibility, turbulence, and wind direction is critical to the safe operation of AAM. Vertiplace design may require infrastructure such as an automated weather observing system (AWOS). Vertiplaces will need to have structured pre-planned procedures for severe weather that ensure the continuity of safe operations. The inclusion of an AWOS will provide temperature, dew point, cloud cover and altitude, visibility, wind speed/direction, any current precipitation, and the location of any lightning strikes. This information enhances safety and information to the pilot and will be especially useful as AAM moves to more autonomous operations in the future.

3.3 Vertiplace Use Cases and Ownership

How a vertiplace will be used will have significant impacts on vertiplace design and how it integrates into the fabric of a community. Whether owned privately or by a city or county, future vertiport facilities should consider strategies to adequately control existing and planned land uses surrounding vertiport facilities. The use cases expected to be most prevalent are discussed below.

Passenger Connection: Vertiplaces designed to improve the connectivity of passengers, often referred to as air-taxis, may include intra-city or region, inter-city or region, or regional destinations. Use cases include connecting passengers between home and work as well as between existing transportation networks. The use of air-taxis for improved connectivity aligns with the NCDOT's vision for transportation to become more efficient, sustainable and equitable while also creating thousands of well-paying jobs.

Cargo Services: Vertiplace used for AAM cargo services will be in different locations than vertiplace used for air taxi operations and will reflect where goods are needed instead of people. These facilities could be located at distribution centers (usually in suburban or rural areas) or co-located at airports and be used to transport goods to pick-up facilities or customer locations. Vertiplaces used for cargo transportation will not need to include passenger support facilities but will include items for cargo screening/security and should include items to make cargo movement more efficient such as loading docks and conveyor belts.

Emergency Services: Initial vertiplaces used for emergency services will be co-located with medical facilities and usually operate as private use. These facilities will not require robust passenger support services and are less about the passenger experience and more about expedited transport. Emergency use vertiplaces may be elevated for urban use and easy identification. Public use vertiplaces being used for emergency transport will circumvent any delays with priority handling just as emergency vehicles do on roadways. Current use cases envision a market for replacing police helicopters and even fire services with AAM. AAM aircraft could deploy automated external defibrillators (AEDs), acting as first responders, which may be collocated with existing police and fire stations.

3.4 Federal and State Guidance on Vertiplace Development

3.4.1 Existing Federal Guidance

While the overwhelming number of current heliports in the United States are private use, the vertiplace model aims for a much higher percentage of facilities available for public use. While the FAA does not regulate the building of private-use aviation facilities, all facilities must follow FAA rules for construction, alteration, activation and deactivation as contained in 14 CFR Part 157 - Notice of Construction, Alteration, Activation, And Deactivation of Airports. The public use vertiplace model will need to follow applicable Advisory Circulars (ACs) published by the FAA, be subject to periodic inspections, and be permitted by the state.

The large number of manufacturers currently developing aircraft for certification, coupled with the limited published aircraft performance data and proprietary nature of aircraft design, has limited guidance on vertiport design. The FAA published Engineering Brief (EB) 105 – Vertiport Design in September 2022 providing initial guidance on design, touchdown and lift off (TOLF) area, final approach and takeoff (FATO) area, approach and departure guidance, lighting, marking, visual aids and safety considerations. EB 105 states the FAA’s position that AAM operations can occur on existing airport infrastructure or on dedicated vertiport facilities and provides guidance and standoff distance requirements for vertiport locations on airport facilities. EB 105A,⁴ published in December 2024, further defined the dimensions of TOLF, FATO, and the Safety Zone for powered-lift and nonpowered-lift with the main difference attributed to the demonstrated precision landing performance of non-powered-lift aircraft allowing for a smaller FATO. These dimensions were refined based on design characteristics of nine aircraft currently in the design phase and three aircraft currently in the development/certification phase. As aircraft continue to progress through the certification process, this guidance is expected to be refined further, and a performance-based AC is expected to be developed sometime in the near future.

EB 105A introduces caution regarding downwash/outwash (DWOW) guidance. To provide vertical lift aircraft produce downward focused propulsion. The closer aircraft get to the ground, during either take-off or landing, the more powerful these forces are felt at ground level. This downwash (and outwash as it impacts the surface) “can be dangerous to people, property, equipment, and other aircraft” and “can result in ground surface erosions, wake recirculation, foreign object debris and wind hazards.”⁵ EB 105A recommends establishing DWOW caution areas (DCA) in locations where air velocities exceed 34.5 mph with the primary mitigation measure being to deny entry while DWOW is in effect. This risk may be somewhat mitigated with the construction of protective walling.⁶

⁴ [EB 105A, Vertiport Design, Supplemental Guidance to AC 150/5390-2D, Heliport Design, December 27, 2024](#)

⁵ [EB 105A, Vertiport Design, Supplemental Guidance to AC 150/5390-2D, Heliport Design, December 27, 2024](#)

⁶ [EB 105A, Vertiport Design, Supplemental Guidance to AC 150/5390-2D, Heliport Design, December 27, 2024](#)

Figure 2 represents the approach and departure corridor guidance from EB 105 extending to a horizontal distance of 4,000 feet with an 8:1 slope in parallel to the corridor and a 2:1 slope horizontally out to 250 feet. This approach corridor should be planned based on the predominant wind direction. If a reciprocal approach/departure path is not recommended, EB 105 directs separating additional corridors by at least 135 degrees.⁷

The FAA recognizes the need to safely integrate vertiports into on-airport locations where AAM aircraft can operate safely with separation from existing approach and departure corridors. This integration may require separate vertiport approach/departure procedures for use during times of high-density traffic to avoid operational effects. EB 105A recommends a 500- or 700-foot distance from FATO Center to Runway Centerline depending on aircraft weight. Directly applicable to land use planners, EB 105A cautions the selection of vertiport locations in close proximity to existing aviation assets due to how that may affect Air Traffic Control procedures, capacity, and safety. For this reason and others, it is imperative that municipalities make deliberate decisions and exercise caution during AAM integration.

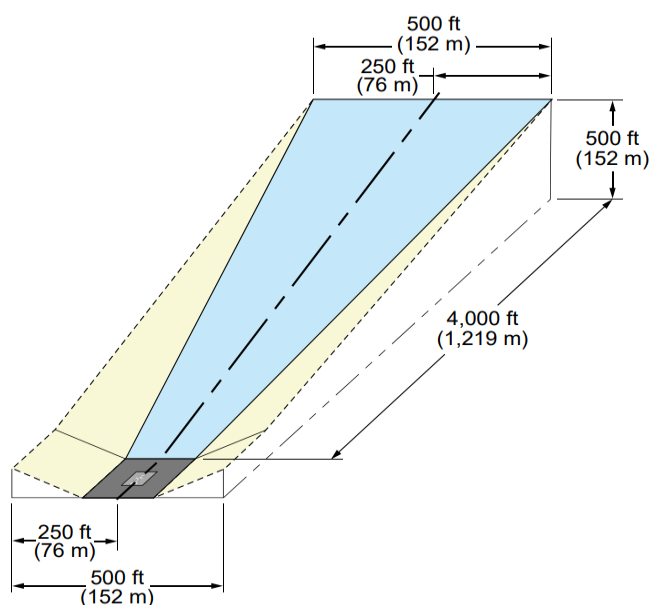


Figure 2. VFR Vertiplace Approach/Departure Surfaces⁸

3.4.2 State Permitting Process

NCDOT’s current helicopter landing permit process is being modified for the inclusion of vertiports. The process includes submission of documents outlining location, type of use, use of IFR procedures, facility information, landing and lighting aids, and a sketch depicting location of closest public road, standoff distances, and obstructions. Ultimately, the North Carolina helicopter/vertiport permitting process will have the final decision on

⁷ [EB 105A, Vertiport Design, Supplemental Guidance to AC 150/5390-2D, Heliport Design, December 27, 2024](#)

⁸ [EB 105A, Vertiport Design, Supplemental Guidance to AC 150/5390-2D, Heliport Design, December 27, 2024](#)

AAM operations after municipalities decide on zoning for compatible land use and building permits for the vertiplace.

4.0 Comprehensive Planning Considerations

North Carolina jurisdictions engage in long-range comprehensive planning to assist in establishing goals and priorities to guide future growth and development. Local governments in North Carolina will need to proactively consider the potential benefits and impacts of AAM on their communities. This includes the existing and planned transportation network, land use development patterns, and infrastructure needs. Establishing an understanding of benefits and impacts will inform a communities' goals and objectives, implementation strategies, and ultimately, the future land use map. Decisions on zoning are often based on the future land use plan developed through the comprehensive planning process communicating stakeholders' desire to shape their community.

Communities should consider the incorporation of AAM into their comprehensive plans, and take a holistic, long-range approach to AAM incorporation and ensure it aligns with community economic growth strategy while safeguarding environmental and cultural resources. Within a zoning ordinance, AAM infrastructure may be easily addressed by those communities that already address existing aviation resources, but AAM offers the opportunity to expand aviation beyond its existing footprint. However, expanding aviation's benefits in new communities and offering new services will require extensive community input.

4.1 Opportunities vs. Drawbacks

The comprehensive planning process may consider the following potential opportunities and drawbacks:

- **AAM offers the potential to improve connectivity in underserved communities.** The placement of AAM infrastructure should consider economic benefits to all communities, with special attention to historically underserved communities. With the second largest rural population in the country at approximately 33%, AAM has the potential to offer rural North Carolinians expedited goods and transportation options.⁹
- **AAM offers an opportunity for multi-modal transit.** Creating a transit hub, where passengers can easily shift from one transportation mode to another, can improve connectivity and potentially reduce carbon footprints by lessening the reliance on single occupancy vehicles and ultimately decreasing roadway congestion. This would align with NC Moves 2050, a long-range multimodal transportation plan, to create a more efficient, inclusive, and diverse system to keep passengers and goods moving safely and efficiently.¹⁰
- **AAM used as an air taxi can connect communities,** potentially mitigating the effect of the affordable housing crisis, and allowing companies to employ workers from a more diverse geographic area. In the state of North Carolina, almost 70% of extremely low-income households (income is less than 30% of area median income and accounts for one-quarter of all rentals) spend more than half their income on rent and utilities.¹¹ By

⁹ [15 Things We Learned from the New 2020 Census Data | Carolina Demography](#)

¹⁰ [nc moves 2050 state of the system final briefing report.pdf](#)

¹¹ [The Gap 2022 – North Carolina Housing Coalition](#)

allowing the possibility of employment from a larger geographic area, AAM could combat the effects of urban sprawl and the necessity to live inside urban boundaries or suffer extended commutes.

- AAM offers a potential avenue for Governor Roy Cooper’s initiative of **workforce development and training**, seeking to connect skilled workers with well-paying jobs. With a forecast of reaching \$115 Billion annually by 2035 and employing more than 280,00 high-paying jobs nationwide, the AAM industry could be impactful to the economic impact and development of the North Carolina workforce.¹²
- AAM can align with a **community’s comprehensive growth strategy and economic development**. Communities that are highly invested in technology and innovation, such as the Research Triangle, may be early adapters and easily see the benefits to community visions and goals. This is in alignment with NCDOT’s 2024 Strategic Plan which states that advanced mobility creates “economic opportunity by attracting new companies to North Carolina and creating high-quality jobs.”¹³
- Expediency in the delivery of **medical packages/lab samples can have lifesaving benefits**. Drone delivery of medications by making backyard retail deliveries has been utilized in North Carolina since 2022. These on-demand deliveries allow medical providers to envision a future, fully remote healthcare model.¹⁴
- **AAM can transform cargo delivery to rural locations and underserved communities**. The positive impacts of this use case can address gaps in commercial industry cargo delivery by providing sufficient supplies or access.
- **Advanced Capabilities: Drones as a First Responders and Search & Rescue**. The use of drones in emergency response can provide situational awareness to response teams with an aerial view of the incident scene. New software capabilities allow drones to scan a large area to quickly search for a thermal heat signature or specific clothing color allowing for rapid detection. Drones provide responders with updates on situational changes such as wind, proximity to landmarks, and threat containment. In December 2024, North Carolina was awarded a \$1.1M Strengthening Mobility and Revolutionizing Transportation (SMART) Grant from the U.S DOT to develop pre-staged “drone-in-a-box” technology used to provide accelerated damage assessment in response to natural disasters and other emergencies.
- Communities may be **unable to overcome concerns** regarding threats to privacy (“not in my backyard”) and the anticipated visual and noise impacts of AAM. If communities are unable to address these concerns through a public education campaign, AAM will be unable to expand and scale.
- Comprehensive plans and land use decisions may restrict vertiplace locations due to **safety concerns regarding hydrogen and battery storage at facilities**. Many community locations will not be appropriate for hydrogen and battery storage on a larger scale and some emergency response departments may not have the capacity or specialized training to respond.

¹² [Advanced air mobility | Deloitte Insights](#)

¹³ [NCDOT Strategic Plan 2023-v6r2.indd](#)

¹⁴ [Health Via Drone: Zipline Now Delivering Medicine Via Fixed-Wing Drones In North Carolina](#)

- Communities may **not realize the potential benefits of AAM** or may place those benefits at a **lower priority** than other concerns. Not every community will desire AAM services, and the degree of economic benefits is not equal across communities. In certain locations, the amount of upfront effort and financial investment may never be recapitalized and therefore may not want to be explored.
- Through the comprehensive planning process, communities may discover that **initial costs of AAM** may be cost prohibitive. Although expected to come down over time during scalability, these initial costs may slow adoption and advancement as certain communities may be hesitant to become early adapters. Communities can identify and publicize desired locations for vertiplace development to maximize benefits to the community and align with community priorities. Ensuring a consistent approach can reduce the potential for redundant development and services. This is also an opportunity for the community to encourage multi-modal development and ensure locations align with the long-term community development strategy.
- Community planners **risk litigation** when not providing consistent decisions regarding land use. Past land use decisions made from zoning regulations with vagueness, ambiguity, and inconsistencies have led to litigation and decisions by the North Carolina Court of Appeals.

4.2 Community Considerations

As communities seek to integrate AAM into zoning framework and land use decisions, they must look at the desires of the community and how AAM could fit into their economic growth plan. A community outreach and education plan can help ensure decision-makers are aligned with community interests and concerns. Repurposing existing aviation assets, such as heliports, can ease initial AAM deployment while validating current land use and allow communities to slowly approach integration while obtaining a pulse on community desires. Additionally, communities with existing aviation structures may have less objection to AAM integration as they are aware of the reputation of safety surrounding commercial aviation and are accustomed to the noises associated with aviation.

It is important to recognize that all communities may not desire AAM integration and not all use cases will be appropriate. This will be the “sweet spot” for the community planners and local decision-makers as they know their communities, and their long-term vision, best. On the flip side, not all communities are attractive to AAM service providers, and deployment decisions in the nascent stage are critical for adaptation and scalability.

Communities will also want to determine how AAM fits into their existing transportation network and if they have the opportunity to exploit gaps in their current system. Additionally, these communities need to consider how these facilities fit into existing roadways/pedestrian facilities, impact local traffic and parking, and how intended hours and density of operations could affect neighboring residential zones. Community planners may want to consider requiring minimal parcel size and establishing mandatory setbacks to create harmonious site design.

4.3 Sub-Area Planning

In many cases, comprehensive community plans include sub-area plans that further divide geographic areas or sectors. While these smaller areas have a greater level of detail, they also have unique sets of attributes, opportunities, and challenges. Sub-area planning focuses on the goals and policies and allows communities to identify focus areas (e.g. Transit-Oriented Districts or Neighborhood Plans). Use of this approach can help to identify the most appropriate locations for AAM integration and ensure development remains in alignment with the community vision.

4.4 Coordination Best Practices

Some potential strategies to coordinate best practices in the local and regional comprehensive planning process may include:

- Identify a county or municipal point of contact and subject area resource. AAM is an emerging technology, characterized by rapid advancements in technology, an evolving regulatory landscape, and varying business models. As such, counties and municipal governments will benefit from consistent planning efforts.
- Coordinate with Regional Partners. Transportation networks, economic benefits, and impacts extend beyond municipal jurisdictions. AAM offers connectivity of goods and passengers within a municipality as well as throughout a region and all of North Carolina. As such, the potential for redundant facilities may exist. Like with other transportation sources, coordinated efforts among regions and jurisdictions is suggested.
- Establish two-way communication with the community. Work collaboratively with residents, businesses, and educational stakeholders to identify the potential benefits and impacts of the range of AAM use cases. Future land use planning around AAM infrastructure should consider community desires for services and sensitivities around potential noise, traffic, and visual impacts. Issues such as noise from AAM operations will become clearer as aircraft are certified and in use by early adopters.
- Consider AAM and associated infrastructure both within and beyond the context of existing aviation. For communities with existing aviation activity, consider how near-term AAM operations at existing aviation facilities will impact transportation patterns and land use decisions. Also consider that AAM operations connecting passengers and goods will not require the same physical footprint as an existing airport, and could be constructed on existing parking facilities, at multi-modal transportation hubs.
- Coordination with Emergency Service and Utility Providers to ensure capacity and specialized certification, if required, and to encourage early and frequent coordination between developer and utility providers to ensure electrical grid capacity. Recognized as vital by the 2024 NCDOT Strategic Plan, increased electrical capacity will determine the viability and scalability of advanced mobility technology.
- Encourage Public-Private Partnerships (P3) for development. P3 development encourages local investment while transferring financial responsibility to the private sector which subsequently recapitalizes those funds with long-term direct-use fees.

5.0 Zoning

To facilitate the adoption of AAM into communities, a zoning framework that is flexible and adaptable to accommodate new technologies and an evolving regulatory environment is key. AAM operators are expected to desire clear and consistent regulations in states and regions. The FAA has identified a range of incompatible land uses that conflict with or impact public-use airports, which should be expected to apply to vertiplane development as well. These include airspace obstructions and hazards to safe navigation to and from the airport (such as tall structures, light, glare, electronic/radio, smoke, or other atmospheric interference emanating from nearby land uses); land uses that attract birds and other wildlife hazards; and land uses with concentrations of people or property within airport runway protection zones, in addition to environmental considerations.

Jurisdictions may elect to address the incorporation of AAM infrastructure into their zoning ordinance by identifying vertiplanes as allowable uses through conventional zoning, including overlay districts, or through the conditional zoning/special use permitting process. The following sections provide an overview of considerations.

5.1 Conventional Zoning Considerations

With conventional zoning, any standards are uniformly applied throughout the jurisdiction with the same standards or property dimensions applying throughout the zone. Any parcel that falls within a zoning district is subject to consistent rules and no individual conditions are considered without a special use permit.

There is considerable variability in zoning classifications and districts throughout jurisdictions in North Carolina. The following paragraphs and summary table are not intended to be all-inclusive but represent generalizations of zoning classifications and descriptions found throughout a sampling of existing North Carolina zoning ordinances.

Residential Districts: Allowing the development of vertiplanes in residential districts should not be recommended and is likely to be the least desirable location for potential AAM operators. Concerns about low-flying aircraft, privacy, safety, additional surface traffic and noise may be prevalent, especially considering the tempo of flight operations. However, the business case for air taxi operations may become more appealing as residential density increases, so communities may elect to consider vertiplane operations in high-density residential areas. Consideration of allowing vertiplane development in residential districts will require extensive public consultation and engagement and careful consideration around minimizing the impact of flight paths over residential areas.

Industrial Districts: Industrial districts typically include both light, medium, and heavy manufacturing, warehouses, distribution centers, heavy equipment repair, existing airports, and other utility infrastructure. Most uses within industrial districts would be considered compatible with the potential impacts of vertiplane development. Industrial districts are prime candidates for air cargo use cases and can provide connectivity for employees.

Commercial Districts: Commercial districts, which include retail, office, service, and light industrial uses, largely offer the potential to realize benefits across AAM use cases. Air taxi operations can connect residential or multi-modal land uses with commercial services and employment centers, air cargo operations can connect warehouses with distribution centers and support business-to-business operations, and emergency services can benefit by potentially bypassing congested surface transportation. Considerations of allowing development in commercial districts should include ensuring sufficient emergency access, sufficient parking, and safety due to the potential for high-density operations. The proximity of a commercial district to residential districts may be a consideration.

Public/Institutional Districts: Institutional districts typically include land uses that serve the public good, including K-12 and institutions of higher education, government functions including police, fire, social support, community centers, hospitals and related healthcare facilities, cultural institutions such as museums and public spaces, and in some cases, places of worship. Generally, institutional zoning districts include areas where these functions are consolidated, but smaller instances of institutional zones are prevalent. These types of land uses include a range of facilities that may be well served by AAM operations, including police and fire stations to aid in first response, hospitals providing lifesaving patient and organ transplants, and the movement of passengers to high-density places of interest, such as popular tourist destinations.

Agricultural Districts: Agricultural districts typically include land uses that allow for farming, ranching and related activities such as crop production, livestock, and agri-tourism. Zoning regulations may specify the types of agricultural activities permitted, lot size, and building restrictions. For the safety and protection of aviation assets, it is recommended to offset development from hazardous wildlife attractants such as wetlands, dredge spoil containment areas, and landfills. Overall, AAM can be incorporated into agricultural districts with special considerations being given to how low-flying aircraft may affect farmers and livestock and deconfliction with any aerial application of pesticides/fertilizers. These concerns should be balanced with the opportunity to serve as a vital link for transporting products (to include perishable goods) and the ability to provide surveillance of large crops with, the potential to alert farmers to threats such as pests or disease.

Table 1. Recommended Allowable Uses

Zoning Classification and Common Categories	Air Taxi	Cargo	Emergency Response
Residential Districts			
Single Family	x	x	✓
Multi Family			✓
Residential Low-Density	x	x	✓
Residential Medium-Density			✓
Industrial Districts			
Heavy or Light Duty	✓	✓	✓
General	✓	✓	✓
Industrial Park	✓	✓	✓
Commercial	✓	✓	✓
Commercial Districts			
General Commercial	✓	✓	✓
Retail	✓	✓	✓
Office	✓	✓	✓
Entertainment/Tourist	✓		✓
Planned Commercial	✓	✓	✓
Highway		✓	✓
Mixed Use	✓	✓	✓
Public/Institutional Districts			
Educational	✓		✓
Healthcare	✓	✓	✓
Government/Social Services/Civic	✓	✓	✓
Place of Worship	✓	x	
Recreational	✓	✓	✓
Arts and Cultural	✓	✓	✓
Agricultural Districts			
General	✓	✓	✓
Rural	✓	✓	✓
Intensive	✓	✓	✓
Conservation/Protection	✓	✓	✓
Urban	✓	✓	✓

✓	Recommended Allowable Use
	Expected limited AAM applicability
x	Not Recommended

5.2 Overlay District Considerations

Overlay districts apply a set of additional land use regulations to an area with an existing zoning designation. Most commonly, overlay districts apply to historic preservation, protection of environmental resources, airports (and potential hazards and environmental considerations), or economic development. The use of an overlay district for AAM activities could protect public health and safety near a vertiplace.

While aviation activities can use an airport overlay district, it is important to recognize that for AAM, while some considerations are similar to conventional airports, some will be different, specifically noise. While airports with conventional aircraft seek to reduce the negative effects of aircraft noise on homes, educational institutions, and places of worship, AAM activities are expected to provide significant noise benefits in comparison and may not require the same degree of mitigation. However, until regular operations begin to occur and community reaction to AAM operations can be gauged, jurisdictions should be cautious in their approach.

A local jurisdiction may wish to identify prohibited land uses within an airport overlay district, to ensure land use compatibility with overflights and noise-sensitive land uses, restrictions on building and structure heights to prevent interference with aircraft flight paths, or environmental concerns. There is no fixed size of an overlay district, and concerns around overflights and associated noise (although less than traditional aviation) may drive the overall geographic area. Article 4 of North Carolina General Statute 63, also known as the Model Airport Zoning Act, discusses hazards to aviation, the permitting of new structures, as well as the adoption of airport zoning regulations. The Act provides a framework to regulate land use around airports, regarding safety, height restrictions, and land use controls.

Some communities in North Carolina are attempting new, creative, and more flexible approaches to the use of overlay districts to accomplish evolving community visions. Specifically, leaders in North Carolina's Research Triangle Park put forth zoning changes to increase density and create more mixed-use land use opportunities. Leaders proposed their vision of a '15-minute city' that would allow a larger variety of businesses and housing options and create transportation efficiencies where residents can access more of their daily needs within a short walk or bike ride. This initiative aims to reduce the reliance on cars and create a more vibrant, sustainable community. If adopted the proposal to both counties, Durham and Wake, would provide landowners with a wider range of options for future land use and development.¹⁵

¹⁵ [North Carolina's Research Triangle Park Could Upzone for Mixed-Use, Housing | Planetizen News](#)

5.3 Conditional Zoning Considerations

A fairly common practice in North Carolina, conditional zoning allows the property owner to make use of their property while incorporating conditions that address the concerns of neighboring property and the local government. Conditional zoning may be an appropriate strategy when a jurisdiction wishes to approve vertiplane development only under certain conditions or with restrictions. Conditional zoning would provide flexibility, which may be appropriate considering the limited scope of operations expected in the near term. Conditional Zoning is a legislative process permitted and stipulated in 160D-703 (a) & (b). Specifically, 160D-703 (b) allows a property to be placed in a conditional district if petitioned by all property owners with all specific conditions consented to by the petitioner in writing. Additionally, the government is prohibited from requiring other conditions not authorized by applicable law.

Conditional Zoning offers more flexibility to adjust standards and apply conditions more so than special use permitting.¹⁶ The conditions that are most often placed on properties are *Use Restrictions* and *Site Plans*.¹⁷ Both of these conditions could be applicable during the integration of AAM through the use of conditional zoning and could potentially rule out the allowance of a vertiplane if objectional to the neighbors or local government. These objections, particularly in close proximity to residential zones, would most likely be based on the use case, density of operations, and hours of operations. Open and transparent communications with all parties, through a public notice period, should help to identify these concerns.

5.4 Special Use Permits

Local governments in North Carolina may issue special use permits to allow land uses in a specific zoning district after the presentation of ample evidence establishing compliance with one or more general standards but requires a decision regarding a specific standard. Special use permits are quasi-judicial, site-specific, allowances based on pre-established standards and require mailed notice of the public hearing to all parcels abutting the property requesting the amendment. Special use permitting is less flexible than Conditional Zoning and the decision-making board is bound by evidence in the record with public engagement being more restrained.¹⁸ Ultimately, the local government requires applicants to provide written consent to the conditions surrounding the permit to enable enforceability.

¹⁶ [Conditional Zoning | UNC School of Government](#)

¹⁷ <https://canons.sog.unc.edu/2021/11/what-conditions-can-be-included-in-conditional-zoning/>

¹⁸ [Special Use Permits: Need for Adequate Guiding Standards | UNC School of Government](#)

6.0 Conclusions

As communities plan and prepare for the integration of AAM into their community’s comprehensive plans, they must identify the potential benefits and drawbacks of this emerging technology for their specific vision. Not all communities have the same goals for economic expansion and community development and different communities will be viewed differently by AAM service providers and operators. This document provided an overview of land use regulations, definition of key infrastructure, and planning considerations to account for when communities incorporate AAM into the complicated planning process. It is the local government’s responsibility to appropriately balance this transformative technology and their community-specific goals.

Since North Carolina empowers local governments to adopt local zoning procedures and categories, so many of these communities have adopted differing approaches to their land use planning. This framework is not intended be a “one size fits all” and there is no expectation from NCDOT that communities reach similar conclusions. This framework is an approach and recommended considerations that local communities can use to determine if, how, and where AAM can be woven into their community. NCDOT recommends that local communities take a holistic, long-range, consistent approach to the adoption of AAM and endeavors to highlight items communities should consider along that journey. But different communities have different tools in their toolkits to accomplish their future goals and communities will need to work inside their process to incorporate AAM.

North Carolina’s reputation as an established pioneer of aviation, coupled with its demonstrated desire to propel the State into this new era of transportation, will firmly establish the State as a leader of innovative transportation solutions and provide other states a model to emulate.

7.0 Resources

- AC No: 150/5190-4B, DRAFT, Airport Land Use Compatibility Planning, available at https://www.faa.gov/documentLibrary/media/Advisory_Circular/draft-150-5190-4B.pdf
- Planning for Advanced Air Mobility, PAS Report 606. American Planning Association, available at <https://www.planning.org/publications/report/9286262/>
- [EB 105A, Vertiport Design, Supplemental Guidance to AC 150/5390-2D, Heliport Design, December 27, 2024](#)
- North Carolina General Statute [Chapter 63 - Article 4](#)
- North Carolina General Assembly [Chapter 160D](#)
- FAA’s [Advanced Air Mobility \(AAM\) Implementation Plan](#) (Innovate 28)