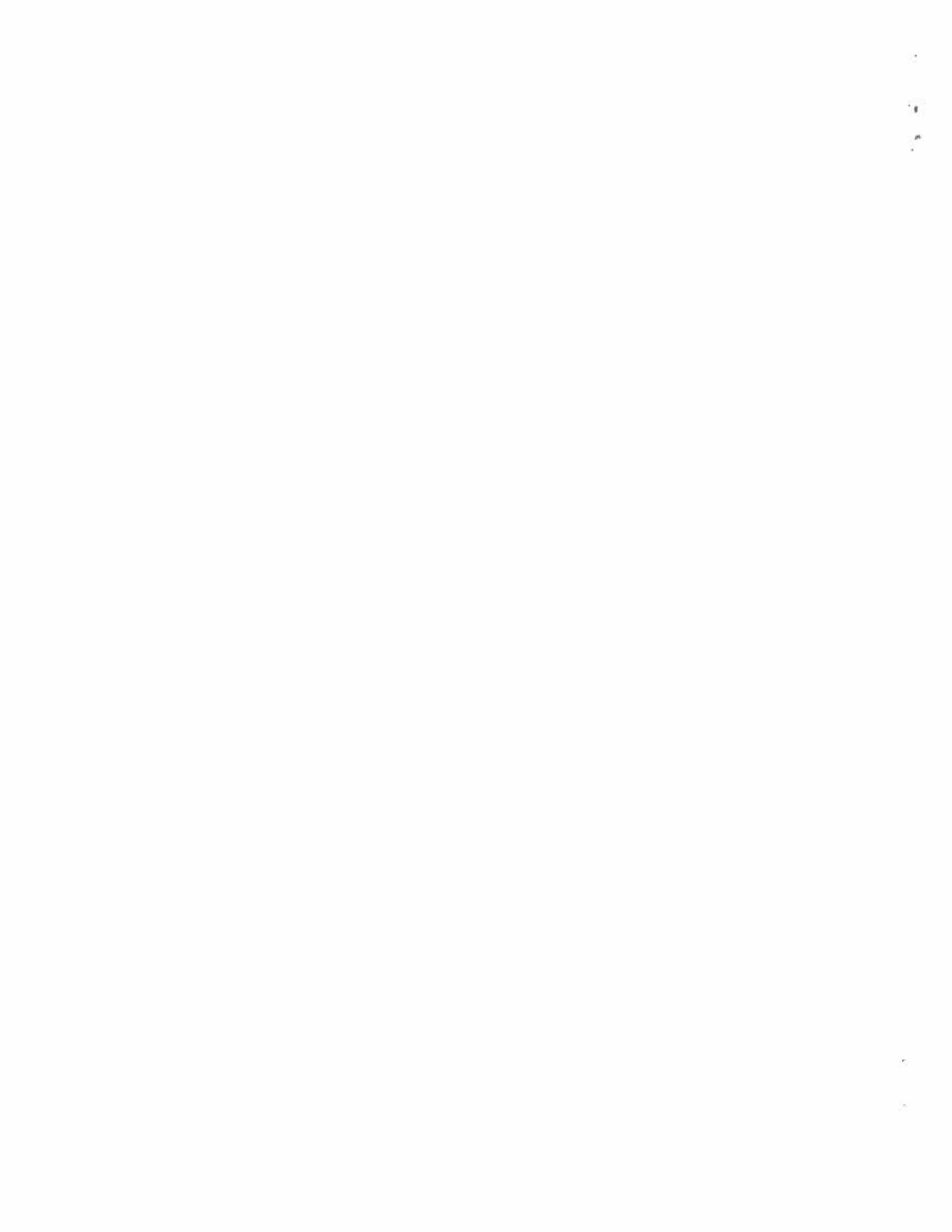




**Virginia's Advanced Air Mobility
Strategy:
Community Led
and
Economically Viable**





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Executive Summary

Emerging aviation technologies encompassing the scope of Advanced Air Mobility (AAM) hold great promise of improved access and transportation between communities across the Commonwealth of Virginia. The advancements being made create a pathway for new, more affordable, more flexible and cost-effective transportation platforms supported by technologies that offer improved safety, lessened environmental impacts, and the increased ability to access communities that may have been closed off to the benefits of traditional aviation. State governments will play a crucial part in planning and developing the essential infrastructure, policies and funding required to support and integrate this transformative mode of transportation on the ground, representing the logical evolution of the current role of state and local government in the context of the Federal Aviation Administration's (FAA) national role in certifying aircraft and operators and conducting national system planning and regulation of the National Airspace System (NAS).

By assuming this critical role, the Commonwealth of Virginia (CoV) can seamlessly enable AAM operations and open markets previously impractical for service by legacy commercial aviation, ushering in an era of connectivity and accessibility. Although manufacturers are still testing their designs for FAA certification, it is necessary for the CoV to begin preparing for AAM to support the industry when it is ready to fly.

The Commonwealth of Virginia has established itself as a leader embracing the future of emerging technologies supporting AAM, and our strategy is the culmination of years of intentional collaboration among various stakeholders and entities within Virginia, both public and private. The Commonwealth's leadership acknowledged early on that collaboration and a whole of government approach would be necessary to foster an environment in the State for emerging aviation technology to thrive. In doing so, the Virginia Department of Aviation (DOAV) and the Virginia Innovation Partnership Corporation/Unmanned Systems Center (VIPCC) established an early partnership, providing focus in both the Commerce and Transportation aspects of this new sector.

The results of this collaboration are the substantial work developed to date exploring AAM in the CoV which have been incorporated in this strategy. These date back to the CoV's successful bid with the Federal Aviation Administration to obtain one of the seven FAA-awarded Uncrewed Aerial System (UAS) test sites and the UAS Work Group chartered by the General Assembly in 2018; the statewide Virginia AAM Alliance (VAAMA) working and advisory group; an economic development study (*Virginia's Advanced Air Mobility Future*); and an infrastructure study (*Analysis of Minimum Viable Infrastructure (MVI) to Support Advanced Aerial Mobility Operations Across the Commonwealth of Virginia*)

Virginia's approach of engaging extensively with industry stakeholders, the FAA and other States has also helped shape this strategy through VAAMA and the AAM Multistate Collaborative (AAMMC). The DOAV, partnering with VIPCC and the State of Ohio, initiated the AAMMC in the Fall of 2023, centered around advancing AAM in a way that harmonizes efforts among States; creates a forum for the exchange of ideas and formulation of policy; provides advocacy for the emerging industry; and engages with FAA in a meaningful way. This effort has grown to more than 30 States that have now joined in

their approach of this new frontier in aviation. The founding of this collaborative, and Virginia's approach to AAM, has established the Commonwealth as a leader among states on the national level.

Leadership in the Commonwealth of Virginia have acknowledged the complexity of integrating many of the emerging platforms and concepts of operation into the national air transportation system. Therefore, the Commonwealth's strategy is a measured approach intended to provide an overall framework to support AAM at appropriate developmental stages that is prudent, practical, economically sustainable and meets the industry where it is.

At the center of the strategy is enhancing current aviation safety, while embracing new aircraft platforms and emerging technologies. Successful integration depends upon creating a system that benefits all aviation stakeholders, making it safer for all users of the system, acknowledging their unique operational requirements. A successful strategy must ensure that any infrastructure investments made within the Commonwealth align with FAA regulations, standards and stated intent, creating a path toward operational viability. To that end, this strategy incorporates investments toward digital and physical infrastructure, while aligning policy that adheres to safety standards, and is also sensible and industry friendly. Finally, it is critical that investments made lead to an economically sustainable model for the future. This is vitally important if the universal benefits of AAM are to reach full potential in the Commonwealth. A key element of AAM is creating access and new transportation opportunities that bring those services to all segments of the economy and population in an affordable way.

This strategy employs a community-led model, where communities across the Commonwealth are given the opportunity to identify real needs and invest in the development infrastructure to support AAM activities within an established framework that provides interoperability within a Virginia intrastate network and aligned with other States across the U.S. This model for deployment of infrastructure has been successful in developing the traditional aviation system in Virginia and the national aviation system. This strategy serves as the initial blueprint to guide the State and provide focus of resources and initiatives toward effective enablement of AAM. It is understood that the strategy will continue to evolve as the industry matures. It rests on six key principles:

1. Investments must demonstrate public benefit commensurate with costs within the next five years and should be community-led;
2. Investments should demonstrate alignment with a realistic federal regulatory pathway;
3. Investments must support the development of industry operations and commercial viability;
4. Investments should demonstrate a path to economic viability and long-term funding;
5. Investments must demonstrate how they create progress toward the integration of new aviation technologies and flight modes; and
6. Investments should specifically create conditions that make Virginia more attractive to aviation industry participants.

The Virginia Department of Aviation and the Virginia Innovation Partnership Corporation/Unmanned Systems Center are extremely grateful for the extensive time, effort and expertise that our partners and stakeholders have generously shared in the development of the Virginia AAM Strategy.

Background to this Strategy

Global aviation, a \$500Bn industry, is undergoing a growth spurt being driven by new technologies from drones to air taxis. Referred to as Advanced Air Mobility (AAM), this includes not only new aircraft, but also new types of power and new types of flight, including remote and autonomous flight. The AAM Multistate Collaborative (AAMMC), of which Virginia is one of the Steering Committee leaders, defines AAM as: “AAM encompasses the integration of new types and modes of aircraft, powerplants, and flight into the ground-based facilities that are part of the national system of aviation facilities as well as new policies, infrastructure and services to support these aircraft as well as those who operate them.”

Based on different research studies, AAM is forecast to add \$25Bn-\$100Bn+ to the global aviation market. However, these aircraft have to be integrated into the aviation system – and they are likely to be integrated at “General Aviation” (GA) airports, where physical capacity exists, and at new, off-airport facilities. Therefore, the Commonwealth of Virginia (CoV) needs to develop an infrastructure planning and investment strategy to support this exciting next generation of aviation. *Virginia’s Advanced Air Mobility Future* estimates that AAM could contribute \$12.6Bn to Virginia’s economy over the next 20 years (Figure 1).

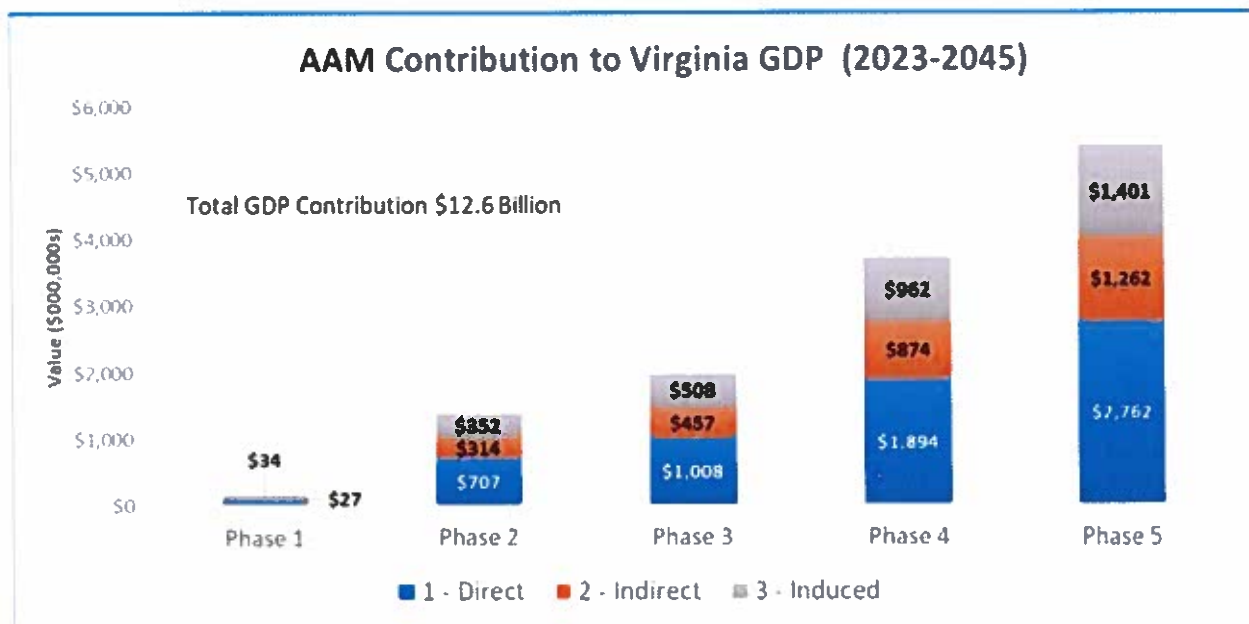


Figure 1: AAM Contribution to the Virginia Economy (*Virginia’s Advanced Air Mobility Future*)

As a base layer, the FAA has provided some indication of its intended direction for the next generation of aviation through three published documents. The FAA UAS Traffic Management Concept of Operations Version 2 (UTM ConOps), the FAA Urban Air Mobility Concept of Operations (UAM ConOps), and the Info-centric National Airspace (ICN).^{1, 2, 3} In these papers, the FAA states the intent to foster a cooperative airspace by enabling certain safety and traffic management functions to be provided by accredited third-party providers, private and public, that meet FAA performance requirements. The FAA also shows a strong understanding that as aircraft and air traffic management become increasingly

reliant on computerized controls and automation, that a new set of digital services will be needed to ensure safe integration of new aircraft types into the National Airspace (NAS).

Relevant aviation standards bodies, such as the Radio Technical Commission for Aeronautics (RTCA) and the ASTM International F38 Committee (ASTM), have already reached a high level of development, working in concert with the FAA, of the technical standards required to implement AAM. Some of the relevant standards include Detect and Avoid Standards (RTCA DO-365C, ASTM F3442/F3442M-23), UAS Traffic Management (ASTM F3548-21), Operational Risk Assessment (ASTM F3178-16), and Surveillance Supplemental Data Service Providers (ASTM F3623-23). These standards can help the CoV interpret industry needs and FAA guidance to identify potential infrastructure that supports AAM development and readiness.

The FAA's Advanced Aviation Advisory Committee (AAAC) chartered the Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) (BVLOS ARC) to provide guidance to the FAA on how the FAA might approach the rulemaking process for safety regulation of BVLOS and automated flight.^{iv} This guidance has been factored into a draft rule that the FAA is developing and that should enter the Notice of Proposed Rulemaking phase in 2025 with expected publication in late 2026. Referred to colloquially as "Part 108," this rule will provide the first clear guidance on safety and compliance for the advanced features of AAM and provides the Commonwealth a unique opportunity, through selective investment, to "hit the ground running" as the FAA starts to promulgate the early guidance and rules for AAM.

This strategy leverages the substantial work to date developing research and work product relating to AAM development in the CoV, dating back to authorizing legislation from the General Assembly (SB 307^v) that created the UAS Work Group in 2018. The UAS Work Group recommended three items: i) the clarification and establishment of a State authority to manage UAS operated on behalf of the CoV, ii) the creation of reasonable UAS guidelines within the CoV that are enforceable, and iii) the ability to manage these guidelines. Two specific outcomes of these recommendations were House Bill 742, which directed the DOAV to create regulations that authorized localities to manage drone take-off and landing on public property, provided that the DOAV provides operators with clear, consistent guidance, which gave rise to the Virginia Flight Information Exchange (VA-FIX) as an authoritative supplemental data service provider in the CoV.

The recommendations of the UAS Work Group led to the Virginia Innovation Partnership Corporation (VIPIC), in partnership with the DOAV, supporting the establishment of the Virginia Advanced Air Mobility Alliance (VAAMA), a forum that supports engagement between aviation stakeholders in the Commonwealth, with an especial focus on industry input on the development of AAM in the CoV. VAAMA led to three specific work products: a Regional Air Mobility (RAM) / UAM study group readout; an economic development study focused on AAM in the CoV; and a low-altitude mobility (LAM) study group readout.

The VAAMA RAM/UAM readout recommended resourcing the DOAV with the capacity to foster the development of AAM, with a focus on the RAM/UAM missions that are likely to enter into service in the near term (2-5 years); consider the general-purpose infrastructure that can enable these operations at

Virginia airports; and explore interstate collaboration to ensure consistent approaches across the region. The VAAMA LAM readout recommended that Virginia develop a “Minimum Viable Infrastructure” (MVI) approach to infrastructure investment and development focused on scaling industry and commercial solutions, and that MVI in Virginia should: i) be risk based, dependent on the operational use case and service area; and ii) be not overbuilt and have a clearly sustainable operating cost while meeting safety performance standards.

The economic development study “*Virginia’s Advanced Air Mobility Future*”^{vi} identified a potential economic benefit from AAM specific to the CoV of up to \$16Bn over the next 20 years and proposed a set of recommendations to support the economic development aspects of AAM in the CoV, including: i) identifying and vesting AAM planning in a dedicated resource; ii) developing an MVI investment and roll-out strategy supporting multiple regions in the Commonwealth by readying airports for AAM; and iii) orienting this MVI investment to support development of the AAM supply chain and attracting AAM commercial enterprises to the CoV. DOAV’s MVI study envisions a thoughtful, incremental roll-out with each step building on the one before, as described in Figure 2 below.

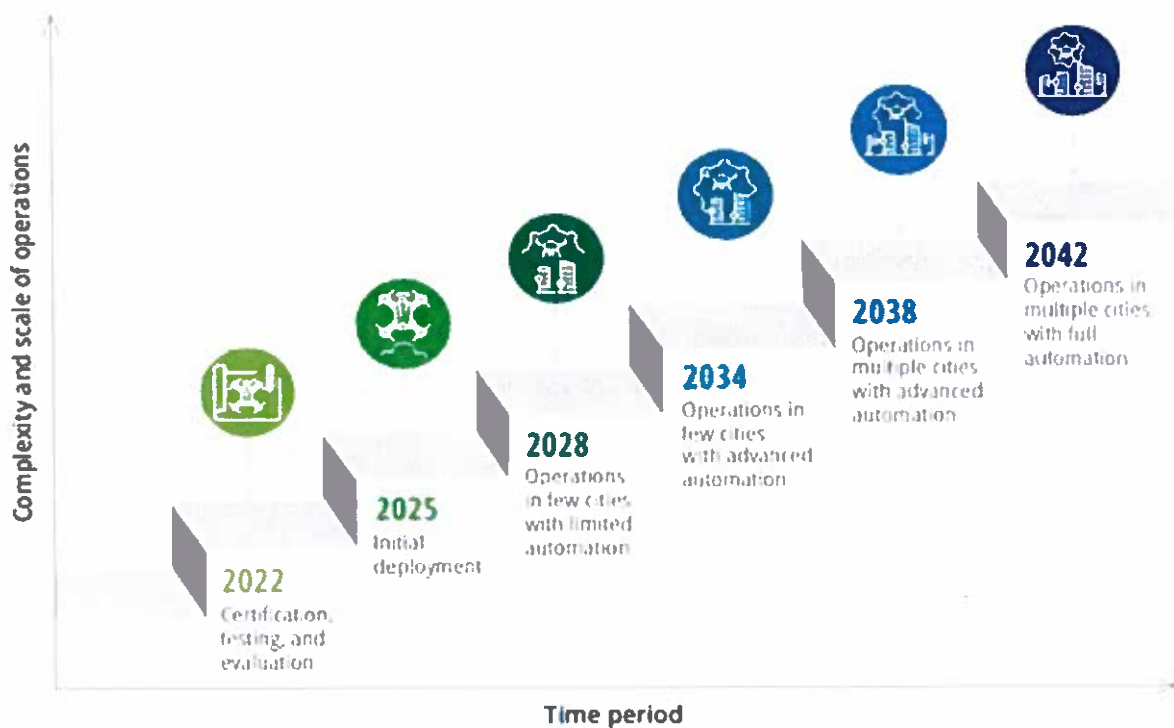


Figure 2: Incremental AAM Infrastructure Rollout

Leveraging the VAAMA studies and readouts, the DOAV commissioned an MVI study from the Virginia Tech Mid-Atlantic Aviation Partnership (MAAP), the CoV FAA test site, and one of only seven test sites approved by the FAA. The MVI study “*Analysis of Minimum Viable Infrastructure (MVI) to Support Advanced Aerial Mobility (AAM) Operations Across the Commonwealth of Virginia*”^{vii} was commissioned by the DOAV to develop a framework for assessing the potential benefits of MVI investments in the CoV, including safety, compliance, and economic benefits. The MVI study proposed four specific general

recommendations: i) enabling supplemental safety systems, such as detect and avoid, using ground based systems; ii) establishing pilot sites with a preference for those that have mandated ADS-B equipage; iii) focusing on enabled entry into service of commercial AAM operations through cost-effective, risk-based supporting infrastructure; and iv) forming partnerships with manufacturers and operators of AAM vehicles (sUAS and larger vehicles) to demonstrate commercial viability through these pilot sites.

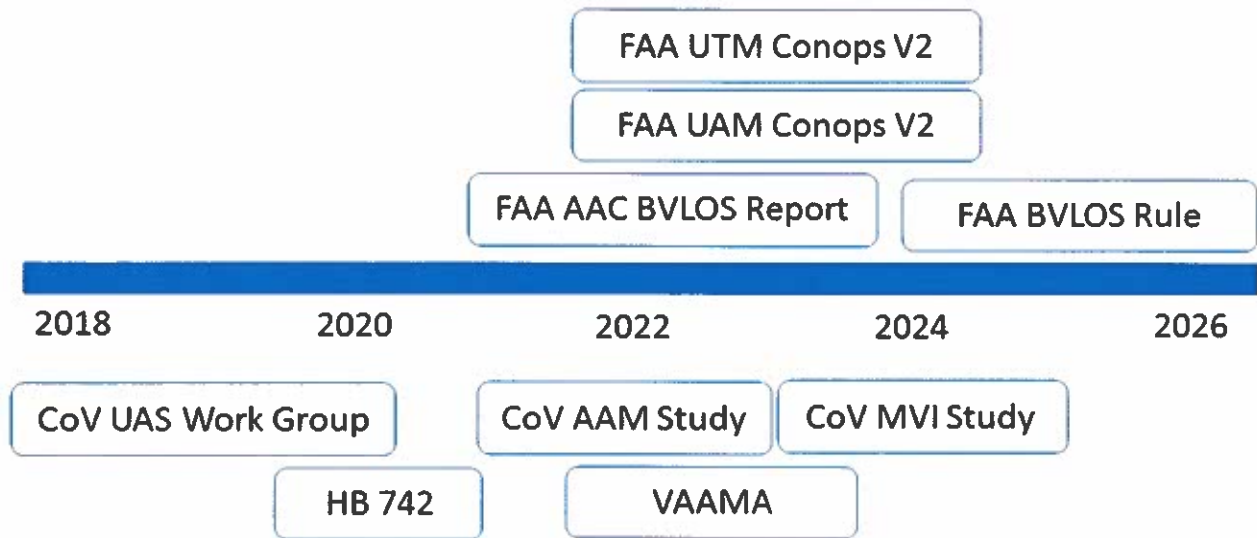


Figure 3: Timing of Background Work Product

The DOAV also has engaged in two relevant, differentiating AAM activities: the licensing of the first Vertiport in Blackstone, Virginia, and leading the Steering Committee of the AAM Multistate Collaborative. The former involves the DOAV partnering with the FAA to “field test” state licensing for some of the initial AAM infrastructure. This provides the DOAV with a unique perspective on the rollout of AAM, complemented by the DOAV’s role as a founding member of the AAM Multistate Collaborative, a forum for aviation and economic development representatives from participating states to exchange views and methods for approaching AAM, to learn from each other, and to identify and develop common approaches to developing AAM. As such, the timing for the CoV to adopt an AAM strategy is propitious.

Throughout and in addition to the background references, work, and reports mentioned above, the DOAV has engaged in multiple one-on-one listening and discovery sessions with key stakeholders, such as Original Equipment Manufacturers and Air Service Operators, as well as airport operations, industry experts, and local stakeholders throughout the CoV. This is complemented by a new study being funded by DOAV exploring the next generation of Navigational Aids (NAVAIDS) in the context of AAM. The combination of completed and ongoing reports, completed and existing working groups, FAA and industry regulatory and standards development, and ongoing stakeholder engagement, has given the DOAV sufficient input to formulate this initial draft strategy.

Given the extensive work to date, the current status of FAA rulemaking, and immediate ongoing interstate collaborative efforts, the DOAV has sufficient information and guidance from the FAA, standards bodies, and industry to formulate an initial strategy for the development of AAM and rollout of AAM infrastructure in the CoV. Further, the AAMMC has demonstrated that there are clear roles for state and local government in the planning and development of the ground-based infrastructure supporting aviation in the NAS. Given pending rulemaking and entry into service of these technologies, this is the appropriate time to consider the development of AAM infrastructure and investment in the CoV to develop and follow a strategy that makes the CoV a safe, welcoming environment for the development of our aerospace industry as part of an overall system plan.

AAM Strategic Objectives, Goals, and Principles

There has already been significant activity advancing AAM in Virginia across various government agencies and industry stakeholders, but efforts are not always well-coordinated and are often in conflict. The objective of this strategy is to provide CoV agencies with a framework and a roadmap to support the development of AAM through policy, infrastructure, and investment and to do so in a way that reflects known, actual needs of Virginia communities; focuses on AAM technologies and operations that will enter into commercial service in the next five years; and places the commercial and financial viability of the system at the heart of our development strategy. The overarching goal of the DOAV is to make Virginia the safest and most welcoming state (operationally, regulatorily, and financially) for the development of new aviation technologies and products.

The intent is to implement this strategy so that the development of AAM in the CoV is community-led, guided by community leadership at Virginia's Airports in partnership with industry and their communities and is done in a financially sustainable way that is a logical evolution of the DOAV's existing System Planning, Licensing, Registration and Administration role. Development will be harmonized at state, regional, and Federal levels and constitute legitimate extension of the CoV's Aviation System. AAM infrastructure in the CoV shall be developed in such a way that infrastructure is interoperable and will support entry into service of new aviation technology across the CoV.

Supporting viable AAM entry into service on the CoV starts by making the CoV the safest state in the nation for aviation, while also balancing rules and regulations to make the CoV the most innovation-friendly state in the nation as well. Achieving this balance consists of balancing the natural tension between safety and innovation: investments in the near-term must improve safety today but also lay the groundwork for autonomy in the future. This leads to four balanced goals:

1. Improve infrastructure at airports for both AAM and existing General Aviation (GA) to enhance safety and services as the airspace becomes more congested, especially at lower altitudes;
2. Ensure the long-term viability of the Virginia Aviation System through a focus on commercially necessary operations, financial sustainability of investment, and standardizing and harmonizing the system within the state and with other states;
3. Focus on value-added services that enable industry to deliver regular, scaled, commercial operations with near-term community benefit but lay the tracks for future capabilities through innovations in aircraft, operations, autonomy, and new propulsion systems; and
4. Ensure that CoV investments support a safe, full integration into the NAS of innovative aerial vehicles by exploring concepts for integration as a partner to the FAA and the industry.

To ensure that these goals are met, AAM investments in the CoV need to answer real world community needs while being financially viable and realistic (i.e. affordable and sustainable). Therefore, policy and investment decisions should be made within pre-agreed guidelines. Therefore, the DOAV has identified six principles that will guide our decisions under this strategy:

1. Investments must demonstrate public benefit commensurate with costs within the next five years and should be community-led;

2. Investments should demonstrate alignment with a realistic federal regulatory pathway;
3. Investments must support the development of industry operations and commercial viability;
4. Investments should demonstrate a path to economic viability and long-term funding;
5. Investments must demonstrate how they create progress toward the integration of new aviation technologies and flight modes; and
6. Investments should specifically create conditions that make Virginia more attractive to aviation industry participants.

As the CoV pursues the development of AAM infrastructure and operations, it is important to form a realistic assessment of when different AAM capabilities will enter into service, informed by consultation with industry and the FAA. This will allow the DOAV to focus on development of and investment in infrastructure needed within the next five years, and planning and evaluation for infrastructure needed in the five- to 10-year range. Further, the DOAV should actively engage with the FAA to ensure that investments do not conflict with FAA regulation and align to the FAA's vision for where ground infrastructure is going. The DOAV will also leverage the harmonization discussions occurring in the AAMMC to ensure that CoV development and investments are consistent with other efforts throughout the country. These approaches specifically support the goals and principles detailed above.



Roles and Responsibilities

The CoV and the DOAV recognize the preemptive role of the FAA in regulating, controlling, and operating the NAS and in promulgating rules and regulations pertaining to the safety and certification of aircraft, equipment, and personnel. The DOAV recognizes the critical role played by the CoV in planning for the local and ground-based elements of a system that can serve the long-term aviation needs of the public, ensuring that state and local policy supports the development of a system that complies with FAA regulation, serves the needs of Virginia’s communities, and supports the appropriate public funding needs of the system.

The DOAV further recognizes the role of local government in locally integrating, and often funding and operating, aviation facilities and the needs these localities have for strategic guidance and support from the DOAV. Finally, the DOAV recognizes that CoV and local policies should align to industry needs (air service operators and aircraft manufacturers) for infrastructure and equipment that allow for the safe, compliant, and commercially viable operation of aircraft in Virginia. Further, that directly aligning CoV investment to commercially viable operator needs can support the reasonable and equitable development and allocations of user-fees to support the maintenance and operation of Virginia’s aviation system.

To facilitate the implementation of an AAM policy and operational framework within the CoV, it is important to understand the roles of responsibilities of stakeholders relative to this strategy. The following table describes, at a very high level, the roles and responsibilities of various stakeholders in this strategy.

Level	Roles	Responsibilities
Federal	Federal Aviation Administration	Regulates airspace and provides air traffic control services in limited areas
	US Department of Transportation	Funding for deployment
Commonwealth / State	Secretary of Transportation	Funding, program, and planning oversight
	Virginia Department of Aviation	Regulates and licenses ground infrastructure, oversees system planning, supports engagement with FAA, manages funding system(s), provides public data feed

Level	Roles	Responsibilities
	Virginia Innovation Partnership Corp.	Funds research programs and supports industry engagement for economic development
Local	County/Municipal Airport Authority	Operates portions of the system, participates in the funding system
Industry	Aircraft Operator	Infrastructure User, User Fee Funder
	Traditional or Remote Pilot	Data Consumer via avionics and tools
	Service Providers (for UAM, UTM and traditional pilots)	Package DOAV data to provide value-added services in avionics and tools
Educational Institutions	Workforce Development, Research, Other	Development and accreditation of curriculum and ensuring development of skills and workforce

It is the expectation of the DOAV that, as this strategy is implemented, these roles and responsibilities will evolve in response to real-time, real-world feedback and lessons learned.

AAM Policy in the Commonwealth

The DOAV recognizes and supports the role of the FAA in regulating the NAS and certifying the safety of aircraft and aviation personnel and the management of the NAS. As the responsible agency in the CoV overseeing the functions of licensure and system planning, the DOAV has a critical role in formulating the policies and planning frameworks that will be used to develop AAM infrastructure and services in the CoV. Elements of CoV policy include consistent rules and policies for planning and evaluation of aviation infrastructure sites, model ordinances and policies for localities to manage AAM infrastructure, and guidance for planning and budgeting. The DOAV will develop these guidelines through consultation with Virginia's communities, the aviation industry, and our peers in other state aviation departments.

The DOAV's goal with respect to AAM policy is to be as light-touch as possible – work to ensure consistency of planning and financial viability of the system while leaving space and flexibility to allow industry and communities to innovate. Our prime focus is on the harmonization of rules within the CoV and with other states to ensure a consistent, safe, and friendly operating environment for AAM. Therefore, we will focus on the specific development of harmonized policy and policy approaches within areas that are the specific purview of the states:

- Land-Use and Zoning Regulations
- Minimum Safety and Operations Standards for Ground Facilities
- State Transportation System Planning and Aviation System Planning
- Infrastructure Development and Funding
- Economic and Workforce Development
- Community Engagement and Public Policy

Approach to Policy

Successful policy reflects the needs of the communities it intends to serve. Therefore, in the development of policy, the DOAV will focus primarily on those areas of need that are directly identified by those we serve: Virginia's communities and the air service operators that serve them. These community-led policies will be developed in concert with industry input, aligned to FAA regulations, and harmonized to the greatest degree possible with other states. Therefore, the DOAV has identified that Virginia AAM policy with respect to AAM should possess four characteristics:

1. Reflect relevant studies, standards, and FAA policies to date that support identified community needs in the CoV;
2. Acknowledge FAA Pre-emption in the airspace and focus on ground policy, infrastructure, and services;
3. Present Virginia as a quality operating environment that is attractive to aircraft operators that complement the FAA approach and support entry into service of aircraft and capabilities; and
4. Focus on those areas that are identified to the DOAV by communities and air service operators, in conjunction with FAA and industry providers.

Strategic Policy Actions

To develop the thoughtful outcome- and community-oriented policies with the characteristics we seek, the DOAV will conduct additional targeted engagement and initial policy development in the coming year. The goal is to identify limited, specific policy proposals that enhance safety and industry access in the CoV and to limit unnecessary or burdensome regulation. Therefore, the DOAV proposes to undertake the following six actions to develop the minimum policies needed with regard to AAM:

1. Engage with Virginia communities, through the leadership of our 66 licensed Public-Use Commercial and General Aviation Airports, to identify specific community air service needs in the near-, medium-, and long-term future to develop community-led projects and policies;
2. Develop a structure dialogue with air service operators, aircraft manufacturers, and industry service providers to understand what services would enhance safety and support entry into service;
3. Publish a state policy under DOAV denoting which AAM aspects are the specific responsibilities of the CoV and which are not the responsibilities of the Commonwealth, in concert with the ongoing work in the AAM Multistate Collaborative, and the respective responsibilities of Commonwealth agencies;
4. Publish a set of harmonized model ordinances to support local zoning and planning decisions that will affect AAM, in concert with partner states to ensure the CoV contributes to a harmonized set of national regulations;
5. Publish DOAV guidance on CoV-wide registration and business licensing for operators to ensure consistency across the CoV and simple access for AAM operators to the CoV and to value-added services in the CoV; and
6. Publish a set of infrastructure guidance for physical and digital infrastructure development derived from community-led needs that includes value-added services provided by the DOAV as part of registration and licensing.

Minimum Viable Infrastructure Approach

The CoV has developed an approach to development termed “Minimum Viable Infrastructure” (MVI) that is less of a “what” and more of a “how.” MVI is a philosophy of development and design: the “minimum” focuses on essential needs in the near term and benefiting the greatest number of stakeholders while not overbuilding infrastructure; the “viable” references the need to ensure alignment with, and compliance to, industry standards and FAA regulation; and the “infrastructure” reminds us that investment needs to produce long-term usable and sustainable aviation transit services.

MVI has three discrete components: supporting policy (discussed above); physical infrastructure, such as facilities and energy; and digital infrastructure that supports the provision, flow, and sharing of information. A successful AAM strategy makes progress on all three, with the recognition that due to cost, complexity, and relative maturity, the progress between them may be uneven.

The Virginia Model

The DOAV, in partnership with VIPC, has been trialing an approach to AAM infrastructure strategy through “Flight Information Exchange” (FIX) and “Minimum Viable Infrastructure” (MVI, together FIX-MVI) using the VA-FIX. FIX-MVI was developed through collaboration in the CoV and creates Public Digital Services that support industry needs today and into the future. FIX-MVI has resonated with other states, and through formal partnerships, the CoV, through DOAV and VIPC, is assisting other states in adopting their own FIX-MVI strategies both under formal Memoranda of Agreement (MOA) and informally through the AAMMC. Referred to colloquially as “the Virginia Model,” FIX-MVI is focused on enabling near-term services and ensuring return on investment through a financially sustainable model. FIX-MVI leverages Virginia’s leadership in the development of public data services at the state level, one example being how VA-FIX integrates between state agencies and aviation participants, as described in Figure 4 below.

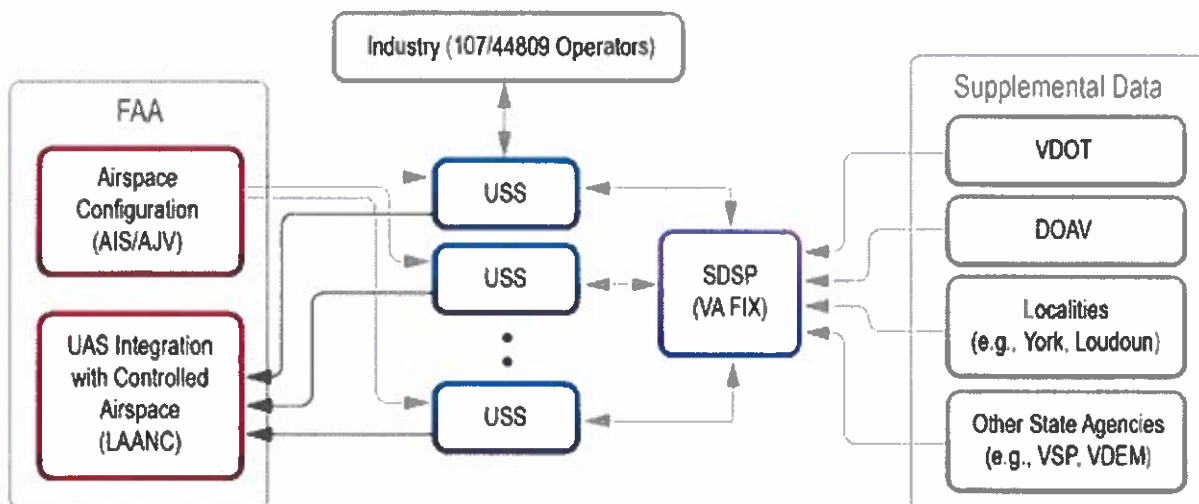


Figure 4: Virginia as an Authoritative Supplemental Data Service Provider

FIX is the focus on cost-effective, secure mechanisms for public data sharing to support Federal Aviation Administration (FAA) requirements for safe AAM integration as Public Digital Services. MVI is a risk-

based approach to infrastructure resulting in cost-effective, not overbuilt deployment of supplemental physical and digital infrastructure enabling immediate next steps in AAM. The cost of deploying infrastructure, relative to the size of community served, is critically important to ensure a commercially viable, financially sustainable aviation system in Virginia. The result is a measured return on investment designed to support real, near-term community air service needs and provide a path to financially sustainable infrastructure within five years.

By charting a path for an incremental roll-out of AAM infrastructure using a FIX-MVI approach, we can better manage the technical and performance risk of new infrastructure investments; reduce total system cost by leveraging existing infrastructure; and focus new investment specifically where needed to address risk and demand. This crawl-walk-run approach to the roll-out of AAM focuses on the discovery of existing infrastructure that can be repurposed for AAM; the hosting of basic public information services by the DOAV and local agencies; and supporting basic, reusable integrations that scale across vehicles, across different aviation stakeholders, and across the different components of the AAM spectrum in two broad categories:

- **Physical infrastructure** consisting of those aspects of AAM infrastructure that are need to support the physical requirements for operating an aviation / AAM vehicle at a particular aviation facility; and
- **Digital infrastructure** consisting of navigation and charting services, configuration and procedures (along with administration), ground-based sensors for vehicle position and navigation, environmental and weather sensors, and vehicle communications.

The “crawl-walk” phase will be focused on engaging with Virginia’s communities through the leadership of our 66 licensed public-use Commercial and General Aviation airports in concert with industry to identify local needs that can be addressed to bring commercially viable operations into service. By focusing on operations and uses identified by operators in partnership with Virginia’s communities, the DOAV will be able to support infrastructure that supports broad groups of stakeholders as well as direct community benefit in the next five years. We will also start exploring, and planning for, the “run” phase by identifying a limited number of potential pilots that will enable the CoV, in partnership with FAA and industry, to identify requirements and lessons learned for how technologies, such as autonomous AAM aircraft, might integrate into Virginia’s aviation system.

Physical Infrastructure

Physical infrastructure pertains to those aspects of AAM infrastructure that are needed to support the physical requirements for operating an aviation / AAM vehicle at a particular aviation facility. We can imagine physical infrastructure including traditional aviation infrastructure, such as take-off and landing surfaces; development of new surface types, such as vertiports, pavement markings and NAVAIDS; hangars; fuel and energy requirements for traditional and novel propulsion systems; the physical aspects of communications, such as fiber optic lines and equipment/mast mounting areas; crew facilities; and maintenance and storage facilities.

The DOAV will focus on developing a set of Minimum Service Level goals, in concert with Virginia’s airports, the FAA, and the AAM industry. We will begin by focusing on what needs to be done to start preparing Virginia’s GA facilities to support and service AAM. Part of this focus includes prioritizing services, such as enhanced aircraft storage services, that benefit the maximum number of aviation, as well as AAM, stakeholders. With this focus in mind, physical infrastructure efforts that can support the broad needs of aviation stakeholders and AAM capabilities that may be in service within the near to medium term include:

- Updating Airfield Configurations: whether through physical modification of structures or changes to operation or navigation procedures;
- Supporting New Propulsion Types: including electric charging infrastructure to support electric and hybrid electric aircraft and distribution of new fuel types, such as hydrogen and sustainable aviation fuel, to support new types of powerplants as these technologies come online and become technologically and economically viable;
- Supporting New Communications: including broadband datacomms on the ground and in the air that can support increasingly digital flight communication and control systems;
- New Navigational Aids: including potential additional support for GPS-based navigation and additional NAVAIDS on the ground to support integration of new aircraft types into airport operations; and
- Additional Needs: that may yet be identified by operators, the FAA, and Virginia’s aviation community to help enhance safety and enable AAM operations in the CoV.

Digital Infrastructure

Digital infrastructure pertains to those aspects of AAM infrastructure that are need to support the information requirements for operating an aviation / AAM vehicle at a particular aviation facility. As aircraft rely increasingly on digital control and navigation components, aviation facilities will need to support digital communications services to and from the aircraft and operator, local sensors for vehicle position and navigation, environmental and weather sensors, digital navigation and charting services, online system configuration, and digital procedures along with system administration and governance. The digital infrastructure can leverage common public backbone services already developed and in development by DOAV and VIPC, as described in Figure 5 below from the MVI report.

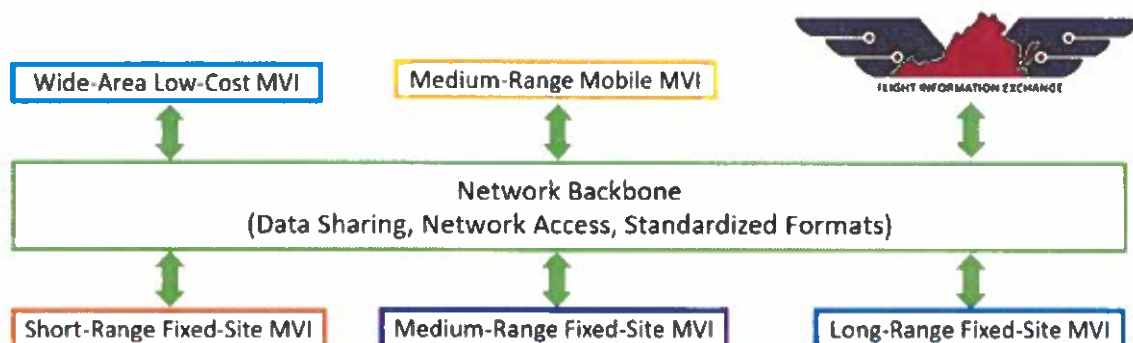


Figure 5: Integrating MVI into public backbone services

Like Physical Infrastructure, the CoV has an opportunity to grow and develop general digital infrastructure services at our GA airports that can service multiple aviation stakeholders, including AAM-specific stakeholders. The CoV also has a unique opportunity to develop tri-use digital infrastructure that also supports UAM, UTM, and public safety UAS requirements, leveraging Virginia's demonstrated leadership position in sUAS and the development of UTM. Similar to Physical Infrastructure, the DOAV can work with Virginia's airports, the FAA, and the AAM industry to develop a set of Minimum Service Levels for digital infrastructure. Focusing initially on the broad needs of aviation stakeholders, prior work, and in concert with Virginia's airports, industry, and the FAA, the DOAV has identified key focus areas for digital infrastructure to support AAM capabilities that may be in service within the near- to medium-term:

- **New Procedures:** to support integration of new aircraft types and flight modes into the pattern, including consideration for the unique flight characteristics of new propulsion types developed in partnership with OEMs to support safe integration at the facility level;
- **Communications Links:** leverage broadband at Virginia aviation facilities to further support the integration and dissemination of public information services, both through ground networks as well as over the air through better understanding of AAM equipment and ground control systems;
- **Navigational Aids:** as much of AAM focuses on low-altitude flight in previously underserved areas, the DOAV should identify additional obstacle, terrain, facility and navigation enhancing data that can be provided to operators of both AAM and GA vehicles;
- **Surveillance Sensors:** identify supplemental surveillance products where there are gaps that, in the context of industry standards and emerging FAA guidance, support the third-party service providers that the FAA envisions supporting the integration of AAM into the NAS;
- **Weather Sensors** [enhance existing products and focus on gaps and low altitude]

Strategic Infrastructure Actions

The role of the CoV may vary in these different infrastructure types, ranging from facilitating community engagement, consulting with FAA and industry, providing planning guidance, to providing select, limited physical and digital infrastructure services. As discussed above, the application of the CoV's FIX-MVI to AAM by DOAV requires a phased, incremental roll-out approach that consists of identification of need, deployment of infrastructure, feedback, and course correction. DOAV proposes a three-phased approach to finalizing input received to date; identification of infrastructure areas that are the responsibility of CoV state and local government under the leadership of DOAV; and developing and publishing requirements and plans for infrastructure, including proposed funding approaches. The three phases of the infrastructure discovery, planning, and roll-out are as follows:

1. **Discovery, prototyping and learning (ongoing through 2026):** community and industry engagement, FAA interaction, and identifying requirements and potential solutions;
2. **Piloting test-centers and learning (late 2024 through 2028)** consisting of targeted deployment of innovative infrastructure solutions that meet specified community need, industry standards, and requirements for compliance with FAA policy and harmonization with the work of other states leading to incorporation of lessons learned into the long-term system plan; and

3. Transitioning to Long-Term System Planning / Sustainable System Financing and Evolution (2027 and beyond) consisting of evaluating deployed pilot infrastructure together with industry, communities, and the FAA to develop system-wide deployment plans as well as a viable long-term system funding model to transition away from the pilot phase (Phase 2) in 2028-2029.

Supporting Phase 1 and the transition to Phase 2, DOAV proposes to undertake the following three actions with respect to the development of infrastructure for AAM in the CoV:

1. Finalize and publish a set of proposed AAM baseline infrastructure requirements, including minimum performance levels and planning/oversight, focused specifically on near- to medium-term benchmarks and those aspects that are the responsibility of the CoV and which leverage Virginia's existing baseline and harmonize with other states for use as a roadmap for piloting test centers and the long-term system plan;
2. Publish a set of physical and digital infrastructure guidelines for GA airports and off-airport operations specific to the pilot phase and developed in partnership with the FAA and industry for use in developing test centers and collecting data to finalize the long-term system plan; and
3. Develop a test-center pilot program to deploy proposed baseline infrastructure in communities where a clear need and path to economic viability can be demonstrated through partnerships with operators; developing a limited network of test-centers across the CoV under the regulatory purview of the DOAV and the safety umbrella of Virginia's existing, accredited FAA test site.

Investment and Economic Viability

The DOAV proposes limited, targeted investment to support the conclusion of Phase 1 and the transition to Phase 2, with a focus on demonstrating utility and compliance of the infrastructure while laying a clear path to a financially sustainable integration of AAM into Virginia’s aviation system. As we invest in the CoV’s aviation infrastructure, we also need to balance the need to support near-term entry into service while also preparing for future technology to support all aviation stakeholders in the CoV: the premise is to research 20 years out, plan for 10 years out, and invest for five years out.

As discussed above, Virginia’s investments in AAM should be at the intersection of community-identified needs, AAM industry operator and FAA requirements, and services that can demonstrate a path to commercial viability and financial sustainability in the next five years. When making investments, the CoV should consider the costs of operations and sustainment, and how those costs will be funded over the long-term. Investments should be community-led, market driven, financially sustainable, and demonstrate how they contribute to enhanced aviation safety for all aviation stakeholders in the CoV.

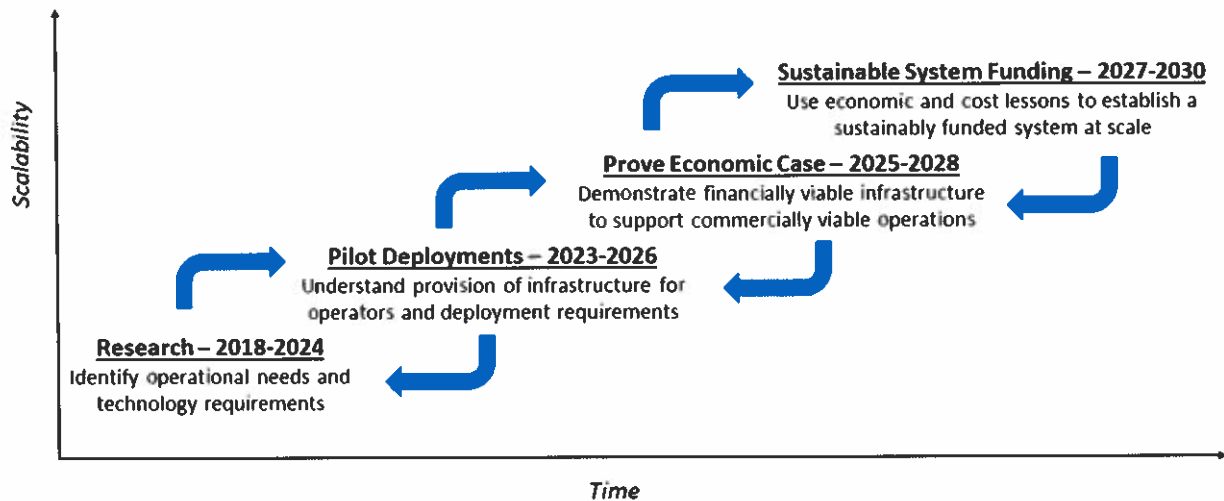


Figure 6: Strategic Investment Feedback Loop for Economic Viability

Approach to Infrastructure Investment: The Virginia Model

As DOAV undertakes the development of AAM baseline infrastructure planning and investment, it will at all times maintain the primacy of the fact that the system must be financially sustainable over the long-term. While the FIX-MVI approach allows DOAV to effectively manage the deployment and sustainment costs of aviation infrastructure, DOAV must also focus on infrastructure that leads to the development of commercially viable air services in accordance with our AAM Strategic Objectives, Goals, and Principles which support revenue. This means focusing on the air services needed by Virginia communities, and collaborating with industry partners that serve these needs rather than identifying interesting technical solutions and trying to build community support after the fact. This results in three questions of economic viability that should be assessed by DOAV in considering AAM infrastructure development proposals:

1. What specific community needs would be addressed by the proposed AAM air services and how do we measure benefit against deployment and operating cost of delivering these services?
2. How does the proposed investment demonstrate an enhancement to aviation safety and service, not just to the immediate AAM operator, but also to other Virginia aviation stakeholders?
3. Can we, together with the communities being served and air service operators, develop and describe a financial sustainment model where all participants pay an appropriate share of the incremental deployment and operating costs?
4. Can we develop a plausible model for how the investment, by generating benefit to the community, reaches a financially sustainable state in the next five years?
5. As part of the plausible financial model, will this investment support the discovery and development of demand for AAM services?

Strategic Investment Actions

DOAV will develop financial models for deployment and sustainment of AAM infrastructure through the development of a network of test centers that provide specific cost and benefit data related to AAM infrastructure roll-out through a pilot program. These test centers then become the formal Entry-Into-Service points for these new technologies as these aviation facilities transition to commercial air services and long-term sustainment, delivering real public and economic benefits to communities in Virginia and creating a regulatorily and cost-competitive environment for aerospace entities to roll out new products. To support this economically viable and competitive vision, and to support AAM system planning at the community and CoV level, DOAV proposes to undertake the following three actions with respect to understanding the cost and sustainment of infrastructure for AAM in the CoV:

1. Convene Virginia communities, through our airports, to identify the “use cases” that are necessary at the community level in partnership with AAM operators and work with the communities to identify where these services are needed;
2. Develop an economic viability model for these “use cases” for evaluating AAM infrastructure investments for a given community or communities in relation to specific, proposed air services and how the system is sustained (e.g., user fee or economic benefit supported operations);
3. Leverage a pilot program of test centers to stress-test these economic models, identify and develop demand for AAM services, and collect data to further refine the economic and planning models for AAM infrastructure in communities where need and economic viability can be demonstrated; and
4. Identify Public-Private partners in a structured, systematic way using the test center pilot program to develop Virginia’s public aviation system through sustainable funding models in concert with industry, ensuring a system that is safe, effective and functional for all stakeholders.

The report “*Analysis of Minimum Viable Infrastructure (MVI) to Support Advanced Aerial Mobility (AAM) Operations Across the Commonwealth of Virginia*” provides detailed information that the DOAV can use

in evaluating infrastructure from the technology and cost perspective, and the report recommended a program where operators and communities could self-identify and join the CoV public system – which a pilot program could facilitate. If developed thoughtfully and flexibly, the pilot sites could, through alignment to AAM industry standard and FAA regulations, graduate from the pilot program and to permanent, shared public AAM aviation facilities.

Evaluating Progress

As with any investment program it is essential that the DOAV develop a framework to measure and evaluate progress against our strategic program goals as described above. The table below lays out an initial framework for monitoring progress, with initial potential metrics that will be further developed by the DOAV as pilot programs are undertaken to better understand AAM system performance as we learn from experience.

Goal	Description	Purpose of Metrics	Potential Metric(s)
Improve infrastructure and enhance safety	Identify infrastructure and services that enhance aviation safety for all participants, including AAM	Measure improvements in safety and efficiency at Virginia's airports	Total operations, stable or reductions in air and ground incidents and address pilot concerns
Ensure long-term viability of Virginia aviation system	Develop a clear understanding of cost of infrastructure role and operating cost relative to commercial operations	Support system planning to ensure that AAM infrastructure can be supported in a financially sustainable manner	Total cost of deployment, total cost of operations, cost per square mile of coverage, cost per operation, cost per covered life
Deliver value-added services that help AAM enter into service	Focus on those investments that add value to AAM operators and bring commercially viable AAM services into operation	Measure the value of supported AAM services to Virginia's communities and assess long-term commercial viability	Commercial operators/services supported, number of operations, aggregate value of services, area/lives covered by services, jobs created, other commercial or public benefit
Support a safe, full integration of AAM into the NAS	Support entry into service of fully integrated AAM capabilities in the NAS	Measure the number of vehicles, services that transition from pilot phase to FAA compliant or approved regular commercial service	Number of facilities supporting regular commercial AAM services, area/lives covered by services, approvals garnered

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 - ⁱⁱ https://www.faa.gov/sites/faa.gov/files/Urban%20Air%20Mobility%20%28UAM%29%20Concept%20of%20Operations%202.0_1.pdf
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