


# A Holistic Approach to Enable Advanced Air Mobility for Regional, Rural and Remote Australia

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**Abstract**

Advanced Air Mobility (AAM) has the potential to improve passenger and cargo connectivity by enabling point-to-point air transport services that extend accessibility across regional, rural, and remote Australia [1]. However, successful implementation will require more than advances in vehicle technology alone. This paper argues that an effective Australian AAM ecosystem depends on a holistic approach spanning people, air and ground operations, enabling technologies, and airspace integration [1,2,6,7]. It examines the principal challenges associated with these four pillars, including social acceptance, infrastructure development, the technical demands imposed by Australian operating conditions, and regulatory readiness. In contrast to many international AAM concepts centred on short-range operations, the Australian context requires consideration of missions of up to 1000 km, often in harsh environments and across unique airspace conditions. The paper therefore highlights why Australia presents both distinctive challenges and a valuable opportunity to shape AAM solutions of broader international relevance [1,6,7,8].

**Keywords:** Advanced Air Mobility (AAM), Air operations, Air vehicles, Social License, Certification.

## 1. Introduction of Advanced Air Mobility to Australia

Advanced Air Mobility (AAM) is attracting increasing global attention as a means of providing point-to-point passenger and cargo transport through new classes of highly automated air vehicles and associated operating concepts [6,7,8]. In the Australian context, however, the introduction of AAM presents challenges that extend beyond those typically addressed in many current international developments [1,2]. In addition to environmental factors such as elevated temperatures, humidity, and dust, the defining constraint is operational range. Enabling meaningful connectivity between urban centres and regional, rural, and remote communities will require missions of up to 1000 km, whereas many overseas AAM concepts are primarily oriented toward short-range operations of approximately 100 km or less. This distinction has important implications for airvehicle architecture, propulsion systems, infrastructure requirements, operating models, and certification pathways [1,4,6]. Figure 1 illustrates a representative future AAM operating scenario across the vast Australian landscape and within uncontrolled Class G airspace.



Figure 1 - AAM air vehicle operating in uncontrolled Class G airspace.

## 2. A Holistic Approach to enable Advanced Air Mobility in Australia

To succeed in materializing what the emergent technology of Advanced Air Mobility (AAM) offers, it will be essential to avoid a scattered approach in the implementation phase. A structured, collaborative and outcome-based approach is required instead, bringing together key stakeholders from AAM industry, AAM operation in the air and on ground, end-users, regulators, and last, but not least, society and communities [1,2,6,7]. If the latter is not accounted for, AAM will continue lacking consideration as being beneficial for the entire society and environment, it will be considered a rich-people technology or drone defense application. The holistic approach to enabling a safe and sound AAM ecosystem consists of four key pillars: people, operations, technology, and airspace integration.

### 2.1 People in the Context of AAM

The successful introduction of Advanced Air Mobility (AAM) in Australia is dependent on the establishment of public awareness, stakeholder confidence, and broad social acceptance of AAM as a safe, reliable, accessible, and economically viable mobility capability for communities, operators, and service users [1,7]. Achieving this outcome requires a coordinated, evidence-based approach that integrates industry, government, academia, operators, and end-users throughout the development and implementation phase. Priority research areas include stakeholder engagement and adoption studies – e.g. through direct interaction with the communities – to identify barriers related to awareness, perceptions, and attitudes. This includes focus on needs around air and ground operations, enabling factors, and application opportunities for AAM across regional, rural, and remote Australia. In parallel, human factors and systems integration research is required to support the progressive transition from conventionally crewed operations to remotely piloted and, ultimately, increasingly autonomous flight operations, with the aim of improving safety, operational efficiency, and overall system effectiveness across the future AAM ecosystem [7,8].

### 2.2 Air and Ground Operations

The development of air and ground operations for Advanced Air Mobility (AAM) in Australia requires the coordinated establishment of both physical and digital infrastructure capable of supporting scalable future services and commercially viable operating models [1,2,3]. A priority area is the creation of communication, navigation, and flight management architectures, including enabling capabilities for air traffic management (ATM) and air traffic control (ATC), developed in close collaboration with Airservices Australia, the Civil Aviation Safety Authority (CASA), and industrial

technology partners such as Thales [2,3]. In parallel, infrastructure design and operational test cases are required to define simple, modular, and cost-effective ground facilities, including vertiports, vertihubs, vertistops, vertistrips, and short take-off and landing (STOL) ports, with particular emphasis on deployment pathways suited to regional, rural, and remote Australian environments [5,6]. This work must be complemented by the design and validation of refuelling and recharging systems, including fuel storage, handling, maintenance, and turnaround requirements for sustainable aviation fuel (SAF), hydrogen, and electric propulsion systems. Collectively, these research and development activities form the operational foundation for an integrated AAM ecosystem that is safe, certifiable, economically sustainable, and adaptable to the unique geographic and airspace characteristics of Australia [2,3,4,5].

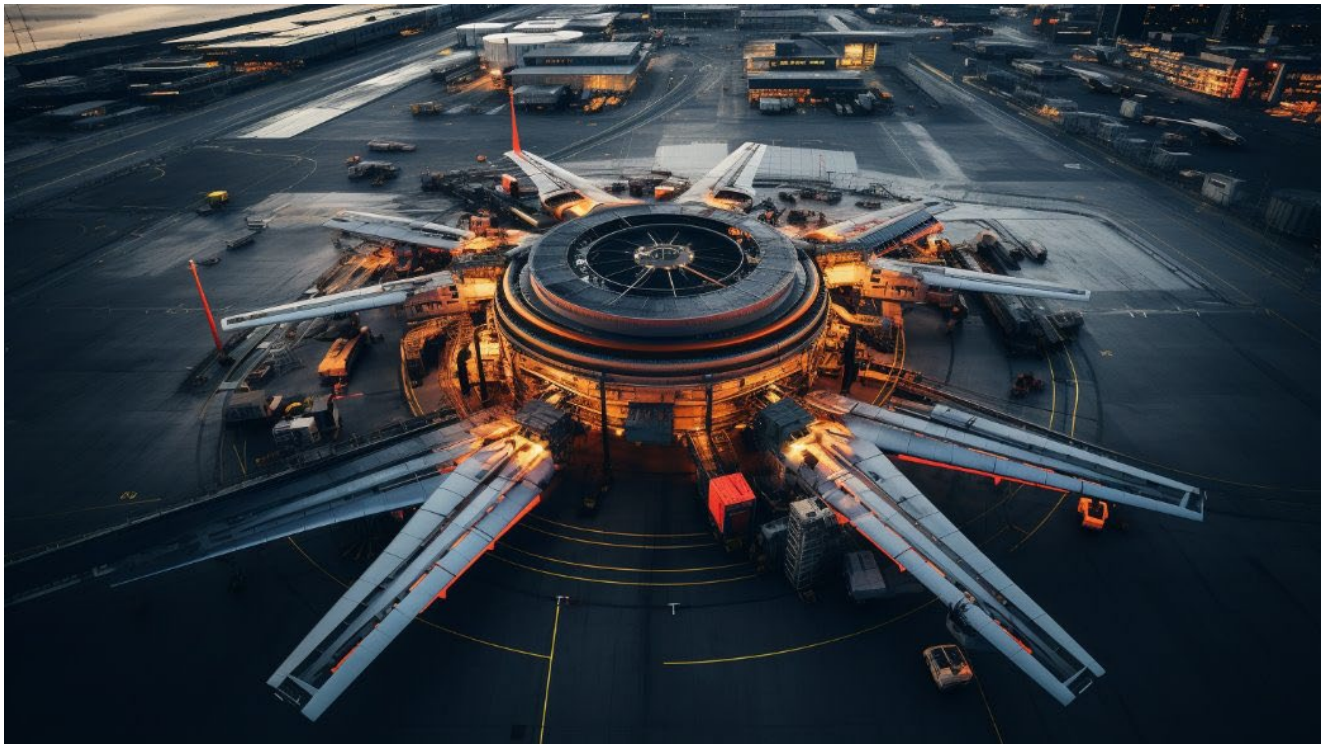


Figure 2 – AAM futuristic infrastructure integrated into conventional airport.

## 2.3 Enabling Technologies

Technology development constitutes a central pillar in enabling Advanced Air Mobility (AAM) in Australia, particularly where long-range operations, harsh environmental conditions, and diverse mission profiles impose performance requirements beyond those addressed by many current overseas concepts [1,6,8]. Research in this domain must therefore focus on the design, integration, and validation of air vehicle technologies that can deliver safe, efficient, and certifiable operation across regional, rural, and remote environments. Priority areas include advanced airframe structures, lightweight materials and manufacturing methods, propulsion and energy systems, onboard autonomy and control architectures, detect-and-avoid technologies, health and usage monitoring, and digital engineering approaches that accelerate development while reducing technical risk [4,8]. Particular emphasis is required on technologies capable of supporting extended range, and operational requirements will define payload flexibility, operational robustness, and maintainability under Australian conditions, including elevated temperatures, dust exposure, and limited ground support infrastructure. In this context, the technology pillar is not confined to vehicle subsystems alone, but spans over integrated development of platforms, digital toolchains, and verification pathways necessary to progress AAM concepts from experimental capability to operationally relevant and commercially deployable systems.



Figure 3 – Representative future image of AAM air vehicles developments.

## 2.4 Airspace Integration

Airspace integration represents a critical enabler for the safe and scalable introduction of Advanced Air Mobility (AAM) in Australia, particularly given the need to accommodate new vehicle classes, novel operating concepts, and increased traffic density across both controlled and uncontrolled airspace [2,3,6,7]. Research in this area must address the integration of AAM operations within the existing aviation system while ensuring compatibility with regulatory, operational, and safety frameworks already governing conventional air transport. Priority areas include the development and certification of operations concepts for mixed airspace environments, detect-and-avoid solutions as well as communication and surveillance architectures, and finally the progressive integration of remotely piloted and increasingly autonomous systems into routine operations [2,3,6]. Regional, rural, and remote Australian operations require particular attention, where Class G airspace, sparse surveillance coverage, long routes, and limited support infrastructure present both opportunities and challenges. Accordingly, airspace integration research must combine technical development with regulatory and operational validation, in close collaboration with government, service providers, and certification authorities, to establish pathways for safe, efficient, and certifiable AAM operations within the Australian airspace system [2,3,4].



Figure 4 – Future airspace events will lead to an increased air traffic density – representative example of a future possible airspace.

## 3. Current Status and Way Forward

Progress toward an Australian Advanced Air Mobility (AAM) ecosystem is already evident through the emergence of coordinated initiatives involving industry, academia, government, and certification stakeholders [1,2,3]. These activities are increasingly moving beyond concept exploration toward structured capability development, test and evaluation, and the definition of implementation pathways aligned with national operational needs. A key next step is the establishment of a long-term research and innovation framework supported by a clear roadmap, measurable milestones, and integrated demonstration activities across the four pillars of people, operations, technology, and airspace integration [1,2,6]. Such a framework should be coupled with workforce development, regulatory engagement, and collaborative validation programs to ensure that technical advances are translated into safe, certifiable, and operationally relevant outcomes. The way forward therefore lies not in isolated projects, but in a sustained national effort capable of maturing AAM from fragmented activity into a coherent and deployable ecosystem for regional, rural, and remote Australia.

## 4. Conclusion

Advanced Air Mobility (AAM) presents a significant opportunity to improve connectivity, accessibility, and service delivery across regional, rural, and remote Australia; however, its successful implementation will depend on more than the maturity of air vehicle concepts alone [1,2]. As argued in this paper, a viable Australian AAM ecosystem requires a holistic and coordinated approach spanning people, air and ground operations, enabling technologies, and airspace integration [1,2,3,6,7]. The Australian operating environment, characterised by long distances, harsh environmental conditions, limited infrastructure, and extensive uncontrolled airspace, demands solutions that differ in important respects from many current international AAM models [1,3,6]. Consequently, future progress will rely on sustained collaboration between industry, government, academia, operators, regulators, and communities to ensure that technical innovation is matched by operational feasibility, regulatory readiness, and social acceptance. If pursued through such an integrated framework and structured, straight approach, AAM has the potential to evolve from an emerging concept into a safe, practical, and nationally beneficial capability for Australia, while also contributing insights of broader relevance to the international aerospace community [1,6,7,8].

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