

Abstract

AAM - A New Transport Mode or the Search for a Useful Application Scenario: Regional Mobility, Adaptable Vertiports and Integration into the Urban Environment

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Advanced Air Mobility (AAM) and electric vertical take-off and landing aircraft offer the possibility of adding a new layer to existing transport systems. Technological feasibility alone, however, does not establish a useful application. The fundamental question is therefore: Why fly in the first place? If an aerial service substitutes an already efficient connection or generates substantial additional ground traffic to access its infrastructure, its systemic benefit becomes questionable. The risk of induced traffic is consequently a key consideration when identifying meaningful applications.

The concept therefore approaches AAM primarily as a complementary transport mode, with particular emphasis on Regional Air Mobility rather than additional intra-city traffic. Application scenarios must be derived from local needs. In Germany, potential uses include structurally or infrastructurally weak destinations without direct rail or motorway access and routes affected by geographical barriers, such as crossing the River Elbe in Hamburg or connecting North Sea islands. Other regional scenarios include long-distance and convenience-oriented travel in North America, substitution of existing helicopter services in South America, new infrastructure for dispersed urban development in parts of Africa, and connections addressing congestion in Asian metropolitan regions. These examples illustrate that infrastructure, geography, culture and patterns of public life determine both the usefulness of the service and the form of its infrastructure.

Once a meaningful application is identified, the question shifts from mobility to urban integration. A vertiport requires land, infrastructure and investment and affects more people than those travelling through it. Operators need safe, efficient infrastructure and viable revenue streams; passengers require fast and convenient journeys; local authorities must consider connectivity, land use and long-term development; and residents experience the building as part of their everyday environment. The design therefore seeks shared value rather than optimising solely for aviation. Aviation-specific space is kept to what is operationally necessary, while other areas can accommodate commercial, logistical, leisure, innovation and public uses, allowing the building to remain active independently of passenger flights.

Sustainability forms part of the same architectural strategy. A prefabricated, customisable timber structure supports different scales and configurations as well as extension, rebuilding, dismantling and second-life use, following cradle-to-cradle-inspired principles. Energy and water recovery systems complement this approach. The same structural logic can support a rooftop vertistop in dense urban fabric or a larger vertihub embedded into topography and landscape, where publicly accessible green space can extend across the infrastructure. In this way, a vertiport can become less an airport within a park and more a park containing aviation infrastructure. Commercial, recreational and public functions can similarly bring established urban activities into the third dimension.

While public and commercial functions remain flexible, aviation processes require precise organisation. A detailed operational analysis resulted in a turnaround sequence of approximately 7.5 minutes, including approach and departure within the safety zones, engine-out considerations, deboarding, boarding and possible baggage handling. Arriving and departing passengers are separated across two levels. Compact mini-gate areas sequence departing passengers in coordination with individual aircraft turnaround, while arriving passengers follow a separate route towards onward transport. Short walking distances and separated flows minimise sequencing delays, designing the terminal around rapid transition rather than large passenger volumes and extended waiting periods.

The resulting approach operates at regional, urban and building scales. Successful AAM begins by identifying a sufficiently compelling reason to fly and then deriving the network, location and architecture from that application. The central question is therefore not simply how cities can accommodate electric aircraft, but whether, where and why AAM should be used - and what the city and its stakeholders gain in return.

Biography

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Oliver Grunewald is a Dipl.-Ing. architect with extensive international experience, including more than a decade working in London. His work focuses on Urban Air Mobility, vertiport development and future mobility infrastructure, combining architecture and urban design with engineering, innovation and application-oriented concept development.