

ADVANCED AIR MOBILITY IN THE RHINE-MAIN REGION

Key insights from the BMDV-funded
FLAMINGO research project



April 2024

Advanced Air Mobility (AAM), or colloquially "air taxi" passenger transport, is an innovative form of mobility that is soon to be trialled commercially. For example, the first air taxi services with electric Vertical Take-Off and Landing aircrafts (eVTOLs), might be offered in summer 2024 at the Olympic Games in Paris, from the end of 2024 in Rome, in 2026 at the Winter Olympics in Milan and from 2026 on in Dubai as part of the public transport system. As a strong economic region and a European transport hub with Frankfurt Airport at its centre, the Rhine-Main region seems to offer good conditions for integrating AAM.

In the FLAMINGO research project ("Flugtaxi in der Rhein-Main-Region"), which was launched at the end of 2022 and is funded by the German Federal Ministry for Digital and Transport (BMDV), the project partners d-fine and Fraport, together with the associated partners Skyports, Beyond 1435 (Deutsche Bahn subsidiary for investments and external partnerships) and the City of Frankfurt, conducted a feasibility study for the development of an air taxi network in the Rhine-Main region, focussing on airport shuttle use case. Based on a passenger survey at Frankfurt Airport and further model- and data-driven analyses, the following

main conclusions were drawn about the potential of AAM:

FOCUS RHINE-MAIN REGION

General willingness to use and pay in the region

The passenger survey conducted at Frankfurt Airport shows that over three quarters of respondents can imagine using an air taxi and think that AAM can offer added value. The most relevant factors from the user's perspective are time savings, safety and reliability. The analyses of price-dependent demand also confirm that users are willing to pay a certain premium compared to a traditional taxi.

Various use cases for AAM with added value for the user

The existing transport model of the Rhine-Main area (VDRM) in PTV Visum was supplemented by the transport mode AAM. The comparison shows that AAM can enable significant reductions in travel times. Premium holidaymakers, business travellers, as well as potentially also commuters and people with poor or no transport connections are identified as potential user groups for a shuttle to Frankfurt Airport. In particular, based on the analysis, the cities of Wiesbaden, Mainz, Heilbronn and Heidelberg, as well as the

(Hoch-)Taunus region, are demand hotspots in the region.

Regional connections with greater potential in the Rhine-Main region

Due to the extensive public and private transport network, the urban area of Frankfurt, i.e. a shuttle from Frankfurt Airport to the city centre, does not provide a value add in terms of time saving. Especially, it is the regional connections, such as to Heidelberg, Heilbronn or the Central Hesse region, can generate added value by reducing journey times and ensuring reliability.

could be, for example, the use as an airport shuttle for employees of large companies as well as the connection of regional airports for passenger or crew transport. Relevant user benefits in comparison to existing taxi shuttles are reliability, shorter journey times and flexibility. With a reduction in investment costs by using existing infrastructure such as helipads and airfields, these applications are particularly promising in the initial market phase.

Achievable prices are initially aimed primarily at premium customers

GENERAL INSIGHTS

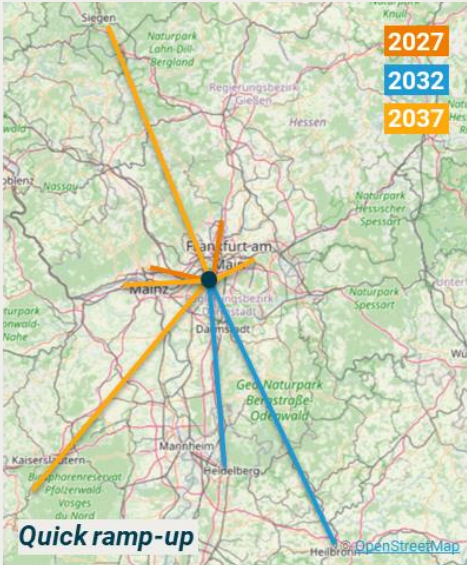
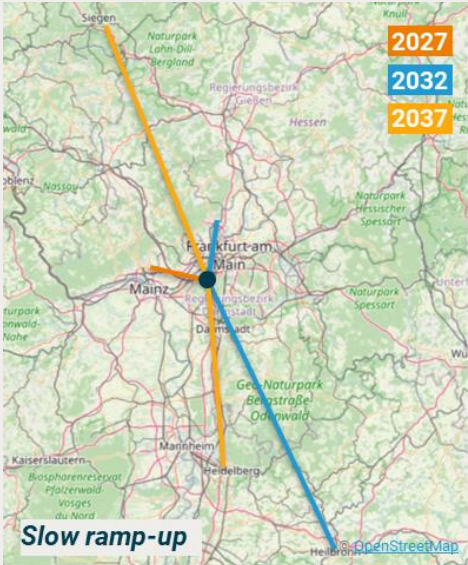
Special use cases as initial applications

In addition to public airport shuttles, AAM can generate added value for specific, partly private use cases. This

In the course of the project, a detailed and customisable tool was developed to assess the economics of tailored AAM networks. The analyses show that the successful development of an AAM network focussing on regional flights can establish competitive prices for air

POTENTIAL AAM NETWORK DEVELOPMENT IN THE RHINE-MAIN REGION

Graphical representation of the potential AAM network development in fast and slow ramp-up. Frankfurt Airport corresponds to the connection point of all routes (dark blue dot).



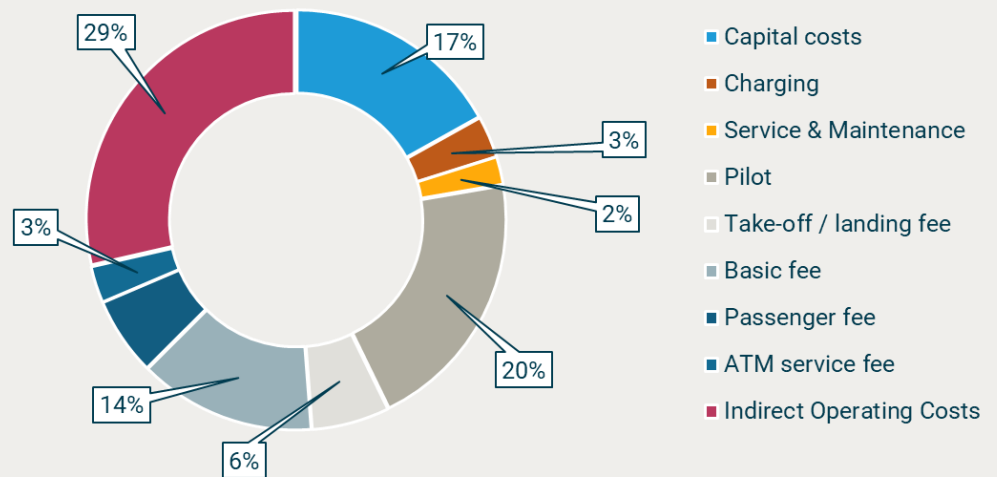
Source: Own illustration, © OpenStreetMap.

taxi services in the mid- to long-run. The key factors here are increasing the capacity of eVTOLs, high capacity

Only through cooperation between the various stakeholders can the relevant regulatory framework be further

EXAMPLE: COST DISTRIBUTION PER FLIGHT

Cost distribution for an eVTOL flight of approx. 75 km in an exemplary AAM network in the Rhine-Main region in 2032.



Source: Own illustration.

utilisation and network optimization. Competitive prices compared to taxis can be achieved, especially on long-haul routes >50km, with high capacity and utilisation of eVTOLs. For exemplary routes in the Rhine-Main region, these are estimated to be in the single-digit € range per passenger kilometre in the period 2027-2037, plus a basis fee of €35-55 on average.

Networking of all regional (AAM) stakeholders necessary

The networking of AAM stakeholders such as eVTOL manufacturers, vertiport operators, AAM service providers and airports with local associations, municipalities, authorities, and companies outside the aviation industry is a prerequisite for the successful and meaningful implementation of AAM.

developed and a socially and economically sustainable AAM network realised. Public funding can support high initial infrastructure costs.

Testing using a pilot route in the region

The implementation of pilot routes is recommended for further research. This will allow real data to be collected on user behaviour, price sensitivity, general operation and social acceptance, e.g. with regard to noise emissions. Accompanying this, digital simulations can support the ramp-up.

GET IN TOUCH WITH THE PROJECT LEADS!

The full project report can be made available upon request.

Simon Graf

Senior project manager at Fraport AG
and commercial director at
FRA Vorfeldkontrolle GmbH

S.graf@fraport.com

Oliver Wohak

Senior Manager & Lead Aviation
d-fine GmbH

Oliver.wohak@d-fine.com

Supported by:



Federal Ministry
of Transport and
Digital Infrastructure

on the basis of a decision
by the German Bundestag

ABOUT THE PROJECT PARTNERS

D-FINE

is a European consulting company focussing on analytically challenging topics, which are handled by a team with a scientific background and a high degree of responsibility for future-proof solutions and their sustainable technological implementation. In the field of mobility and transport, d-fine primarily develops data and model-based solutions, e.g. for optimising processes, assessing the potential of business cases or developing models to support decision-making – from rail transport to urban mobility and logistics through to aviation.

FRAPORT

is Europe's leading airport operator and sets standards worldwide. Fraport is active at 29 airports worldwide in various forms with the business segments Aviation, Non-Aviation and Ground Handling. Frankfurt Airport is regarded as a Group showcase airport. Currently 86 airlines take off from FRA to 292 destinations in 92 countries worldwide.

SKYPORTS

is the leading vertiport developer and operator with a presence in 12+ markets. Founded in 2017, Skyports partnered with Volocopter in 2019 to build the first vertiport in Singapore. Skyports is actively involved in regulatory development in close cooperation with

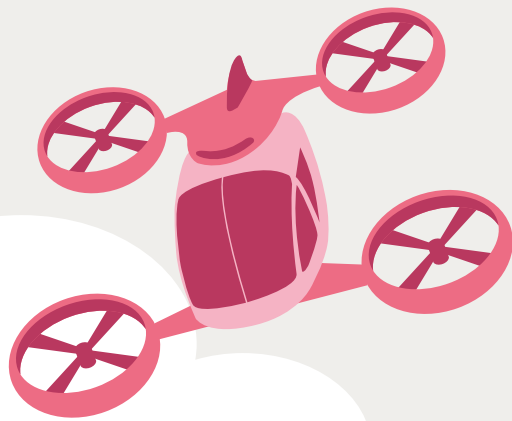
EASA and FAA. Together with Dubai's Road and Transport Authority (RTA) and all-electric aircraft company Joby Aviation Skyports will launch commercial passenger air taxi services in Dubai by 2026.

BEYOND1435

(former Deutsche Bahn Digital Ventures) sets up cross-company cooperation models for Deutsche Bahn. It is the contact partner when it comes to binding cooperation between DB and external companies with a strong focus on sustainability and production.

STRAßENVERKEHRSAMT FRANKFURT AM MAIN

is responsible for traffic planning, control and safety in the city. It ensures safe and smooth road-based mobility for 750,000 Frankfurt residents and 500,000 commuters every day and operates traffic monitoring, traffic control, traffic information and traffic management, among other things.



Fraport AG
Frankfurt Airport
Services Worldwide
60547 Frankfurt a. M.

www.fraport.com

d-fine GmbH

An der Hauptwache 7
60313 Frankfurt a. M.

www.d-fine.de