Factors Shaping the Passenger Experience in Advanced Air Mobility: Insights from Literature

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SUMMARY

Advanced Air Mobility (AAM) offers a new form of sustainable air transportation for passengers moving across urban and regional areas, making passenger experience a crucial factor in its societal adoption and commercial success. This paper reviews literature on key human factors influencing AAM acceptance, including motion comfort, ride quality, trust in pilotless operations and the role of in-flight information. Existing studies indicate that acceleration, vibration and attitude influence in-flight comfort, while research on autonomous mobility highlights the importance of system transparency and the communication of system state for trust. However, current literature shows a limited understanding of angular motion comfort, differences in ride quality across AAM vehicle types, and the effectiveness of auditory in-flight information for autonomous journeys. These gaps highlight clear opportunities for future motion-based experimental work to support passenger-centred AAM design.

KEYWORDS

Advanced Air Mobility, Passenger Comfort, Autonomy, Ride Quality, Trust, In-Flight Information

Introduction

Advanced Air Mobility (AAM) will use cleaner, short-range electric and hybrid aircraft to move people and goods across urban and regional environments (UK Civil Aviation Authority, n.d.). Typical passenger use cases include short urban trips, airport transfers and regional point-to-point journeys, enabled by a range of electric and automated aerial vehicle configurations such as electric vertical take-off and landing (eVTOL) aircraft (Garrow et al., 2022). Achieving a positive passenger experience is critical to the commercial success and societal acceptance of AAM.

Unlike conventional air travel, AAM introduces new flight dynamics, low-altitude operations, and increasing levels of automation, which may affect passenger experience through distinct motion profiles and sensory cues. Previous studies have identified a range of factors influencing societal acceptance of AAM services, including passenger comfort, noise and cost (Al Haddad et al., 2020; Cohen, Shaheen and Farrar, 2021; European Union Aviation Safety Agency, 2021; Laudien, Ernst and Schuchardt, 2022; Lotz et al., 2023; Elsdon-Baker et al., 2025). However, it remains unclear how on-board passenger experience factors shape user adoption of AAM.

The aim of this paper is to review existing literature on motion comfort, ride quality and trust in autonomy to identify knowledge gaps specific to the AAM context. While these topics have been widely studied in conventional aviation and autonomous ground vehicles, they have not yet been sufficiently contextualised for the operational environment and motion characteristics of AAM aircraft. The objectives of this review are to summarise key findings and clarify where further research is needed, focusing on angular motion comfort, ride quality across vehicle configurations, passenger responses to piloted versus autonomous operations and the role of in-flight information.

Background and Literature Review

This review examined research papers and technical reports published between 1975 and 2025, identified through a focused search for studies on motion comfort, ride quality and trust in autonomy in the context of aerospace and automated vehicles. Relevant studies were reviewed if they addressed human responses to motion, perceptions of vehicle behaviour or interaction with automated systems.

Key themes were organised into three areas: motion comfort, ride quality and trust (Figure 1), enabling identification of areas with limited evidence in AAM literature.

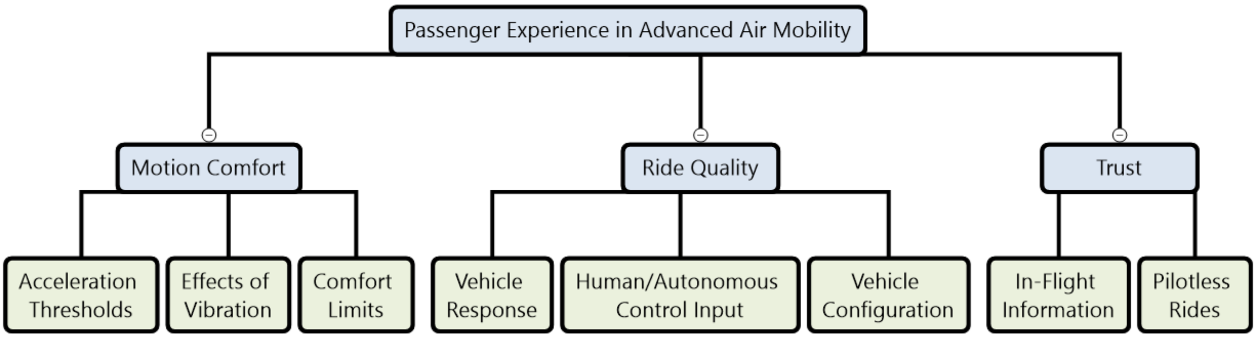

Figure 1: Layered conceptual framework showing how motion comfort, ride quality and trust shape AAM passenger experience.

Motion Comfort in Aerial Environments

In-flight comfort is a central human factors consideration for passenger-carrying aerial systems and is associated with increased likelihood of repeat flying (Zhong and Han, 2019). For AAM, passenger comfort is particularly important due to its unconventional operating environment, with vehicles flying close to ground infrastructure, increased encounters with turbulence and reliance on novel electric propulsion technologies (Edwards and Price, 2020; Keller et al., 2021; Ugwueze et al., 2022). Acceleration is the primary flight mechanical factor influencing comfort (Krishnamurthy and Handojo, 2021), detected by the vestibular system across six degrees of freedom (Fitze et al., 2024).

Human tolerance to acceleration defines upper physiological limits, while discrimination thresholds define the minimum perceptible motion. Motion comfort therefore lies between perceptual detection thresholds and physiological tolerance limits. Reported discomfort thresholds include 0.78-0.88 m/s^2 vertical, 0.24-0.27 m/s^2 lateral, and 3.92-5.88 m/s^2 longitudinal (Edwards and Price, 2020; Rinalducci, 1980). Comfortable roll and pitch angles remain below 30° and 10°, respectively (Schoonover Jr., 1975), with preferred angle of attack near 14° (Ping et al., 2021). Vibration levels above 0.04 g or within 0.25-0.5 Hz can reduce comfort and induce motion sickness (Edwards and Price, 2020).

Motion sickness represents an additional dimension of discomfort and arises from both motion magnitude and sensory conflict between expected and actual vestibular, visual and proprioceptive cues (Reason, 1978; Golding, 2006; Hinninghofen and Enck, 2006). This suggests that both motion intensity and predictability are relevant for passenger comfort in AAM.

While these findings provide useful baseline insight, most evidence is derived from conventional fixed-wing aviation or ground transport contexts. There are currently no established passenger comfort thresholds for angular rates or angular accelerations in aviation, indicating a gap in current AAM motion comfort research where short-duration manoeuvres, rapid attitude changes and automation-driven trajectories are expected to be common.

Ride Quality and Autonomy Across AAM Configurations

Ride quality extends the concept of motion comfort by describing how vehicle motion responses from external disturbances and control inputs translate into perceived comfort, influencing passenger acceptance and future vehicle usage (Mckenzie and Brumaghim, 1975; Conner and Jacobson, 1976). For AAM, ride quality is shaped not only by motion magnitude but also by vehicle type, operating environment and control systems.

Distributed electric propulsion has enabled a wide range of AAM eVTOL configurations, which can be broadly categorised into wingless and powered-lift designs (Ugwueze et al., 2022). These architectures produce distinct motion profiles during take-off, transition and landing, while low-altitude operations further influence ride quality through interactions with terrain and nearby structures (Keller et al., 2021).

Empirical evidence comparing passenger ride quality across AAM configurations remains limited. Most studies have focused on single vehicle concepts or expert opinions. Qualitative interviews identified vehicle motion as a key concern for prospective eVTOL passengers (Edwards and Price, 2020). A virtual reality study using a hexacopter with 23 participants (five females, 16 males, aged 18 to 65+) found that sudden increases in vertical acceleration and jerk reduced comfort (Hanson, Ramia and Barnes, 2025), while a motion simulator study of quadcopter passengers (19 males, four females, mean age 42.8 years) reported increased motion sickness during rotor speed-controlled flight, although comparisons with alternative vehicle configurations were not conducted (Adelstein et al., 2022). As different configurations are expected to generate distinct six degrees of freedom motion profiles, understanding passenger responses to these differences is critical for informing vehicle design and operational planning.

Higher levels of autonomy are expected as AAM demand increases (Wing et al., 2020), meaning that ride quality will progressively depend on automated trajectory generation rather than pilot control inputs. How autonomous AAM vehicles influence passenger experience therefore remains an important area for further investigation.

Trust in Autonomous Operations

Trust is central to the adoption of automation and is influenced by perceived system transparency, competence and reliability (Choi and Ji, 2015). A user study found that most participants (56 males, 79 females, mean age 31.96 years) preferred piloted air taxis (Lotz et al., 2023), while a large-scale survey indicated that over half of 2500 respondents were not fully comfortable using autonomous air taxis (Hasan, 2019). However, these findings are based on hypothetical survey questions, and little is known about how passengers respond to piloted versus autonomous AAM flights when exposed to representative motion cues.

Research from autonomous automotive studies shows that communicating vehicle states and motion can improve passenger experience and perceived trust (Kim et al., 2023; Schneider et al., 2021). In autonomous AAM operations, passenger information needs include safety status and explanations of route progression (Beringer, 2021). A mixed-reality study of an autonomous air taxi found that participants (14 females, 16 males, mean age 41 years) valued information about vehicle intentions, particularly during re-routing events (Papenfuss et al., 2025). Similarly, a virtual reality motion-simulator study with 34 participants (12 females, 22 males, mean age 27.7 years) reported that providing movement information increased perceived reliability of autonomous eVTOL vehicles (Kim and Ji, 2024). However, auditory in-flight information was not evaluated as a primary communication modality, and its influence on trust and comfort in autonomous AAM operations remains largely unexplored.

Overall, existing literature suggests that in-flight information and trust in automated vehicles influence passenger experience in autonomous AAM. However, focused motion-based experimental studies comparing piloted and pilotless operations, as well as evaluating auditory in-flight information, are lacking. Addressing these gaps is essential for understanding how autonomy and in-flight information interact with physical motion to shape passenger experience in future AAM operations.

Discussion and Future Work

Understanding passenger experience is crucial for AAM adoption and societal acceptance. This review highlights key factors influencing passenger experience, including motion comfort, ride quality and trust in autonomous operations. However, significant gaps remain in current literature. Important knowledge gaps include angular motion comfort, ride quality across different vehicle configurations, motion-based studies comparing autonomous and piloted AAM operations, and the effectiveness of auditory in-flight information. Targeted motion-simulation studies provide a practical means to address these gaps and establish comfort and trust criteria specific to AAM. This review emphasises the importance of integrating comfort-focused operational measures, simulation-based evaluations and clear in-flight communication early in AAM design. These insights aim to support passenger-centred services and improve confidence in future AAM systems.

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