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Commentary

Market Potential, Opportunities and Challenges to Mainstreaming Advanced Air Mobility

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DESCRIPTION

Advanced Air Mobility (AAM) is a broad concept enabling consumer's access to air mobility, cargo and package delivery, healthcare applications, and emergency services through an integrated and connected multimodal transportation network [1]. AAM includes local use cases of about a 50-mile radius in rural or urban areas and intraregional use cases of up to approximately 500 miles that occur within or between urban and rural areas [1]. In recent years, a number of companies are designing and testing enabling elements of Advanced Air Mobility (AAM) including; prototypes of Vertical and Short Take-Off and Landing (VTOL/STOL) capable aircraft, operational concepts, and market studies to understand potential business models.

A number of market studies estimate that AAM passenger and emergency services will begin to transition to VTOL and Electric VTOL (eVTOL) aircraft in the mid to late 2020s. Broadly, these market studies estimate a passenger mobility market of 2.8 to 4 billion USD by 2030, and a global AAM market potential of 74 to 641 billion USD in 2035 [2-8]. A study by Herman, et al. estimates a market potential of 318 billion USD across the 74 cities in 2040 [6]. Another study by Porsche Consulting estimates a global demand for 23,000 eVTOL aircraft in 2035 [4]. Goyal et al. estimates that AAM passenger services could have a daily demand of 82,000 passengers served by approximately 4000 four- to five-seat aircraft in the U.S., under the most conservative scenario, representing an annual market valuation of 2.5 billion USD [1]. However, another study by Goyal and Cohen, finds that eVTOL aircraft could confront a number of operational and economic challenges for aeromedical applications compared to hybrid vertical Take-off and Land (VTOL) aircraft and rotorcraft [9]. The study found that reduced charge times, increased range, and battery swapping could make the eVTOLs more reliable and cost-effective for aeromedical transport [9].

While AAM may be enabled by the convergence of several factors, several challenges such as: community acceptance, social equity, affordability, safety, issues around planning and implementation, airspace, and operations, could create barriers to mainstreaming [10]. Safety is existentially critical because many AAM use cases envision operations in low altitude airspace over urban areas. One of the principal challenges with AAM is that it will likely have to interact with commercial aviation and unscrewed aircraft systems/drones ecosystems in a variety of contexts [10]. Additionally, the legal, policy, and regulatory environment may present challenges for certifying and authorizing the use of some novel technologies and combinations of features that could be found in AAM aircraft (e.g., autonomy and highly complex software, electric and alternative fuel propulsion systems, etc.) [10]. Finally, many AAM use cases will require extensive infrastructure such as a network of take-off and landing facilities; maintenance facilities; charging/fueling stations; and communications, navigation, surveillance, and other information technology infrastructure [10].

Both direct and indirect impacts of AAM could also present challenges to the adoption and mainstreaming of AAM. A few key potential key areas of concern could include noise, visual pollution, privacy, and service affordability [10-11]. Both community engagement and research are needed to advance understanding of potential societal barriers, and to identify policies that serve the public good [10]. It is also important to remember that there is a difference between engaging communities and building public support for AAM. The public and private sectors should evolve community engagement from informing and consulting the public, to deep collaboration and community empowerment where the public has the ability to influence decision-making and outcomes.

While numerous societal concerns have been raised about AAM, it has the potential to offer additional options for an array of use cases. The public and private sectors should prioritize humanitarian, aeromedical, and emergency response use cases to demonstrate broad societal benefit and build public acceptance of emerging aviation technologies, such as AAM.

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