



Urban Air Mobility

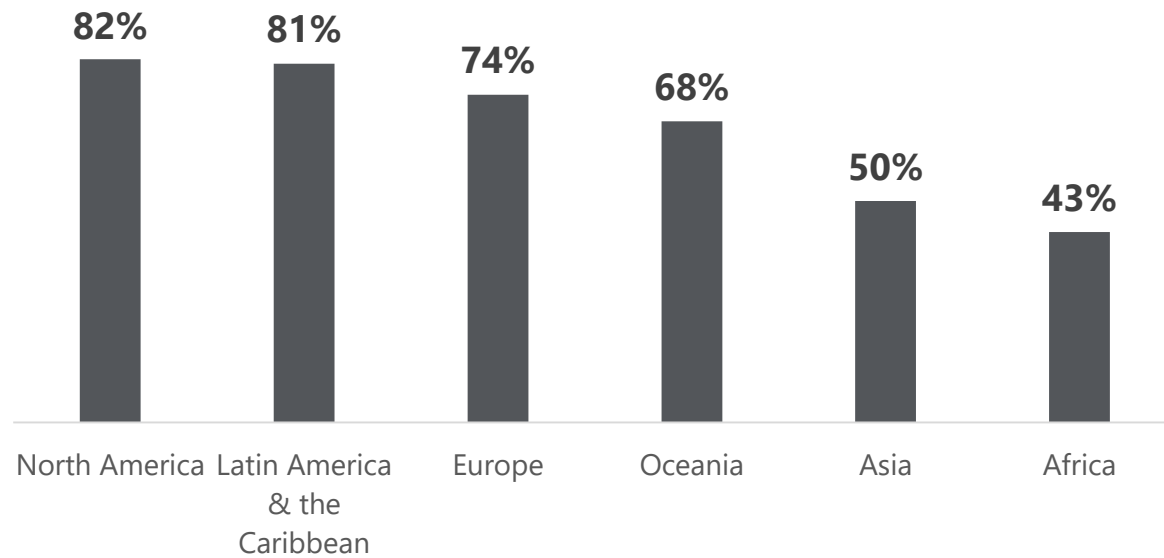
*Matthew Metcalfe
Managing Director
Future Aviation Systems*

3/2/2020

Smart Cities | **Driven by Unprecedented Urbanization**

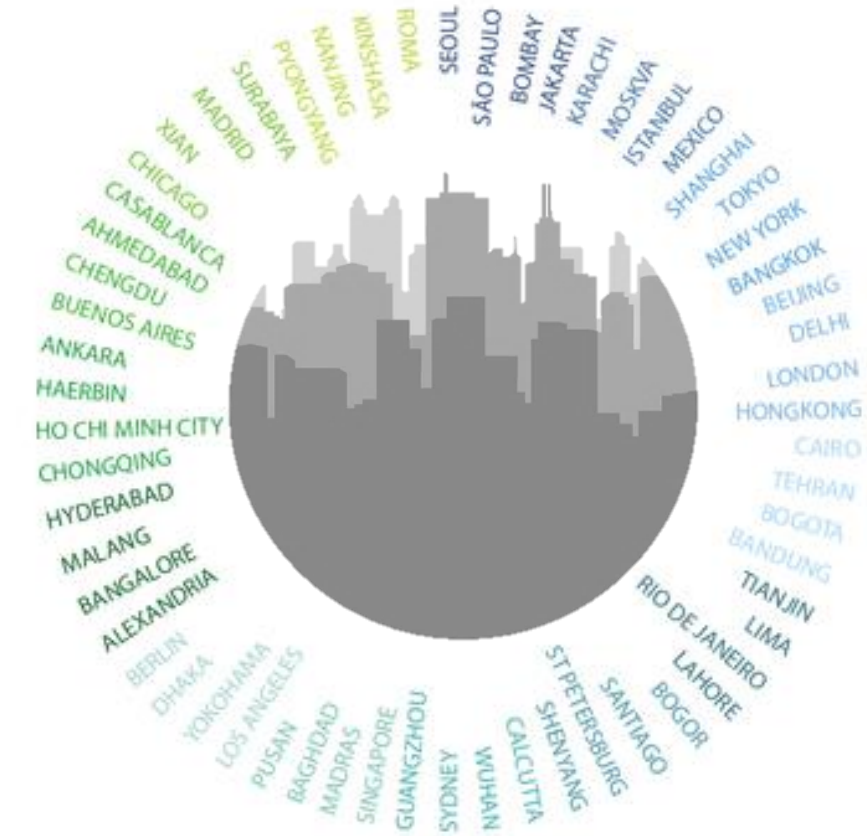
About 55% of the world's population now resides in urban areas which is expected to grow to 68% by 2050¹

Urbanization levels (2018)



Emerging megacities

The world is expected to have **43 mega cities** by **2030**, mostly in developing countries



By 2050, about 70 percent of the world population is expected to live in urban areas¹, and mobility within these cities will likely require new solutions.

¹ World Urbanization Prospects: The 2018 Revision, UN DESA

Urban Air Mobility | **Transforming how we move goods and people**

Using emerging technologies to realize air travel as practical transportation mode for the general public



US PASSENGER eVTOL MARKET COULD REACH \$17.7B BY 2040



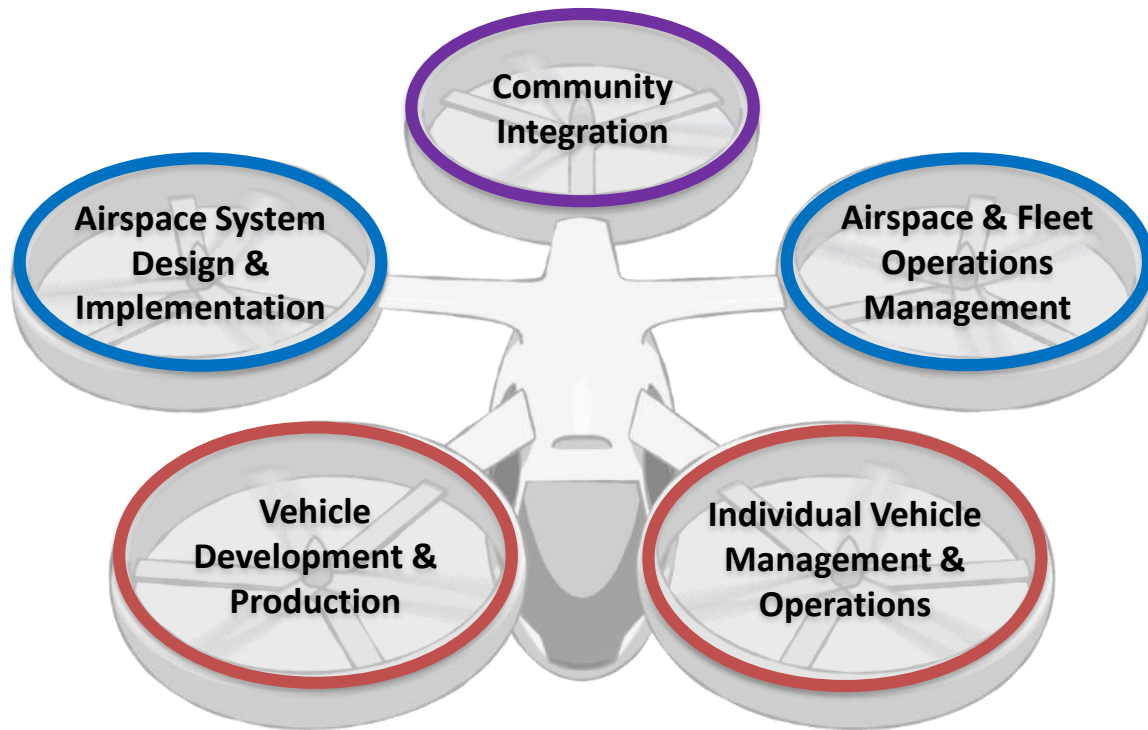
The Electric VTOL Wheel of Fortune

Shown here are representative aircraft designs in major categorization of electric propulsion VTOL aircraft.

NASA UAM ConOps| **Urban Air Mobility Community Concept of Operations**

UAM vision is to revolutionize mobility around metropolitan areas by enabling a safe, efficient, convenient, affordable, and accessible air transportation system

Vision ConOps



Structure Based on NASA OpsCon

Vision ConOps

- Provides a high-level view of key concepts for the future
- Covers all pillars

Scope

- Passenger-carrying operations
- Vision at the Intermediate state (UML-4)
- Practical cost effective transportation mode for the general public

NASA UAM ConOps | **Insights from NASA's Community ConOps**

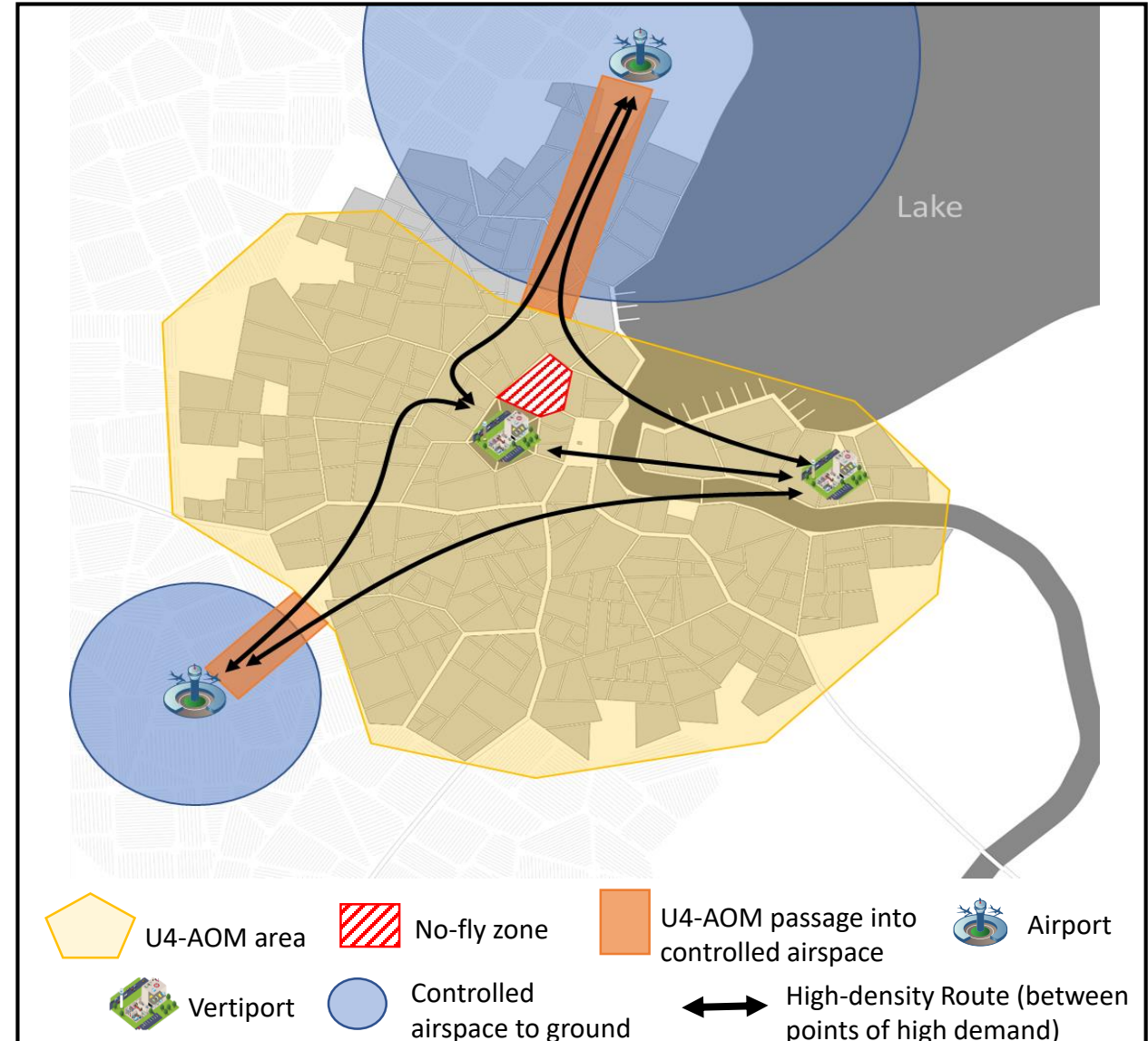
UAM Maturity Level (UML) -Level 4: medium density and complexity operations with collaborative and responsible automated systems

Air travel is a practical cost effective local / regional option for the general public

- 100s -1000s of simultaneous operations generally over urban areas extending to the metropolitan periphery
- Highly automated Electric Vertical Take Off Landing (EVTOL) are more cost effective and reduced noise levels
- U4 Service Suppliers (U4-SS) are federated suppliers of various services including air traffic management

Five Pillars

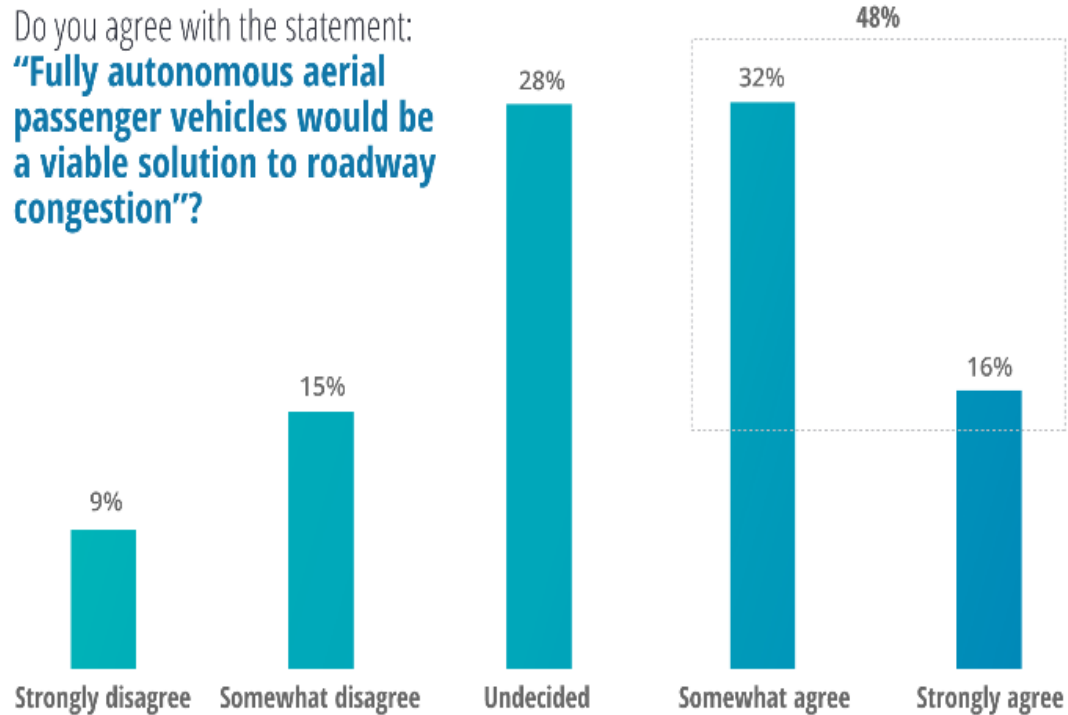
- Airspace Design
- **Community Integration**
- Vehicle Development
- Individual Vehicle Operations
- Fleet Operations



Urban Air Mobility | **Consumer insights and perceptions**

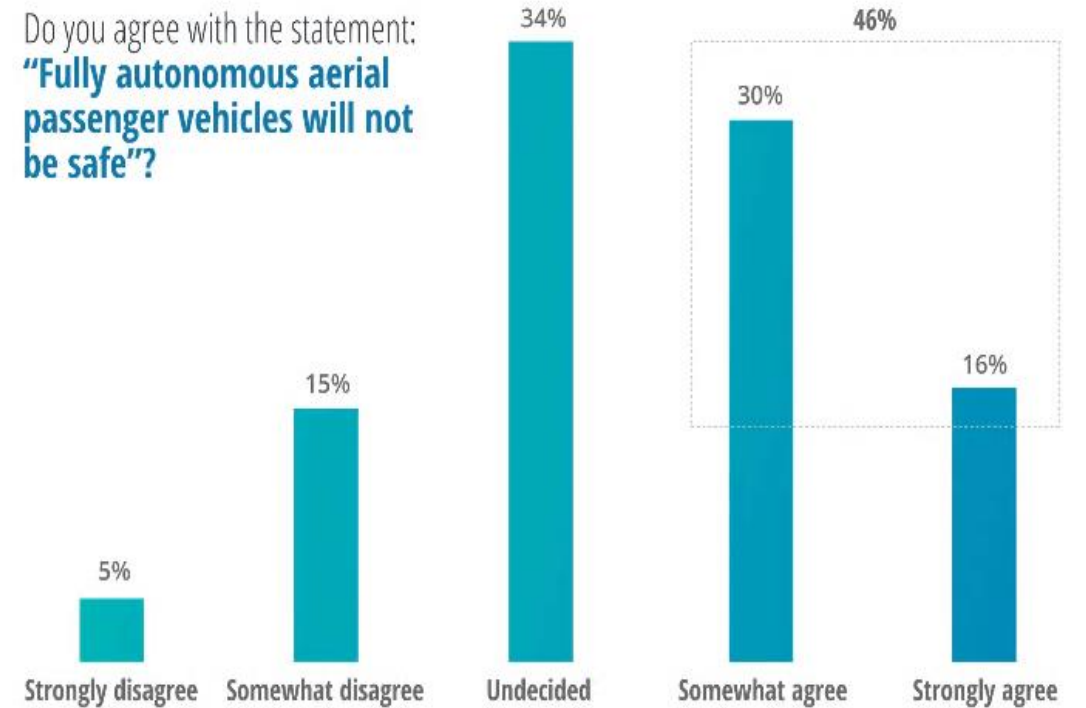
Safety is the number one concern for the flying public and the local community

Nearly half of survey respondents see aerial passenger vehicles as a possible way to solve roadway congestion



Source: Deloitte Global Auto Consumer Survey, October 2018.

Nearly half of survey respondents are unconvinced that aerial passenger vehicles will be safe; a fifth are more confident



Source: Deloitte Global Auto Consumer Survey, October 2018.

NASA ConOps | **Community Integration**

Community Integration is a pillar of NASA's UAM ConOps

Category	Pillar	Operational obj.	Description
Community Integration	<p>Community Integration</p> <p><i>Achieve public acceptance of UAM vehicle operations in and around metropolitan areas by addressing UAM-related social concerns such as safety, security, affordability, noise, privacy, and legality.</i></p>	Public Acceptance	<ul style="list-style-type: none"> Achieve public acceptance of the UAM concept by overcoming concerns over issues such as safety, non-user risk exposure, security, affordability, effects of increasing autonomy, noise, and privacy as well as a lack of consensus on the public value proposition of UAM.
		Supporting Infrastructure	<ul style="list-style-type: none"> Develop and implement the required supporting infrastructure for integrating UAM operations into metropolitan areas, including Vertiports, energy infrastructure, and test ranges.
		Operational Integration	<ul style="list-style-type: none"> Implement multi-mode transportation integration and address operations-related community impacts, including passenger/cargo security, protection from malicious use of vehicles and denial of service attacks, and graceful degradation of the transportation ecosystem in reaction to disruption of UAM services.
		Local Regulatory Environment & Liability	<ul style="list-style-type: none"> Enact laws and regulations for governing UAM operations, such as zoning, privacy, and noise, striving for consistency across operating locations (i.e., states, municipalities) and develop a framework for the analysis of liability associated with the development and operation of increasingly automated and autonomous systems.

NASA ConOps | **Community Integration**

Lessons Learned from other aviation and non-aviation industries

- **Improve understanding of community concerns.**
Community involvement provides an opportunity to learn about social, economic, and environmental conditions and local needs and concerns.
- **Inform the community.** Open communication and flow of information can help the public understand the need, be familiar with the factors that inform decision making, and provide more meaningful input.
- **Use community input to improve decision making.**
Collaboration with the community can help shape the project and lead to more effective solutions.
- **Enhance the transparency of the decision-making process.**
While not everyone may agree on the outcome, community involvement can allow the public to better understand the factors weighed in the decision-making process.

Facilitate Inclusive Participation

Build Trust Through Transparency

Coordinate Across Agencies

Coordinate with Airport Operators

Involve the Community Early

Establish Ongoing Communications

Questions

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