Urban Air Mobility

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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)**

<table>
<thead>
<tr>
<th>Region</th>
<th>Urbanization Level</th>
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<tbody>
<tr>
<td>North America &amp; the Caribbean</td>
<td>82%</td>
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<tr>
<td>Latin America &amp; the Caribbean</td>
<td>81%</td>
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<tr>
<td>Europe</td>
<td>74%</td>
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<tr>
<td>Oceania</td>
<td>68%</td>
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<tr>
<td>Asia</td>
<td>50%</td>
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<tr>
<td>Africa</td>
<td>43%</td>
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**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 DESC
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
- 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

Structure Based on NASA OpsCon
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
- Vehicle Development
- Fleet Operations
- **Community Integration**
- Individual Vehicle Operations

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

Do you agree with the statement: “Fully autonomous aerial passenger vehicles would be a viable solution to roadway congestion”?

- Strongly disagree: 9%
- Somewhat disagree: 15%
- Undecided: 28%
- Somewhat agree: 48%
- Strongly agree:

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

Do you agree with the statement: “Fully autonomous aerial passenger vehicles will not be safe”?

- Strongly disagree: 34%
- Somewhat disagree: 15%
- Undecided: 5%
- Somewhat agree: 46%
- Strongly agree:

## Community Integration

Community Integration is a pillar of NASA’s UAM ConOps

<table>
<thead>
<tr>
<th>Category</th>
<th>Pillar</th>
<th>Operational obj.</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Community Integration</td>
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<td>Public Acceptance</td>
<td>• 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.</td>
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<td>Supporting Infrastructure</td>
<td>• Develop and implement the required supporting infrastructure for integrating UAM operations into metropolitan areas, including Vertiports, energy infrastructure, and test ranges.</td>
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<td>Operational Integration</td>
<td>• 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.</td>
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<td>Local Regulatory Environment &amp; Liability</td>
<td>• 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.</td>
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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.
Questions