

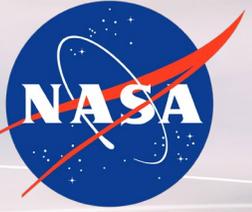
AAM Ecosystem Working Groups (AEWG):

Urban Air Mobility (UAM)
Concept of Operations (ConOps)

*Community Integration
Breakout*

July 10th, 2020

1:00pm-2:30pm EDT



The UAM vision will only be achievable if everyone benefits

Image Source: NASA UAM Grand Challenge Industry Day

Agenda

July 10th, 2020

1:00pm-2:30pm

Topic	Content	Presenters	Timing	Duration
Welcome Introductions Overview	Rules for the Road Meeting Speakers Community Integration Pillar Overview	Nancy Mendonca Dwight DeCarme	1:00-1:15	0:15
Concept Deep Dive(s) Interactive Polling	Community Integration Pillar	Brian Hill Christine Griffin	1:15-2:15	0:60
Next Steps Questions	Next Steps Questions	Dwight DeCarme	1:15-2:30	0:15

Speakers, Objectives, & Logistics



Nancy Mendonca, National Aeronautical and Space Administration (NASA)
Deputy, AAM Mission Office, NASA COR



Yuri Gawdiak, National Aeronautical and Space Administration (NASA)
Airspace Operations & Safety Program Associate Director, ARMD, NASA HQ



Brian Hill, Deloitte
Specialist Master, Systems Engineering for Government & Public Sector Practice



Christine Griffin, Deloitte
Senior Consultant, Systems Engineering for Government & Public Sector Practice



Dwight DeCarme, Deloitte
Senior Consultant, Systems Engineering for Government & Public Sector Practice

Objectives



Engage



Elicit



Respond

Scope



This **ConOps “Community Integration” breakout session** is designed such that **detailed, pillar-related content will be covered.**

Logistics

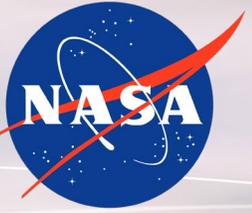


Polling & Questions: Use **Conferences IO** (<https://arc.cnf.io/sessions/hcbd/#!/dashboard>).



Recording: This meeting is being **recorded** so it can be accessed at any time for watch back and for those that could not attend today.

Feedback received during the AEWG ConOps sessions will NOT be incorporated into Version 1.0 of the UAM ConOps



Poll

Conferences I/O

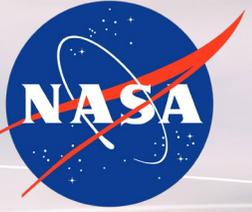
Polling is anonymous

*Were you able to successfully
join the Conferences I/O?*

<https://arc.cnf.io/sessions/hcbd/#!/dashboard>

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Please keep Conferences I/O open throughout the duration of this presentation



Poll

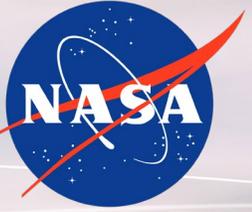
Stakeholder Classification

Polling is anonymous

*In which stakeholder group
do you classify yourself?*

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Poll

*ConOps Overview
Attendance*

Polling is anonymous

*Did you attend the UAM
ConOps Overview Session on
June 25th?*

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Poll

*ConOps Overview
Attendance*

Polling is anonymous

*Did you attend the UAM
ConOps Vehicle Breakout
Session on June 26th?*

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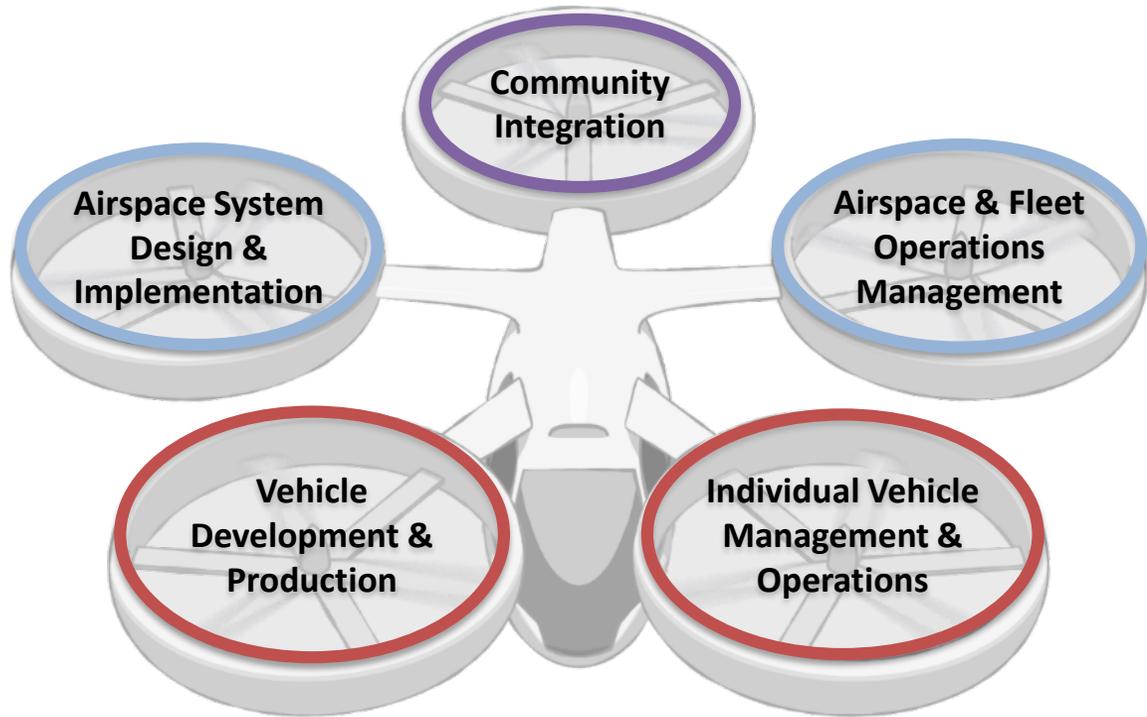
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Urban Air Mobility Community Concept of Operations

Vision ConOps

(Structure Based on NASA UAM Framework)



UAM Vision

Revolutionize mobility around metropolitan areas by enabling a safe, efficient, convenient, affordable, and accessible air transportation system

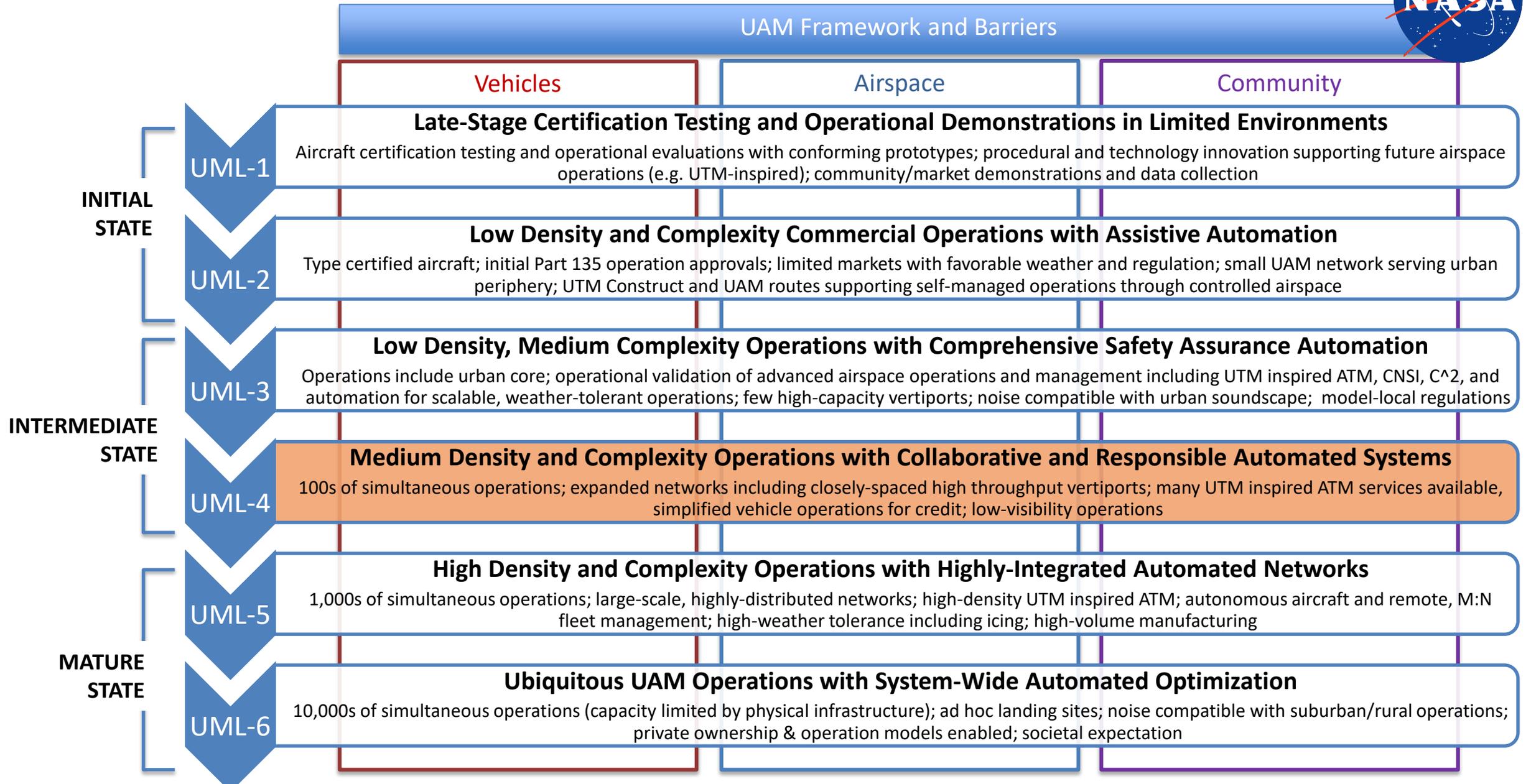
“Vision ConOps”

- High-level – Providing a vision of key concepts in the future
- Broad, covering all pillars

Scope

- Passenger-carrying operations
- Vision at the Intermediate state (UML-4)
- Placing air mobility within reach of the general public (i.e., realistic / cost effective transportation choice for general public)

UAM Maturity Levels (UML)



Concept Decomposition – UAM Pillars & Barriers



UAM concept development relied on input from a diverse set of stakeholders across different mediums

- Subject Matter Expert Input** from
- NASA ARMD
 - FAA
 - Deloitte Ecosystem Advisory Group

Engagement of 100+ organizations through a series of **two-day community workshops**

Review of **160+ sources of UAM and UAM applicable literature** (e.g., UAM, AAM, UAS, UTM, etc.)

Community-wide information sharing generating 1000+ comments and **800+ were incorporated**

Concept decomposition

Pillar

The 5 UAM Pillars divide the UAM concepts into various high-level categories. These pillars define the major areas of focus for the UAM concept

Barrier

A barrier to realizing the UAM concept. These barriers break out the next level of detail within each pillar. The UAM concept is defined through the details associated with each barrier.

UAM ConOps Content

These bullets are the detailed, decomposed concepts as they pertain to each barrier. They represent the body of the ConOps and how the concept at UML-4.

Remaining Unknowns

The unknowns are the areas that require more detail and future research. These unknowns will require further investigation as the UAM concept matures.

Community Integration

Barrier: Operational Integration

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.

NASA Community ConOps

- At UML-4, operational integration creates opportunities to **integrate UAM** with other transportation modes, including autonomous cars, to allow for a **seamless transportation experience**.
- Advanced security technologies expedites **passenger and cargo screening**.
- UAM ecosystem is built to address the **vulnerabilities of automated systems** and includes **safety measures** to defend against and mitigate threats such as **cybersecurity** attacks.
- The **transportation ecosystem** at UML-4 includes mitigation strategies to account for service disruptions on **any particular mode**, such as **strategically placing** vertiports in order to **prevent overloading** of any single mode of transportation in event of **service disruption and graceful degradation** of the entire transportation ecosystem in event of disruption of one or more of the various modes.

Areas with Remaining Unknowns

Multi-Modal Integration

Cybersecurity

Security Screening & Boarding

23

This “vision” ConOps is a **living document** and will continue to be revised as concepts mature through research, development, and UMLs 1-3.

Key UAM Elements of Community Integration at UML-4



U4-UAM is a value added, **integrated component of a city/region's multi-modal transportation system** and is part of local/regional transportation plans

Cohesive federal, state, and local roles and authorities support design and development of air and ground UAM infrastructure

Effective processes established to engage and consider community integration concerns (e.g., safety, noise, visual, privacy)

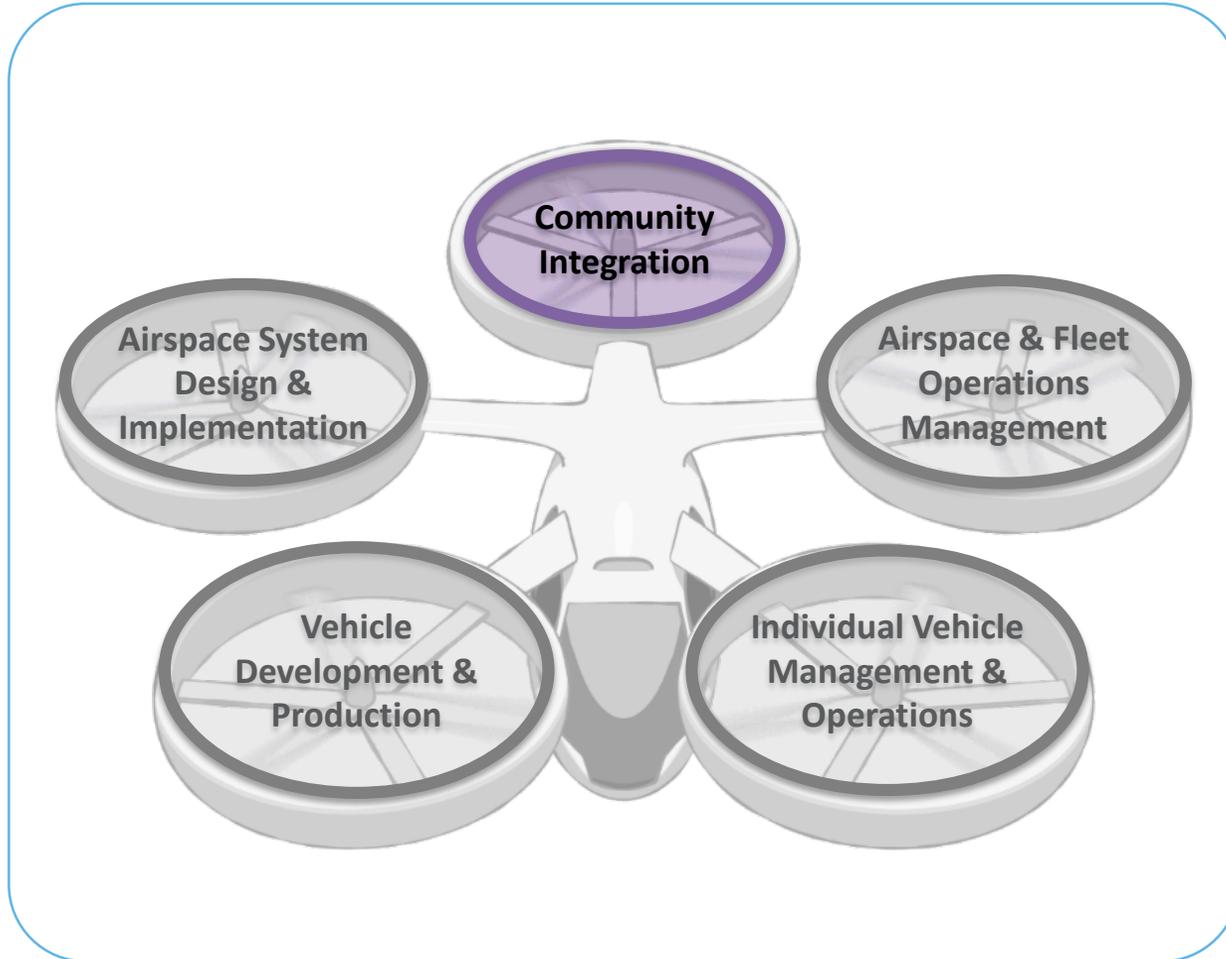
Infrastructure meets industry standards, local ordinances, and other regulations

Infrastructure integrates advanced technologies to support UAM operations (e.g., grid/power capacity, security, ground transportation, weather sensing, and navigational infrastructure)



Community Integration

Scope and Focus



Barriers

- Public Acceptance
- Supporting Infrastructure
- Operational Integration
- Local Regulatory Environment & Liability

Concept Insights & Questions



As the concepts are presented through the course of this presentation, we would like you to keep the following in mind:



Please rate your **familiarity with the Draft NASA UAM ConOps**



Which of the Community Integration **unknowns are the highest priority?**



Which Community Integration concepts **require immediate investigation?**



Are there any **additional** high level **barriers for Community Integration that should be addressed in this ConOps?**



How long do you think it will take **to enact key policies and regulations**



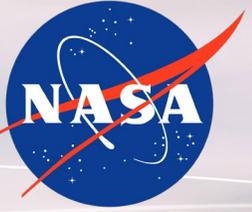
For the Community Integration concepts, **what year will UML-4 be realized**



For future sessions, **should the format and audience size be adjusted to accommodate greater interaction?**



Specific questions associated with the concepts within the Community Integration pillar and barriers



Poll

*Draft NASA ConOps
Familiarity*

Polling is anonymous

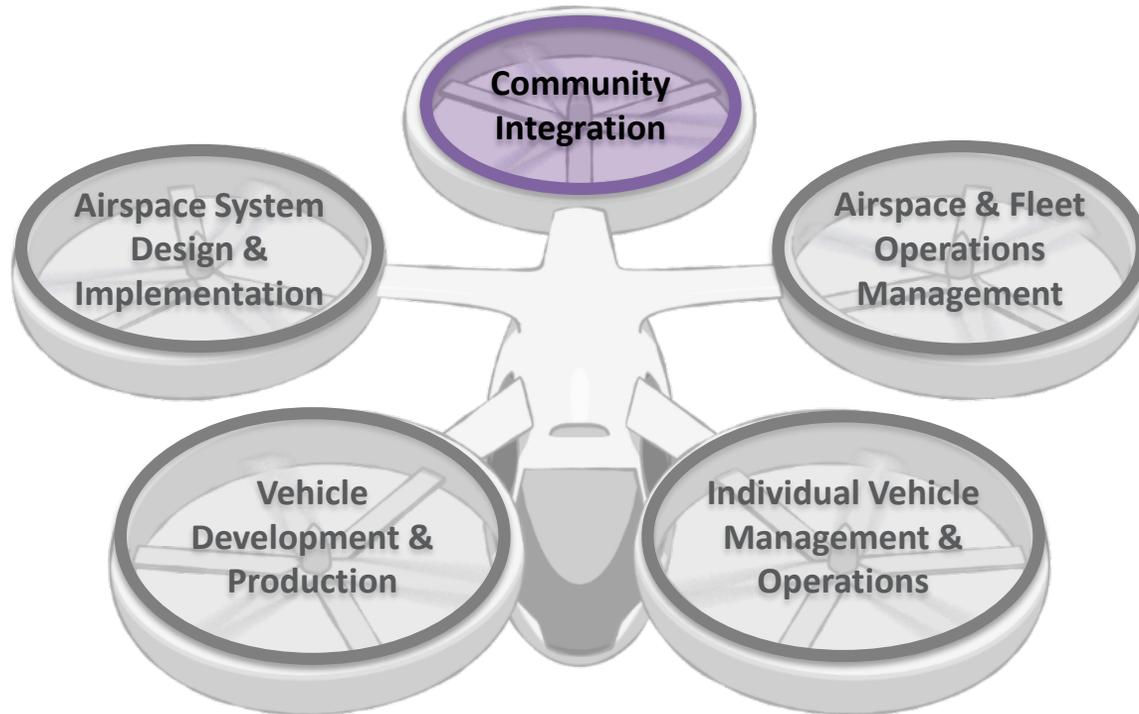
*Please rate your familiarity
with the Draft NASA UAM
ConOps*

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Community Integration

Scope and Focus



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 liability.

Barriers

- Public Acceptance
- Supporting Infrastructure
- Operational Integration
- Local Regulatory Environment & Liability



Community Integration



Barrier: Public Acceptance

Achieve public acceptance of the UAM concept overcoming concerns regarding safety, demonstrating public benefit, and addressing community and environmental impacts.

NASA Community ConOps

- Safety**
 - The **foundation built at UMLs 1-3** enables **safe passenger-carrying operations at UML-4**.
 - The UAM industry builds confidence by **proactively identifying hazards** and their safe resolutions.
- Public Benefit**
 - Employment by **UAM manufacturers, operators, PSUs, SDSPs** and others in the UAM ecosystem creates a equitable mix of **technical and non-technical jobs** and **spurs economic development**.
 - Successful **demonstration** of UAM at earlier UMLs of operations such as **medical transport** proves the concept and enables greater **public acceptance at UML-4**, which leads to higher **passenger usage** (which will **drive down cost** on a per ride basis) and decrease public resistance.
- Community/Environmental Impact**
 - UAM enables metro commuters to **travel farther and faster** than today, potentially **reducing commuter time and congestion**.
 - At UML-4, vehicles are **quieter** than **previous UMLs** due to the evolution of technology.
 - Regulators will have established **vehicle and fleet noise standards** and worked with communities to address localized concerns through **flight route planning, temporal modifications, and flight procedures**.
 - Mitigating privacy concerns occurs through **effective community engagement** and builds upon privacy policies being developed for unmanned aircraft systems (UAS) today.
 - Emission** levels conform with **existing standards** and development of **new standards** is iterative and compliant with regulations.

Areas with Remaining Unknowns

Public Familiarity with UAM

Emissions Standards

Economic Impact

Mitigating Visual Impacts

Noise Standards

Demonstrating Affordability

Demonstrating Safety



Community Integration



Barrier: Supporting Infrastructure

Develop and implement the required supporting infrastructure for integrating UAM operations into metropolitan areas, including utilities, data networks, and Vertiports.

NASA Community ConOps

- The physical infrastructure for vertiports, navigation, and data networks can be **publicly owned, privately owned**, or part of a **public-private partnership**.
- Municipalities, operators, and utility companies **cooperatively** determine how much **infrastructure investment** is required to sustain a UAM market, and decide **who bears the costs**.
- Operators **coordinate with municipalities and utility companies** to ensure **sufficient power** is available for vehicle charging operations.
- Emergence of new and innovative **partnership models** between UAM operators and energy companies may offer opportunities to simultaneously **satisfy energy needs** and **incorporate alternative energy sources**.
- UML-4 includes UAM “**purpose-built**” vertiport structures in addition to **preexisting, repurposed** vertiports (e.g., a heliport retrofitted to be a vertiport or one that serves both helicopters and UAM vehicles).
- Vertiports are designed and built with safety and security infrastructure in place to ensure safety and security for passengers.
- **Passenger demand** and **scalability** are critical for determining **vertiport location & infrastructure requirements**.
- Communities can control UAM growth areas via **zoning** ordinances.

Areas with Remaining Unknowns

Financing Infrastructure Upgrades

Data Network Ownership & Responsibility

Energy Infrastructure Requirements



Community Integration

Barrier: Operational Integration

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.

NASA Community ConOps

- At UML-4, operational integration creates opportunities to **integrate UAM** with other transportation modes, including autonomous cars, to allow for a **seamless transportation experience**.
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Areas with Remaining Unknowns

Multi-Modal Integration

Cybersecurity

Security Screening & Boarding



Community Integration



Barrier: Local Regulatory Environment & Liability

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 Community ConOps

- The legal and **regulatory framework** and **case law** incorporates the roles and authorities of each: **FAA, DOT**, other **federal agencies** (e.g., **EPA** and **FCC**), **state** government, and **local/city/municipal** government.
- FAA maintains its role as **federal regulator**, and while **federal preemption** applies, rules that do not conflict with, or occupy the “field” of, a federal regulation/regulator may be promulgated at the **state and/or local** level.
- Because UAM vehicles operate so close to where people live and work, much **local involvement** and **public interest** in the **rulemaking** process surrounding UAM is anticipated.
- By UML-4, **FAA and industry** have improved **forums and processes** used in 2010s to engage **state and local leaders** to a greater extent than they did in the 2010s in order to **harmonize** regulations/ordinances promulgated at the state and local level **avoiding a patchwork of rules**.
- Communities maintain their **power to control** the development of **ground infrastructure** (vertiports, weather sensors, etc.) through **zoning ordinances** and **noise** through **noise ordinances**.
- Laws and other means to assign **liability will be based upon current common carrier liability principles** and will be **updated to address the utilization of autonomous systems**.

Areas with Remaining Unknowns

Federal and Local Government Engagement

Role of Local Governments

Harmonization of Local UAM Regulations



Community Integration



Unknowns

Key Issues for Further Exploration

Public Familiarity with UAM

How can the public be made aware of UAM's benefits in order to promote public acceptance?

Demonstrating Safety

How can UAM stakeholders demonstrate UAM safety?

Noise Standards

How can public concern regarding noise be mitigated? Will the public's threshold of acceptability for UAM-related noise be different than their threshold for noise created by commercial aviation?

Mitigating Visual Impacts

How can stakeholders respond to public concern regarding visual noise created by UAM operations and vertiports?

Energy Infrastructure Requirements

What tools or analyses can municipalities use/perform to determine how much energy infrastructure is needed to support a metropolitan UAM market?

Financing Infrastructure Upgrades

How can public-private partnerships be utilized in financing infrastructure and vertiports for UAM? Is this the best solution? What alternatives are available?

How will vertiports be funded?

Multi-Modal Integration

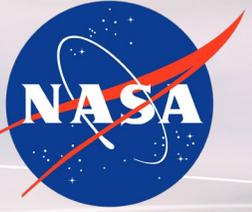
What needs to occur to enable operational integration of UAM with other forms of transportation?

Security Screening & Boarding

How will passengers and cargo be screened and processed at vertiports?

Federal and Local Government Engagement

How can federal regulators better engage local government as the UAM ecosystem develops? What about the reverse?



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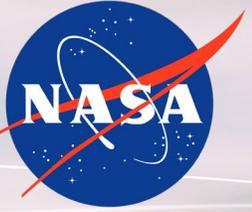
*Community Integration
Unknowns*

Polling is anonymous

*Which of the Community
Integration unknowns are the
highest priority? (select 3)*

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Immediate Investigation

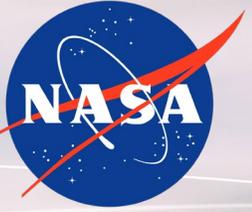
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Which Community Integration concepts require immediate investigation? (select 3)

Thing that are hard to do and are long lead

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Poll

Missing Barriers?

Polling is anonymous

Are there any additional high-level barriers to Community Integration that should be addressed in this ConOps?

<https://arc.cnf.io/sessions/hcbd/#!/dashboard>

UAM Concept Maturation & Next Steps



The UAM ConOps is a living document that coincides with the maturation of the UAM concept. These concepts and associated documentation will be updated at appropriate intervals. Updates could also align with results from research, test, industry trends, federal/city/state/local policy and regulations, and community input.

ConOps Version 1.0 Release

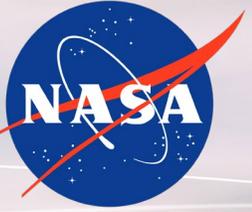
- The UAM Community ConOps **Version 1.0 release is targeted for July of 2020**
- This document will be **released into the public domain** and serve as the **“Vision” ConOps for UAM at UML-4**

AAM Ecosystem Working Groups

- Each **AEWG will address domain specific UAM concepts**
- The AEWGs will serve as the **main forum for concept discussion, feedback, and forward work**

UAM Concept Maturation

- **UAM concepts will mature as government, academia, industry, & community coalesce**
- As various **UAM activities are realized**, such as research & test, **the UAM concepts will be updated**



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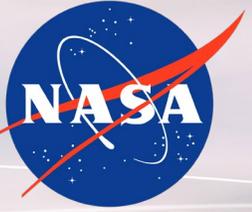
*Policy & Regulation
Development Timeline*

Polling is anonymous

*How long do you think it will
take to enact key policies and
regulations?*

Can be Federal or Local. Looking to determine long lead items

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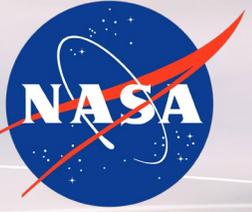
UML-4 Realization

Polling is anonymous

*For the Community
Integration concepts, what
year will UML-4 be realized?*

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Future Sessions - Format

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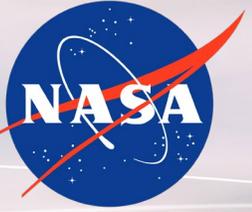
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QUESTIONS



Image Source: NASA UAM Grand Challenge Industry Day



THANK YOU

*This recording and materials can
be found on the NARI website in
the next few days*