AAM Community Integration Working Group Kickoff
Questions and Answers:

Conference.io

Web Address:
https://arc.cnf.io/sessions/t5am/#!/dashboard
AAM Community Integration Working Group Kickoff Agenda

CIWG KickOff (30 minutes)
  Welcome
  Introduction NASA WG Lead
  UAM Ecosystem
  High-level overview of Community Integration WG (CIWG) content/roadmap
  Discuss path forward for WG
  WG Logistics
Panel Discussion, including Q&A (1:20 minutes)
Closing (10 minutes)
### Vehicle Develop & Production

- **Government**: FAA/AIR, DocD Standards: ASTM, RTCA, SAE, EUROCAE, ICAG

### Individual Vehicle Management & Ops

- **Government**: FAA/AIR/APS Standards: ASTM, RTCA, SAE, EUROCAE, ICAG

### Airspace System Design & Implementation

- **Government**: FAA/AIR/ATO Standards: RTCA, ICAG

### Air Traffic & Fleet

- **Government**: FAA/AIR, DocD, DocD, DHS Standards: RTCA, ICAG

### Community Integration

- **Local/National**
  - Mayors/City Councils/Boards of Supervisors
  - Tribes/Councils
  - Departments of Transportation
  - Departments of Commerce
  - National League of Cities (2000+ cities, 49 states with additional cities)
  - Port Authority (of various big cities)
  - US Conference of Mayors
  - National Governors Association

- **National/International**
  - US Congress
  - DOT/FAA, AIR, APS, ATC
  - DOC/NHTSA (public/primary spectrum)
  - DOC/NIST (national spectrum)
  - European Aviation Safety Agency (EASA)
  - European Organization for Civil Aviation Equipment (EUROCAE)

### Decision Makers (Local)

- **Committee Integration**
  - American Society for Testing and Materials (ASTM)
  - National Fire Protection Association
  - Radio Technical Commission for Aeronautics (RTCA)
  - Society of Automotive Engineers (SAE)
  - International Civil Aviation Organization (ICAO)

### Decision Makers (National)

- **Committee Integration**
  - NASA
  - National Academies-Transportation Research Board
  - National Institutes of Standards and Technology (NIST)/Smart Cities
  - National Transportation Safety Board (NTSB)

### Incubators/Innovators

- Alliance Tech
  - Alliance Innovation (CA)
  - JPL
  - NASA
  - Onset Technologies (CA)

### Contributors

- **International**
  - International Forum for Aviation Research (IFAR)

### Associations

- **International**
  - American Institute of Aeronautics and Astronautics (AIAA)
  - Air Traffic Control International (ATCI)
  - Airports Council International (ACI)
  - Association of Air Medical Services
  - Association for Unmanned Vehicle Systems International (AUVSI)
  - Civil Air Traffic Management Services Organization (CAMSOS) – AIMM providers
  - Environmental (Greenwire, WWF)
  - Eurocontrol (Europe)
UAM Framework and Barriers

1. **Vehicle Design & Integration**
   - 1. Vehicle Design & Integration
   - 2. Airworthiness Standards & Certification
   - 3. Vehicle Noise
   - 4. Weather-Tolerant Vehicles
   - 5. Cabin Acceptability
   - 6. Manufacturing & Supply Chain

2. **Airworthiness Standards & Certification**
   - 1. Safe Urban Flight Management
   - 2. Increasingly Automated Vehicle Operations
   - 3. Certification & Ops Approval
   - 4. Ground Ops & Maintenance

3. **Vehicle Noise**
   - 1. Safe Airspace Ops
   - 2. Efficient Airspace Ops
   - 3. Scalable Airspace Ops
   - 4. Resilient Airspace Ops
   - 5. Fleet Management
   - 6. Urban Weather Prediction

4. **Weather-Tolerant Vehicles**
   - 1. Public Acceptance
   - 2. Supporting Infrastructure
   - 3. Operational Integration
   - 4. Local Regulatory Environment & Liability

5. **Cabin Acceptability**
   - 1. Airspace Design
   - 2. Operational Rules, Roles, & Procedures
   - 3. CNSI & Control Facility Infrastructure
   - 4. UAM Port Design

6. **Manufacturing & Supply Chain**
   - 1. Safety
   - 2. Security
   - 3. Affordability
   - 4. Noise
   - 5. Autonomy
   - 6. UAM Ports

7. **Community Integration**
   - 1. Public Acceptance
   - 2. Supporting Infrastructure
   - 3. Operational Integration
   - 4. Local Regulatory Environment & Liability

8. **Airspace System Design & Implementation**
   - 1. Safe Airspace Ops
   - 2. Efficient Airspace Ops
   - 3. Scalable Airspace Ops
   - 4. Resilient Airspace Ops
   - 5. Fleet Management
   - 6. Urban Weather Prediction

9. **Airspace & Fleet Operations Management**
   - 1. Airspace Design
   - 2. Operational Rules, Roles, & Procedures
   - 3. CNSI & Control Facility Infrastructure
   - 4. UAM Port Design

10. **Individual Vehicle Management & Operations**
    - Regulations/Certification
## UAM Pillar 5: Community Integration

<table>
<thead>
<tr>
<th>Category</th>
<th>Pillar</th>
<th>Barrier</th>
<th>Description of Operational Objective that solves barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Integration</td>
<td>Community Integration</td>
<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>
</tr>
<tr>
<td></td>
<td></td>
<td>Supporting Infrastructure</td>
<td>• Develop and implement the required supporting infrastructure for integrating UAM operations into metropolitan areas, including UAM Ports, energy infrastructure, and test ranges.</td>
</tr>
<tr>
<td></td>
<td></td>
<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>
</tr>
<tr>
<td></td>
<td></td>
<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>
</tr>
</tbody>
</table>
Representative industry proposed UAM timeline\(^1\) and milestones

<table>
<thead>
<tr>
<th>CY2020</th>
<th>CY2022</th>
<th>CY2024</th>
<th>CY2025</th>
<th>CY2026</th>
<th>CY2027</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Piloted UAM aircraft cert. basis</strong></td>
<td><strong>Initial pilot training &amp; licensing</strong></td>
<td><strong>Advanced urban capable aircraft</strong></td>
<td><strong>Assured vehicle automation</strong></td>
<td><strong>High capacity UAM ports</strong></td>
<td><strong>Integration of automated systems</strong></td>
</tr>
<tr>
<td><strong>Conforming prototypes</strong></td>
<td><strong>Initial operational approvals</strong></td>
<td><strong>Vehicle security</strong></td>
<td><strong>Automation-enabled pilots</strong></td>
<td><strong>Scaled vehicle production</strong></td>
<td><strong>Automated airspace operations and 3rd party services</strong></td>
</tr>
<tr>
<td><strong>Early adopter locations</strong></td>
<td><strong>Procedures &amp; technologies for high capacity, closely-spaced UAM pads and ports</strong></td>
<td><strong>CNSI Technologies</strong></td>
<td><strong>Airspace operations management technologies</strong></td>
<td><strong>Deployment of UTM-inspired constructs in early adopter cities</strong></td>
<td><strong>Infrastructure installation</strong></td>
</tr>
<tr>
<td><strong>Low volume airspace operations</strong></td>
<td><strong>Low volume airspace operations</strong></td>
<td><strong>Airspace security</strong></td>
<td><strong>Airspace security</strong></td>
<td><strong>Airspace operations management technologies</strong></td>
<td><strong>Airspace security</strong></td>
</tr>
<tr>
<td><strong>Integrated system-wide safety tools &amp; methods</strong></td>
<td><strong>Initial infrastructure deployment</strong></td>
<td><strong>Local regulations enacted</strong></td>
<td><strong>Infrastructure installation</strong></td>
<td><strong>Initial UAM ConOps development</strong></td>
<td><strong>Initial UAM ConOps development</strong></td>
</tr>
<tr>
<td><strong>Overarching</strong></td>
<td><strong>Initial UAM ConOps development</strong></td>
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<td><strong>Initial UAM ConOps development</strong></td>
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<tr>
<td><strong>Vehicles</strong></td>
<td><strong>Initial UAM ConOps development</strong></td>
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<tr>
<td><strong>Airspace</strong></td>
<td><strong>Initial UAM ConOps development</strong></td>
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<tr>
<td><strong>Community</strong></td>
<td><strong>Initial UAM ConOps development</strong></td>
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<td><strong>Initial UAM ConOps development</strong></td>
</tr>
<tr>
<td><strong>Industry milestone</strong></td>
<td><strong>Initial UAM ConOps development</strong></td>
<td><strong>Initial UAM ConOps development</strong></td>
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</tr>
</tbody>
</table>

1 Based on a range of publicly available industry projections; not a consensus view; aggressive
### Milestone definitions (1/3)

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>UML 1</strong></td>
<td></td>
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<tr>
<td>UAM CONOPS development</td>
<td>The initial concept of operations for UAM is defined and implemented. The CONOPS is reviewed and revised as needed to suit evolving technology, system needs, and demands.</td>
</tr>
<tr>
<td>Piloted UAM certification basis</td>
<td>Certification pathways are charted, and associated regulations and standards for the type certification of piloted UAM aircraft are developed.</td>
</tr>
<tr>
<td>Conforming prototypes</td>
<td>UAM vehicle prototypes are developed that conform to the requirements defined by the piloted UAM certification basis.</td>
</tr>
<tr>
<td>Early adopter cities</td>
<td>Initial evaluation of the positions of state and local governmental officials and stakeholders and an assessment of public opinion is complete for candidate cities for early UAM adoption.</td>
</tr>
<tr>
<td><strong>UML 2</strong></td>
<td></td>
</tr>
<tr>
<td>Initial pilot training &amp; licensing standards</td>
<td>Requirements, standards, and training programs are implemented for piloting UAM vehicles.</td>
</tr>
<tr>
<td>Part 135 operator standards</td>
<td>Operator standards, similar to those in Part 135, are implemented for UAM fleet operators and flight service providers.</td>
</tr>
<tr>
<td>Low volume flight procedures</td>
<td>Procedures and airspace systems are in place to support low volume UAM operations in the urban periphery (e.g., traffic management, weather services, contingency management, etc.)</td>
</tr>
<tr>
<td>1st Type certificates awarded</td>
<td>The first type certificate for a piloted UAM aircraft is awarded.</td>
</tr>
<tr>
<td>Commercial operations</td>
<td>Commercial, passenger carrying UAM operations begin.</td>
</tr>
<tr>
<td>Operations in urban periphery</td>
<td>Commercial operations in urban peripheries begin.</td>
</tr>
</tbody>
</table>
Proposed overview of CIWG efforts

- Informational
  - Stakeholder identification
  - Educational information
  - Community Events – Conferences and Meetings

- Addressing CI barriers
  - Milestones
  - Existing or planned efforts
  - Initiating effort(s) to address existing gaps
# Stakeholders

## Government (Federal)
- NASA
- National Academies-Transportation Research Board
- National Institutes of Standards and Technologies (NIST)/Smart Cities
- National Transportation Safety Board (NTSB)

## Incubators/Investors
- Alliance Texas
- Defense Innovation Experimental (DUix)
- FAA/IPP: Choctaw, San Diego, IEIA (VA), KS DoT, Ft. Myers (FL), Memphis Airport (TN), NC DoT, ND DoT, Reno (NV), UAF (Fairbanks, AK), LA DoT, WA DoT
- Starburst
- Strategic Alliances Resources Network (StarNet)
- Sustainable Aviation Limited
- Uber

## Associations (Domestic)
- American Association of Airport Executives (AAAE)
- American Insurance Association
- Aircraft Owners and Pilots Assoc (AOPA)
- Community Air Mobility Initiative (CAMI)
- Chambers of Commerce
- Commercial Drone Alliance
- Coalition of UAS Professionals
- Environmental Groups (e.g. Sierra Club)
- Experimental Aircraft Association (EAA)

## Community Integration

### Local/National
- **Decision Makers (Local)**
  - Mayors/City Councils/Boards of Supervisors
  - Tribal Councils
  - Departments of Transportation
  - Departments of Commerce
  - National League of Cities (2000+ cities, 49 states with additional cities)
  - Port Authority (of various big cities)
  - US Conference of Mayors
  - National Governors Association

### National/International
- **Decision Makers (International)**
  - US Congress
  - DOT/FAA – AIR, AFS, ATO
  - DOC/NTIA (public/federal spectrum)
  - FCC (commercial spectrum)
  - European Aviation Safety Agency (EASA)
  - European Organization for Civil Aviation Equipment (EUROCAE) (Europe)

### Decision Makers (National)
- US Congress
- DOT/FAA – AIR, AFS, ATO
- DOC/NTIA (public/federal spectrum)
- FCC (commercial spectrum)
- DHS
- DOJ/FBI

### Standards
- American Society for Testing and Materials (ASTM) (I)
- National Fire Protection Association
- Radio Technical Commission for Aeronautics (RTCA) (I)
- Society of Automotive Engineers (SAE) (I)
- International Civil Aviation Organization (ICAO) (I)

## Government (Intranational)
- Civilian Aviation Authority (CAA-UK)
- German Aerospace Center (DLR)
- Japan Aerospace Exploration Agency (JAXA)
- Korea Aerospace Research Institute (KARI)
- Netherlands Aerospace Center (NLR)
- ONERA (French Aerospace Center)
- Nordic Network for Electric Aviation (NEA)

## Contributors (International)
- International Forum for Aviation Research (IFAR)

## Associations (International)
- American Institute of Aeronautics and Astronautics (AIAA)
- Airports Council International (ACI)
- Association of Air Medical Services
- Association for Unmanned Vehicle Systems International (AUVSI)
- Civil Air Navigation Services Organization (CANSO) – ANSP providers
- Environmental (Greenpeace, WWF)
- Eurocontrol (Europe)
- General Aviation Manufacturers Association (GAMA)
- International Air Transport Association (IATA) - Airlines
- International Telecommunication Union (ITU)
- Joint Authorities for Rulemaking on Unmanned Systems (JARUS)
- Vertical Flight Society (AHS)
Advanced Air Mobility in Rural Areas & Beyond" featuring Anna Dietrich (CAMI) and Darrell Swanson
https://www.youtube.com/watch?v=-cYnsTN04DY

CAMI Resources Library https://www.communityairmobility.org/resources

VFS Virtual Workshop on eVTOL Infrastructure
https://vtol.org/events/virtual-workshop-on-evtol-infrastructure

ACI-NA Airport Economic Impact Study https://airportscouncil.org/intelligence/economic-impact-study/

AAM Ecosystem Working Groups Virtual Meetings https://nari.arc.nasa.gov/aamecosystem
## Upcoming Conferences & Meetings

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Location</th>
<th>Type</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>May</strong></td>
<td>Webinar - Virtual Workshop on air/ground integration and noise</td>
<td>Geneva, Switzerland</td>
<td>Virtual</td>
<td><a href="https://www.eurocae.net/events/eurocae-symposium-2020">https://www.eurocae.net/events/eurocae-symposium-2020</a></td>
</tr>
<tr>
<td></td>
<td>Conference - More Electric Aircraft USA Conference</td>
<td>Washington, D.C.</td>
<td>Virtual</td>
<td><a href="https://www.lng.com/events/more-electric-aircraft-usa-d-3/">https://www.lng.com/events/more-electric-aircraft-usa-d-3/</a></td>
</tr>
<tr>
<td></td>
<td>Conference - ATCA Tech Symposium</td>
<td>Atlantic City, NJ</td>
<td>Virtual</td>
<td><a href="https://www.atca.org/techSymposium">https://www.atca.org/techSymposium</a></td>
</tr>
<tr>
<td></td>
<td>NASA, NBEE CoP Meeting and SE Workshop</td>
<td>NASA</td>
<td>Virtual</td>
<td><a href="https://www.nasa.gov/events">https://www.nasa.gov/events</a></td>
</tr>
<tr>
<td><strong>July</strong></td>
<td>Conference - VPS Forum LTD</td>
<td>Montreal Quebec</td>
<td>Virtual</td>
<td><a href="https://vps.org/events/forum/forum-73">https://vps.org/events/forum/forum-73</a></td>
</tr>
<tr>
<td></td>
<td>Conference - Smart Cities Expo Atlanta</td>
<td>Atlanta, GA</td>
<td>Virtual</td>
<td><a href="https://smart-city-expo-america.com">https://smart-city-expo-america.com</a></td>
</tr>
<tr>
<td></td>
<td>Conference - EVS3 / World Electric Vehicle Symposium &amp; Exposition</td>
<td>Portland, OR</td>
<td>Virtual</td>
<td><a href="https://www.evsymposium.org">https://www.evsymposium.org</a></td>
</tr>
<tr>
<td></td>
<td>Conference - AIAA Aviation Forum and Exhibition</td>
<td>Virtual (was Reno, NV)</td>
<td>Virtual</td>
<td><a href="https://www.aiaa.org/aviation">https://www.aiaa.org/aviation</a></td>
</tr>
<tr>
<td></td>
<td>Conference - FAA UAS Symposium</td>
<td>Baltimore, MD</td>
<td>Virtual</td>
<td><a href="https://faas/uas.net/faa2020/attend">https://faas/uas.net/faa2020/attend</a></td>
</tr>
<tr>
<td></td>
<td>Conference - AC277 Autonomy in Aviation Symposium</td>
<td>Virtual (was Washington, DC)</td>
<td>Virtual</td>
<td><a href="https://www.asa.org/events">https://www.asa.org/events</a></td>
</tr>
<tr>
<td><strong>August</strong></td>
<td>Event - FAA AVVenture</td>
<td>Oklahoma City</td>
<td>Virtual</td>
<td><a href="https://www.eaa.org/events">https://www.eaa.org/events</a></td>
</tr>
</tbody>
</table>

**Red text shows postponed or cancelled events (due to COVID-19). Green text shows virtual events.**
Existing or Planned Efforts

Acoustics Technical and UAM Noise Working Groups (UNWG)
Spring 2020 Meeting https://evt.grc.nasa.gov/atwg-spr2020/
POCs: Steve Rizzi s.a.rizzi@nasa.gov & Dennis Huff dennis.l.huff@nasa.gov

NIST Global City Teams Challenge, Smart and Secure Cities and Communities Challenge- A Guidebook from the Cybersecurity and Privacy Advisory Committee (CPAC) Public Working Group
Community Integration Working Group

**NASA Community Integration Working Group Lead:**

Nancy Mendonca  
Nancy.Mendonca@nasa.gov

**Community Integration Working Liasion:**

NAME
EMAIL

**NASA Aeronautics Research Institute (NARI) Project Lead:**

Richard Walsh  
Richard.walsh@nasa.gov

**NARI AAM PORTAL:**

In Work
• **May Events**
  Community Integration Working Group Kickoff meeting – Today
  Aircraft Working Group kickoff meeting - TBD

• **June Events**
  UAM Concept of Operations (ConOps) Overview – June 25\(^{th}\) 1:30-3:00 EDT
  ConOps, Aircraft Pillars – June 26\(^{th}\) 1:30-3:00 EDT

• **July Events**
  Con Ops, Airspace Pillars – TBD
  ConOps, Community Pillar – July 10\(^{th}\), 1:00-2:30 EDT
  Airspace Working Group Kickoff meeting - TBD
Community Integration FAQs
<table>
<thead>
<tr>
<th>Panel Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rex Alexander</td>
</tr>
<tr>
<td>President Five-Alpha</td>
</tr>
<tr>
<td>Shawn Bullard</td>
</tr>
<tr>
<td>President Duetto Group</td>
</tr>
<tr>
<td>Anna Mracek Dietrich</td>
</tr>
<tr>
<td>Co-Executive Director Community Air</td>
</tr>
<tr>
<td>Mobility Initiative</td>
</tr>
<tr>
<td>Chris Oswald</td>
</tr>
</tbody>
</table>
| Senior Vice-President Airports Council-
  International                        |
| Chris Hewlett                        |
| Specialist Leader Deloitte Consulting |
| Basil Yap                             |
| Vice President Hovecon                |

[https://arc.cnf.io/sessions/t5am/#!/dashboard](https://arc.cnf.io/sessions/t5am/#!/dashboard)
Panel Questions

• From your perspective, can you highlight a critical community need?
• What do you see as some of the primary community integration barriers?
• Can you give an overview of a current effort working to solve a community integration barrier?
• What are your thoughts around building on the great work done by VFS, CAMI, Smart Cities and other community members?
• How do you see this group providing benefit to the community?
• How would you define “community” and or “ecosystem” in the context of the NASA Advanced Air Mobility initiative?
Upcoming Events

**May Events**
- Aircraft Working Group Kickoff meeting – Next week (Tentative)

**June Events**
- UAM Concept of Operations (ConOps) Overview – June 25th 1:30-3:00 EDT
- ConOps, Aircraft Pillars – June 26th 1:30-3:00 EDT
- Airspace Working Group Kickoff meeting – TBD
- Cross Cutting Working Group Kickoff - TBD

**July Events**
- ConOps, Community Pillar – July 10th, 1:00-2:30 EDT
- ConOps, Airspace Pillars – TBD
Back-Up
## Milestone definitions (2/3)

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airspace security standards</strong></td>
<td><strong>Policy, standards, and best practices</strong> are developed for physical and cybersecurity relating to UAM airspace technologies and systems (e.g., CNS, traffic management)</td>
</tr>
<tr>
<td><strong>Procedures for high capacity, closely spaced UAM ports/pads</strong></td>
<td>Procedures for <strong>high volume UAM operations</strong> with <strong>high capacity, closely spaced UAM ports and pads</strong> are implemented</td>
</tr>
<tr>
<td><strong>Airspace Technologies</strong></td>
<td><strong>Technologies for safe UAM airspace operations</strong> (e.g., communication, navigation, command and control, surveillance) are developed and <strong>approved for operation use</strong></td>
</tr>
<tr>
<td><strong>Vehicle security standards</strong></td>
<td><strong>Policy, standards, and best practices</strong> are developed for physical and cybersecurity relating to operational UAM vehicles</td>
</tr>
<tr>
<td><strong>Advanced urban capable aircraft</strong></td>
<td><strong>Certified next generation aircraft</strong> are developed with <strong>capabilities suitable for advanced urban operations</strong>. These include <strong>low noise</strong>, <strong>weather tolerance</strong>, quick aircraft turn around time, and <strong>suitable battery energy density</strong></td>
</tr>
<tr>
<td><strong>Initial Infrastructure deployment</strong></td>
<td><strong>First purpose built UAM infrastructure</strong> installations are <strong>completed and operational</strong></td>
</tr>
<tr>
<td><strong>Local regulations enacted</strong></td>
<td><strong>Local regulations developed by early adopter cities</strong> are being <strong>broadly adopted</strong></td>
</tr>
<tr>
<td><strong>Operations in urban core</strong></td>
<td><strong>Commercial operations in urban core areas</strong> have begun (i.e., central downtown)</td>
</tr>
</tbody>
</table>
## Milestone definitions (3/3)

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomous system integration</td>
<td>Standards and best practices are developed for the integration of autonomous airspace and vehicle technologies into a unified air transport operations system</td>
</tr>
<tr>
<td>Standards and policy</td>
<td>Overarching standards and policies to govern the development, testing, and operations of UAM vehicles, technologies, and systems are developed</td>
</tr>
<tr>
<td>Training and standards for simplified operations</td>
<td>Requirements, standards, and training programs are developed and implemented for simplified flight operations and remotely piloted UAM vehicles</td>
</tr>
<tr>
<td>Assured vehicle autonomy</td>
<td>Systems and technologies that enable autonomous vehicle operations and take into account heterogeneous vehicle operations are developed and approved for operational use</td>
</tr>
<tr>
<td>Scaled vehicle production</td>
<td>The manufacturing of UAM vehicles has reached a point of critical scalability and vehicles are cost effective for fleet operators</td>
</tr>
<tr>
<td>Deployment of UTM-inspired constructs in early adopter cities</td>
<td>UAM airspace systems and technologies are widely deployed in early adopter cities and support medium density operations, serving as a model and guide for future adopter cities</td>
</tr>
<tr>
<td>Autonomous airspace operations and 3rd party services</td>
<td>Government and 3rd party technology and systems that enable smooth autonomous airspace operations (e.g., surveillance, ATC, weather, NOTAMS, flight planning, etc.) are developed and approved for operational use</td>
</tr>
<tr>
<td>Infrastructure installation</td>
<td>UAM ports/pads and supporting infrastructure are widely deployed and capable of supporting scaled UAM operations</td>
</tr>
<tr>
<td>1st V&amp;V of responsible automated systems</td>
<td>First fully-autonomous UAM vehicle and airspace systems are validated and verified for reliable and responsible operation</td>
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</table>
Nancy Mendonca, is currently the NASA ARMD portfolio manager overseeing the formulation of new projects within ARMD and a member of the ARMD headquarters office responsible for strategic analysis and resource management. She served 24 years in the Navy flying H-46 helicopters. Between the Navy and NASA she worked at the Missile Defense Agency, on the Marine Corps MRAP Program and at NTIA working on the Federal Strategic Spectrum Plan. She graduated from the U.S. Naval Academy with a B.S. in Aeronautical Engineering and subsequently earned M.S. degrees in Aeronautical Engineering and National Security and Strategic Studies. She is also a Certified Public Accountant and has currently prioritized rescuing Great Danes and riding horses over flying helicopters.