UAM INTEGRATION FOR STATES: PATH FORWARD

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“To be fully deployed, UAM technology must first win the public’s trust and acceptance. UAM systems will be flying directly over and landing near neighborhoods and workplaces. So it is imperative that the public’s legitimate concerns about safety, security, noise and privacy be addressed. I challenge the UAM industry to step up, and educate communities about the benefits of this new technology and win their trust. It is critical to ensuring that UAM technology reaches its full potential.”

U.S. Secretary of Transportation Elaine L. Chao

Urban/Rural Aerial Mobility: Enabling a Safe, Secure and Inclusive Sky

Davos, Switzerland

Thursday, January 23, 2020
Human continues its worldwide migration from rural areas to cities, cities to cities, countries to cities, etc.

Rapid Urbanization is driving road congestion and crowding, making transport by ground bound vehicles increasingly difficult in urban environments.

Enabling efficient and effective mobility in urban areas is a key challenge.

Several initiatives have introduced serious efforts to introduce a third (vertical) dimension to moving people and goods in urban environments.

Unmanned vehicles are a major part of Smart City initiatives which aim to utilize digital assets to create sustainable urban environments centered around maximum efficiency and zero waste.
UAM is an innovative transportation option to avoid congestion plaguing many cities and suburbs around the world. The number of initiatives underway around the world is accelerating rapidly:

- Belgium
- Bulgaria
- France
- Germany
- United Kingdom
- Switzerland
- Netherlands
- China
- Japan
States are working on various pilot projects and initiatives:

- California
- Kansas
- North Carolina
- Utah
- Ohio
- Nevada
- Tennessee
- Oklahoma
- Virginia
- North Dakota
- Alaska
National Airspace System will be impacted by the entrance of Urban Air Mobility operations. Many of these challenges are being addressed to some extent with the emergence of UAS operations:

**Infrastructure** – Sufficient ground infrastructure, such as vertiports and charging/refueling stations

**Certification & Standards** – Pilots, vehicles, operations, etc.

**Communication** – C2 links, detect and avoid, connectivity and air navigation services

**Regulations** – New or modified rules, procedures, and airspace definitions will be required.

**Other Challenges** – Battery, Noise, Weather, Security, etc.
UAS AUTONOMY LEVELS

Autonomous flight is a major target goal of all technologists

Level 0: There is no autonomy.

Level 1: There are autonomous systems, like altitude control, but the pilot is in control.

Level 2: There are multiple autonomous systems running simultaneously, but the pilot is in control.

Level 3: The craft operates autonomously under certain conditions, but a pilot must monitor its progress.

Level 4: The craft is autonomous in most situations; the pilot can take over but generally doesn’t have to.

Level 5: The drone is fully autonomous.
UAM MATURITY LEVELS

UML-1 Early Operational Exploration and Demonstrations in Limited Environments

UML-2 Low Density and Complexity Commercial Operations with Assistive Automation

UML-3 Low Density, Medium Complexity Operations with Comprehensive Safety Assurance Automation

UML-4 Medium Density and Complexity Operations with Collaborative and Responsible Automated Systems

UML-5 High Density and Complexity Operations with Highly-Integrated Automated Networks

UML-6 Ubiquitous UAM Operations with System-Wide Automated Optimization
Key Players - Manufacturers, regulators, technology innovators, state & local leaders and the infrastructure & investment community will come together to discuss on-demand aviation for smart cities and to create a new future for air transportation.

Concept of UAM – Passenger services as well as aircraft operations for other activities, such as public safety, medical and rescue services, news gathering, disaster response, weather monitoring, and package delivery.

Innovation & Technology - Advances in autonomy, artificial intelligence, data analytics, hybrid and fully electric propulsion have unlocked new possibilities that are guiding us to reimagine travel and transportation.
UAM concepts, technologies, and procedures be designed with safety in mind from the start.

UAM needs to be able to guarantee the safety of both its passengers and anyone along the path of travel.

UAM will be subject to the same safety standards as traditional commercial aviation.

UAM manufacturers will also be expected to demonstrate compliance with safety regulations specific to them.

UAM manufacturers will need to implement the necessary safety precautions and redundancies to ensure that UAM vehicles, can operate safely even under highly unusual circumstances.
Vertiport design will include state, local, and federal inputs like fire codes, local zoning restrictions, etc.

Operational considerations such as approaches and departures, landings and takeoffs, passenger loading and unloading, security, and charging/refueling need to be accounted for.

To achieve the maximum societal benefit, operators should place vertiports in those spots that help reduce congestion.

Unforeseen technical issues are inevitable, so predefined and dedicated backup sites for unplanned landings.

Regard noise in vertiport design and construction.
UTM is envisioned as a subset of ATM that is aimed at the safe, economical and efficient management of UAS operations.

States efforts to define and launch a statewide UTM will result in key benefits:

- continued safety of all air traffic, manned and unmanned
- safety of persons on the ground
- complex low-level UA operations
- ongoing support of technological advancements
- evaluation of security and environmental risks; and

With the growing interest in the possibilities for UAM, key players in the industry, including NASA and the FAA, are working on a UTM system for low altitude UAS operations that will integrate into the national airspace.
In order for UAM to become a reality, it must be safe and scalable, which means states will need to overcome significant barriers to adoption and growth. The robust UTM for UAS will provide the first step to solving many of the barriers facing UAM to safely enter low-altitude airspace at scale.

The components and considerations for UAM airspace integration are:

- Congestion Management
- Scheduling
- Separation
- Interoperability
- Disruption Management
- Contingency Response Management
- Complex UAM Operations
States will need to identify Stakeholders to Collaborate on:

- Public Private Partnerships
- Regulatory requirements for BVLOS, Ops over people, etc.
- Modernizing Infrastructure
- Regulatory Framework for UAM
- Statewide Unmanned Traffic Management
- Solving Connectivity Issues and Spectrum Allocation
- Remote ID integration with Public Safety
- Counter UAS
- Standardized Training
- Community Outreach
CAMI is a nonprofit organization dedicated to supporting the responsible integration of the third dimension of urban transportation at the state and local level.

Mission

To educate and equip state and local decision makers, the public, and the media with the information they need to set policies and design infrastructure and systems that address transportation needs for their communities.

To help the urban air mobility (UAM) industry better meet the needs of local stakeholders and maximize the value they bring to communities.

Team

CAMI’s team is comprised of passionate experts in the urban air mobility, electric aircraft, sustainability, nonprofits, infrastructure and innovative personal aviation industries. We’re excited to be part of the next transportation revolution.
Aerospace Arizona Association promotes and advances the unmanned industry throughout the State of Arizona through actions focused on advocacy, education, networking and partnerships.

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Airavat provides commercial companies and government agencies worldwide the education, integration and training on emerging technologies like Unmanned Systems, Artificial Intelligence and Robotics

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