URBAN DRONE, URBAN AIR MOBILITY / ADVANCED AIR MOBILITY BEST PRACTICES IN COMMUNITY ENGAGEMENT

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CIVATA
global

If urban drone, urban air mobility (UAM) and advanced air mobility (AAM) industries are to successfully evolve from being "technology-push" to becoming "community/customer-pull" sectors they will need to engage the communities they will be serving not just as potential customers and neighbours but also as integrated community assets in the same way that ground urban transport networks are viewed.

There are two challenges to be overcome before this can happen:

- Developing a set of core principles which ensure that net public benefit is generally recognised as being at the heart of the industry
- Developing a set of educational and communications tools to ensure that challenges are clearly identified and acknowledged while the benefits are made clear so informed community judgement on welcoming, or not, proposed new drone/UAM/AAM services can be made.

The evidence surrounding the public's current perception of drones and eVTOLs is contradictory. The European Union Aviation Safety Agency (EASA) in May 2021 announced the results of the first European wide study of citizens' expectations of urban air mobility (UAM). The on-line quantitative survey polled 4,000 citizens in six European urban areas. This was complemented by more than 40 qualitative interviews, as well as a noise simulation test. The survey showed that 83% of respondents have a positive initial attitude towards UAM, with 71% ready to try out UAM services. Cases in the common interest, such in emergencies or for medical transportation received strong support.

However, in April 2021 the Sky Limits joint research project run by Technische Universität Berlin and Wissenschaft im Dialog announced the results of its work to define the opportunities, challenges and risks associated with the possible use of delivery drones and air taxis in cities and found "that the majority of people living in Germany fundamentally reject the use of delivery drones (55 percent) and air taxis (62 percent). The majority can only imagine their use in emergencies, such as to deliver medicine (63 percent) and to transport the sick (65 percent). As a result, the Sky Limits team recommends that future developments take account of the wishes expressed by society and restrict the use of transport drones to medical emergencies."

At the current state of drone/UAM/AAM industry development all that can be said is that the jury is out. Some very high-level principles can be recognised – public acceptance of drones being used emergency medical service missions is higher than for other missions (as indeed is its acceptance of helicopter operations) and that communities tend to be more receptive of drone services once they have experienced them in real life. But each community is different – launch services will have to be aligned with the priorities of each community.

The following is a compilation of "best practice" principles developed by CAMI, CAAM, CIVATA-global, FlightCrowd ITF-OECD and other relevant stakeholders.

Building the industry on a set of core principles

The Canadian Advanced Air Mobility Consortium (CAAM) has developed a set of five core principles on which to advance UAM programmes with impacted communities. The World Economic Forum has developed a set of seven core principles.

01 Work in partnership with communities.

Organizations of various across the region are tapped into various communities that can aid efforts to engage sections of the public. This project needs to participate at collaborative tables and work with communities to identify partnership opportunities.

02 Create space to reflect the full diversity of perspectives.

Socioeconomic, cultural, and inter-generational diversity are all important when working with different communities. A variety of perspectives can benefit the project further. Working with Indigenous led organizations is important to build trust.

03 Create conditions for actionable public judgment.

Allowing community members to provide feedback is important. To go further, showing community members how that feedback will be incorporated meaningfully into existing processes can yield many benefits in building trust and generating enthusiasm.

04 Increase shared understanding.

Exploring ideas of need and use-cases for advanced air mobility to improve lives is an exercise that can be undertaken at dialogues with communities. Hosting community showcases to inform and build understanding with the public is crucial.

05 Commit to openness and transparency.

Transparency and openness aren't achieved by simply offering up information to those who request it. In order to build trust and enthusiasm, making sure that information is accessible is important. This can only enhance the project's development.

The seven UAM principles

Safety
New forms of air transport must achieve levels of safety performance consistent with conventional aviation operations

Sustainability
UAM must improve environmental outcomes and embrace innovation to achieve more sustainable behaviours

Equity of access
There should be equitable access to mobility for disadvantaged communities

Low noise
Noise disturbances should be measured and mitigated by a community-first approach

Multimodal Connectivity
UAM should connect to existing, high-quality transport options, offering seamless travel

Local workforce development
UAM is expected to increase jobs on the ground and in the air

Purpose-driven data sharing
Data sharing should help providers quickly respond to passenger need and market demand

Identifying core principles which underpin all operations will be key to developing a successful community engagement strategy. As well as identify high level mission statements more granular principles will also need to be developed.

Safety should always be the priority – appropriate safety levels must be clearly identified

"To earn public trust, safety is non-negotiable, but what is "safe enough"? The Federal Aviation Administration (FAA) uses a concept called the "safety continuum" to determine the certification rigor that is appropriate to a given project....For the A/UAM industry to earn the public's trust, the aircraft, infrastructure, and operations must all be seen as being "safe enough". The legacy of safety that has been built already in the aviation industry is being leveraged to this new mode of transportation. Commercial aviation is widely acknowledged as the safest way one can get from place to place. Even general aviation, with which the public is often less familiar and therefore less comfortable, has a long-standing safety culture on which to build. Enhancing this perception of safety and ensuring the security of operations is a top priority for the industry and is an early opportunity for public outreach and education - CAMI

All urban drone/UAM/AAM operations must comply with current regulations and laws

All local authority managed drone operations should abide by the appropriate data protection laws and human rights conventions, with clear limits on the use of drone data collection, retention, and dissemination. A Data Protection Impact Assessment should be put in place which sets rules for how drones, remote pilot and airspace observer crew must work. All weaponization of drones should be prohibited. Drone activities should not infringe upon rights or discriminate against persons based upon their ethnicity, race, gender, national origin, religion, sexual orientation or gender identity – CIVATAglobal

Urban drone/UAM/AAM operations must be low noise operations

Noise disturbances should be measured and mitigated by a community first approach to vehicle design, infrastructure siting and route planning. Community noise acceptance metrics should be co-created with stakeholders, including city planners, community associations, vehicle manufacturers, service providers and others. Industry partners and government leaders understand that noise disturbances can challenge the expansion of any transport system. These complaints are not unwarranted, as significant study has been done to quantify the impacts of noise (defined as unwanted sound) on the cognition, well-being and performance of individuals across ages, activities and more, as well as the integrity of natural environments. Proposed service and vehicle designs must consider adverse impacts on surrounding communities from the beginning. Decision-makers tasked with use designation, zoning and entitling development of private properties must be well informed prior to permitting facilities for flight operations – World Economic Forum

Noise is a key factor which could be a major obstacle to drone integration if it is not carefully managed. This is due not only to the actual noise drones produce (often a high-pitched tone that is typically between 20 and 70 decibels), but also to the ways in which noise is perceived – such as people's familiarity with and acceptance levels of drones, or surrounding noise levels. In cities, the ambient noise levels of conventional vehicles may make drone noise less apparent. However, their proximity to residential areas, and the increasing uptake of quieter electric vehicles, may make drones more noticeable. Although most drones produce zero tailpipe emissions, this does not mean they do not contribute to net greenhouse gas emissions. All drones will consume energy. The amount of energy used will depend on the design of the drone, its payload, the energy mix used for electricity production, and the method of electricity transmission to the battery. The production and scrapping of drones at the end of their lifespan will also consume energy and produce emissions -ITF/OECD

Compliance with privacy laws will need particular consideration

Existing research (Rice, 2019; Bajde et al., 2017; Chang, Chundury and Chetty 2017) finds that privacy concerns regarding drones are contextual and depend on:

- *the specific drone use case (e.g. concerns are higher when the drone is used by law enforcement than when the drone is used by hobbyists – and are especially high when the purpose of a drone use is unknown);*
- *the frequency of the drone use (e.g. concerns are lower when a drone is known to be used for a specific mission, rather than on a continuous basis);*
- *the location of where the drone is used (e.g. concerns are less in public places (parks, streets) and respectively higher in relation to private spaces, especially where drones offer a direct view into dwellings);*
- *the speed at which the drone flies – in general, the faster the movement, the lower the privacy concern (e.g. concerns are higher if a drone is hovering over one's dwelling/garden for a longer period of time, which may enable the drone to film and take pictures, compared to a drone that merely flies by);*
- *many characteristics of the drone itself, such as its colour, size, and sound; and*
- *the characteristics of the person or community affected (e.g. women are typically more concerned than men).*

Concerns about data collection and misuse by drones are amplified by the fact that drones may easily gather information about people who have not engaged in any drone – ITF/OECD

All urban drone/UAM/AAM operations must be cyber secure

Modern drones are more than simple flying machines. Drones have become network-connected devices that should be subject to cybersecurity reviews – CIVATAglobal

Appropriate levels of transparency should be applied to all urban drone/UAM/AAM operations

The eco-system manager should create a public website so drone/eVTOL flights can be monitored and public concerns aired, taking into account the requirement for anonymisation/protection measures in the UTM/U-space system for safety and security reasons. For absolute transparency the setting up of independent authority to investigate accidents/incidents/complains related to drone/eVTOL operations should be considered - CIVATAglobal.

Urban drone/UAM/AAM operations should be aligned within urban decarbonisation and wildlife protection policies

The net emissions of drones compared to traditional modes of transport will depend on the specific use case and the local context. In some cases (carrying lightweight packages in sparsely populated areas that would have otherwise required a delivery van), drones may reduce emissions. In other cases, drones may result in a net increase in emissions. Drones will also have other environmental impacts, both positive and negative. They are likely to help alleviate air pollution in urban cities, as the majority of drones are electric powered. Drones may also have impacts on wildlife and generate visual disturbance, however, and these impacts will need to be carefully managed – ITF/OECD

Local authorities will need to develop an understanding how drone operations will be integrated into their strategic decarbonisation plans, including the provision of proper maintenance processes and controls for batteries to extend their life cycle and ensure the most eco-friendly drones (including re-cycling of parts) are being operated. Eco-system managers should also promote the use of renewable energy sources to recharge batteries and the use of sustainable aviation fuel for hybrid drones - CIVATAglobal

UAM/AAM operations must be built on principles of diversity and inclusion

For one important group of people, UAM and AAM offer a particularly important opportunity. UAM is now the single biggest opportunity to transform mobility options for millions of people who struggle daily with currently inaccessible ground transport services. If the promise - and full market value - of this new transport era is to be fully realised it can only be done so on the basis of inclusivity. From the very start UAM/AAM services need to be planned with the needs of those who stand to benefit most from its introduction – disabled communities. Once beyond prototype designs autonomous air vehicles will need to be developed to transport visually impaired passengers and those requiring wheel-chair access in ways which have been introduced in many other urban transport networks. This means:

- Ensuring developers of UAM ground infrastructure and platforms fully take into account the needs of disabled passengers – and the non-travelling public - in considering issues of access and egress.
- To help in this, aviation safety regulators must take account of the needs of people with reduced mobility in their regulations.
- In smart city programmes where autonomous vehicles are being planned (air and ground), it is vital that disabled community groups are incorporated into the earliest planning. Before eVOTLs are flying in our cities they will have to be given not just an aviation safety regulator's certificate to fly but a licence from the communities they will be serving.
- Developing a repository of "best practices" from around the world so developers can understand not just the basic principles but the detailed engineering solutions – CIVATAglobal/Aerobility

UAM/AAM operations should also be inclusive in terms of the affordability of services

Affordability in the long term is an important part of eliminating or mitigating financial barriers to using UAM. Although private stakeholders reiterated that urban aerial mobility will likely operate as a premium priced service at the outset, providers should be able to outline a longer-term plan for affordable consumer pricing. Any new form of transport aiming to integrate into a city's multimodal transport network can only be relevant by offering efficient travel times, inclusive pricing schemes and dignified customer experience – World Economic Forum

UAM/AAM operations will need to be Integrated with other forms of transport

Companies must consider all stages of eVTOL operations including departure and approach, passenger boarding and disembarking, vehicle charging and maintenance. Additionally, there needs to be several back-up landing sites catering for potential unforeseen technical issues a vehicle might experience in flight. It is understood that the design and development of the physical infrastructure supporting large-scale UAM services will oblige industry stakeholders to make significant investments. However, during the initial stages of eVTOL operations, developers can take advantage of the existing helicopter landing pads (helipads), car parks, rooftops etc. To ensure the optimal societal benefit, UAM operators should position vertiports strategically to help ease congestion while not adding to the existing regional noise level, but more than anything, to enable equal access to passengers and cargo of all classes. -FlightCrowd

To fulfill its potential, UAM must be much more tightly integrated with other modes of transportation. This integration needs to consider the existing transportation landscape, accessibility, social equity, and secondary impacts. Some of the ways that this integration can be accomplished are to connect to existing transit with "urgency trip" pairing and deliberate rail or bus station access, to address transportation deserts through vertiport placement, and to include equity and accessibility considerations when determining landing and route locations. Local jurisdictions can influence this integration through strategic use of land use permissions. Integrating into the existing power grid is another key for long term success of UAM. Electrification of both ground and air travel will require significantly more power than is currently

demanded in many locations. Not only must this power be transmitted and stored, it must be generated in a sustainable way in order to mitigate some of the potential adverse environmental impacts of UAM. Other potential adverse impacts include noise (of course), visual clutter, shifts in ground congestion patterns, an increased risk of urban sprawl, and battery disposal. By being transparent about these potential negative impacts early in the development and integration of UAM in a community, the industry can gain the trust of, and work with local leaders to mitigate the impacts that can't be avoided. Local decision makers also have the greatest ability early in the process to chart a course that builds in mitigations and maximizes benefits for UAM long term.-CAMI

Developing a clear set of communications tools

Communication is a two-way process. Communities must be able to express their concerns and expectations in a way which will lead to genuine industry responsiveness. Industry should be clear about the benefits and disbenefits this new sector will bring. For the industry to succeed it will require high levels of trust on all sides and an understanding that communities are key stakeholders in the drone/UAM/AAM ecosystem.

Public Acceptance

Trust · Public Benefit · Integration · Limited adverse impacts
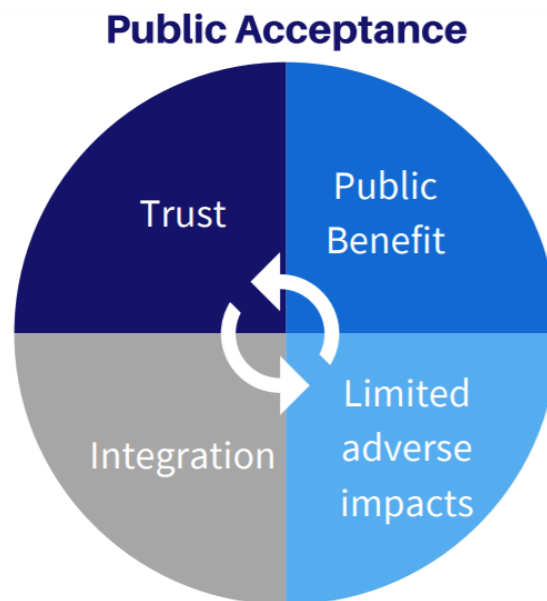
Source: CAMI

In this process, early engagement is key. But is should be in a structured way.

Engaging the public through "co-creation" processes that allow both users and non-users to actively participate in service and infrastructure design. This will endorse equitable services, bringing benefits to all potential user groups. Launching public information/communication campaigns that focus on the benefits of drones and promote positive use cases. They should also address risks of drone use and specifically how public concerns are being addressed. Campaigns could also inform the public about:

- *existing drone research and continuous research efforts to close research gaps;*
- *how drone use is regulated (i.e. what drone operators are / are not allowed to do) and how existing regulation may change in the future; and*
- *how the public can report illegal drone activity and what actions are taken to enforce the rules. Such campaigns will provide the public with transparency about how drones are being used and how policy issues are being addressed, and foster a sense of trust among the public.*

Raise awareness among drone operators regarding the public's concerns and how the operators could address them – for example, by outlining their necessary qualifications and certifications as part of their company's information, or by informing neighbours or people in the area that a drone may be flown – ITF/OECD

Data sharing that enables all authorized stakeholders to quickly respond to the needs of passengers, communities and market demands is fundamentally important to the success of

UAM. Data availability can allow for dynamic urban airspace usage and the operation of supportive infrastructure, like vertiports, in a more connected and efficient way. Cities and other stakeholders seeking enhanced access to data and information should clearly articulate their need for specific data and information and prioritize the protection of individuals' privacy. Just as the streets of a city are designed, operated, maintained and managed by city officials, local decision-makers will continue to champion clear and transparent decision-making and design capabilities for UAM, including as they relate to the collection of data generated by individuals using this new mode. Cities should consider building internal capacity and promoting awareness of the urban air mobility industry in anticipation of aviation expansion in the urban environment, today, and especially in anticipation of purpose-driven data sharing -World Economic Forum

CAAM has developed a set of principles around the best ways to engage with communities, at both local authority and citizen association levels. Demonstrations will be key to giving citizens a first-hand experience of what to expect.
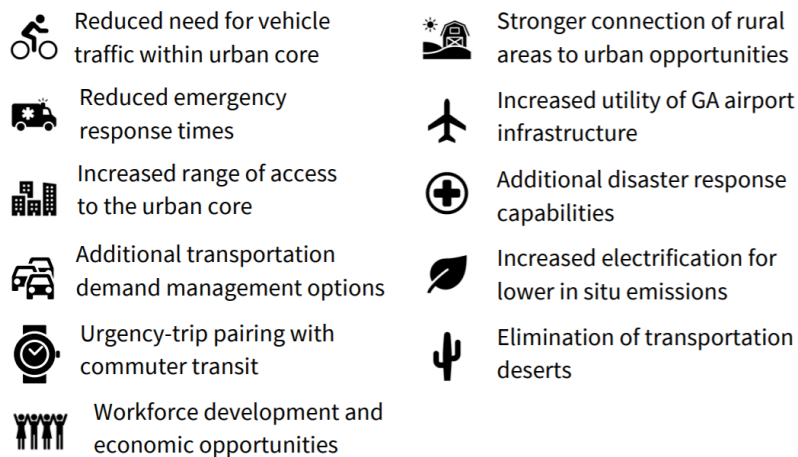

01 Showcase Events + Virtual Town Halls.

Hosting showcase events across the region, with partners, can help different communities learn more about the technology, its benefits, and how it will interact with their lives. Virtual Town Halls can allow for a more in-depth exploration with the public.

02 Public Demonstrations.

Allowing all interested parties to physically see the technology in action and understand how it will occupy space in reality is important. These demonstrations can highlight use cases and can generate a significant amount of goodwill with proper messaging.

03 Presentations at Municipal Councils + Committees

CAAM should select the relevant city and regional bodies that might have an interest or concern in this initiative and make presentations in a timely manner. Representatives on these bodies can provide a picture of community concerns.

04 Presentations to Boards of Trade + Commerce

The business community is an important voice in civic issues. Often, the first community concerns surround effects on local businesses and livability. In many locales, these groups play a significant role in communicating initiatives to the public.

05 Working with an Intersectional Lens

Effective social engagement appreciates that outcomes are not equal throughout society's various cross sections. Working with Indigenous communities, immigrant advocacy groups, and cultural bodies allows for a more complete engagement.

As a preamble to all efforts undertaken by CAAM, baseline surveying and opinion studies will be performed to gauge the public's understanding and positions on various aspects of UAM deployment.

Source: CAAM

Catalogue the high level benefits of urban drone/UAM/AAM operations

If UAM is seen as inaccessible for most people or only of benefit to a select few, it is less likely to be tolerated, regardless of the objective magnitude of any adverse impacts. Benefits include: improved emergency response times, increased connectivity between rural and edge communities to the economic, educational, and medical opportunities within the urban core, the potential for greater sustainability in a community's transportation landscape through electrification, workforce development, increased utility of existing community airports, and the ability to pair flight with ground transit to encourage a wider variety of ridership and traffic management options. A virtuous cycle can be encouraged in which public benefit is increased, thus driving greater acceptance, and thus increasing the opportunities for UAM to provide a

meaningful positive impact. This long-term vision for maximizing public good also has the potential to maximize the potential ultimate UAM market size. – CAMI

Reduced need for vehicle traffic within urban core

Stronger connection of rural areas to urban opportunities

Reduced emergency response times

Increased utility of GA airport infrastructure

Increased range of access to the urban core

Additional disaster response capabilities

Additional transportation demand management options

Increased electrification for lower in situ emissions

Urgency-trip pairing with commuter transit

Elimination of transportation deserts

Workforce development and economic opportunities

www.communityairmobility.org

Source: CAMI

The economic benefits of drones are significant. Drones are expected to expand access to goods by allowing for faster and less expensive air transport, unbound by the expensive and expansive infrastructure traditional aircraft require. Drones are likely to increase productivity and create new manufacturing and technology development streams, which will create jobs throughout the economy... Drones may also affect land use patterns, as improved accessibility may create an incentive for people or businesses to move away from dense urban areas. – ITF/OECD

Through the process of engaging city and industry stakeholders, one priority outcome became clear – it does not make sense to devote resources, energy and commitment to opening the urban sky to new forms of travel unless these new modes improve environmental outcomes. Furthermore, sustainability needs to be thought of as a holistic and umbrella term encompassing the effects of UAM on the natural environment, as well as the people, animals and plants that depend on it. It would be short-sighted to focus exclusively on the vehicles' emissions and energy consumption without also considering supporting infrastructure for sustainable practices- World Economic Forum

UAM should create employment opportunities for the residents of cities and the surrounding regions in which there are operations. Unlike other technological developments being considered for the next decade, UAM is expected to increase jobs on the ground and in the air. One new employment opportunity in commercial aviation operations generates multiple jobs in manufacturing, maintenance, flight approval or other related positions down the line. One new employment opportunity in commercial aviation operations generates multiple jobs. The introduction of various UAM curriculum to universities, colleges and vocational schools at early stages will serve as a tremendous value add to the ecosystem. With an aim to become global transport technology leaders, industry partners should partner with city management and together engage labour representatives, education and training experts, and community-based organizations to craft a next generation aviation workforce development strategy. – World Economic Forum

....But alongside the benefits be clear about the challenges and the risks

In the more distant future, they may also shift or eliminate jobs within portions of the transport sector. Over time, drones can also be expected to affect land use and property values, both positively and negatively. Where drones are perceived to provide benefits, property values are likely to increase, but where they are perceived to be an annoyance (e.g. due to noise, visual disturbance or privacy concerns), property values are likely to decrease – ITF/OECD

Today, off-the-shelf commercial drone technology poses a significant threat to governments, corporations and the public. While the positive use cases for deploying commercial drones are many, like all technologies, drones have a dark side that security professionals must prepare for. If history is any judge, the trend toward using drones for clandestine surveillance, espionage, and armed attacks has already been proven. Human nature being what it is, as commercial and recreational drone sales accelerate, it is only sensible to expect history to repeat itself. – Dan Dunkel

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