

# Benchmarking Non-Aviation Regulation Relating to Urban Drone Use

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for the

## Drone Ready Cities Project

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## Executive Summary

Drone Ready Cities (DRC), a Department of Science, Innovation & Technology (DSIT) funded project, aims to remove non-aviation regulatory barriers to the realisation of the value of urban drone use. As part of the project, delivery partner Midlands Aerospace Alliance has captured the status of non-aviation regulation and policy related to drone use.

This is for the purpose of identifying best practice and how the UK compares globally, the role of local authorities, stakeholders and as an input to stakeholder/regulator workshops.

Although no utopian solution was identified, there was significant variance between territories researched. In many territories, including the United Kingdom (UK), a confusing and discouraging array of regulation at various governance levels is apparent. This has potential to impede the realisation of the value of urban drone use.

The current non-aviation regulatory environment does not appear to have been tested and developed in readiness for the full realisation of the value of urban drone use in any of the territories researched. This could give the UK the opportunity to take a lead with a widely applicable regulatory framework.

Some commentators question the quality and legal enforceability of local UK drone regulation. On the other hand there is a public desire for the regulation of drone use, including at a local level.

Other organisations are working with adjacent and overlapping scope to the Drone Ready Cities project and engagement with these is underway.

The list of identified potential activities for local authorities is long and includes activities relating to aviation regulation. It is clear that local authorities will need to plan and prepare for urban drone use. It is intended to use the list to create a regulatory framework structure to be populated with relevant regulations, tools and stakeholders. This is planned to be used as input to workshops to be held with sector innovators, local authorities and other stakeholders from April 2024.

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In addition to Federal aviation law governing the use of drones, many states, regions, cities and counties have created additional regulation. There is little consistency across territories and drone users need to educate themselves on local regulation before operating in any new area. Perhaps understandably, it is nearly impossible to operate a drone in Washington D.C. The majority of this regulation is concerned with restricting use in national parks, interference with blue light services and data protection but there are many other areas covered; some of them appear spurious. For example, the reiteration of privacy law and the prohibiting of drone operation under the influence of alcohol or drugs which is already covered by the national aviation regulations. The areas of regulation identified are listed in Appendix A – detailed findings for US states, counties and conurbations. ....	9
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## Background

Drone Ready Cities (DRC) is a project being delivered by Coventry City Council and Midlands Aerospace Alliance and funded by the Department of Science, Innovation & Technology (DSIT) under the Regulators’ Pioneer Fund.

The project aims to develop and disseminate a non-aviation regulatory framework for use by the UK's Local Authorities, thereby removing barriers to the realisation of the economic and social benefits of urban drone use. Addressing barriers now will lead to faster consumer acceptance and accelerated investment in infrastructure.

The project will engage with stakeholders and run workshops to develop this framework. Compiling this report is a necessary precursor to this engagement and the workshops.

Other Government, regulatory, funding and industry players have identified the need for an approach to the broad regulation relating to drone use that enhances collaboration and embraces evolving or new responsibilities. DRC will complement efforts of the drone and aviation industry which is focused on airspace regulation.

## Introduction

In collaboration with Department for Business, Energy & Industrial Strategy (BEIS) and the Department for Transport (DfT), PWC estimated that commercial drones could contribute £45bn to the UK economy, reduce carbon emissions by 2.4m tons, benefit 650k FTE workers and save £22bn in costs by 2030.<sup>1</sup>

Yet when Coventry City Council took part in an urban airport demonstration, in the absence of appropriate regulation, roads had to be closed when drones flew. With constraints like this, the full benefit of drones will not be delivered.

Poor regulation of drone use and infrastructure could force innovators in the sector to move to other jurisdictions.<sup>2</sup>

*“To win over public and business trust in drones, people need to feel drone operators are subject to regulation and there is accountability in place.”*<sup>3</sup> Public consultation by Innovate UK as part of the Future Flight Challenge suggested that the public seek and expect “appropriate levels of governance... at both central and local level”.<sup>4</sup>

Indeed, PWC's study suggested that accountability and governance of drone use will be important to achieving public confidence and 78% of the public want drone operators to be licensed.<sup>5</sup>

The European Commission highlights the responsibility of regulators at various levels across the European Union. *“The Union legislator, the Commission... and the Member States all have an institutional responsibility to... ensure that all drone services are provided in a manner that ensures safety, security, sustainability, privacy, and affordability, in line with citizens' expectations and addressing their concerns.”*<sup>6</sup>

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<sup>1</sup> [PWC, 2022, “Skies Without Limits v2.0”, PWC, July 2022](#)

<sup>2</sup> [Al-Rubaye, S., Braithwaite, G., Panagiotakopoulos, D. & RYAN, R., 2020, “The Legal Framework of UTM for UAS”, Cranfield University, 2020](#)

<sup>4</sup> [CAMILLERI, E., GISBORNE, J., MACKIE, M., PATEL, R., & REYNOLDS, M., \(IPSOS UK\), 2022, “Future Flight Challenge – Mini Public Dialogue”, UK Research and Innovation, June 2022](#)

<sup>5</sup> [PWC, 2019, “Building Trust in Drones”, PWC, 2019](#)

<sup>6</sup> [EC, 2022, “A Drone Strategy 2.0 for a Smart and Sustainable Unmanned Aircraft Eco-System in Europe”, European Commission, Brussels, {SWD\(2022\) 366 final}, 29<sup>th</sup> November 2022 COM\(2022\) 652 final](#)

## Report Objectives

Capture information to

- Identify best practice in local authority regulation relating to drones
- Understand how UK compares to other territories in this
- Understand the role of local authorities in realising the value of urban drone use
- Identify appropriate stakeholders for engagement in workshops to develop a regulatory framework
- Provide input for stakeholders taking part in the development of workshops

## Scope

The project scope is the use of drones in UK urban areas but this report captures information from other territories too.

Although the scope of the project is non-aviation regulation, references to aviation regulation are made in this report where relevant.

## Method

A literature search identified sufficient prior research to mitigate the need for primary research.

The contents of this report will be developed iteratively as stakeholders are fully engaged and information is captured in workshops.

Although the research was not exhaustive, it was judged that the marginal returns of further research had diminished to an extent that it would not add appreciable value compared to the effort required.

## Findings

### The regulatory environment

UK

UK aviation guidance requires drone operators to seek permission from landowners to take off or land on their property. It imposes restrictions, including maximum distance from the ground and minimum distances from uninvolved people depending on the drone weight.<sup>7</sup> The UK has numerous mandatory drone no-fly zones for a variety of good reasons including Danger Areas, High Intensity Radio Transmission Areas (HIRTAs), Prohibited Areas, Flight Restriction Zones, Airfields and Aerodrome and Restricted Areas. The location of these is readily available online and in a number of drone flight management applications.<sup>8,9</sup> As long as a drone is operated within the national aviation legislation, the flying of drones over any land is not prohibited by national aviation law as long as other laws such as data protection are observed.

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<sup>7</sup> [CAA, 2022, "Unmanned Aircraft System Operations in UK Airspace – Policy and Guidance", CAP722, Ninth Edition Amendment 1, Civil Aviation Authority](#)

<sup>8</sup> [NATS, 2023, "UAS RESTRICTION ZONES", NATS-UK.ead-it.com, accessed 15<sup>th</sup> November 2023](#)

<sup>9</sup> [NO FLY DRONES, noflydrones.co.uk, accessed 6<sup>th</sup> November 2023](#)

So that the reader can appreciate the implication of some of the content in this report, the UK categories of operation for Remotely Piloted Air System (RPAS) and a summary of the basic limitations applied can be found in Table 1. For further detail, the reader should refer to the CAA’s publication CAP722 “Unmanned Aircraft System Operations in UK Airspace – Policy and Guidance”.<sup>7</sup>

Table 1 UK RPAS Categories of Operation

Category	Key Risk Characteristics	Mass	Max Height	Other Restrictions
Open	A1 fly over people except ‘assemblies’ of people	<250g	120m (400ft)	VLOS* Only one UA may be operated at any one time
	A2 with a minimum horizontal distance of 50m from people	<2kg		
	A3 fly far from people and >150m metres horizontally from residential, commercial, industrial or recreational areas	<25kg		
Specific	Greater risk than Open Category, or element(s) of the operation fall outside open category boundaries	No limit	No limit	Operational authorisation issued by CAA based on operator risk assessment
Certified	Equivalent risk to that of manned aviation	Until unique UAS regulations are available, subjected to the same regulatory regime as manned aviation		

\*VLOS – Visual Line of Sight

It is recognised that current UK aviation regulation requires development in the areas of operation Beyond Visual Line of Sight (BVLOS), in populated areas or/and without a dedicated pilot per each drone to unlock the social and economic the value of drone use to the UK.<sup>10,11</sup> As part of its Airspace Modernisation Strategy, the UK aviation regulator, the Civil Aviation Authority (CAA) is working to develop strategy for operating drones BVLOS without confining them to restricted experimental environments.<sup>12</sup>

Meanwhile, some UK authorities have sought to restrict drone use. Many of the restrictions apply to national parks. Others are complete bans over very wide areas that appear to be a knee-jerk reaction to the very small number of rogue private operators who fly drones without proper regard for safety and privacy. Some authorities demand a fee for licence applications and issue licences to operate despite it being the CAA that decides whether the operator’s risk assessment is adequate. The ability to enforce these restrictions has been questioned. Research suggests that the lower the governance level at which drone regulation is developed, the greater potential for it to have been developed by those without technical or legal expertise and therefore to be of poor quality. For example, a parish council could be expected to have lesser legal expertise than a combined authority. The literature finds that 71% of England’s 310 councils do not have a relevant byelaw or policy that could be readily identified. The

<sup>10</sup> CRANFIELD UNIVERSITY, “The development of an uncrewed traffic management (UTM) system using cross-cutting technologies

<sup>11</sup> [UK Research and Innovation, 2021, “Future Flight Vision and Roadmap”, UKRI, August 2021](#)

<sup>12</sup> [CAA, 2023a, “Airspace Modernisation Strategy 2023–2040 Part 1: Strategic objectives and enablers”, CAA, CAP1711, 23<sup>rd</sup> January 2023](#)

figure is 26 for a subset of 100 of the largest authorities. Within these authority areas, many lower tier authorities did have policies. Some authorities' policy is an outright ban on recreational drone use within their boundaries and many create barriers to their use by requiring application for a permit for camera equipped drones. Others demand extraordinarily high levels of public liability insurance. It is observed that these regulations are untested in the courts and commentators question whether drone-related byelaws would pass tests of legality.<sup>13,14,15</sup>

Much of the literature concerning local authority regulation is restricted to recreational drone use from authority owned open or green spaces. Nevertheless, it gives valuable insight into the inconsistent, piecemeal and restrictive approach applied to local authority drone regulation.

In addition to authorities, many landowners prohibit the use of drones over their land without permission, some with the power of byelaws. For example, "National Park Byelaws prohibit the use of drones and model aircraft on or over any common land within the National Park, except with prior written authority from the National Park Authority."<sup>9</sup> For those areas not covered by byelaw, the potential for legal enforcement of any prohibition is highly questionable. The law is complex and landowners rely on byelaws and the CAA's requirement for pilots with permits to 'have control' over the area where they intend to use a camera-drone. This includes control of people and vehicles in the area.<sup>13,16</sup>

Social research commissioned by the Future Flight Challenge suggests that the public would like central and local governance to constrain the expansion of commercial drone use so that safety, social impacts, and environmental impacts could be monitored.<sup>4</sup>

Particular areas of concern raised by members of the public where the involvement of a local authority would be required were:

- Privacy – identifying 'no-fly zones' and 'fly-zones'
- Routing
- Public consultation
- Planning
- Managing tendering of certain local public flight services
- Environment – demonstration of green benefit over ground alternatives, protecting wildlife and biodiversity, air and noise pollution
- Disaster plans for the event of a drone crash

In 2022, the UK Research & Innovation (UKRI) Future Aviation Industry Working Group on Airspace Integration (FAIWG:AI) published a short report announcing its aim to build a plan to address a lack of

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<sup>13</sup> [DUBE, K., FENTON, N., GILLESPIE, A., MCLACHAN, S. & SCHAFER, B., 2022, "The Chaotic State of UK Drone Regulation", DOI:10.13140/RG.2.2.25709.87521, April 2022](#)

<sup>14</sup> [GEE, C, 2020A, "Making drones work in local government", Local.Gov.co.uk, 14<sup>th</sup> January 2020](#)

<sup>15</sup> [KOWALSKI, A, "Local government and adopting a drone strategy", Government Business, Issue 28.3, p37, 2021](#)

<sup>16</sup> [BLAKISTON'S, 2019, "Who Wins? Drone operators or Local Government?", Blakistons.co.uk, 11<sup>th</sup> November 2019](#)

pace and funding to develop regulation to realise the value created by new classes of air vehicles including drones.<sup>17</sup>

Later, UKRI published “Let’s get flying: Our plan for action”, which stated “Timely changes are necessary to regulations on airspace, vehicles and safety cases, infrastructure, operating procedures, and emerging technologies to help businesses reduce risk and develop marketable services.” Although this implies actions on non-aviation regulation and policy, none are specifically mentioned.<sup>18</sup>

DfT has drafted the UK Future of Flight Action Plan which is expected to propose airspace regulation objectives and actions that are likely to include plans for the development and industrialisation of RPAS for commercial purposes and all electric, Vertical Take-Off and Landing vehicles (eVTOLs) and their integration into the existing civil aviation system.

### European Union

The Urban-Air-Mobility Initiative Cities Community (UIC2) of the EU’s Smart Cities Marketplace found that “cities and regions are starting to claim the low-level airspace above them as part of their urban space”. It notes that this is generally not in their jurisdiction being an international or national concern and that “influence of the local level might be restricted to the assessment of ground risks and associated infrastructure”.<sup>19</sup>

The EU Security Union Strategy and the Counter-Terrorism Agenda recognise that the threat of non-cooperative drones needs to be addressed and a proposed Directive on the resilience of critical entities (CER Directive) will require Member States and critical entities to conduct risk assessments.<sup>20</sup>

### Australia

Australia is often seen as an environment more suited to the adoption of drone use. The aviation rules of the Civil Aviation Safety Authority's (CASA) concerning drones are similar to those of other advanced nations. Although the flying of drones over people is more tightly restricted than in most territories, with the operation of any drone over populous areas or events being forbidden, the large amount of low-populated areas leads to many opportunities for drone use cases, including BVLOS.<sup>21,22</sup> The process for application to fly BVLOS is slightly more evolved than that of many other developed nations with the option of using standard scenarios or a Specific Operations Risk Assessment (SORA).<sup>23</sup> At a local level, states and territories often have their own drone-related regulations that restrict drone use in parks,

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<sup>17</sup> [FAIWG.AI, 2022, “Airspace Integration problem statement: ‘Future Airspace Integration: Leading the World’”, UK RI Future Aviation Industry Working Group on Airspace Integration, 5<sup>th</sup> August 2022](#)

<sup>18</sup> [FAIWG.AI, 2023, “Let’s get flying: Our plan for action”, UKRI Future Aviation Industry Working Group on Airspace Integration, February 2023](#)

<sup>19</sup> [AGOURIDAS, VASSILIS & CZAYA, AXEL & STĘCHŁY, JAKUB & KUMAR, ROHIT & PATATOUKA, ELENA, 2021, “Urban Air Mobility and Sustainable Urban Mobility Planning – Practitioner Briefing” DOI 10.6084/m9.figshare.19314005.v1.](#)

<sup>20</sup> [EC, 2022, “COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS ‘A Drone Strategy 2.0 for a Smart and Sustainable Unmanned Aircraft Eco-System in Europe’”, COM\(2022\) 652 final, Brussels 29<sup>th</sup> November 2022](#)

<sup>21</sup> [CASA, 2023a, “Drone safety rules”, CASA.gov.au, accessed 14<sup>th</sup> November 2023](#)

<sup>22</sup> [UAVCOACH, 2023, “Drone Laws in Australia”, uavcoach.com, accessed 14<sup>th</sup> November 2023](#)

<sup>23</sup> [CASA, 2023, “Apply for beyond visual line-of-sight approvals”, CASA.gov.au, accessed 14<sup>th</sup> November 2023](#)



secure areas, major events and correctional facilities. State and territory rules are readily accessible via a government website and generally only apply additional restrictions to drone use in national parks and during events. A few cities' websites have pages dedicated to the use of drones in the cities that refer to CASA regulation in a consistent way that reduces the opportunity for user confusion.<sup>21,24</sup>

### United States of America

The Federal Aviation Authority's (FAA) Advanced Air Mobility Implementation Plan states that the Department of Transportation (DOT) Interagency Working Group will address aspects of infrastructure not directly in the FAA's scope such as electrification for charging. It also recognises that not all operating facilities will require FAA approval and may be subject to local rules. New vertiports should be placed to facilitate multimodal transport. The FAA has an interagency agreement with the Department of Energy's National Renewable Energy Lab (NREL) to determine the impacts of aircraft electrification. Furthermore, it identifies the need for more research in the area of vertiport firefighting needs.<sup>25</sup>

It is the aviation regulator, FAA, that is responsible for evaluating the environmental impact of aviation and FAA is considering how to streamline the legacy review process for AAM. Certification will require compliance with the National Environmental Policy Act (NEPA). Outside this, there may be other implications to consider, for example, developing routes for AAM could trigger NEPA. In this event, FAA would still be responsible for the environmental review but that could require public involvement and supplementary community engagement.<sup>25</sup> This would likely involve the relevant local authorities.

DOT Hazardous Materials Regulations (HMR; 49 CFR parts 171-185) apply to any operator transporting hazardous materials in commerce.<sup>25</sup>

In addition to Federal aviation law governing the use of drones, many states, regions, cities and counties have created additional regulation. There is little consistency across territories and drone users need to educate themselves on local regulation before operating in any new area. Perhaps understandably, it is nearly impossible to operate a drone in Washington D.C. The majority of this regulation is concerned with restricting use in national parks, interference with blue light services and data protection but there are many other areas covered; some of them appear spurious. For example, the reiteration of privacy law and the prohibiting of drone operation under the influence of alcohol or drugs which is already covered by the national aviation regulations. The areas of regulation identified are listed in Appendix A – detailed findings for US states, counties and conurbations.

### Role of Local Authorities in the UK

A significant body of research and reporting on the role that local authorities should or could play in the regulation of drone operations was found. For the benefit of the reader, the findings are summarised as lists before the detailed findings are shared.

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<sup>24</sup> [AUSTRALIAN GOVERNMENT, 2023, "State and territory rules", Drones.Gov.au, Australian Government Department of Infrastructure, Transport, Regional Development, Communications and the Arts, accessed 17<sup>th</sup> November 2023](#)

<sup>25</sup> [FAA, 2023, "Advanced Air Mobility \(AAM\) Implementation Plan. Near-term \(Innovate28\) Focus with an Eye on the Future of AAM", Federal Aviation Authority, Version 1.0, July 2023](#)

## List of Local Authority Roles Relating to Aviation Regulation

Prior to the safe scale-up of drone operations in urban settings, local authorities need to decide where the boundary between their responsibility and that of the local aviation regulator lies.<sup>15</sup>

It is unlikely that the CAA will have the resource or local knowledge to manage lower airspace in all local settings. There will certainly be many local issues that are too detailed for the national regulator to deal with. For example, the distribution of flightpaths to reduce disturbance for individuals. Some commentators suggest that Local Authorities would be appropriate for managing lower airspace, i.e. below 120m (see Table 1 UK RPAS Categories of Operation). Additionally, provision of such services and infrastructure could offer revenue opportunities for local authorities.<sup>2,15,26</sup>

Roles for local authorities that relate to regulated aviation have been identified by a number of studies and works. These include:

- The location of air corridors for drones/eVTOLs<sup>27,37,44</sup>
- Providing critical and dynamic aeronautical information<sup>40</sup> to the on movements of people and high-altitude platforms (such as cranes)<sup>27,44</sup>, blowing debris, construction staging, etc.<sup>44</sup>
- Defining no-go zones<sup>6,27,14,37,44</sup>
- Integrating drone/eVTOL flight networks within ground transport infrastructure planning<sup>27</sup>
- Defining the locations of ground-based conspicuity surveillance and communication devices<sup>27</sup>
- A role in the organisation which operates the drone/eVTOL network and UTM system<sup>27</sup>
- Ensuring byelaws on drone/eVTOL operations are consistent with civil aviation regulations<sup>27</sup>
- With the national aviation regulator determine a licensing system<sup>27</sup>
- Earmarking emergency landing sites<sup>28,44</sup>
- Providing National context - legislation and regulation<sup>14</sup>
- Local context - local airspace restrictions and permissions required<sup>14</sup>
- Management of exceptions such as emergency services and flying clubs<sup>14</sup>
- Prosecution of infringements of the public use of the urban airspace<sup>37</sup>
- Providing data on location of buildings, antennas, trees, migratory routes, critical infrastructure, etc. for the determination of routes and location of drone infrastructure<sup>6,44</sup>
- Providing flight planning data<sup>29,30</sup>

## List of Local Authority Roles Not Related to Aviation Regulation

Local Authorities have a wide role to play in promoting the safe use of drones and an environment supporting growth of use. Those identified in the research include:

- Being part of the decision making process on when and where to launch operations<sup>6,27,37</sup>
  - Location - Critical infrastructure, Fire station locality, Transport interconnection, Local land use, Maturing vegetation, Hazards from specific land uses e.g. birds at landfills, ash

<sup>26</sup> [GEE, C., RYAN, R. 2020, "Will local authorities become airspace planners?", Local.Gov.co.uk, 28<sup>th</sup> January 2020](#)

<sup>27</sup> [AAM4GOV, 2023, PMI-Limited, aam4gov.com](#)

<sup>28</sup> [KPMG, 2023, "Integrating air mobility into wider infrastructure", KPMG in Ireland, 24<sup>th</sup> April 2023](#)

<sup>29</sup> [ESRI, undated, "The City of Ontario Emerges as One of the First Drone-Ready Cities", esri.com, accessed 14<sup>th</sup> November 2023](#)

<sup>30</sup> [THOMAS, C., 2022, "How a Southern California City Became Drone-Ready with Geospatial Technology", govloop.com, 28<sup>th</sup> April 2022](#)

from burning, Property under approach and departure paths, Noise sensitive area, Nearby animals (zoo, domestic), Protected wildlife habitats, Future property values, Impact of traffic, Privacy, Distraction to other activities e.g. drivers<sup>44</sup>

- Deciding on drone take-off and landing areas especially on council-owned property<sup>27,14,37</sup>
- Transportation<sup>19</sup>
  - Infrastructure financing<sup>27,42</sup>
  - Infrastructure planning<sup>27,42,44</sup>
  - Including AAM into the definition of multimodal hubs<sup>42</sup>
  - Permit approval<sup>42</sup>
- Ensuring appropriate fire services<sup>28,38,44</sup>
- Community/stakeholder consultation/engagement<sup>27,41,42,44</sup>
- Integrating UAM planning with a local authority's decarbonisation strategy<sup>27</sup>
- Identifying safe spaces where recreational drone operators can fly their drones<sup>27</sup>
- Planning roles<sup>6,42</sup>
  - Land use and zoning<sup>42,44</sup>
  - Considering support facilities like emergency services near hubs<sup>28</sup>
  - Buildings to deal with noise of AAM<sup>28</sup>
  - Structures to accommodate landing<sup>28</sup>
  - Structures that can accommodate battery storage, charging and refuelling<sup>28,41</sup>
  - Addition building regulations relating to fire, electrical power<sup>41, 42, 44</sup>
  - Parking facilities<sup>28</sup>
  - Communication infrastructure<sup>28</sup>
  - Navigation infrastructure including sensors<sup>28</sup>
  - Charging stations<sup>28,19</sup>
- Legal department roles<sup>42</sup>
  - Liability, privacy & property rights<sup>44</sup>, noise regulations, security
- Economic development<sup>14,28,41,44</sup>
  - Utilize AAM to provide a local benefit commensurate with the cost<sup>41,44</sup>
  - Marketing/incentives, maximising economic opportunities for adjacent land, redevelopment/reuse<sup>14,42</sup>
  - Workforce readiness<sup>41</sup>
  - Funding/grant restrictions<sup>44</sup>
- Identifying grid bottlenecks for charging<sup>28</sup>
- Security infrastructure - Cyber security, data privacy, and geofencing<sup>28,44</sup>
- Police department liaison – enforcement, public relations, security<sup>42</sup>
- Suspicious drone activity - Reporting suspicious activity or usage that presents a threat<sup>14</sup>
- Council strategy to realise benefits from drone technology<sup>14,31,32</sup>
- Security<sup>44</sup>

<sup>31</sup> [ESRI, undated, "The City of Ontario Emerges as One of the First Drone-Ready Cities", esri.com, accessed 14<sup>th</sup> November 2023](#)

<sup>32</sup> [THOMAS, C., 2022, "How a Southern California City Became Drone-Ready with Geospatial Technology", govloop.com, 28<sup>th</sup> April 2022](#)

- Conduct risk assessments for nefarious drone use, and on critical entities to take technical, security and organisational measures to ensure their resilience against identified risks<sup>6</sup>
- Equity – evaluate impacts to enable positive outcomes<sup>41,44,33,34</sup>
- Data - Support standards development and processes to facilitate sharing of AAM data<sup>41</sup>
- Operations and Interoperable Infrastructure - Consider technology-agnostic, long-term
- Environmental
  - Sustainability<sup>44</sup> – life-cycle impact<sup>41</sup>
  - Wildlife protection<sup>44</sup>
  - Noise pollution<sup>6,42,44</sup>
  - Visual impact<sup>39,44</sup>
- Support matchmaking of site hosts, OEMs, charging equipment suppliers, utilities, permitting agencies and funders<sup>42,35,36</sup>
- Utilities<sup>44,39</sup>
  - Electrical
  - Data
  - Water
  - Fuel delivery/storage for hydrogen or hybrid aircraft
  - Waste water
  - Gas

<sup>33</sup> [ESRI, undated, “The City of Ontario Emerges as One of the First Drone-Ready Cities”, esri.com, accessed 14<sup>th</sup> November 2023](#)

<sup>34</sup> [THOMAS, C., 2022, “How a Southern California City Became Drone-Ready with Geospatial Technology”, govloop.com, 28<sup>th</sup> April 2022](#)

<sup>35</sup> [ESRI, undated, “The City of Ontario Emerges as One of the First Drone-Ready Cities”, esri.com, accessed 14<sup>th</sup> November 2023](#)

<sup>36</sup> [THOMAS, C., 2022, “How a Southern California City Became Drone-Ready with Geospatial Technology”, govloop.com, 28<sup>th</sup> April 2022](#)

## Detailed findings

The AAM4gov<sup>27</sup> project has identified 16 areas where local authorities have a role in preparing for the use of drones at scale which are listed below. Work conducted with Dublin Smart Cities has contributed to this list.

1. Being part of the decision making process on when and where to launch initial drone/UAM operations and identifying priority services
2. Deciding the sites of drone take-off and landing areas, eVTOL vertiports, especially on council-owned property
3. Working with the aviation regulator/UTM service provider the location of air corridors for drones/eVTOLs to balance flight efficiency, environmental protection and citizen safety
4. Providing critical and dynamic aeronautical information to the regulator/U-space service provider on movements of people and high-altitude platforms (such as cranes)
5. Liaising with police and security agencies to develop a policy to deal with rogue drone operations.
6. Defining no-go zones for environmental, wildlife and other ground protection issues
7. Integrating drone/eVTOL flight networks within ground transport infrastructure planning
8. With necessary experts, defining the locations of ground-based conspicuity surveillance devices (such as radar or RF detectors) for low-level detection of crewed and uncrewed aircraft
9. Taking a role in the organisation which develops, manages and operates the drone/eVTOL network and UTM system. Ensuring that any byelaws on drone/eVTOL operations are consistent with the wider legal framework and civil aviation regulations.
10. With the national aviation regulator determine a licensing system for drone/eVTOL operators, take-off and landing infrastructure providers, battery storage and charging facilities etc and operations for specific urban use-cases. This will also require understanding the implications of high energy use by busy vertiport operations on the local grid and the capabilities of first responders to deal with battery fires
11. Ensuring all UAM stakeholders comply with non-aviation rules and procedures, such as the storage of, and access to, data collected by drones
12. Agreeing the placement of sensors on buildings for drone/eVTOL operational communications
13. Liaising with the local community
14. Integrating UAM within strategic transport infrastructure financing and planning
15. Integrating UAM planning with a local authority's decarbonisation strategy
16. Identifying safe spaces where recreational drone operators can fly their drones

For AAM, KPMG believes that infrastructure for door-to-door and hub models would be similar but safety analysis, business case, and risk assessment would be different. It sees the two main regulatory hurdles as building safety standards and air traffic management rules able to handle hub services. At a city level, KPMG proposes that fit-for-purpose infrastructure will anticipate AAM by:

- Incorporating landing sites in urban planning
- Including AAM into the definition of multimodal hubs
- Considering support facilities like emergency services near hubs
- Identifying grid bottlenecks for charging
- Earmarking emergency landing sites

...and implies planning implications for:

- Buildings to deal with noise of AAM
- Structures to accommodate landing
- Structures that can accommodate battery storage, charging and refuelling
- Additional fire fighting services

...and recommends.

- Making AAM a routine consideration in town planning and major development processes
- Allocating budget to AAM infrastructure
- Developing private partnerships to expedite infrastructure development
- Developing regulated income streams from AAM

It sees local authorities meeting these challenges by considering AAM infrastructure in town planning and major development processes; allocating budgets to AAM infrastructure; developing private partnerships to expedite development of AAM infrastructure where possible and developing regulated income streams from AAM infrastructure operations.<sup>28</sup>

GEE, C., 2020A suggest roles for local authorities, as part of their policy, to provide:<sup>14</sup>

- National context - legislation and regulation
- Local context - local airspace restrictions and permissions required
- Council owned land - restrictions and opportunities for recreational flying from
- Commercial use of drones - facilitating the growth and economic benefits
- Exceptions - management of exceptions such as emergency services and flying clubs
- Suspicious drone activity - Reporting suspicious activity or usage that presents a threat
- Council strategy – how the local authority intends to realise benefits from drone technology

The EU UAM Initiative Cities Community – UIC2 requested that<sup>37</sup>:

- Cities/Regions have a deciding role for allowing the operation of UAM services of public interest
- Cities/Regions have a deciding role in establishing to what extent UAM/U-Space operations can be conducted in their territories
- Cities/Regions have a deciding role where UAM/U-Space flight operations are permitted within their territories
- Cities/Regions have a deciding role where take-off and landing sites are to be built
- Prosecution of infringements of the public use of the urban airspace over a city/regions remains a local task

The need for the provision of appropriate fire services related to the use of drones at scale is to require planning and action by local authorities.<sup>38</sup>

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<sup>37</sup> [UIC2, 2021, “Manifesto on the Multilevel Governance of the Urban Sky”, UAM Initiative Cities Community – UIC2, V3.1 December 2021](#)

<sup>38</sup> [BUTTERWORTH-HAYES, P., 2023, “UAM/AAM reality check: fire training-course approvals as important as airworthiness certificates”, UrbanAirMobilityNews.com, 29<sup>th</sup> August 2023](#)

The EU's recognition of the threat of non-cooperative drones is raised in its Drone Strategy 2.0. ¶110 mentions proposed Directive on the resilience of critical entities, such as transport infrastructure, (CER Directive) that will introduce obligations to conduct risk assessments, and on critical entities to take technical, security and organisational measures to ensure their resilience against identified risks.<sup>39</sup>

European Union Aviation Safety Agency (EASA) recent guidance on a regulatory framework for U-space specifies what a competent authority would need to do but not who it might be. Local authorities are mentioned frequently as being a stakeholder that should be consulted in all phases and be able to provide information. It included local authorities as a stakeholder that might provide information to, and retrieve information from, the Common Information Service (CIS) provider and that a U-space coordinator should coordinate with various entities including administrative authorities. This could include accounting for constraints (e.g. with regard to the environment and the society) imposed by regional and local authorities. Authorities, including local ones, and emergency services could raise issues, such as declaring a local emergency with the competent authority that may choose to implement a temporary routing change as a result.<sup>40</sup>

The EU's Drone Strategy 2.0 sees local communities as having a key role in deciding the extent of drone operations in their territories. Examples of protecting critical infrastructure, whether day or night operations should be allowed, noise and visual abatement measures. Further it sees municipalities having a pivotal role in planning for the accommodation of infrastructure, vertiports and landing/take-off points.<sup>6</sup>

The European Platform on Sustainable Urban Mobility Plans states that planning policy has to incorporate the ground infrastructure and interfaces for take-off and landing, aircraft parking, charging infrastructure, air traffic control infrastructure and communications.<sup>19</sup>

The National Aeronautics and Space Administration (NASA) has produced an "Advanced Air Mobility Community Integration Considerations Playbook" to provide an overview of planning considerations relevant to local and regional AAM planning activities<sup>41</sup>. Recommendations are summarised as follows:

- Institutional Readiness – plan and prepare for AAM
- Equity – evaluate impacts to enable positive outcomes
- Community Engagement
- Planning for Multimodal Integration
  - Evaluate how technologies, such as automation, data analytics, and new propulsion fuels, along with how new structures and their codes and regulations, could impact plans, planning processes, and requirements development.
  - Specific mention of building codes, fire codes, ensuring electrification plans will meet the needs of multiple modes of transport, land use, zoning
- Funding - Utilize AAM to provide a local benefit commensurate with the cost
- Economic Development and Workforce Readiness

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<sup>39</sup> EC, 2022, "A Drone Strategy 2.0 for a Smart and Sustainable Unmanned Aircraft Eco-System in Europe", European Commission, Brussels, {SWD(2022) 366 final}, 29<sup>th</sup> November 2022 COM(2022) 652 final

<sup>40</sup> EASA, 2022, "Acceptable Means of Compliance and Guidance Material to Regulation (EU) 2021/664 on a regulatory framework for the U-space", EASA, Issue 1, 16<sup>th</sup> December 2022

<sup>41</sup> NASA, 2023, "Advanced Air Mobility Community Integration Considerations Playbook", ntrs.nasa.gov, May 2023

- Data - Support standards development and processes to facilitate the systematic and secure sharing of AAM data across stakeholders, agencies, and authorized parties.
- Operations and Interoperable Infrastructure - Consider technology-agnostic, long-term investments providing benefits across multiple modes of transportation
- Environmental Sustainability - Consider life-cycle environmental impacts

Although FAA engages with communities and elected officials on aviation noise in the case of a new airport project, for AAM changes, it does not expect the same level of engagement as for a major airspace change. The FAA sees engagement at regional level as most effective and will apply its Community Involvement Manual when engaging. It believes that project proponents such as airport sponsors may be the most appropriate community engagement lead for AAM projects.<sup>25</sup>

Ohio’s AAM Framework suggests that local authorities should prepare for AAM adoption and help develop regulations and ordinances to advance AAM. It goes on to advise that state legislators and administrators should engage in evolving regulation to help attract businesses to the state. It recommends a lead officer for unmanned aviation policy initially focussed on drones initially and provides the brief framework in Figure 1 for local agency support of Ohio’s AAM Ecosystem.<sup>42</sup>

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<sup>42</sup> [OHIO DEPARTMENT OF TRANSPORTATION, 2022, “Advanced Air Mobility – Ohio AAM Framework”, Ohio Department of Transportation, August 2022](#)



Type	Recommended Future Local Agency Actions
City Ordinance or Regulation	Local governments can develop and adopt thoughtful zoning, multimodal planning, vertiport building safety and fire codes and noise ordinances.
Infrastructure	Support matchmaking of site hosts, OEM & battery charging equipment suppliers and dealers, utilities, permitting agencies, and funding opportunities within their jurisdiction.
Local Departments	Incorporate processes and procedures into their local government operations. Specific considerations include: <ul style="list-style-type: none"> <li>• Law Department: liability, privacy &amp; property rights, noise ordinance, security</li> <li>• Building Department: building codes, fire codes, enforcement of such, building permits</li> </ul>
Type	Recommended Future Local Agency Actions
	<ul style="list-style-type: none"> <li>• Planning Department: zoning codes, land use planning, entitlements, zoning changes and neighborhood buy-in</li> <li>• Fire Department: input on location, fire codes, incident management, recovery of costs from owners, enforcement of codes/inspections, ability to respond to emergencies</li> <li>• Police Department: enforcement, public relations, security</li> <li>• Economic Development Department: marketing/incentives, maximizing economic opportunities for adjacent land, redevelopment/reuse</li> <li>• Transportation Department: permit approval, traffic impacts/parking, multimodal planning, data/statistics, vehicle staging</li> <li>• Municipal/Local airport considerations: <ul style="list-style-type: none"> <li>○ Coordination with FAA and updated standards/training</li> <li>○ Compliance with current FAA design standards and grant assurances</li> <li>○ Required credentials for pilot/owner permitting</li> <li>○ Requirements for vehicles/vehicle permitting and inspections</li> <li>○ Space management (if at airport) – rent, contracts</li> <li>○ Air traffic control (local or FAA/both) and space needs</li> <li>○ Other office space needed and additional staff</li> <li>○ Monitoring noise complaints, crash data, other data/statistics</li> <li>○ Enforcement</li> <li>○ Aircraft maintenance support</li> <li>○ Formation and education of Airport Zoning Boards as AAM scales</li> </ul> </li> </ul>

Figure 1 - Ohio AAM Ecosystem local agency support framework

Although Minnesota’s Air Mobility Strategy Plan recognises that most aviation regulation happens at federal level, local government is expected to want to have input into drone delivery operations.<sup>43</sup>

Despite NASA 2022 being focussed on the considerations for vertiports for AAM passenger operations, it offers a valuable and extensive list of considerations created from substantial stakeholder brainstorming. Those items considered relevant to the scope of this report are extracted with some terminology adapted for UK relevance e.g. National replaces Federal.<sup>44</sup>

- National Regulatory
  - Funding/grant restrictions
  - Health & Safety

<sup>43</sup> [MINNESOTA DEPARTMENT OF TRANSPORTATION OFFICE OF AERONAUTICS, 2022, “AIR MOBILITY STRATEGIC PLAN”, Minnesota Department of Transportation Office of Aeronautics, April 2022](#)

<sup>44</sup> NASA, 2022, “Advanced Air Mobility Vertiport Considerations: A List and Overview”, 20th June 2022, <https://doi.org/10.2514/6.2022-4073>

- Climate
- Environmental
- Physical security
- Building regulations
- Wildlife protection
- Local Regulatory
  - Zoning – site and surrounding
  - Environmental – incl. noise, hours, etc.
  - Economic Development Plan
  - Build codes
  - Fire codes
  - Local Transportation Plan
  - Stakeholder consultation
  - IT requirements for publicly funded infrastructure
- Physical – Fixed
  - Nearby buildings, antennas, trees, etc.
  - Property owner(s) rights
- Physical - Mobile and Temporary e.g.
  - Cranes
  - Blowing debris
  - Construction staging
  - Noise
  - Lightning protection equipment
  - Non-acoustic annoyance e.g. visual
  - Static discharge
- Surrounding Uses affecting location and design
  - Impacted by surrounding area
    - Critical infrastructure
    - Fire station locality
    - Transport interconnection
    - Local land use
    - Maturing vegetation
    - Hazards from specific land uses e.g. birds at landfills, ash from burning
  - Impacting surrounding area
    - Local land use e.g. schools, hospitals
    - Property under approach and departure paths
    - Noise sensitive area
    - Nearby animals (zoo, domestic)
    - Protected wildlife habitats
    - Future property values
    - Impact of traffic
    - Privacy
    - Distraction to other activities e.g. drivers
- Economic – business case if publicly funded/owned

- Environmental – largely concerned with impacts of the environment on the vertiport
  - Impact on wildlife/ecosystems
- Airspace
  - Migratory patterns
  - No fly zones e.g. prisons
  - Sensitive infrastructure, events, etc.
  - Community input on routing
  - Route planning to minimise hazard to population etc.
- Contingency
  - Contingency landing sites
  - Emergency procedures
  - Grid resilience
  - Firefighting needs
  - Locally driven building/fire regulations
  - Emergency response times
  - Resiliency contribution to transport system
  - Role in local disaster plans
  - Hazardous material procedures
- Equity
  - Impact of property value
  - Environmental justice e.g. flying over low-income neighbourhoods
  - Locations of supporting infrastructure e.g. comms, nav
  - Business models incentivised to be more equitable
  - Equal access to public resources
  - Access for those with disabilities
- Security
  - Physical
  - Cyber
- Utilities
  - Electrical
  - Data
  - Water
  - Fuel delivery/storage for hydrogen or hybrid aircraft
  - Waste water
  - Gas

The City of Ontario, Southern California, declares itself a ‘drone-ready city’. In making this claim it has used Airspace Link’s AirHub™ to map air and ground hazards and build safety case reports. AirHub™ is freely available to recreational and commercial drone pilots on the local authority’s website where they can access:

- data on areas of potential risk, advisories for local events or emergencies
- automated near real-time Low Altitude Authorization and Notification Capability (LAANC)
- approvals to fly in local controlled airspace (under 400’) in just two clicks

It worked with local businesses to get public acceptance to provide drone delivery option for less mobile residents and is working to add more businesses offering drone delivery.

It is also working with real-estate developers to encourage the incorporation of drone deliver sites<sup>45,46</sup>

The City of Ontario does not appear to have specific local legislation relating to drones.<sup>Error! Bookmark not defined.</sup>

## Conclusions and Next Steps

In our search for best practice, a clear framework that could be adopted, with modification, was not found. Instead, each successive World territory revealed an array of regulation at various governance levels. The applicable national aviation regulation does not vary enormously between developed nations but the devil in the detail arises at the local level. This could be confusing or discouraging for potential drone operators.

The current non-aviation regulatory environment does not appear to have been tested and developed in readiness for the full realisation of the value of urban drone use in any of the territories researched

Much local UK drone regulation is of questionable quality and legal enforceability.

There is a public desire for the regulation of drone use, including at a local level.

Other organisations are working with adjacent and overlapping scope to the Drone Ready Cities project and engagement with these is ongoing.

The list of identified potential activities for local authorities is long and does include some activities relating to aviation regulation. It is clear that local authorities will need to plan and prepare for urban drone use. The list provides the information needed to create a regulatory framework structure. It is intended that the list will be structured into categories and research conducted to populate these categories with relevant regulations, tools and stakeholders. This is planned to be used as input to workshops to be held with sector innovators, local authorities and other stakeholders from April 2024.

These objectives of these workshops are currently to:

- Identify areas of good regulation
- Identify areas requiring improvement
- Suggest required actions

With no territory with a clear lead in the non-aviation regulatory environment being identified and the public desire for regulation of drone use, the UK has the opportunity to take a lead in this area. This would require a non-aviation regulatory framework that can be applied widely. The framework on its own is not enough to create the change required. This would require dissemination and communication of the framework. Things that would encourage adoption could include training, advice and case studies from early adopters.

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<sup>45</sup> [ESRI, undated, "The City of Ontario Emerges as One of the First Drone-Ready Cities", esri.com, accessed 14<sup>th</sup> November 2023](#)

<sup>46</sup> [THOMAS, C., 2022, "How a Southern California City Became Drone-Ready with Geospatial Technology", govloop.com, 28<sup>th</sup> April 2022](#)

## Definitions & Abbreviations

AAM- Advanced Air Mobility

DBT - Department for Business and Trade

BEIS - Department for Business, Energy & Industrial Strategy (now within DBT)

BVLOS - Beyond Visual Line of Sight

CAA - Civil Aviation Authority (UK)

CASA - Civil Aviation Safety Authority

DfT - Department for Transport

DOT - Department of Transportation (US)

DSIT - Department of Science, Innovation & Technology

Drone – an uncrewed air vehicle for recreation and/or the carriage of sensors, detachable payload or transmitters

EASA – European Union Aviation Safety Agency

eVTOL – Electric Vertical Take Off and Landing (vehicle)

FAA - Federal Aviation Authority (US)

FAIWG:AI - Future Aviation Industry Working Group on Airspace Integration

EU – European Union

HIRTA - High Intensity Radio Transmission Areas

NAS - National Air System (US)

NASA - National Aeronautics and Space Administration (US)

NEPA - National Environmental Policy Act (US)

NREL - National Renewable Energy Lab (US)

OEM – Original Equipment Manufacturer

RPAS - Remotely Piloted Air System – often referred to as ‘drone’

SORA - Specific Operations Risk Assessment

UAM – Urban Air Mobility

UAS – Unmanned Air System (drone)

UIC2 - UAM Initiative Cities Community (EU)

UK – United Kingdom

UKRI – UK Research and Innovation

U-Space - European system that is being developed to manage unmanned aerial systems traffic

UTM - Unmanned Aircraft System Traffic Management

VLOS – Visual Line of Sight

## Appendix A – detailed findings for US states, counties and conurbations

Range of state, county and conurbation drone regulations found for USA

- state law pre-empting and forbidding local drone laws
- data protection in the case of police use of drones
- reiteration of privacy law and restrictions of data capture e.g. concerning critical infrastructure and crime scenes
- outlawing the use of drones for harassment or stalking
- restriction of drone use in certain areas e.g. local authority land, schools, prisons, parks and at particular times e.g. at night or during special events
  - some local regulations prohibit flying over city property including streets and paths
  - some prevent flying over private property without approval
  - forbidding drones e.g. City of Lakewood, CO, Town of St. Bonifacius, MN
- town and city regulations permitting the use of drones in certain parks
- mandating that cities and towns with more than one park must allow drones in at least one of them e.g. Arizona
- permitting blue light use of drones
- forbidding interference with first responders
- immunity for first responders damaging a drone interfering with the first responder while providing emergency services
- requirement for a study to identify ways to integrate UAS into blue light services
- operating drones under the influence of alcohol or drugs
- protection of wildlife
- state licensing/registration of drones e.g. Louisiana, Minnesota
- insurance for drone operators e.g. Jackson County, St. Louis City Parks, MO
- noise level restrictions e.g. Jackson County, MO
- arming of drones