

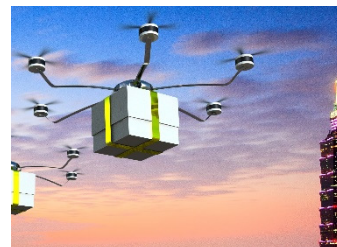


## Noise from Drones

It is predicted there could be 76,000 drones operating in the UK by 2030, with 628,000 jobs in the drone economy<sup>i</sup>. The Institute of Acoustics (IOA) has been considering the potential future noise generated by increased drones in our skies.

### Use of Drones

Drones or Unmanned Aerial Vehicles (UAVs) can be employed for a range of inspection, monitoring, and security applications. They can capture images and video; access places difficult to reach by people; carry items (from consumer goods to medical items) and, in time, are expected to transport people. Small camera-laden drones are generally remotely piloted by someone on the ground, though can also be programmed for autonomous flight. Both drones and their operators must adhere to relevant Civil Aviation Authority (CAA) regulation and follow a series of protocols in order to avoid topography, buildings, and other drones.

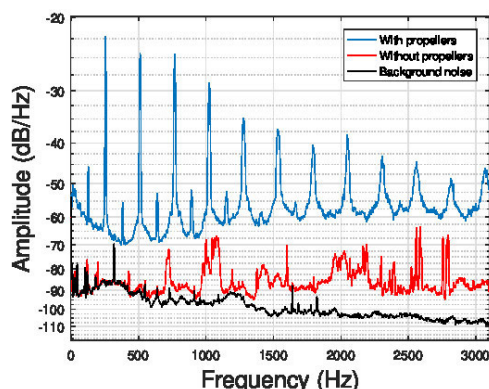


While offering a host of benefits, drones can be noisy and protocols for use should take account of the impact of noise. With safety remaining at the forefront of existing regulation and debate, noise has not been thoroughly considered. For example, although routing protocols are crucial to the safe and secure operation of these vehicles, they should also be seen as critical to minimising noise impact. Therefore, as regulation is developed to manage new drone applications, we should

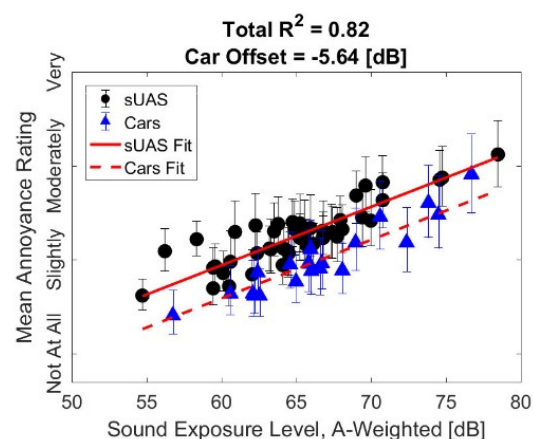
ensure both safety and noise impact are considered. Drone air taxis carrying people will likely be piloted at first but will eventually fly autonomously. The principle is the same as the personal transport pods now used at Heathrow airport for ground transport from car parks. Operating in three dimensions, air taxis will use Unmanned Traffic Management routing protocols, rather than physical guides.

### Drone noise

Drone noise is arguably more annoying than other transportation noise. This can be seen on the graph<sup>ii</sup>. Here, the black dots represent drones, which have the same annoyance rating as cars, when they are nearly 6dB quieter.



One reason for this can be seen in this graph<sup>iii</sup> plotting the sound level against the frequency of the sound. Drone sound is very tonal, with a mixture of hums and whistles caused by the rotating blades and motors.





## Potential measures for managing drone noise

- **An acceptable level of noise** needs to be established before any methodology for controlling it is designed. A balance between the need for drones and their impact on people, along with the input of technical expertise, will inform political decision-making on appropriate standards and how they should be applied. More research is certainly needed on the impact of drone noise on people.
- **Controlling noise at source** by setting maximum sound levels is indeed essential but the actual noise levels impacting communities depends on how many drones there are and where they are flying. This requires localised and case study investigations.
- **The control of flight numbers** is problematic, with drone use arguably being much more like a car than an aircraft and the number and routing of drones being in the hands of individuals. This measure should be considered in greater depth, particularly in densely populated areas being considered for drone deliveries.
- **The control of drone flightpaths** is likely to be an important consideration. This is necessary not only for reasons of privacy and security, but also the drone's potential impact on wildlife. Studies have shown that drones can be disruptive and stressful to a range of wildlife.<sup>iv</sup> Preferred routes may be adopted, where there are fewer people and wildlife, or where the noise level is already high such as above motorways. Preferred routes must always consider any safety issues.
- **Noise control relaxations and exemptions** may be appropriate, depending on the purpose of the flight. For example, should drones delivering a pizza have the same noise limits as drones carrying donor organs for transplant?

An exploratory study on the future of regulation on drone noise recommends government should use public engagement to track noise considerations around increasing drone use.<sup>v</sup>

**To find out more:** email: [briefing@ioa.org.uk](mailto:briefing@ioa.org.uk)      <http://www.ioa.org.uk>

*With thanks to Dick Bowdler FIOA and Anna Jackman, University of Reading for preparing this briefing.*

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<sup>i</sup> Skies Without Limits. [www.pwc.co.uk/dronesreport](http://www.pwc.co.uk/dronesreport) 2018

<sup>ii</sup> Andrew Christian. NASA

<sup>iii</sup> T. Blanchard, J.-H. Thomas, and K. Raoof, Acoustic localization estimation of an unmanned aerial vehicle using microphone array,

<sup>iv</sup> M Mulero-Pázmány, S Jenni-Eiermann, N Strebel, T Sattler, J José Negro, and Z Tablado (2017) Unmanned aircraft systems as a new source of disturbance for wildlife: A systematic review. PLoS ONE <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0178448>

<sup>v</sup> The Regulation of Drones: An Exploratory Study, The Regulatory Horizons Council, 2021