Written submission to

The Science and Technology Committee inquiry

on the ethical and safety implications of the growing use of civilian drones, of all sizes, across the UK

Preamble:

The Science and Technology Committee launched an inquiry to look at the ethical and safety implications of the growing use of civilian drones, of all sizes, across the UK and is looking at the written submission on:

Q1: The ethical implications of civilian drones on citizen privacy and safety in the UK;

Q2: The effectiveness of built-in drone safety features, such as tracking and monitoring capabilities, in mitigating the risks of civilian drones;

Q3: The effectiveness of anti-drone technology in mitigating the risks of civilian drones;

Q4: The economic opportunities arising from the growth of drone technology

Q5: The success, or otherwise, of regulatory frameworks for civilian drones and what should be covered in the forthcoming 'Drones Bill';

Q6: The plans for registration of civilian drones in the UK;

Q7: The current state of drone safety education and research in the UK; and

Q8: International comparators with exemplary drone-interference prevention policies.

ARPAS-UK is the UK Drone Association. It works closely with industry regulators and various stakeholders to ensure that the framework for the safe and professional operation of drones is fit for purpose and encourages best practice. Members cover all areas of the UK, and all adhere to a Code of Conduct based on safety, professionalism and respect.

ARPAS-UK is honoured to contribute to the Science and Technology Committee inquiry and to contribute to the safe development of drone operations and economy in the UK.

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Q1: The ethical implications of civilian drones on citizen privacy and safety in the UK

The use of drones raises implications in terms of:

- Safety in the air: risk that a drone hits another airborne vehicle, including a manned aircraft;
- Safety on the ground: risk that a drone lands or falls on the ground, damages property or injures an animal or a person;
- Citizen privacy: risk that a drone captures images of people without their consent;

- Security: risk that a drone is used to deliver drugs in prison, or plan robberies by capturing images of houses' backyards

These risks relate to the emergence of drones as commercial products for the recreational market, similar to flying cameras, easy to use and readily available on the market, from an industry that has limited safety and security background.

- Enhanced security risks or terrorism: risk that a drone is used to perform a malicious attack on sensitive sites, on high profile individual targets, or on crowds.

This risk relates to the military and terrorist use of drones, where enemies have used drones available on the commercial market to carry explosive devices in operational theatres.

Having stated these risks, it is important to reassess that the drone market in the UK is a regulated industry and that the regulator implemented measures to mitigate these risks. ANO 2016, 2018 and now 2019 define the framework for using a drone, applicable to recreational use on one hand and to professional remote-pilots on the other hand. The ethical and safety implications of civilian drones on citizens have been taken into account in the UK from the first drone-specific ANO amendments in 2016.

- It is illegal to take images of people without their consent;
- Recreational flight is permitted under the terms of The Drone Code only. The vast majority of recreational drone users fly responsibly;
- Professional drone operators such as ARPAS-UK members are trained professionals. They fly smart, they fly responsibly within the framework of law. They adhere to a Code of Conduct and strive to achieve best industry practice;
- Until the Gatwick incidents in December, we were not aware of significant incidents in the UK.

Q2: The effectiveness of built-in drone safety features, such as tracking and monitoring capabilities, in mitigating the risks of civilian drones

Commercially available drones non-toys or above a certain mass generally offer tracking and monitoring solutions through GPS positioning. This feature enables the remote pilot to take immediate actions in case of an emergency.

Drone manufacturers such as DJI have also implemented a geo-fencing function that prevents remote pilots from flying in no drone zones.

These measures significantly mitigate safety risks. However:

- These features are not designed to protect citizen privacy. But one might argue that cameras have not been designed to prevent paparazzis from taking illegal photos either;
- Geo-fencing could be circumvented or deactivated on certain solutions. But one might argue that cars have not been designed to prevent drivers from hitting pedestrians on the sidewalk, nor have trucks been designed to prevent their drivers from hitting the crowds on Westminster Bridge.
- Statistics on the reliability of solutions or specific features are not available, which makes it difficult to assess their effectiveness.

Q3: The effectiveness of anti-drone technology in mitigating the risks of civilian drones

Counter-UAV or anti-drone activities relates to situations where a drone, or several drones, are used illegally and may cause an incident resulting in damages or injuries. Such situation may be the result of an earnest involuntary technical or human error, or lack of training and knowledge (eg distressed friendly pilot), or malevolence (eg a remote-pilot with malicious intent).

The case of the distressed or unaware friendly remote pilot can be considered as a matter of information dissemination, training, and regular law enforcement.

The case of malicious intent resulting from domestic or international threat is a matter of counter-UAV. They are principally the domain of the Home Office and to the extent the counter UAV involves flight, either the Department for Transport and Civil Aviation Authority, or the Ministry of Defence.

Nevertheless, our understanding is that several technologies are being experimented and several solutions are maturing. Major R&D countries in this field such as the USA and Russia are currently investing significant amounts in this field.

The typical steps in Counter-UAV are :

- Detect, by using one or combining several of the following technologies and leveraging data-fusion to combine the data and reach detection effectiveness:
    - Radar. Traditional radars detect large fast moving objects eg a missile, an air-craft. Birds and most recreational drones may be discarded as noise by tradi-tional solutions and eliminated. Radar technologies must therefore be adapted to reach detection effectiveness;
    - Radio frequency detection: identify drones by scanning for frequencies used;
    - Electro Optical: identify drones based on their visual signature (during day time);
    - Infra-Red: identify drones based on their heat signature;
    - Acoustic: detection based on the unique sound produced by the drones. Its implementation can be challenging in noisy contexts such as airports.
- Categorise:
    - Algorithms sort the data, eliminate noise and make positive identification: bird vs drones, then what kind of drone;
    - The next step is to categorise friendly drones that are authorised in the area (for example: police crowd surveillance during an event, or drone filming the event) vs unidentified drones or malicious drones.
- Track, ie lock the signal and follow it
- Neutralise
    - Radio frequency or RF jamming, including RF jamming “guns”: drone loses link with ground control station. They normally hover, then return to home;
    - GNSS jamming: drone loses its satellite link. They normally hover, then return to home;
    - Spoofing: take control of/hijack the communication link and feed false or new command to the drone such as “land”;

- Localisation of ground-control station through RF tracing and apprehension of the remote pilot;
- Direct-energy “guns” to burn the drone;
- Regular guns and weapons;
- Nets;
- Eagles;
- A drone or a swarm of drones to jam locally, or neutralise locally

Q4: The economic opportunities arising from the growth of drone technology

The economic opportunities arising from the growth of drone technology are expected to be significant. Drones create value by gaining time, reducing costs, reducing workers’ exposure to dull, dangerous, or dirty missions, providing unique insight from the sky, delivering engineer-grade digital twins of reality… Drones have a positive impact in very wide array of applications.

In fairness it is difficult to predict and quantify accurately the future. However many consulting firms across the globe, including PWC in the UK, but also McKinsey, BCG, Accenture, Roland Berger and other major consulting firms point in that positive direction.

The growth and job opportunities spread across the value chain:

- The end-users industries eg farmers, surveyors, infrastructure managers…
- The big data and artificial intelligence industries. Images and data captured by drones are the fuel to new data-driven services, providing not only massive quantities of raw data, but also the opportunity for new services based on data analysis. For example, the construction industry is gradually embracing the benefits of digital twins of buildings and construction sites in order to better plan their work and their maintenance
- The design, manufacture, distribution and maintenance of unmanned aerial systems.
- The technological building blocks that are part of the unmanned aerial systems, such as the platform itself, the hardware, the power sources, the software, the communication modules, the system’s cybersecurity
- The enabling infrastructure such as the telecommunication networks and the future unmanned traffic management system
- The provision of services at each of these steps: data as a service, operations as a service, training, maintenance services, leasing of drones, but also UTM as a service or geofencing as a service
- The provision of counter-UAV technologies and services.

Drones are part of the autonomous vehicle evolution, as well as the digital transformation. Their development has the potential to create growth opportunities on the domestic market and on the export markets across the value chain.

Q5: The success, or otherwise, of regulatory frameworks for civilian drones and what should be covered in the forthcoming ‘Drones Bill’

The UK has been one of the leading countries in providing a regulatory framework that allows the safe expansion in the use of drones.

Like other regulatory matters, a significant effort in communication is required to ensure that citizens are aware of the law and abide by it.

Equally, a dedicated effort is required to ensure that the law is enforced and the forces have received appropriate training, have clarity on their mandate and the capacity to act.

As a trade association of professional operators, we are keen to see visible actions against illegal operations because they damage the industry's reputation.

At the same time, we are keen to ensure that these enforcement measures will not result in excessive interference or blocking of lawful operations by approved operators.

A possible way to ensure a balancing approach would be to set a regular reporting on the number of interventions, and resulting law enforcement actions.

Q6: The plans for registration of civilian drones in the UK

We welcome the plan that drone operators should register themselves and their drones for drones weighing 250grams or more.

A similar registration has been in place in the USA for a few years, through a web portal, FAAdronezone.faa.gov, for drones weighing 0.55lbs or 250grams or more.

In Ireland, drone registration has been mandatory since December 2015. All drones over 1kg must be registered through a web portal, as do all drones, irrespective of weight flown higher than 15m above the ground or water. In France the web portal Alphatango was launched in October 2018. Operators/remote pilots owning a drone of 800g and more must register themselves and their drone, as well as follow online training and test.

The draft European drone regulation provides for similar registration, online training and test, for operators of drones weighing 250g and more.

In practice, implementation through a very easy-to-use web portal will be key to facilitate recreational users onboarding.

Q7: The current state of drone safety education and research in the UK

The training of "Permission for Commercial Operations" PfCO holders who operate commercially is undertaken via "National Qualified Entities". NQE's are authorised and audited by the Civil Aviation Authority. There are plans to provide online training and testing in particular for the leisure community, as part of the registration process, when it is announced.

ARPAS UK believes there should be a practical element as well as an online component, in order to enhance overall safety associated with the use of Drones.

Q8: International comparators with exemplary drone-interference prevention policies.

It was made public that Russia equipped large cities hosting the football world cup 2018 with military grade anti drone technology , possibly RF radio-frequency jamming guns.

It was also made public that Paris Roissy Charles de Gaulle airport is testing the Hologard solution based on a holographic radar coupled with electro-optic EO sensors. Data fusion is implemented to mix intelligence from the sensors. The detection range is expected to be 5km, so around 5 minute warning at 70km/h.