



Department
for Transport

Taking Flight: The Future of Drones in the UK

Moving Britain Ahead



July 2018

The Department for Transport has actively considered the needs of blind and partially sighted people in accessing this document. The text will be made available in full on the Department's website. The text may be freely downloaded and translated by individuals or organisations for conversion into other accessible formats. If you have other needs in this regard please contact the Department.

Department for Transport
Great Minster House
33 Horseferry Road
London SW1P 4DR
Telephone 0300 330 3000
Website www.gov.uk/dft
General enquiries: <https://forms.dft.gov.uk>



© Crown copyright 2018

Copyright in the typographical arrangement rests with the Crown.

You may re-use this information (not including logos or third-party material) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/> or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or e-mail: psi@nationalarchives.gsi.gov.uk

Where we have identified any third-party copyright information you will need to obtain permission from the copyright holders concerned.

Contents

Foreword	6
Executive summary	8
How to respond	10
Freedom of Information	10
Confidentiality and data protection	10
1. Introduction	12
What is a drone?	12
Benefits of drones	13
Delivering the Government's industrial strategy with drones	13
Summary of existing legislation on drones	14
Tackling drone misuse and raising awareness of the rules	15
Future Regulation	16
Consultation outline	18
Section A - Foundation of future flights: The Air Navigation (Amendment) Order 2018	19
2. Minimum Age Requirements for Drone Operators	20
Overview of the role of Drone Operator and Remote Pilot	20
Establishment of a proposed minimum age	22
Proposed minimum age restriction for drone operators	22
3. Restrictions on small drone flights near protected aerodromes	25
Why drone flight restrictions near aerodromes are required	25
Action the Government has taken	26
Future review of the aerodrome restriction	28
4. Model Aircraft Flying Associations & the impact of drone legislation	30
Introduction	30
Outcomes of engagement between Government and model aircraft flying associations so far	31
Section B: A Draft Drones Bill	32
5. Mandating and/or regulating the use of a Flight Information and Notification System(s) (FINS(s)) for certain drone activities and users	33
Purpose	33

Overview	34
The Flight Information and Notification System	35
Pre-flight Notification	35
Responsibility	36
Making a FINS(s) available to the public	39
Accessibility to a FINS(s)	40
Managing System Provider(s)	42
Data sharing	42
Payment	45
Model Aircraft Clubs	47
6. Police Powers Relating to Drones and Fixed Penalty Notices	48
Introduction	48
The challenges of enforcing of law and pursuing investigations	48
What the Government is aiming to do	49
Fixed Penalty Notices	54
Section C: The Future: Counter-drone technology and modelling the uptake of drones.	56
7. Counter-Drone Technology	57
Introduction	57
Threat	57
Government approach	57
Framework	58
Reducing reckless or negligent drone use and deterring hostiles	58
Detecting drone activity	59
Assessing the security threat posed by a drone	61
Taking responsive action to disrupt or stop the continued operation of a drone which poses a threat	63
Testing drone detection technology and drone electronic effectors	66
8. Commercial Drone Scenario Modelling	69
Introduction	69
Approach	69
Commercial Users	69
Commercial Drones	70
What will happen next	73
Annex A: Impact assessment	74
Annex B: Full list of consultation questions	75
Annex C: Consultation principles	89

Annex D: Situational hierarchy between an SUA operator and remote pilot of an SUA	90
Annex E: List of protected aerodromes	92

Foreword

Drones and unmanned aircraft present both exciting benefits to society, and challenges we must address.

Since the end of the Department for Transport's drone consultation last year, there has been considerable activity which has further highlighted the potential benefits that drones can bring to the UK. In November, the industrial strategy set out how we are building a Britain fit for the future, with significant opportunities for new modes of transport to revolutionise how we transport people and goods around the country. In February, Nesta announced the 5 cities selected as part of the Flying High Challenge, working together to develop aspirations for drone use based on local community needs and ambitions. In May, PwC announced that the social and economic benefits of drones in the UK by 2030 could be as much as £16bn in net cost savings, adding £42bn to GDP, with over 600,000 drone sector jobs.

But drones can also be misused, risking safety, security and privacy.¹ As we look to the future, the Government is focused on ensuring the potential of drones is harnessed for the UK, whilst appropriately addressing the risks. In the last year, the Government has taken action to do so. In May, we amended current laws relating to small unmanned aircraft (also referred to in this document as "small drones") to put in place new flying restrictions, and introduce registration and pilot test competency requirements. The 400ft height and flying near aerodromes restrictions will come into force on 30th July 2018.

But this was just the first step in the drones legislative programme being developed by the Department for Transport. This consultation is the next. Your views will shape the content and impact of a draft Drones Bill covering new technology such as apps and possible future drone traffic management systems, and police powers to enforce the law. This consultation also covers the minimum age for being an operator of a small drone and the recent restriction on flying near aerodromes which we put in place. Finally we are seeking your input into how counter-drone technology in the UK could and should be used to protect sensitive national infrastructure and large events from potential malicious use of drones.

¹ For the purposes of this consultation, the terms drone and drones are used as shorthand for drones and other unmanned aircraft.

We want our measures to help create the right conditions for this technology to grow, tackling misuse of the technology and ensuring the public's trust in the sector. Ensuring drones are being used safely and properly will pave the way for their increasing use in society. This aligns with the approach of the Future of Mobility Grand Challenge and the Government's modern industrial strategy.

As well as this, in 2019, the DfT will publish our Aviation Strategy, where the use of innovative technology and a new approach to regulation is integral to delivering cleaner, quieter and quicker journeys. This is an exciting and pivotal moment for the use of drones in the UK.

A handwritten signature in black ink, appearing to be 'L. Sugg', written in a cursive style.

Baroness Sugg

Minister for Aviation, Department for Transport

Executive summary

Last year the Department for Transport (DfT) published its response to the consultation 'Unlocking the UK's high tech economy: consultation on the use of drones in the UK' which set out proposals to develop the UK's policy and regulatory framework for drones. As now, our approach was to address the challenges without restricting opportunity, to ensure the UK remained competitive in this developing market sector, whilst maintaining high standards.

In the UK, drones are used by a wide variety of industries and public sector services. The police, fire service and search and rescue use drones in emergency situations, providing vital support in critical situations. Farmers use them to inspect crop growth, and maximise their output. They are also used in a wide variety of harsh and difficult environments, and reduce the risks associated with this work. There are possibilities for business and the public sector to create new high tech jobs and boost the UK economy in ways which could not have been conceived a few years ago.

On 30th May 2018 the Government laid new legislation in the Houses of Parliament, amending the Air Navigation Order 2016, to introduce:

- A height restriction of 400ft for all small drones;
- A 1km restriction on all small drone flights around protected aerodromes;
- A registration scheme for operators of small drones of a mass between 250g and 20kg inclusive; and
- Competence requirements for remote pilots of small drones of a mass between 250g and 20kg inclusive.

Exemptions can be made for innovative, commercial use of drones above 400ft or within 1km of a protected aerodrome boundary if the CAA deems it appropriate and safe to do so.

These new measures, alongside an upcoming draft Drones Bill, are the first step in setting the UK on a path to be a global leader in the drones market, tackling misuse to build public confidence in drone technology and encourage positive, innovative drone use in the UK.

This consultation covers:

Next steps following the amendments made to the Air Navigation Order 2016 by the Air Navigation (Amendment) Order 2018 (the 2018 Amendment Order):

- The proposed age limit for small drone operators
- Whether the airport restriction coming into force on 30th July 2018 is sufficient, and if not, what kind of further extension should be considered;

The possible content of a draft Drones Bill:

- The proposed use of a flight information and notification system (FINS) or systems (FINSs) prior to and/or whilst flying certain types of drone or for certain types of users, and how this could or should be regulated;
- Police powers relating to drones and fixed penalty notices;

Looking further forward:

- How counter-drone technology could be used as a means of addressing the potential threat malicious misuse of drones can pose; and
- The estimated growth in numbers of commercial drones in the UK over future years.

The views gathered in this consultation will influence the future steps Government takes. Aviation is a reserved matter (i.e. the subject matter has not been devolved to the devolved parliaments in Scotland, Wales and Northern Ireland). As such, aviation legislation, including drone-specific legislation, is the responsibility of the UK Parliament. It is anticipated that any legislation resulting from this consultation will extend to the whole UK. The Government will keep this under review and continue to engage with the devolved administrations as policy proposals develop and any proposed legislation is drafted.

How to respond

The consultation period began on 26 July 2018 and will run until 17 September 2018. Please ensure that your response reaches us before the closing date as there can be no extensions to this. If you would like further copies of this consultation document, it can be found at <https://www.gov.uk/dft#consultations> or you can contact dronesconsultation@dft.gov.uk if you need alternative formats (Braille, audio CD, etc.).

Consultation responses should be submitted through the online survey to be found on the gov.uk page for this consultation.

Freedom of Information

Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the Freedom of Information Act 2000 (FOIA) or the Environmental Information Regulations 2004.

If you want information that you provide to be treated as confidential, please be aware that, under the FOIA, there is a statutory Code of Practice with which public authorities must comply and which deals, amongst other things, with obligations of confidence.

In view of this it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information, we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department.

The Department will process your personal data in accordance with the Data Protection Act (DPA) and in the majority of circumstances this will mean that your personal data will not be disclosed to third parties.

Confidentiality and data protection

The Department for Transport (DfT) is carrying out this consultation on drone legislation in the UK. The consultation is being carried out in the public interest to inform the development of policy. DfT is the data controller for your personal information.

As part of this consultation we're asking for your name and email address. This is in case we need to ask you follow-up questions about any of your responses. You do

not have to give us this personal information. If you do provide it, you consent to DfT using it only for the purpose of asking follow-up questions.

This consultation document has been developed in collaboration with other Government departments and partner agencies. Consultation responses may be shared with these other bodies, but will not include personal details on respondents. This will aid in the facilitation of future Government policy development and legislation.

You can withdraw your consent to be contacted at any time by emailing dronesconsultation@dft.gov.uk.

DfT's privacy policy has more information about your rights in relation to your personal data, how to complain and how to contact the Data Protection Officer. You can view it at <https://www.gov.uk/government/organisations/department-for-transport/about/personal-information-charter>.

To receive this information by telephone or post, contact us on 0300 330 3000 or write to Data Protection Officer, Department for Transport, Ashdown House, Sedlescombe Road North, St Leonards-on-Sea, TN37 7GA.

Your personal information will be kept securely on a secure IT system within DfT and destroyed within 12 months after the consultation has been completed.

1. Introduction

What is a drone?

- 1.1 In the context of this consultation, a 'drone' is an unmanned aircraft.² The Air Navigation Order 2016 (ANO) defines "small unmanned aircraft" (SUA) as "any unmanned aircraft, other than a balloon or a kite, having a mass of not more than 20kg without its fuel but including any articles or equipment installed in or attached to the aircraft at the commencement of its flight."
- 1.2 Typically, an unmanned aircraft will be controlled by a ground based remote pilot, with a communications system linking the two. This is collectively referred to as an Unmanned Aircraft System (UAS).
- 1.3 A drone is also sometimes referred to as a Remotely Piloted Aircraft System (RPAS). However as technology progresses, drones are becoming increasingly automated, and may one day become fully autonomous without the need for a remote pilot. In the future, highly automated or autonomous drones could feasibly be used to deliver critical medical supplies between hospitals, carry out storm damage surveys along miles of pylons, or search for a missing person over miles of land without a pilot needing to be physically present.
- 1.4 Drones come in a variety of shapes and sizes, ranging from small handheld devices, up to large aircraft, potentially a similar size to airliners. They can be of a fixed wing design like a commercial airliner, rotary wing like a helicopter, or a combination. Drones may also include more traditional radio controlled aircraft, and model aircraft.
- 1.5 Smaller drones typically use electric motors for propulsion, whereas larger drones tend to use combustion engines, similar to other conventional aircraft.
- 1.6 Drone flights typically fall into two categories:
 - Commercial - where the flight is being conducted for business purposes;
 - Recreational - where the flight is being conducted as a pastime, or in a sporting capacity (i.e. non-commercial).
- 1.7 Drones are typically categorised in the UK according to their mass, with heavier categories of drone having specific additional requirements placed on their operators and pilots. Drones are currently split into three separate categories according to their mass:
 - 20kg or less - Small Unmanned Aircraft (SUA) - this class covers all types of drones including remotely controlled model aeroplanes, helicopters or gliders, as well as remotely controlled toy aircraft. These SUA are subject to certain aviation laws in the ANO.
 - >20kg to 150kg - Light Unmanned Aircraft - this class covers the larger and potentially more complex types of unmanned aircraft and large model aircraft.

² The terms "drone" and "drones" are used as shorthand for both drone(s) and other unmanned aircraft.

This class of drones is subject to all aspects of UK aviation law. Approval for this class of drone to operate is granted by the Civil Aviation Authority (CAA) following review of a safety case for the planned drone operation(s).

- Over 150kg - unmanned aircraft within this class are subject to the same level of regulatory approval as manned aircraft. They will normally be certified by the European Aviation Safety Agency (EASA), although there is also scope to make approvals for UK-only operations via the same process that is used for Light Unmanned Aircraft.

Benefits of drones

- 1.8 Drones have the potential to significantly change the use of UK airspace. Recent analysis by PwC showed that there could be over 76,000 commercial drones in UK skies by 2030, with more than a third utilised in the public sector (including in defence, health and education).³
- 1.9 The uplift in the use of drones in the UK has the potential to bring economic benefits to a large number of sectors. According to PwC, the use of drones across a wide range of UK industries could deliver net cost savings of up to £16 billion by 2030 through increased productivity. The technology, media and telecoms sector stands to save the most through the deployment of drones, with a potential net saving of £4.8 billion by 2030.
- 1.10 Drone technology can create opportunities for both skills development and job creation. The Government's industrial strategy has set out the ambition to cement the UK's status as the leading location for technology companies to want to build their business, and drones will form an important part of this strategy.
- 1.11 Drones are in use today by police, fire, and search and rescue services in emergency situations. Internationally, between May 2017 and April 2018 at least 65 lives were saved using drone technology, according to a report by DJI.⁴ Drones are also being used to maintain and inspect key national infrastructure - reducing the risk of accidents and resulting in substantial improvements in industry productivity, efficiency, and cost.

Delivering the Government's industrial strategy with drones

- 1.12 Robotics and autonomous systems, including drones, are critical to realising economic growth in the UK through improving productivity. As a tool that can be deployed across many sectors, drones provide a key opportunity for the Government to deliver on its industrial strategy. They can also help tackle future global challenges.
- 1.13 For example, it is predicted that overall global agricultural consumption will increase by 69% from 2010 to 2050. The use of drone monitoring and autonomous machinery can significantly improve crop management and increase harvests in order to meet this rising demand.⁵
- 1.14 The Government recognises the need to unlock policy and regulatory barriers, and to encourage innovation as drone technology develops. This must be achieved whilst

³ <https://www.pwc.co.uk/dronesreport>

⁴ <https://www.dji.com/newsroom/news/drones-rescued-at-least-65-people-in-previous-year>

⁵ <https://www.pwc.pl/en/publikacje/2016/clarity-from-above.html>

ensuring that drones are operated with high standards of safety, security and privacy. BEIS, DfT and the Transport Systems Catapult are working on this to create a coherent regulatory environment in which an effective drone sector can develop.⁶

- 1.15 UK drone companies are also exporting their services across the world, further cementing the UK's place as a global leader in innovative services and generating productivity and growth across a range of international sectors.
- 1.16 The Flying High Challenge, funded by Innovate UK and run by Nesta, was launched in November 2017.⁷ The project aimed to help cities develop a vision of how drones could be integrated into complex city environments in order to address local needs. An independent panel of judges, including Government representatives, selected five cities or city regions to take on the challenge: Bradford, London, Preston, Southampton and the West Midlands.
- 1.17 These five cities and city regions identified key complexities involved in using drones, such as technology, infrastructure, regulation, safety and privacy. The Flying High report, which was published on 23rd July 2018, identified the need to update regulations to reflect advances in drone technology, particularly around management of urban airspace, and advised that further investment in infrastructure to support drones is required.⁸
- 1.18 Within the DfT, innovation funding has enabled small and medium enterprises to develop their drone products and research, develop and test concepts that will support a future drone economy. In 2017, 4 projects were selected for funding through competition:
 - Altitude Angel - developing a digital system of systems for aircraft, operator and pilot management, flight planning and real-time safety awareness.
 - Gnosys Global, Eagle Eye Innovations Ltd, and Big Sky Theories Ltd - investigating which technologies and procedures are most suitable for the command and control of a drone beyond visual line of sight (BVLOS).
 - SalusUAV and University of Bath - developing automated flight planning and control systems which dynamically determine the flight path with least safety risk based on real-time data sources.
 - University of Kent - adapting research developed for automated object avoidance on electric wheelchairs for use in drones, allowing it to fly to a specific destination while intelligently avoiding obstacles along its route.
- 1.19 It is projects such as these, alongside the Government's wider drone programme, which are driving the UK's position as a global leader in drone services.

Summary of existing legislation on drones

- 1.20 All drones must be used in accordance with the rules set out in the ANO.
- 1.21 The ANO requires small drone pilots to maintain direct, unaided visual contact with their drone and that any person must not recklessly or negligently cause or permit their aircraft to endanger any person or property. Also set out in the ANO are the penalties resulting from misuse, including up to five years' imprisonment for anyone

⁶ The TSC is a not for profit organisation that works in collaboration across academia, Government, industry and SME's to provide innovative UK transport solutions and drive economic growth. It is one of eleven technology and innovation centres established and overseen by the UK's innovation agency, Innovate UK.

⁷ <http://flyinghighchallenge.org/>

⁸ <https://www.nesta.org.uk/report/flying-high-challenge-future-of-drone-technology-in-uk-cities/>

endangering an aircraft. A small drone remote pilot must only fly the aircraft if reasonably satisfied that the flight can safely be made.

- 1.22 When a small drone is equipped with a camera, rules are considerably stricter. The remote pilot must not fly their small drone within 50m of a person, vehicle or building and must also avoid flying over or within 150m of densely populated areas.
- 1.23 In addition, SUA operators and remote pilots that collect personal data must comply with the Data Protection Act 2018 (DPA), unless a relevant exemption applies. The requirements of the DPA are overseen by the Information Commissioner's Office (ICO) which can take enforcement action against people who breach the DPA by requiring them to change practices, impose fines, or by prosecution for unlawfully obtaining or accessing personal data.
- 1.24 In May 2018, the Government laid the 2018 Amendment Order, introducing into the ANO a 400ft height restriction and a 1km restriction around certain aerodromes when air traffic control is operating for small drones. These provisions will come into force on 30th July 2018. As with other parts of the ANO, the CAA are able to exempt remote pilots and SUA operators from these rules if it deems appropriate.
- 1.25 The 2018 Amendment Order also introduced in to the ANO specific duties on SUA operators (the SUA operator is defined as the person who has the management of the small unmanned aircraft), and remote pilots of small unmanned aircraft of 250g-20kg in mass. These new requirements relate to the registration of the SUA operator and the competency of the remote pilot, which must be complied with before a small drone of this mass is flown. These registration and competency requirements will come into force on 30th November 2019. Information on compliance with these laws has been released by the CAA and is available online.⁹

Tackling drone misuse and raising awareness of the rules

- 1.26 There have recently been a number of prosecutions for criminal use of drones. In 2017, an individual was given a community resolution sentence after being reported for breaching the ANO by flying a drone a short distance from the Tornado steam train.¹⁰ The first successful prosecution relating to a drone was in 2014, when an individual was prosecuted for flying a drone within 50 meters of Jubilee Bridge near the BAE System submarine testing facility.¹¹ Since then, prosecutions have increased.
- 1.27 The Prison Service has also led a number of prosecutions. To date, there have been at least 30 convictions related to drone activity, with those sentenced serving a total of more than 100 years in prison.
- 1.28 Whilst some drone users knowingly flout the law, the Government thinks it likely that the vast majority of drone users breaking the rules are unaware of the law and are doing so unintentionally.
- 1.29 To tackle this, the DfT has been working with the CAA to raise awareness of the law with drone users, both commercial and recreational. Through the 'Dronecode' safety awareness campaign, the CAA aims to teach a simple set of rules to ensure that those who use drones are doing so safely, and within the law.

⁹ <http://publicapps.caa.co.uk/docs/33/CAP1687-SUAANOAmendmentOrder-3.pdf>

¹⁰ <https://www.networkrail.co.uk/communities/safety-in-the-community/drone-safety-law-unmanned-aircraft-vehiclesuavs/>

¹¹ <https://www.theguardian.com/world/2014/apr/02/uk-first-drone-conviction>

- 1.30 In 2016 the CAA reviewed the impact of the Dronecode and its impact on user behaviour. The report showed that 73% of public thought it was very important that drone users adhere to the code. But whilst 54% of drone users were aware of the name 'Dronecode', few could recall specific rules when asked.¹² Since then, the CAA has intensified its work on the Dronecode to try and improve this awareness.
- 1.31 The Government has also encouraged the use of safety apps, such as 'Drone Aware' - a smartphone app which is designed to highlight where it is unsafe, or illegal, to fly a drone. As part of this consultation, we will be seeking views on whether the Government should mandate the use of similar systems when using a drone.
- 1.32 Safety apps such as this could be an important precursor to drone traffic management systems. It is envisaged that these systems would replicate safety standards of manned aviation traffic management and would also help to enable the next stage of drone development, such as the ability to routinely fly BVLOS. As we look to the future, the number of drones in UK skies is expected to be significant.
- 1.33 There is not yet a clear understanding of what systems and procedures might be required, but there are a number of measures we can take to prepare. This includes efforts such as ensuring that all drone operators and pilots have the ability to understand exactly where they can and cannot legally fly a drone, and which allows them to plan a safe and legal flight. We are considering the use of flight information and notification services for drone users to be aware of what restrictions apply to their flight, and in turn file flight plans or incident logs. The geo-awareness, that flight information and notification systems could provide, will be supported by outcomes from Project Chatham. Project Chatham is a DfT project working to provide a relevant and authoritative "map" to the drone community based on existing airspace information.
- 1.34 In the long term, the increase in drone traffic will be met with an increase in conventional air traffic, requiring a broader analysis of how all air traffic is managed.

Future Regulation

- 1.35 The Government has set out its intention previously for a programme of drone regulation, which adapts to changes in the drone sector as they happen. The 2018 Amendment Order was the first step in this programme.
- 1.36 Following this consultation, the Government will consider responses and produce a draft Drones Bill for publication. It will also announce next steps with regards to the other proposals in this consultation.
- 1.37 The UK is not alone in seeking to introduce new measures on drones. The "Basic Regulation" is an EU Regulation, the main objective of which is to establish and maintain a high uniform level of civil aviation safety in Europe. It is in the process of being updated. The European Parliament and Council of the European Union recently voted to adopt the "Revised Basic Regulation", which will apply to all unmanned aircraft and sets out essential requirements for the design, production, maintenance and operation of drones.¹³ The revised Basic Regulation also contains provisions which empower the Commission to adopt delegated and implementing acts setting out detailed rules and provisions; currently, two regulations are being worked on which cover issues such as drone product safety standards,

¹² http://dronesafe.uk/wp-content/uploads/2016/11/CAA_Consumer_Drone_Users_report.pdf

¹³ Regulation of the European Parliament and of the Council on common rules in the field of civil aviation
<http://data.consilium.europa.eu/doc/document/PE-2-2018-REV-1/en/pdf>

interoperability of Member State registration schemes, and requirements of pilot competency tests. The two regulations are scheduled to be voted on by the EASA committee later in 2018 and likely to come into force in December 2018/January 2019. More information on both regulations and the EASA Opinion and Guidance, can be found on the EASA website: <https://www.easa.europa.eu/easa-and-you/civil-drones-rpas>

- 1.38 The Government and the CAA continue to engage with EASA on the development of its Basic Regulation and associated implementing regulations.
- 1.39 On 23 June 2016, the EU referendum took place and the people of the UK voted to leave the European Union (EU). Until exit negotiations are concluded, the UK remains a full member of the European Union and all the rights and obligations of EU membership remain in force. During this period the Government will continue to negotiate, implement and apply EU legislation. The outcome of these negotiations will determine what arrangements apply in relation to EU legislation in future once the UK has left the EU.
- 1.40 It is, therefore, the Government's intention that UK drone legislation will meet the requirements of the Revised Basic Regulation, implementing regulations and EASA Guidance as necessary. The Government and the CAA will continue to engage with EASA on the development of these EU reforms and new UK legislation in parallel.

Consultation outline

Chapter	Title	Legislative context	Who should respond
2	Minimum age requirements for SUA operators	The 2018 Amendment Order provides that the Secretary of State may prescribe a minimum age for SUA operators. Responses to this chapter will inform the decision on a minimum age for drone operators	Drone operators and remote pilots, the general public
3	Restrictions on SUA flights near protected aerodromes	These restrictions were included in the 2018 Amendment Order. Responses will inform an assessment into whether the 1km restriction around aerodromes is sufficient.	Drone operators and remote pilots, general public, airports and other aviation stakeholders.
4	Model aircraft flying associations and the impact of drone legislation	This chapter details the outcome of engagement with model aircraft flying associations on drone legislation and how to lessen the burden of drone legislation on members of these associations.	Members of model aircraft flying associations, other aviation stakeholders.
5	Mandating and/or regulating a Flight Information and Notification System(s) for certain drone activities and users	For potential inclusion in a draft Drones Bill. Responses will inform the decisions as to what should be put into legislation	Drone operators and remote pilots, app companies, general public.
6	Police powers and fixed penalty notices	For potential inclusion in a draft Drones Bill. Responses will inform the decisions as to what should be put into legislation.	Drone operators and remote pilots, police forces and organisations, general public.
7	Counter-drone technology	Responses will be used to inform Government policy and possible future legislation.	Counter-drone technology companies, drone manufacturers and industry stakeholders, drone operators and remote pilots, general public.
8	Drone scenario modelling	No legislation - responses will inform data used by DfT in assessing impact of legislation on the sector.	Companies which either operate, or plan to operate drones in the future, drone manufacturers, drone industry bodies.

Table 1 Outline of the consultation and the legislative context of chapters.

Section A - Foundation of future flights: The Air Navigation (Amendment) Order 2018



This section relates to further options for measures which were included in the 2018 Amendment Order:

- The introduction of a minimum age for SUA operators; and
- Increasing the 1km restriction zone for small drones around protected aerodromes.

2. Minimum Age Requirements for Drone Operators

Overview of the role of Drone Operator and Remote Pilot

- 2.1 There are currently no age restrictions in UK legislation with regards to the use of small drones for leisure purposes. The CAA has a minimum age requirement of 18 to have a permission issued allowing operators to conduct any commercial operations with their drone. A permission is valid for up to 12 months, and subject to annual renewal.¹⁴
- 2.2 The Government has defined in the recent amendment to the ANO two distinct roles - the SUA operator, and the remote pilot. These roles are defined in the table below:

Role	Definition
SUA Operator	The person who has the management of the small unmanned aircraft.
Remote Pilot	The individual who operates the flight controls of the small unmanned aircraft by manual use of the controls, or when the small unmanned aircraft is flying automatically, monitors its course and is able to intervene and change its course by operating its flight controls.

Table 2 Definition of Drone Remote Pilot and Operator, as provided for in the ANO 2016, as amended by the 2018 Amendment Order¹⁵ laid on 30th May 2018.

Role of the Operator

- 2.3 For every SUA, there should be an SUA operator, as well as a remote pilot or pilots.
- 2.4 The relationship structure for operators and remote pilots is set out in Annex D.
- 2.5 The list in table 3 below outlines the requirements on the operator. Please be aware this list is not exhaustive.

¹⁴ <https://www.caa.co.uk/Commercial-industry/Aircraft/Unmanned-aircraft/Small-drones/Permissions-and-exemptions-for-commercial-work-involving-small-drones/>

¹⁵ <http://www.legislation.gov.uk/ukxi/2018/623/made>

Responsibility area	Specific requirements
Remote pilot competence	As of 30th November 2019, the SUA operator must not cause or permit the SUA to be flown unless they have reasonably formed the view that the remote pilot of the aircraft has been issued with a valid acknowledgement of competency.
SUA operator registration	As of 30th November 2019, the SUA operator of a drone of 250g-20kg in mass will be required to register themselves before causing or permitting any of their small drones to be flown.
SUA flight restrictions	<p>The operator must not cause or permit a small drone to be flown at a height of more than 400ft above the surface, unless permission of the CAA has been obtained.</p> <p>The operator must not cause or permit the small drone to be flown in the Inner Zone or the Outer Zone of a protected aerodrome in the set of circumstances set out in article 94B of the ANO.</p>

Table 3 Summary of responsibilities of the drone operator

Role of the Remote Pilot

- 2.6 In accordance with the definition in the 2018 Amendment Order, the remote pilot is the person who is operating the flight controls of the drone.
- 2.7 Specific areas of responsibility for a remote pilot are set out below in table 4.

Responsibility Area	Specific Requirements
Remote Pilot competency	From 30th November 2019, before flying an SUA of a drone of 250g-20kg in mass, the remote pilot will be required to obtain a valid acknowledgement of competency from the CAA.
Ensuring a safe and legal flight	The remote pilot of a small drone may only fly the aircraft if reasonably satisfied that the flight can safely be made.
SUA flights	The SUA remote pilot will be responsible for ensuring they are adhering to all other relevant articles of the Air Navigation Order 2016, such such as restrictions on height limits which drones can fly up to, ensuring the drone is kept within visual line of sight, and avoiding any restricted airspace (such as near airports or sensitive sites).
Operator registration number	As of 30th November 2019, for a drone of between 250g-20kg in mass, the remote pilot must ensure the SUA operator's registration number is affixed onto the drone and that the operator has a valid certificate of registration.

Table 4 Summary of responsibilities of the Remote Pilot

Establishment of a proposed minimum age

- 2.8 Drones are flown by a wide range of people, including minors. Age is not necessarily an indicator of competence and the Government does not want to unnecessarily restrict access to the market by young people, particularly as early use of technology can build vital skills for later in life.
- 2.9 The previous section lays out the different roles and responsibilities of the SUA Operator and Remote Pilot. Chiefly, these differences are:
- For an SUA operator, that they are responsible for the management of the SUA. Management of an SUA could include things such as maintenance and risk registers for operations with that SUA. The ANO also lays out some specific responsibilities on operators, in that they must ensure that any remote pilots have completed and maintained the mandatory competency requirements before they are permitted to fly an operator's SUA. An operator must also not 'permit or cause' the breaking of certain laws (such as flying above 400ft) with their SUA, even where they are not necessarily the ones flying the SUA.
 - For remote pilots, that they operate the flight controls of the SUA by manual use of remote controls, or when the SUA is flying automatically, monitors its course and is able to intervene and change its course by operating the flight controls. The rules governing airspace in the UK may be complicated to understand for those who have had no formal pilot training. It is important that all remote pilots are aware of the rules and laws governing drone use in the UK, but also of their responsibilities as the pilot of an aircraft. For this reason, the Government introduced a competency requirement in the 2018 Amendment Order. It is expected that this competency requirement will be met by passing a CAA-specified test, as promised following the Government policy consultation in 2017.
- 2.10 **To reflect the additional legal responsibilities a small drone operator has, in particular as with regards the behaviour of another person, the Government is therefore proposing to introduce a minimum age requirement for an operator, but not for a remote pilot. If, in the future, the Government decided to introduce a minimum age for a remote pilot, this would require an additional amendment to the Air Navigation Order.**

Proposed minimum age restriction for drone operators

- 2.11 In order to establish a minimum age for a small drone operator, the Government has sought to balance the responsibility of the role and a common sense approach, which would be accepted by drone users, and not bar young people from engaging with the technology.
- 2.12 The Government has also factored in the legal minimum ages for contracts and criminal responsibility. A summary of the comparative ages used by the Government in this decision is in the table below:

Age	Transport comparative	Legal/Social Comparative
No minimum age	No minimum statutory age to fly a plane, whilst under supervision.	N/A
Below 10	N/A	Minimum age of criminal responsibility in Scotland.
10	N/A	Minimum age of criminal responsibility in England, Wales and Northern Ireland.
12	N/A	Minimum age of criminal prosecution in Scotland.
14	Trainee pilots can begin to log hours towards the mandatory minimum for licence qualification. Glider and balloon pilots can engage in solo flights.	N/A
16	Minimum age to ride a moped, with an engine size of 55cc with a provisional licence.	Minimum age to enter into some contracts, with a parental counter signature. Minimum age to get a full time job.
18	CAA minimum age for a commercial permit to fly a UAV. Minimum age to drive a lorry weighing up to 7.5 tonnes.	Minimum age to purchase fireworks, cigarettes and alcohol. Minimum age to enter into credit agreements, and most contracts.
21	Minimum age to hold an airline pilots licence for an aeroplane or helicopter.	Minimum age to supervise a learner driver (providing a full licence has been held for 3 years)

Table 5 Comparative minimum age limits

- 2.13 The European Commission's regulations on drones includes a requirement for Member States to share information on drone operators with European law enforcement agencies, so that a drone operator's registration is valid across Europe and can be recognised as such. This suggests the minimum age for a drone operator should be one at which they are deemed sufficiently able to understand the implications of their data being shared with enforcement agencies across the European Union.
- 2.14 Most insurance policies are accessible from the age of 18. Given the responsibilities a drone operator has, insurance - although not mandatory for leisure drone use - may be something many operators wish to purchase.
- 2.15 The age of 18 is widely considered as the age at which one becomes an adult, and gains full citizenship rights.
- 2.16 The Government's view is that considering the responsibilities of the SUA operator, particularly with regards ensuring they do not permit or cause a remote pilot of their drone to fly in certain circumstances, the potential difficulty with data sharing

arrangements and accessibility to insurance, a minimum age for a small drone operator of 18 is appropriate.

2.17 This would mean that anyone below the age of 18 could only be a small drone remote pilot for a drone of 250g-20kg in mass, and would likely in practice require the permission of the SUA operator to fly their drone.

2.18 If a drone is *below* 250g in mass, as many toy drones are, then there is no requirement for an SUA operator to register or for a remote pilot to meet the competency requirement. An SUA operator in this scenario could be under the proposed age of 18.

- Question 1: Do you see any advantages to the introduction of a minimum age for SUA (small drone) operators?
 - Yes
 - No
 - Don't know
- If yes, what advantages?
- Question 2: Do you see any disadvantages to the introduction of a minimum age for SUA (small drone) operators?
 - Yes
 - No
 - Don't know
- If yes, what disadvantages?
- Question 3: do you agree with the Government's proposal that a minimum age of 18 should be introduced for SUA (small drone) operators?
 - Yes
 - NoIf no, why not?
- Question 4: Do you believe that the introduction of a minimum age of 18 for SUA (small drone) operators will have a positive or negative impact?
 - Positive
 - Negative
 - No impactWhy?

3. Restrictions on small drone flights near protected aerodromes

Why drone flight restrictions near aerodromes are required

- 3.1 Small drones available on the high street are capable of causing disruption to other aircraft. This is particularly the case for aircraft on approach to an airport, or in early stage of take-off.
- 3.2 In its response to the consultation 'Unlocking the UK's High Tech Economy: Consultation on the Safe Use of drones in the UK', the Government outlined plans to explore options related to 'No Drone Flying Zones' around national infrastructure sites including airports, power stations and Government buildings.
- 3.3 The Government published its 'Drones Update' on 27 November 2017. This detailed plans to produce a legislative package on drones and included a commitment to review the ANO to restrict the use of drones within the proximity of an airport. This review was completed, and the 2018 Amendment Order was laid in Parliament on 30th May 2018.
- 3.4 The CAA collates reports of air proximity hazards, also known as Airprox reports. An Airprox report occurs following a situation in which, in the opinion of a pilot or air traffic control services personnel, the distance between aircraft, as well as their relative positions and speed, have been such that the safety of the aircraft may have been compromised. Since 2014, the number of incidents of manned aircraft encountering a drone has been increasing year on year, with a total of 93¹⁶ incidents reported to the Airprox board in 2017.
- 3.5 In July 2017, the Government reported on research conducted into the potential effects of a mid-air collision between a drone and conventional aircraft¹⁷. The research simulated a drone strike on the windscreen of a helicopter and large airliner. The results showed that helicopter windscreens could be critically damaged in a collision with a drone. It was also shown that helicopter tail rotors are vulnerable. Whilst airline windscreens proved to be more resilient, testing and modelling showed that they could be critically damaged by mid-air collisions with drones when at high speeds but not those used for take-off or landing. In comparison with bird strikes, it was discovered that drones could cause significantly more damage than birds of a similar mass.
- 3.6 The UK is not alone in assessing the potential damage which can be caused in a mid-air collision between a drone and an aircraft. The US Federal Aviation Authority (FAA) published a report¹⁸ in July 2017, which stated that there is a risk of aircraft structure failures in several impact scenarios analysed, and, in certain circumstances,

¹⁶ This is subject to change, based on updates to Airprox reports

¹⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/628092/small-remotely-piloted-aircraft-systems-drones-mid-air-collision-study.pdf

¹⁸ https://www.faa.gov/news/updates/?newsId=89246&omniRss=news_updatesAoc&cid=101_N_U

the drone strike had enough force to puncture the skin of the aircraft. The report highlighted that whilst the damage inflicted in a collision is dependent upon the size of the aircraft, and the speed it is travelling at, findings are inconclusive on the amount of damage which can be caused. The report did highlight that a collision between a 1.2kg drone, and the windscreen of a commercial jet airliner travelling at 250 knots would not likely cause serious damage.

- 3.7 In addition to being a collision hazard, drones can also act as a distraction to pilots, causing disruption and/or the closure of airport runways. In July 2017, a drone caused the closure of the runway at Gatwick airport for a total of 14 minutes, forcing 5 flights to be diverted and resulting in a significant impact on airport operations.
- 3.8 The Government views this as a serious issue and has worked with the CAA to communicate to drone users that they should not fly drones near aircraft, airports or airfields.¹⁹ Although this communication campaign has informed many drone users about the dangers, it is not enough. Action has therefore been taken to introduce penalties for those who fly above 400ft and near aerodromes. These measures are on top of already existing rules, in particular: anyone recklessly or negligently acting in a manner likely to endanger an aircraft, or a person in an aircraft, can be imprisoned for up to five years, under Article 240 of the ANO.
- 3.9 As drone technology continues to develop, it is anticipated that measures such as blanket airport restrictions may become redundant. Research into Unmanned Aircraft Systems Traffic Management (UTM) is becoming more widespread. UTM systems enable more sophisticated and tailored communication of zones where drones should not fly, and are more usable for both remote pilots and drone operators.
- 3.10 The Government is running Project Chatham, in collaboration with the CAA and NATS, to assist with this. The Project's aim is to regularly publish data of UK areas where both commercial and non-commercial drones should not be flown. The intention is to publish this data in a way which will show restrictions visually on apps, in a format which is easily digestible by a member of the public. Combining detailed data like this with a phone's GPS signal, could one allow an app to give a very specific restriction tailored to that person's location and its knowledge of other flight plans in the area.
- 3.11 However, until the data and technology are available to realise this, a standard restriction for all aerodromes is necessary.

Action the Government has taken

- 3.12 The Department for Transport has recently introduced in the ANO a new restriction on flights by SUA to protect airports, referred to as 'aerodromes' in legislation²⁰. The 2018 Amendment Order laid in Parliament on May 30th created flight restriction zones for protected aerodromes:
 - a. The "Inner Zone" which is the area within, and including, the boundary of an aerodrome;
 - b. The "Outer Zone" which is the area between:
 - the boundary of the aerodrome, and

¹⁹ <http://dronesafe.uk/drone-code/>

²⁰ <http://www.legislation.gov.uk/uksi/2016/765/contents/made>

²¹ <http://www.legislation.gov.uk/uksi/2018/623/made>

- a line that is 1km from the boundary of the aerodrome

3.13 This measure comes into force on 30th July 2018.

3.14 The measure requires that:

- a. The SUA operator must not cause, or permit the SUA to be flown and a remote pilot must not fly an SUA in the Inner Zone of an aerodrome outside the hours of watch of the Air Traffic Control Unit (ATCU) or Flight Information Safety Unit (FISU) (or if there are no such units at the relevant aerodrome) unless permission from the operator of the aerodrome and, where the flight is above 400ft, the permission of the CAA has also been obtained.
- b. If the flight is taking place during the hours of watch of the ATCU or FISU, permission must be obtained from the ATCU or FISU. The SUA operator must not cause or permit the SUA to be flown and a remote pilot must not fly an SUA (at any height) in the Inner or Outer Zone of an aerodrome during hours of watch of the ATCU or FISU, unless permission from the ATCU or FISU has been obtained. For flights above 400ft, the permission of the CAA must also be obtained.

3.15 The notified hours of watch of ATCU and FISU are available publically via the Aeronautical Information Publication (AIP), which is produced in collaboration with NATS and the CAA. Similar information is also available to the public for Government aerodromes via the UK Military Aeronautical Information Publication (UK MILAIP). A list of aerodromes included in this restriction is included at Annex E.

3.16 The 1km restriction around the boundary of an airport during notified hours of watch of the ATCU or the FISU is designed to reduce the number of incidents where drones are in close proximity to aircraft, particularly during take-off and landing.

3.17 In developing the airport restriction policy, the Government considered alternative restriction zone sizes, and shapes. Alternative suggestions which were considered included:

- An extended restriction zone, up to 5km from the boundaries of an airport;
- A restriction which would be based on the descent and take-off path of aircraft (i.e. a rectangular shaped restriction based on the direction of the runway) and different for each runway; and
- Staggered height restrictions around airports, where drone users would be allowed to fly drones at a lower height than the 400ft limit near the airport boundary (such as up to 50ft beyond 1km of the airport).

3.18 DfT estimates that 126,000 people live within 1km of the aerodrome boundary around Heathrow, Gatwick, Stansted and Manchester airports.

3.19 When this model is repeated to show the number of people living within 5km of the centre of the same airports, the number increases to 373,000. This increase is not as large as might be expected in comparison with the previous number. This is because the first number is based on a 1km measurement from the edge of the aerodrome boundary, whilst the second number includes the aerodrome itself in the estimate, where, in most scenarios, no one lives. In general though, this suggests the principle that the larger the restriction area, the greater number of people impacted.

3.20 Whilst the Airprox reports of drones near airports have increased in number, they typically occur at altitudes over 400ft - which is now covered by the 400ft height

restriction for all drones, introduced in the 2018 Amendment Order. Of the 93 airprox reports involving drones from 2017, a total of 84 occurred above 400ft.

- 3.21 The Government has consistently reinforced the message that drone flights should take place far away from aircraft, however, a small number of people continue to fly drones close to aircraft and airports. Changing the law could have an impact on the behaviour of specific individuals in relation to flying drones close to manned aviation.
- 3.22 For security reasons, the Government has introduced an SUA flight restriction within the Inner Zone - unless you have the permission of the aerodrome operator and the CAA to fly there outside hours of watch of the ATCU or FISU. Permission from the ATCU or FISU is required if the flight is taking place during the hours of watch. Where any proposed flight in the Inner Zone is above 400ft, the permission of the CAA is required in addition to the other permissions.
- 3.23 Aerodromes have established security measures (such as security scanners and fences). However, drones create a method for these security measures to be circumvented, and this restriction within the Inner Zone is designed to prevent this.

Future review of the aerodrome restriction

- 3.24 Following the introduction of the 1km restriction on 30th July 2018 and at least one year of the restriction being in force, the CAA will be reviewing the restriction to assess its effectiveness, as well as other questions that are relevant to the policy.
- 3.25 The review will consider questions such as:
- What the minimal acceptable vertical separation between a drone and an aircraft should be;
 - How the surrounding geography around specific airports could impact on this restriction;
 - Areas where drones are likely to be used (such as public parks) which are near aerodromes, and could be issued with a permanent exemption;
 - Whether additional aerodromes should be added to the list of protected aerodromes;
 - Whether the restriction has had any impact on the number of drone sightings and Airprox reports near aerodromes;
 - The number of permission requests generated, and what percentage were accepted or rejected; and
 - Whether a different kind of restriction should be considered - such as radius circles near the runway thresholds.
- 3.26 Conclusions from this consultation will be passed to the CAA for consideration in its review.

- Question 5: What other areas do you feel the review should cover?
- Question 6: Do you believe that the 1km restriction zone around a protected aerodrome is sufficient?
 - Yes
 - No (please explain)

- Question 7: Do you feel that a restriction zone of a different shape would be more appropriate? If yes, state the shape and its dimensions, and why.
 - Yes
 - No

4. Model Aircraft Flying Associations & the impact of drone legislation

Introduction

- 4.1 The department has been working with key stakeholders to lay the right foundation to build accountability, promote safer drone operations, and encourage innovation as the drone sector develops.
- 4.2 In its response to the previous drone policy consultation, the Government made a commitment to work with model aircraft flying associations to examine ways in which it may be possible to exempt members of model aircraft flying associations with adequate safety cultures and practices from certain elements of registration and other educational requirements, or where their club could be permitted to undertake regulatory requirements on their behalf. This commitment was made in recognition of the long-standing safety culture model flying associations tend to engender in their members.
- 4.3 Flying a model aircraft safely can require considerable skill, and there are significant risks if they are not flown safely. In 2002, a teenager was killed in a tragic accident after being hit by a model aircraft, and on rare occasions there are reports of model aircraft coming into unsafe proximity with other aircraft.
- 4.4 Model aircraft flying associations showcase best practice for managing these safety risks and reducing them. They ensure safe flying by having their members register, creating bespoke knowledge and competency courses which many of their members complete, and requiring mandatory insurance for all activities. They also encourage and uphold a strong safety culture at local facilities for their members.
- 4.5 However, if a model aircraft flyer is not a member of one of the model aircraft flying associations, then there is no assurance that such safety measures are being implemented by the individual in question and followed. Last year in the consultation response, the Government therefore set out that flyers of model aircraft who are not members of an association, or are members of an association not recognised by the CAA as implementing adequate safety standards, could not be considered for possible exemption from drone legislation. Any model aircraft flyer in doubt as to whether this applies to them, should contact their association for clarification.
- 4.6 A question related to model aircraft flying association members and how FINS(s) proposals should apply to them has also been included at the end of Chapter 5.

Outcomes of engagement between Government and model aircraft flying associations so far

- 4.7 Since then, the Government has pursued the intention set out in its consultation response last year by engaging in direct meetings with model aircraft flying representatives and the CAA, discussing each policy measure in turn and examining possible ways to lessen the burden on model aircraft flying associations and their members.
- 4.8 With regards the 2018 Amendment Order made in May 2018, the following progress has been made:
- **400ft restriction:** It is possible for the CAA to exempt someone from having to follow particular ANO articles, if the CAA deems it appropriate to do so. The model aircraft flying associations have applied to the CAA for an exemption for their members from this rule, which the CAA is currently reviewing. Model aircraft flying associations will communicate this outcome to their members once this decision has been made. Should the application be successful, the impact on model aircraft flyers with regards this restriction should be minimal.
 - **Protected aerodromes restriction:** The nature of this restriction is very localised, and information on all flight in the restriction zone will be valuable to Air Traffic Control in advising pilots, and ensuring safety. Those wishing to fly model aircraft within the 1km vicinity of a protected aerodrome's boundary should therefore apply to Air Traffic Control for permission to fly. This should not be an onerous requirement, and as model aircraft flyers are typically very aware of airspace rules and aviation safety risks, it is expected that the majority are already undertaking this kind of action as best practice. To ensure that the impact on any frequent model aircraft flying activity within the 1km vicinity of a protected aerodrome is lessened, as well as any other legitimate and safe drone activity, an exemption for a particular geographical area can be applied for. Any individual or local model aircraft flying association facility wishing to make use of this should apply to the CAA for this.
- 4.9 With regards to drone operator registration and remote pilot test competency, discussions are still ongoing. These have covered possible solutions that could:
- Take account of how model aircraft flying associations already ensure registration of their members and many of their members also take bespoke knowledge and competency qualifications provided by the association, and
 - Ensure no significant financial burden on either the taxpayer or model aircraft flying associations or significantly compromise the integrity of the legislation as a result.
- Question 8: Do you have any other proposals for solutions to minimise the impacts on safe model aircraft flying that we could consider?

Section B: A Draft Drones Bill



This section covers the potential content of a draft Drones Bill, which could:

- Mandate and/or regulate a Flight Information and Notification System(s) (FINS(s)); and
- Extend police powers and fixed penalty notices relating to drone misuse.

5. Mandating and/or regulating the use of a Flight Information and Notification System(s) (FINS(s)) for certain drone activities and users

Purpose

- 5.1 The ability to manage the safety, security and privacy of the public becomes increasingly difficult as the frequency and volume of drone use increases within UK airspace. Therefore, due to forecast growth in the drones market, a key aim of the Government's drone policy is to improve safety, awareness and accountability of drone operations, and ensure they can be safely integrated into our skies.
- 5.2 These are similar objectives to those of the European Commission (EC) who are undertaking work to unleash the true potential of drones, in a way that is both safe and secure. The resulting U-space project considers a range of technologies important in this objective, including services for drone flight management such as planning and approvals.
- 5.3 In line with this, the proposals being considered below form part of DfT's longer term objective to facilitate the management of unmanned aircraft in airspace, often referred to as Unmanned Traffic Management (UTM).

Unmanned Traffic Management

UTM is a system designed to enable the integration of drones into airspace, including that used by other aircraft. There are numerous opinions and models of UTM, but such a system could potentially enable ubiquitous awareness for drones or drone users of permanent and dynamic airspace restrictions; awareness of other airspace users; conflict detection and resolution between drones and other aircraft; and handle requests for permission to enter or transit through controlled airspace. It is seen as an important step in realising the full potential of drones, including routinely and safely flying 'beyond visual line of sight' (BVLOS).

- 5.4 While the aspiration of a ubiquitous and fully functional UTM is some years away, flight information and notification systems are already having real positive effects on drone operations. This technology is still evolving, but there are already applications on the market covering both flight planning and mid-flight support; delivered via smartphone applications or as software solutions built into specialist hardware.

- 5.5 If a decision is made to introduce the proposals below, they will likely not come into force until 2020 at the earliest, given the time required for a Bill and any legislation that sits underneath this to pass through Parliament.

Overview

- 5.6 The option of mandating the use of a Flight Information and Notification System(s) (FINS(s)) for certain drone users and/or for certain activities, has been put forward for consideration. It is proposed the FINS(s) could provide digital, interactive and real time information and a means of two-way communication between the user, other users around them, and relevant Government authorities. We envisage the delivery mechanism could take the form of an electronic application (an 'app'), and may be used on a phone, tablet or web browser for example, but could equally be delivered via other equipment. Any solution would be built on open standards, to avoid lock-in to a specific vendor and to encourage continued innovation for drone pilots and the sector in the light of evolving market and industry development.
- 5.7 The proposal is not to mandate the specific type of delivery device that must be used. Therefore there is scope for the development of alternative methods of operating the FINS(s) as further technology becomes available.
- 5.8 The system itself could take the broad form of an electronic map with overlays of air space use and restrictions, real-time traffic information, and the ability to notify other airspace users or controllers. The system could also be used to inform the user of changes to airspace restrictions, local traffic or weather conditions around them; for instance advance warning of an incoming helicopter or other aircraft. The user might also be able to use the system to inform authorities of drone incidents or flight plans.
- 5.9 The Government is considering the option of requiring the use of an approved FINS for certain flights of drones above a certain mass to:
- Obtain real time local airspace information and local traffic or weather conditions;
 - Check it is permitted to use the surrounding airspace or observe local flight restrictions; and
 - Create a notification that a drone is going to be flown at a particular location at a given time.
- 5.10 The aim of this proposed policy is to increase drone user accountability and to ensure a flight can be made safely, without compromising the security or privacy of others. The real-time data and records made by a FINS could also be useful for enforcement.
- 5.11 The Government is also considering what regulation of a FINS(s) would be appropriate to ensure these policy aims in a risk-based proportionate manner, with effective monitoring and enforcement. Such regulation would also need to ensure value for money to protect consumers and maintain minimum standards.
- 5.12 The proposal being considered would include relevant drone use outside, where the take-off mass is 250g and over. This mass would exclude any fuel, but would include any additional goods added to the drone, such as a camera. Drones with a mass of 250g and over are being considered for inclusion as they are more likely to injure a person in an accident. They are also more likely to have cameras, and fly higher, further and for longer than drones that have a mass less than 250g. It is therefore considered that use of these drones require a higher level of regulation, in order to

increase the accountability of these users. The same rationale was applied in the 2018 Amendment Order laid on 30th May 2018 which provide, for example, for registration of SUA operator in respect of flights by small unmanned aircraft with a mass of 250g or more, coming into force on 30th November 2019.

- 5.13 The maximum mass of drones for which the use of a FINS may be required is still under consideration. Heavier mass classes of drone are already subject to higher levels of regulation (see the Introduction chapter of this consultation for current legislation on different masses of drone). It is likely secondary legislation will be used to specify the minimum and maximum mass of a drone that requires use of a FINS, and specify exactly which users and drone activities would be covered by the requirement. Using secondary legislation to achieve this will allow the Government to amend these requirements in future to ensure future proofing of the legislation for such a developing and emerging market.
- 5.14 Should the Government take the decision to include any proposals laid out in this chapter in a draft Drones Bill, those provisions will, of course, need to reflect the rights and obligations of EU membership and, therefore, be in accordance with the various EASA regulations which relate to drones (see the Introduction of this document for further information).

The Flight Information and Notification System

- 5.15 The proposals include the "approval" of a FINS. Whether or not it is decided that using a FINS should be mandatory for certain users and/or certain activities, it seems there could be advantages in regulating them and creating an official approvals process. Regulation of the FINS(s) could allow Government to baseline the quality of the FINS(s) and allow control over certain minimum standards; such as where 'no fly zones' for drones are shown.
- 5.16 As such, the proposal is for some form of approval process to determine if a system meets the minimum requirements and is therefore fit to be approved; a status that can be revoked if necessary.
- 5.17 The exact minimum requirements for the FINS(s) have not yet been determined. However, as explained above, the system would likely allow two-way, real time communication and display and communicate local airspace data, so that specified drone users could:
- Check local airspace information to ensure a flight is permitted, which could include notifications of changes to airspace information and any other information it is deemed appropriate for the FINS to display and communicate to the user. The FINS will be able to show whether drone use is permitted in a particular area, and clearly indicate zones which are subject to permanent or temporary flight restrictions. This will help maintain safety, security and privacy;
 - File a pre-flight notification before flying, making the drone user accountable and visible, albeit anonymously, to those around them and anyone using a FINS;
 - Report any safety incidents or flight information after the flight has taken place.

Pre-flight Notification

- 5.18 To maximise the safety, security and enforcement benefits of the FINS(s), it is proposed that a flight notification could be filed prior to flying. This could be displayed

on the FINS, indicating to other users that a drone is being flown in a particular location at a given time and allow the FINS to display and communicate local information to the user, tailored to the proposed location of the flight to the user. The pre-flight notification could be required for both commercial and leisure drone use, or for certain other specified users or drone activities.

- 5.19 The notification will help better manage UK airspace and reduce the likelihood of inflight drone collisions. That the user has identified themselves in this way could be reassuring to the public and promote more accountability in drone operations. It would also make it easier for security personnel to identify those who may not wish to be responsible and have not therefore filed a pre-flight notification, potentially indicating an intention to act unlawfully. Security personnel could then take mitigating action, to establish whether this was the case (for example, by approaching the person for a conversation). It is also possible that law enforcement could use the FINS(s) to identify those in the area that may need to be notified of any incidents, issues or flight restrictions imposed, if, for example, an emergency situation had occurred. There is therefore an added security benefit to the pre-flight notification function.
- 5.20 When would be the most suitable time to file a pre-flight notification is still being considered. Ensuring notifications are filed well in advance of take-off could be beneficial for forward planning and allow authorities (such as the police, or security officials) more time to address any concerns relating to a particular flight. However, a requirement to file a notification too far in advance could be restrictive to drone users who wish to spontaneously fly their drone.
- 5.21 It is also important to consider data reliability of the FINS(s). Large lead times between the pre-flight notification and take-off could lead to inaccurate data on the FINS(s), unless some form of further validation of the flight could be used just before take-off.
- For example, a person files a pre-flight notification five days in advance of flying, indicating at 13:30 they will use their drone at a given location. Then to ensure this information is still accurate it is verified by the drone user closer to the time of flight.
- 5.22 Further consideration is being given to the possible maximum and minimum time before flight a notification could be made. If these proposals were introduced, a balance would need to be struck between ensuring data reliability and safety in drone use, and not creating overly burdensome legislation.
- 5.23 For context and comparisons within traditional aviation, the general International Civil Aviation Organization (ICAO) requirement is that aircraft should have flight plans filed at least 60 minutes before clearance to start-up or taxi is requested.

Responsibility

- 5.24 If a requirement to use a FINS were introduced for any types of drone activity and/or certain users, it is proposed that drone pilots should not have sole responsibility in relation to use of a FINS. Others, such as the SUA operator who has the management of small drone, should also be given a degree of responsibility in respect of any required use of a FINS.²²

²² See article 94G of the ANO

5.25 With regard to the FINS(s), it will be important for appropriate measures to be put in place so that accurate data is provided to drone users. FINS providers will therefore need to ensure the information displayed on their system is correct, in order for the benefits of this policy to be realised.

- Question 9: Do current drone information apps provide enough support to ensure the safe and appropriate use of drones?
 - Yes
 - No
 - Don't know
- Why?
- Question 10: Do you think there is a need to mandate the use of a FINS(s) for certain types of drone activity?
 - Yes
 - No
 - Don't know
- Why?
- Question 11: Should the government explore options to achieve similar policy aims, but without mandating the use of a FINS(s)?
 - Yes
 - No
 - Don't know
- Why?
- Question 12: Do you agree with the requirement to use a FINS as outlined by the government?
 - Yes
 - No
- Why?
- Question 13: What do you think should be the maximum mass of a drone for which its user should have to use a FINS(s), if such a requirement were to be introduced?
 - 20kg
 - 50kg
 - 100kg
 - Over 100kg
- Why?

- Question 14: Should there be a requirement to file a pre-flight notification on the FINS(s) before flying a drone?
 - Yes
 - No
- Why?
- Question 15: What do you think should be the minimum allowed time, prior to take-off, for filing a pre-flight notification on the FINS(s)?
 - File the notification at point of take-off?
 - File the notification no less than 5 minutes before take-off.
 - File the notification no less than 30 minutes before take-off.
 - File the notification no less than 1 hour before take-off.
 - File the notification no less than 3 hours before take-off.
 - Other
- Why?
- Question 16: What do you think should be the maximum allowed time, prior to take-off, for filing a pre-flight notification on the FINS(s)?
 - File the notification at point of take-off
 - File the notification no more than 5 minutes before take-off.
 - File the notification no more than 30 minutes before take-off.
 - File the notification no more than 1 hour before take-off.
 - File the notification no more than 3 hours before take-off.
 - File the notification no more than 24 hours before take-off.
 - File the notification no more than a week before take-off.
 - Other
- Why?
- Question 17: It is proposed that remote pilots should not have sole responsibility in relation to the use of a FINS. Do you agree?
 - Yes
 - No
- Why?
- Question 18: Should there be a duty on FINS providers to display accurate information?
 - Yes
 - No
 - Don't know

- Question 19: Should it be an offence for a FINS provider to display inaccurate data to drone users?
 - Yes
 - No
 - Don't know

Making a FINS(s) available to the public

5.26 It is important to consider how a FINS(s) could be approved as this is likely to have an impact on public choice and the type of service offered by the FINS(s). There are a number of different options available, each with their own merits. A single FINS could be approved or multiple FINSs could be approved for use at either a UK-wide or regional level. Careful consideration is being given to each approach and no final decision has yet been made.

Options if the use of a FINS is mandated for certain drone activities and users

Option 1

A single FINS could be approved for use across the UK, following a successful competitive tender. This method could make data reliability better, as all information would be managed through a single system. However, this option provides no choice to the public, as only one FINS would be available.

Option 2

Multiple FINSs could be approved for use that all have full UK coverage. This would give the public choice over which system to use, and could potentially increase competition between developers. However, there may be more challenges managing data transfer between system providers, to ensure the most accurate and reliable data reaches the drone user.

Option 3

Different FINSs could be approved for use in different areas of the UK. The exact geography each FINS would cover would need to be determined, however collectively there would be full UK coverage by multiple FINSs. This approach could lend itself to systems providing higher levels of detail, due to the more localised area they focus on. However, challenges may arise when piloting a drone close to a border or travelling to different regions in the UK for the purpose of flying a drone.

- Question 20: What do you believe should be approved for the public to use:
 - A single FINS?
 - Multiple FINSs?
- Why?

- Question 21: In your opinion what should the FINS(s) cover? :
 - all of the UK
 - select regional information, but together multiple FINSs would provide full UK coverage
 - Other
- Why?

Accessibility to a FINS(s)

- 5.27 There may be instances when access to an approved FINS cannot be gained. This would prevent the filing of a pre-flight notification and checking of airspace information in a given area. As one of the proposals being considered is to mandate the use of an approved FINS for certain drone activities and/or certain users, if access cannot be gained this would in effect be a barrier to take-off.
- 5.28 We have anticipated scenarios when accessing an approved FINS might not be possible, to further understand the potential barriers to drone flight this policy proposal could pose. We have predicted a lack of access could be due to a number of reasons, including:
- Poor signal,
 - No battery on the electronic device (e.g. phone or tablet) running the approved FINS, or
 - The approved FINS being offline / down for maintenance
- 5.29 Real time information is an important aspect to the proposed policy options. However, there is a need to consider if exceptions should be made for using an approved FINS in certain circumstances, weighing up the benefits and risks of exceptions accordingly.
- 5.30 It is worth noting the Government is committed to ensuring there is reliable connectivity nationwide, which includes extending mobile coverage to 95% across the UK by 2022. Therefore, continuing advances in communication and technology, such as battery life and 5G coverage, may create different scenarios for consideration in the future.
- 5.31 There are a number of different approaches that could be used to address accessibility issues to the FINS(s). There are certain limitations of each option and no decision has been made on how best to manage a lack of access to a FINS if a decision is made to make use of a FINS(s) compulsory. Some of the main possibilities are outlined below, which could be used in isolation or in combination.

Options

Option 1

Have a number of exceptions when the use of a FINS is not required or refrain from mandating the use of a FINS at all. This would impact the accuracy of information provided by the FINS(s) for other users in nearby areas and potentially create safety, security and privacy concerns. It would however be inclusive for drone users, by not posing a barrier to

drone flight. Considerations on appropriate exceptions would need to be given, as well as possible loopholes that may hinder law enforcement.

Option 2

Impose a ban on drone flight if access to a FINS cannot be gained. This option presents accessibility concerns for drone users as some areas of the UK, where signal is poor, may effectively become no fly zones. However, this method could be a good option to maximise safety, security and privacy of the public.

Option 3

Some form of geographical zoning could be used. There would need to be careful thought on the practical application of this approach. However, this method would allow flights in certain low risk areas to go ahead if access to a FINS could not be gained or was deemed disproportionate, and restrict them in higher risk areas. This could present additional challenges if a temporary emergency airspace restriction was ever imposed in a low-risk no-access to FINS area, as drone users might not be aware of the airspace restriction and fly their drone regardless, breaking the law.

Option 4

Although it is not always possible to anticipate having poor signal, using offline information on a FINS could go some way to combatting this problem and create an inclusive solution for drone users. It is possible that drone users could pre-download airspace information or use offline data within a FINS. However, using data that is not real time presents concerns for safety, as the accuracy of the information can be brought into question. Similarly, legal loopholes and the ability to file a pre-flight notification would need to be considered and accounted for.

- Question 22: Besides poor signal, no battery on the electronic device, maintenance or crashing do you think there are other scenarios which could restrict access to the FINS(s)?
 - Yes
 - No
 - Don't knowWhat scenarios?
- Question 23: If real time access to the FINS(s) cannot be gained do you believe the drone flight should be allowed?
 - Yes
 - No
- Question 24: Do you think there should be an exception from using real time data on the FINS(s) if access is restricted by:
 - poor signal
 - no battery on device
 - the FINS crashing
 - the FINS being offline for maintenance
 - Other
- Why?

- Question 25: If real time access to a FINS cannot be gained, how should this be managed?
 - Allow drone flight in certain scenarios
 - Allow drone flight in designated geographically zoned low risk areas, but not in higher risk areas
 - Allow drone flight using offline maps and data from the FINS(s)
 - Other
- Why?

Managing System Provider(s)

5.32 The proposition to use an 'approved' FINS would necessitate giving an organisation certain functions, which would include approving each FINS (and also terminating approval) and regulating the use of a FINS(s) more generally.

- Question 26: Which organisation do you believe is best suited to manage and regulate the FINS(s)?
 - Civil Aviation Authority
 - NATS (the UK air navigation service provider)
 - Department for Transport
 - Other
- Why?

Data sharing

5.33 Sharing anonymised data more widely is part of the Government Transformation Strategy to improve transparency and encourage economic growth.²³ To continually improve services, the transport sector has always collected and analysed large quantities of data. Appropriate data sharing, including opening up government data where appropriate, will provide further opportunities for development across the drones sector as a whole.

5.34 There will be a large quantity of data held on any FINS system which could be needed by a range of organisations in order for them fulfil their function(s). Examples of the type of information needed by different organisations are given below:

- The DfT may require anonymised, aggregated data to assess the success of its policies and to develop any future policy changes.
- The CAA may require access to the service provider's data, likely also in an anonymised and aggregated format, to inform CAA safety risk assessments and policy making.

²³ <https://www.gov.uk/government/publications/government-transformation-strategy-2017-to-2020/government-transformation-strategy-better-use-of-data>

- The police may require certain data, including personal information, for the purposes of preventing and investigating crime (any provisions would reflect the provisions of the DPA 2018).

5.35 Therefore, it is proposed that information gathered by the FINS(s) will be accessible, on request, to a number of organisations. The purpose is to help ensure the safe use of drones in the short and long term; whether this is investigating suspected drone misuse or informing future Government policy. There would be a duty on any FINS(s) provider(s) to provide information to a list of organisations specified in legislation, if a specified organisation made an information request. Importantly, the FINS(s) providers will only be able to provide information relevant to the organisation's function, which will dictate if the data is anonymised or whether some personal data can be released to the requesting organisation.

5.36 Permitting and/or requiring FINS providers to share information with the following organisations is currently being considered:

- Department for Transport
- Civil Aviation Authority
- UK Police
- Intelligence and Security Services
- Border Force
- National Crime Agency
- Air Accidents Investigation Branch
- HM Prisons and Probation Service

5.37 It is proposed that if the FINS provider(s) were to refuse a valid request for information it would be an offence (i.e. the FINS provider would be required to share the information). This is being considered as a possible deterrent to stop provider(s) failing to fulfil data requests from authorised persons. The maximum punishment for this could be an unlimited fine in England and Wales or a fine not exceeding the statutory maximum in Scotland and Northern Ireland.

- Question 27: In line with government strategy should anonymised drone data from the FINS(s) be shared with the industry to drive technological development?
 - Yes
 - No
 - Don't know
- Why?

- Question 28: For the purposes of carrying out their function, to which organisation or organisations should a FINS provider have to provide data if requested?
 - Department for Transport
 - Civil Aviation Authority
 - UK Police
 - Intelligence and Security Services
 - Border Force
 - National Crime Agency
 - HM Prisons and Probation Service
 - Other
 - None of the above
- Why?
- Question 29: There would be a duty on any FINS(s) provider(s) to provide information to a list of organisations specified in legislation. The specified organisation may only request information in order for them to carry out their function. Potential organisations may include, but are not limited to: the CAA, Department for Transport, UK police, Intelligence and Security Services.

Do you agree it should be an offence for a FINS system provider to withhold information from an authorised person if a valid request for data is made?

 - Yes
 - No
 - Don't know
- Why?

5.38 In order for law enforcement to best manage improper use of drones it is being discussed whether any organisations should have some form of instant, or near instant, access to information on the FINS. This would include the access to personal data, so that law enforcement can conduct more effective and efficient investigations into suspected drone misuse. A comparable example to this is how the police have access to driving licence details, which increases their ability to act quickly when presented with new lines of enquiry. The technological practicality of instant access would still require consideration, and no decision on this matter has been made.

- Question 30: Do you believe certain organisations should have some level of instant, or near instant, access to all data from the FINS(s)?
 - Yes
 - No

- Question 31: Which organisation do you believe should have some level of instant, or near instant, access to all data on the FINS(s)?
 - Police
 - Intelligence and Security Services
 - Border Force
 - National Crime Agency
 - HM Prisons and Probation Service
 - Other
 - None of the above

Why?

Payment

5.39 As mentioned previously there are a range of applications currently available which provide some degree of airspace information to drone users. Many of these are free to use, however this could change if the use of a FINS were to be mandated by Government.

5.40 Although some companies might choose to recoup money through such means as adverts or additional chargeable add-ons, so that the service is free to users, other providers could decide to charge for its use. The Government has a number of options available to regulate this and protect consumers, whilst allowing the market to sustain itself.

Options

Option 1

In a similar way to the vehicle MOT test, the Government could set the maximum amount a system provider could charge for the using of a FINS.

Option 2

Allow competition in the market to regulate itself, meaning the Government would not have control over any possible charge for a FINS. Instead, competition between system providers would be relied upon to ensure any costs remained competitive, if indeed providers decided to charge.

Option 3

The Government could legislate to permit regulatory control over the maximum amount system providers can charge if such control were deemed necessary. This would mean competition in the market could be allowed to determine the charge (if indeed there was a charge) in the first instance, but that the Government would have the power to intervene and impose control over the fee if it was deemed necessary at a later date.

5.41 If the decision were made to mandate a FINS for certain drone activities and/or certain users there would also need to be a degree of control and assurance to guarantee the approved FINS provider(s) is able to maintain services and ensure the FINSs is available to users to comply with any legal duties. Any failure of an approved FINS provider could adversely impact this, as well as safety, security, privacy and adherence to airspace restrictions and impose costs on any users who

might then need to register with a new FINS provider. In this possible scenario therefore, the Government could want to mitigate any risk of an approved FINS provider entering insolvency, to ensure that drone users and operations were not affected.

5.42 One way to try and maintain services and compliance with legal requirements in the event of insolvency is through a Special Administration Regime (SAR). This would put a focus on maintaining services, and not repaying creditors, in the unlikely event a system provider were to enter insolvency. It has been argued previously this may have an adverse effect on the cost of borrowing for the company protected by the SAR; this could be undesirable in an emerging sector such as drones. Other options would be to manage insolvency risk as part of the commercial selection process for a FINS provider(s).

- Question 32: Do you believe there should there be a charge to the drone user to use a FINS?
 - Yes
 - No
- Why?
- Question 33: If a FINS provider decided to charge for using the system, should the Government have the ability to control the maximum cost that could be charged?
 - Yes
 - No
 - Don't know
- Why?
- Question 34: Do you think there is a need to have a Special Administration Regime to manage the risk of insolvency for FINS providers?
 - Yes
 - No
 - Don't know
- Why?

The following questions are for technology providers or companies considering being involved in the development of a FINS, to increase understanding of this new market:

- Question 35: If an approach is chosen that uses multiple FINSs, in your opinion would it be better to have:
 - All FINSs transfer information to a single back end system?
 - Multiple FINSs transferring information between each other directly?
- Why?

- Question 36: How would you consider funding a FINS?
 - Charge the drone user
 - Charge to the industry
 - Use adverts
 - Have additional add-ons that can be purchased
 - Other
- Why?
- Question 37: Would you anticipate a yearly subscription fee for users of the FINS(s)?
 - Yes
 - No
 If yes, how much?
- Question 38: Are you a technology provider or a company considering being involved in the development of a FINS?
 - Yes
 - No
- Question 39: Would you consider bidding for the work to provide a FINS?
 - Yes
 - No
- Why?
- Question 40: Would you be interested in attending a Government focus group session with other potential sector technology providers?
 - Yes
 - No

Model Aircraft Clubs

5.43 The proposal to mandate the use of a FINS(s) is in the early stages of development. However, the adoption of this approach could have implications for model aircraft clubs. If proposals are taken forward, as with the 2018 Amendment Order, the government will consider implications on model aircraft clubs, and assess how the policy objective can be maintained but with minimal disruption to model aircraft flying association operations.

- Question 41: Should the Government work with model aircraft flying associations to consider ways in which the policy could be shaped to minimise the impact of any new legislation relating to FINS(s) for this group?
 - Yes
 - No
- Why?

6. Police Powers Relating to Drones and Fixed Penalty Notices

Introduction

- 6.1 The Government committed to reviewing the powers available to law enforcement agencies with regards drones as a result of the public consultation 'Unlocking the UK's high tech economy: consultation on the safe use of drones in the UK.'

The challenges of enforcing of law and pursuing investigations

- 6.2 As misuse of drones and incident reports have increased, challenges have emerged in pursuing effective enforcement and investigation.
- 6.3 The National Police Chiefs Council (NPCC) released guidance to constabularies in 2015 in order to support the prosecution and recording of incidents involving drones.
- 6.4 In addition to this, a Memorandum of Understanding was signed between the NPCC, Home Office, DfT and the CAA in 2016. This set out the role and responsibilities of each party in relation to the investigation and prosecution of offences set out in the ANO that are committed by small drones; information sharing with the Government for the purpose of developing Government drones strategy and legislation; engagement with the media; and educating the public in relation to the use of drones.
- 6.5 An ongoing challenge in investigating and prosecuting drone misuse is that it is often difficult, if not impossible, to ascertain who the remote pilot of a drone was, as drones can be flown a long physical distance from the remote pilot. This is an issue which is being addressed through several measures including the implementation of a registration system, apps notifying plans to fly and electronic identification standards at EU level. Electronic identification refers to the ability to identify a drone's serial or registration number from a distance by electronic and 'smart' means.
- 6.6 Despite this challenge, prosecutions of drone users breaking the law have taken place, and are gradually increasing, particularly with regards to the use of drones to fly illicit items into prisons.
- 6.7 Through the consultation held from 21 December 2016 to 15 March 2017 and engagement with the NPCC, Police Scotland and Police Service of Northern Ireland, it became clear that the police lack the appropriate powers with regards to two key categories of scenarios:
- **Enforcing the law which applies to the use of drones, and investigating and prosecuting suspects; and**
 - **Dealing with everyday situations, such as car accidents, crime scenes or large event management where there may be a risk of terrorist attack, or**

where drones may be used by the media or bystanders in a manner which is not conducive to effective and safe management of the incident.

An example of where additional police powers would aid investigations and enforcement

A remote pilot is suspected of frequently breaching the ANO by flying in a congested area. However, the police are unable to catch the drone pilot in the act. By the time the officer arrives at the scene, the drone pilot has already put his drone away into the car. The police constable has no powers to search the car to find the drone and therefore no action can be taken.

What the Government is aiming to do

- 6.8 The overall aim is to reinforce the importance of compliance and increase the deterrent effect, to encourage current non-compliant and/or reckless drone users to comply with the law.
- 6.9 By increasing the powers available to the police, we hope to see more frequent prosecutions when non-compliance is identified, and in combination with the impact of other consultation response measures, a reduction in the number of incidents occurring.
- 6.10 The specific powers which the Government are proposing, would allow the police to:
- ensure that a drone operator has registered themselves and that the remote pilot of the drone has met the required competency requirements;
 - check compliance with other legal requirements related to drone use;
 - investigate who was flying the drone when an offence was committed;
 - prevent an offence from being committed when there is a reasonable suspicion of this happening;
 - discourage repeat offending with respect to drone misuse; and
 - gather key evidence from drones suspected of misuse.
- 6.11 To allow the police to carry out the actions above, the Government is proposing to introduce the following powers for the police across the UK to:²⁴
- 1 Require the production of evidence in specified circumstances for:
 - drone operator registration;
 - remote pilot acknowledgement of competency;
 - the use of a mandated and/or regulated Flight Information and Notification System by the remote pilot and/or drone operator, should the decision be taken to mandate their use;

²⁴ Under section 8 of the Prisons Act 1952, prison officers, whilst acting as such, have the same powers, authority, protection and privileges of a police constable. It is therefore possible that a prison officer may be permitted to exercise some powers outlined in 6.11

- evidence relevant to other requirements for certain flying, such as commercial permissions or exemptions from the CAA from any ANO 2016 articles;
- 2 Obtain information such as the names and addresses of the registered drone operator and/or remote pilot believed to be in charge of the drone in specified circumstances (such as where there is a reasonable suspicion of the commission of an offence). If the identity of the drone operator is not provided, the name and address of who made the drone available for use by the remote pilot;
 - 3 Require a remote pilot to land a drone in specified circumstances;
 - 4 Enter and/or search premises, with a warrant, where there is reasonable suspicion that there is a drone and/or its associated components which a constable reasonably suspects of having been involved in the commission of an offence;
 - 5 Seize and retain a drone and/or its associated components which a constable reasonably believes of having been involved in the commission of an offence on entering and/or searching premises;
 - 6 Access information stored electronically on a seized drone and/or its associated components which a constable reasonably suspects:
 - is evidence in relation to an offence; or
 - has been obtained in consequence of the commission of an offence; and
 - that it is necessary to do so in order to prevent it being concealed, lost, tampered with or destroyed.
 - 7 Require any information stored in electronic form on a drone to be produced in a form in which it can be taken away and in which it is visible and legible. The power can only be exercised if constable has reasonable grounds for believing that:
 - it is evidence in relation to an offence; or
 - it has been obtained in consequence of the commission of an offence; and
 - that it is necessary to do so in order to prevent it being concealed, lost, tampered with or destroyed.
 - 8 Stop and search powers. The Home Office intends to consult on extending stop and search to cover the possession of corrosive substances in a public place without good reason. We are working with the Home Office to consider the possibility of including within that a similar power for the possession of drones in certain circumstances.
 - 9 The Government proposes to allow drone users, such as drone operators and/or remote pilots a seven day grace period within which to produce the required evidence at a police station. This will minimise the burden on magistrates courts as well as allow those who may not have the necessary documentation on them, to demonstrate their compliance. If a person does not produce this evidence, they will be liable to paying a Fixed Penalty Notice fine (more details on this below). This process is similar to that of certain road traffic offences as contained in the Road Traffic Act 1988.

- Question 42: Do you agree that the police require new powers in relation to the misuse of drones?
 - Yes
 - No
 - Don't know
- Why?
- Question 43: Do you agree that the police should be able to require the production of evidence from drone users:
 - Where there is a reasonable suspicion of an offence being perpetrated;
 - Or where compliance with a legal requirement is being checked?
 - Yes
 - No
 - Don't know
- Why?
- Question 44: The proposal is that for those unable to produce the relevant evidence at the request of a police constable, they will have 7 days in which to produce it at a police station.

Do you agree with the proposal to grant a 7 day grace period to produce this evidence?

- Yes
- No
- Don't know
- Why?
- Question 45: Do you agree the police should be able to obtain information to check that the following have complied with the law:
 - a. A drone user
 - b. A drone operator
 - c. A remote pilot
 - d. The person who made the drone available for use
 - Yes
 - No
 - Don't know
- Why not?

- Question 46: Do you agree that the police require powers to instruct a remote pilot to land a drone, if there is a reasonable suspicion of the commission of an offence?
 - Yes
 - No
 - Don't know
- Why?
- Question 47: Do you agree that the police require powers to instruct a remote pilot to land a drone if a constable believes that:
 - a. It will protect persons from harm, harassment, alarm or distress;
 - b. It will protect persons occupying any premises from nuisance;
 - c. It is causing an annoyance relating to the occupation of a premise;
 - d. It will protect public order;
 - e. It will protect property from damage;
 - f. It would assist in exercising the functions of a police constable.
 - Yes
 - No
 - Don't know
- Why?
- Question 48: Do you agree the police should have the power, when a drone and/or its components are suspected of being involved in the commission of an offence to enter and search premises with a warrant?
 - Yes
 - No
 - Don't know
- Why?
- Question 49: Do you agree the police should have the power, when a drone and/or its components are suspected of being involved in the commission of an offence, to seize and retain the drone and/or its associated components?
 - Yes
 - No
 - Don't know
- Why?

- Question 50: Do you agree the police should have the power to access electronically stored information from the drone or its components if a constable reasonably suspects that it:
 - a. is evidence in relation to an offence; or has been obtained in consequence of the commission of an offence and
 - b. that it is necessary to do so in order to prevent it being concealed, lost, tampered with or destroyed?
 - Yes
 - No
 - Don't know
- Why?
- Question 51: Do you agree the police should have the power to require any information stored on the drone or its associated components to be duplicated in a legible form that can be taken away if a constable believes:
 - a. that it is evidence in relation to an offence or it has been obtained through committing an offence and
 - b. it is necessary to prevent concealment, loss, tampering or destruction of the data?
 - Yes
 - No
 - Don't know
- Why?
- Question 52: Are there other powers you feel the police should have in relation to drone misuse?
 - Yes
 - No
 - Don't know
- What powers and why?
- Question 53: These proposed powers are only being considered for police constables. Do you believe any of the proposed powers should also be extended to:
 - a. Prison officers?
 - b. Police community support officers?
 - c. Council enforcement officers?
 - d. Other?
 - Yes
 - No
- Why

Fixed Penalty Notices

- 6.12 In addition to granting the police more powers in relation to drone offences, the Government is considering the use of Fixed Penalty Notices (FPN) and giving the police the powers to issue them in relation to certain drone offences (both offences under the ANO and any new offences created by a Drones Bill (and related secondary legislation).
- 6.13 An FPN is an alternative to prosecution in which the individual is issued with a monetary penalty for committing an offence.
- 6.14 Looking to the Road Traffic Offenders Act 1988 for comparable penalty levels, we would look to set the penalty range from £100-£300. The exact penalty amount for the different offences will not be specified in the Bill, but in secondary legislation.
- 6.15 An FPN would only be applicable to those 18 years and over. Any offences committed by under 18s will be dealt with through the current youth framework, such as through diversion, a community resolution or an out of court disposal where appropriate.²⁵ We believe this is in keeping with the overall aim of the youth justice system to prevent offending by children and young people.
- 6.16 The Government considers FPNs as a reasonable and appropriate way to deal with less serious drone-related offences, also decreasing the pressure on Magistrates' Courts. The immediate nature of FPNs can act as a sufficient deterrent to offenders and allow police constables to deal with the offence quickly and effectively.
- 6.17 We propose to attach FPNs to the following offences:
- Not producing registration documentation, and/or proof of registration for drones between 250g and up to and including 20kg in mass, at the request of a police constable;
 - Not producing evidence that a flight plan was submitted before flying, or that an appropriate FINS is being used, should the decision be taken to mandate the use of FINS;
 - Not producing evidence of any other relevant permissions required by legislation, for example if you are a commercial drone operator or have an exemption from the CAA from an ANO 2016 article;
 - Not complying with a police officer when instructed to land a drone;
 - Flying a drone without a valid acknowledgement of competency, or failure to provide evidence of meeting this competency requirement when requested;
 - Other offences under the ANO, such as flying a small drone (SUA) with a camera or other data collection device within 50m of people, vehicles or buildings.
- 6.18 An FPN would only be issued when certain conditions have been met, those being where a constable believes that the offender did not, and did not intend to:
- endanger any other aircraft (whether or not an unmanned aircraft),
 - cause any persons harm, harassment, alarm or distress,
 - cause any persons occupying any premises nuisance or annoyance relating to their occupation of the premises,

²⁵ <https://www.yjlc.uk/wp-content/uploads/2015/03/Youth-Out-of-Court-Disposals-Guide-for-Police-and-Youth-Offending-Services.pdf>

- undermine security or good order in prisons or in other institutions where persons are lawfully detained,
- disturb public order, or
- damage property (including land or buildings),

6.19 If the constable believes the offender did intend to, or did cause, any of the above, then an FPN is not seen as an appropriate mechanism of enforcement, given the potential harm any of the above could cause.

- Question 54: Do you agree that Fixed Penalty Notices (FPN) are a suitable alternative to prosecution for certain drone-related offences?
 - Yes
 - No
 - Don't know
- If no, why not?
- Question 55: Do you agree if a person is unable to produce the required evidence within 7 days of a police constable's request they should receive an FPN?
 - Yes
 - No
 - Don't know
- Why?
- Question 56: Do you agree that drone users not complying with a police officer's instruction to land a drone should receive a FPN?
 - Yes
 - No
 - Don't know
- Why?
- Question 57: Do you agree that the FPN cost should be between £100 and £300?
 - Yes
 - No
 - Don't know
- Question 58: The power to issue FPNs is only being considered for police constables. Do you believe the power to issue a FPN should also be given to:
 - a. Police community support officers?
 - b. Council enforcement officers?
 - c. Other?
 - Yes
 - No
 - Don't know

Section C: The Future: Counter-drone technology and modelling the uptake of drones.



This section covers two areas - combatting the threat from drones through counter-drone technology, and drone scenario modelling, which will help to inform future thinking on the uptake of drones for commercial purposes.

7. Counter-Drone Technology

Introduction

- 7.1 This consultation chapter covers the use of counter-drone technology. The responses to this specific chapter will be used to inform cross-governmental discussions and development of a policy framework. Measures related to this may be included in legislation in the future.

Threat

- 7.2 The key threat area from a criminal perspective relates to the transport of contraband into prisons. Over recent years, Her Majesty's Prison and Probation Service (HMPPS) has witnessed a significant increase in the use of drones to convey illicit items into prisons in England and Wales. The significant volume of contraband delivered per flight (an average payload of 1kg) can have a considerable impact on the safety and security of prisons.
- 7.3 More broadly, the number of drone incidents in the UK is increasing, with over-flights of critical and sensitive sites now not uncommon. Some of these are due to drone users being unaware of the rules contained in the ANO, or reckless users flying their drone in an irresponsible manner.
- 7.4 The prospective threat to public events is also significant, and critical national infrastructure, sensitive sites, Government buildings, defence establishments and crowded places may also be at risk of criminal or hostile drone activity. Small drones have also been used in neighbourhood disputes to cause harassment to one of the parties involved.
- 7.5 Within the aviation sector, there have been increasing numbers of reports of drones coming into close proximity with other aircraft. The number of incidents reported to the Airprox board involving objects believed to be drones has risen from 6 events in 2014 to 29 in 2015, 71 in 2016 and 93 in 2017.
- 7.6 Overseas, terrorists are using drones for a variety of purposes, primarily in conflict zones, from surveillance to dropping improvised explosive devices.

Government approach

- 7.7 The Home Office and Ministry of Defence chair a cross-government counter-drones working group, leading the Government's work on countering drones.
- 7.8 The Government is ensuring that security requirements are factored into new national and international drone legislation, including the Department for Transport's 2018 Amendment Order to the Air Navigation Order 2016, the proposed draft Drones Bill and the European Aviation Safety Agency's proposed regulations for civil drones.

- 7.9 The Government is also engaging directly with drone manufacturers and industry on technical solutions, for example geo-fencing (software and data contained in the drone that can restrict it from flying in certain areas, such as airports).
- 7.10 In addition, there are multiple programmes of work underway focusing on testing and evaluating technology to detect and counter drones, supporting the development of new technology, and understanding how these systems should be practically used. Trials and demonstrations have taken place to examine the applicability of different technological options.

Framework

- 7.11 The Government is consulting on a possible framework for the testing and use of counter-drone technology, applicable to drones. This framework is based around four sequential steps that security personnel in charge of a site may take in order to address the threat from hostile drone activity:
- Reducing reckless or negligent drone use and deterring hostile activity;
 - Detecting drone activity;
 - Assessing the security threat posed by a drone; and
 - Taking responsive action to disrupt or stop the continued operation of a drone which poses a threat.
- 7.12 Security personnel could be military personnel, the police, prison staff or Government officials, and in some instances trained security personnel such as private security managers and commercial guard forces.

Reducing reckless or negligent drone use and deterring hostiles

- 7.13 Where, for security purposes, drones should be restricted or prohibited from operating in, or over, a particular site or area, security personnel can implement numerous operational and procedural countermeasures.
- 7.14 Preventative measures are important for a number of reasons: they can assist in reducing the number of incidents occurring as a result of misunderstanding or lack of awareness, e.g. where users are unaware of the rules contained in the Air Navigation Order 2016; or prevent reckless users flying their drone in an irresponsible manner. Maximising preventative measures gives organisations the opportunity to better determine the intent of the person flying the drone and the assessment of any threat, e.g. if they have deliberately ignored an airspace restriction and signage to deter flying in the area it increases the likelihood that they have malicious intent. This would allow security personnel to assess whether the use of counter-drone technology is justified in a particular instance and implement a response proportionate to the perceived threat. It would also help ensure counter-drone technology is not directed at legitimate users.
- 7.15 The Government recommends a number of operational and procedural countermeasures that security personnel implement before, or in support of, deploying counter-drone technology. These countermeasures include:
- Designating an area of airspace as restricted for unmanned aircraft;

- Geo-fencing a site or raising geo-awareness through drone manufacturers or drone safety apps²⁶;
- Educating the public on the CAA Drone Code and areas where unauthorised drones should not be flying;
- Educating staff and security personnel on a site of the drone threat and developing appropriate response procedures;
- Developing and implementing deterrence communications, such as no drone zone signage;
- Identifying site vulnerabilities for drone threats, i.e. where and how a site may be vulnerable to different types of drone threat;
- Target hardening: making it harder to operate a drone at a site through the use of physical countermeasures (e.g. netting, barriers, etc.);
- Community engagement; and
- Working with regulatory bodies to influence legislation on drone use or influencing the design build of drones.

Detecting drone activity

- 7.16 There are two methods security personnel may use to detect a drone: manual sighting of a drone (or the controller); or using drone detection technology.
- 7.17 There are a number of different drone detection technologies currently available on the market and under development. Radar sensors transmit radio waves and receive the reflection of those waves from objects in their path. The reflected signals can be processed to determine the range, direction and, in some '3D' radars, the altitude of the object. Electro-optic sensors are cameras that can "see" the visible part of the electro-magnetic spectrum, and which require normal daylight to operate. Infra-Red sensors (or thermal imagers) are cameras that can see the infra-red part of the electro-magnetic spectrum which enables them to operate in poor light or at night. Radio frequency uses detected flight control signals emitted from the ground control station to a drone, or video downloads from the drone to the ground control station to classify an emission as coming from a drone. Acoustic sensors detect sound waves emitted by the object of interest and compare the received sound signature with pre-recorded signatures in a library.
- 7.18 Each of the different types of technologies has different capabilities and limitations, and the choice of sensor, or combination of sensors, will depend on an individual organisation's requirements and geographical location. Some systems may be more suitable for deployment in a rural environment, whereas others will be better placed for use in an urban environment. The technology may also provide information which assists in determining the intent of the operator.
- 7.19 The purpose of drone detection technology is to provide security personnel more time to determine whether a drone poses a security threat than visual sighting allows. It is also potentially more reliable than visual sightings, allowing detection to occur at a greater range. If a drone is assessed to pose a security threat, drone detection technology can provide critical and timely information to enable, where appropriate, a

²⁶ A function which warns the operator or remote pilot of the aircraft when in close proximity to, or entering, restricted airspace

proportionate and effective response to be deployed. Drone technology also enables post-incident learning and provides investigative support to the police.

7.20 However drone detection technology must be deployed proportionately to avoid disproportionate interference, which could result in privacy offences being committed. The Government assesses that the use of this technology should therefore be used only where it is necessary and proportionate for one or more of the following operational purposes:

- In the interests of national security;
 - For the purpose of preventing or detecting crime;
 - For the purpose of safeguarding the economic well-being of the UK;
 - In the interests of public safety;
 - For the purpose of preventing death or injury to a person; or
 - For the purpose of preventing damage to property.
 - For the purpose of maintaining prison security or good order and discipline
- Question 59: Do you think the operational purposes identified for the use of drone detection technology are appropriate?
 - Yes
 - No, please explain why
 - Don't know

7.21 The Government recognises that to ensure the appropriate use of this technology, a number of safeguards must be put in place. It is considered that the following types of safeguards could be appropriate when any drone detection technology is operational:

- Drone detection technology is limited to use by trained and/or licensed operators;
- There is a clear purpose and scope for use of the technology, and operational policy specific to each site which is in line with appropriate legislation (for example, a defined code of practice);
- Where applicable, a full risk assessment is conducted in line with Health and Safety legislation;
- A Memorandum of Understanding with the relevant regulatory bodies could be put in place where appropriate, covering dispute resolution mechanisms and resolving difficulties arising from malfunctioning or misuse of the technology;
- Any data captured from drone detection technology is managed (including storage and transference) in accordance with the appropriate legislation (for example, the Data Protection Act);
- The technology is only deployed in line with an operational requirement where its use is deemed necessary and proportionate in line with appropriate legislation (for example Article 8 of the European Convention on Human Rights)²⁷;

²⁷ By way of example, as set out in the unannounced inspection report at HMP Liverpool in September 2017, drugs were readily available in the prison with survey results suggesting that prisoners felt that it was much easier to get drugs into that particular prison compared to others. According to the report, in the six months prior to the inspection, more than one drone per week had been

- The technology has undergone fit for purpose testing and testing to minimise incidental interference;
- Regulatory bodies with responsibility for oversight of the technology deployed are informed when the drone technology is installed and where possible, prior to its installation;
- Depending on the nature of the site or event, organisations warn the public (through use of public communications, community engagement and signage) that unauthorised drone use will be monitored and enforcement action may be taken; and/or
- There is appropriate insurance in place.

- Question 60: Do you think the safeguards identified for the use of drone detection technology are appropriate?
 - Yes
 - No, please explain why
 - Don't know
- Question 61: Are there any other safeguards for the use of drone detection technology you think we should consider?
 - Yes, please explain what you would like these safeguards to be, and why
 - No, please explain why
 - Don't know

7.22 The Government plans to develop a clear policy framework governing the use of drone detection technology, and set minimum operator training standards. It will also publish guidance on drone detection technology and guidelines for the development of a clear purpose and scope for use of the technology, and operational policy.

- Question 62: Do you think anything else should be done to assist organisations in meeting the defined safeguards?
 - Yes, please explain what should be done to assist organisations in meeting the defined safeguards.
 - No
 - Don't know

Assessing the security threat posed by a drone

7.23 When a drone has been detected, security personnel then need to determine the level of security risk posed. Any factors indicating malicious intent of the pilot would be relevant in this context, but there will be situations in which the drone in question poses a threat because of where and how it is flying, irrespective of the intent of the pilot. The decision-making process can be supported by a multitude of factors including:

recovered. The prison therefore worked with Merseyside Police to address the problem, put in place physical security counter-measures to secure windows and also employed counter-drone technology to detect, track and identify drones that might, or were in the process of, encroaching into the airspace above the prison.

- Whether the pilot has ignored no-fly zone regulation, signage or geo-fencing;
- Whether the pilot is in breach of laws, e.g. flying within 50m of people or a building not under their control;
- The drone's flight profile, i.e. the speed of travel, the approach, type of drone, e.g. fixed wing or multicopter;
- Whether the drone is carrying an identifiable payload which is either unlawful in nature or prohibited in the particular context in question;
- The threat picture, based on identified threat levels and relevant intelligence; and/or
- Information regarding previous incidents.

7.24 Security personnel making this assessment could be military personnel, the police, prison staff or Government officials. However there will often be a requirement for organisations to defer authority to trained security personnel to enable them to make timely decisions on whether a drone poses a security threat. These will include private security managers and commercial guard forces.

7.25 It will not always be appropriate to await a response from the police to carry out this decision making, as this may be too slow to enable an effective response against the drone. Assessing whether a drone poses a security threat will also be site specific and require an understanding of the drone detection technology in place, both of which is knowledge that would not necessarily be held by the police. Permitting organisations to defer authority to trained security personnel who can make a decision in real-time will often be important to enable a response that is necessary, proportionate and timely, increasing the likelihood of an effective response.

7.26 The Government recognises that in order for organisations to defer authority to trained security personnel to make an assessment of threat, a number of safeguards must be put in place. Trained security personnel will include military personnel, the police, prison staff, private security managers and commercial guard forces. It is proposed that the following types of safeguards ought to be considered:

- A minimum training requirement; and
- A site specific operational policy informed by the Government guidance on how to assess a drone threat.

- Question 63: Do you think the safeguards identified to enable deferred authority are appropriate?
 - Yes
 - No, please explain why
 - Don't know
- Question 64: What other safeguards would you like to be considered to enable deferred authority?

Taking responsive action to disrupt or stop the continued operation of a drone which poses a threat

- 7.27 Once the nature and level of the threat has been assessed the relevant decision maker will decide how to respond. The response may identify a need to:
- Deploy staff to locate the pilot (or drone);
 - Move valuable assets away from the drone, e.g. move a VIP inside;
 - Call the Emergency Services to locate and engage with the pilot; and/or
 - Activate effector technology to stop or disrupt the drone's flight.
- 7.28 In the event that security personnel assess that a drone poses an unacceptable risk to the safety or security of a site or person(s), or to the continuous functioning of a critical site, it may be necessary for an organisation to prevent the drone from completing its mission using a technical effect.
- 7.29 Physical effectors such as birds of prey net guns, and nets launched from other drones may have utility for some specific scenarios, e.g. during temporary events. Kinetic effectors (guns and missiles) that could be used to defeat a hostile drone will also be suitable for use in limited scenarios, primarily by law enforcement and military personnel if applicable. The Government is currently scoping the use of such technologies outside of that covered by existing legislation.
- 7.30 Electronic effectors, also known as "jammers" or "spoofers", interfere with or disrupt the electronic signals that allow the drone to complete its mission. Electronic effectors are particularly suited to countering nefarious drones in the majority of homeland security scenarios because of their ability to disrupt or defeat a drone in flight at a distance. They offer a more widely deployable alternative to kinetic and physical effectors, especially where authority has been deferred to private security managers and commercial guard forces. For this reason, electronic effectors will be the focus of the rest of this consultation.
- 7.31 Electronic effectors work in a number of ways including:
- Jamming of command transmission from the control system to the drone and/or of the video transmissions from the drone to the control system, which overpowers a frequency band with 'noise';
 - Jamming of Global Navigation Satellite Systems (Sat Nav; GPS, GLONASS), which is one way of disrupting drones flying on autonomous pre-planned satellite navigation routes;
 - GPS Spoofing, which offsets the GPS receiver in the drone by simulating false satellite signals and, in effect "moves the map" underneath the drone in order to divert it off course or to a chosen location; or
 - Control uplink spoofing to mimic/overpower commands from the original control system, from taking control of a drone in flight to inducing drone failsafe or return to home behaviour.
- 7.32 Electronic effectors which jam wireless telegraphy signals, spoof GPS signals or mimic/overpower commands from the drone's controller may provide those that need it with the ability to respond to a nefarious drone in a proportionate and timely manner, ultimately preventing the user from completing their mission.

7.33 The Government assesses that the use of this technology should be only where it is necessary and proportionate for one or more of the following possible specified operational purposes:

- In the interests of national security;
- For the purpose of preventing or detecting crime;
- For the purpose of safeguarding the economic well-being of the UK;
- In the interests of public safety;
- For the purpose of preventing death or injury to a person; and/or
- For the purpose of preventing damage to property.
- For the purpose of maintaining prison security or good order and discipline

- Question 65: Do you think the operational purposes identified for the use of drone electronic effectors are appropriate?
 - Yes
 - No, please explain why
 - Don't know

7.34 The jamming of command transmission from the control system to the drone, the video transmissions from the drone to the control system, and global navigation satellite systems have the potential to impact on other systems operating in the same frequency band in the surrounding area. The Government is undertaking work to evidence the potential for this collateral damage and to seek to identify appropriate mitigations, which may include Government advice on where to situate, and when to operate, such effectors.

7.35 The Government is also working to understand, and standardise if needed, what happens to the drone once this technology is activated, e.g. the drone returns to home or lands safely. The results of this study will inform where to use these technologies and support the development of local procedures for decision-making. Both of these studies are ongoing activities to minimise the safety risks associated with deploying an electronic effector when the security risk dictates it is necessary and proportionate.

- Question 66: Should any other studies be conducted to minimise the safety risks associated with deploying electronic effectors in the UK?
 - Yes, please explain what these studies should focus on
 - No, please explain why
 - Don't know

7.36 The need to use this technology will be driven by threat and perceived risk. Each site will have unique technical requirements: some will require technology which can disrupt nefarious drone activity at a longer range (perhaps kilometres away), whereas others will rely on closer range solutions as a last defence; some sites will be situated in rural areas, whereas others will be located in urban towns or cities, each of which

poses different challenges. As with the assessment of the threat, it will not always be appropriate to wait for an emergency services' response.

7.37 The Government proposes that, as with the assessment of the threat, this authority be deferred in some cases to the security team for the site or event, with appropriate authorisation. In the case of critical national infrastructure sites, major events and crowded places, this could include private security managers or commercial guard forces. In due course, the Government may consider the case for introducing new provisions in legislation to expressly permit research, development, training, and assessment of the efficacy of counter-drone technologies.

7.38 The Government recognises that to ensure the appropriate use of this technology a number of safeguards must be put in place, and is giving consideration to the following types of possible safeguards when drone electronic effectors are in place:

- Drone electronic effectors are limited to use by trained, approved and/or licensed operators;
- There is a clear purpose and scope for use of the technology, and operational policy specific to each site, which is in line with appropriate legislation (for example, a defined code of practice);
- Where applicable, a full risk assessment is conducted in line with Health and Safety legislation;
- A Memorandum of Understanding with the relevant regulatory bodies is put in place where appropriate, covering dispute resolution mechanisms and resolving difficulties arising from the malfunctioning or misuse of the technology;
- Any data captured from drone electronic effectors is managed (including storage and transference) in accordance with the appropriate legislation, e.g. the Data Protection Act;
- The technology is only deployed in line with an operational requirement where its use is deemed necessary and proportionate, in line with appropriate legislation, e.g. Article 8 of the European Convention on Human Rights;
- The technology has undergone fit for purpose testing and testing to minimise incidental interference;
- Regulatory bodies with responsibility for oversight of the technology deployed are informed prior to installation of any drone electronic effectors;
- Depending on the nature of the site or event, organisations warn the public (use of public communications, community engagement and signage) that unauthorised drone use will be monitored and enforced; and/or
- There is appropriate insurance in place.

- Question 67: Do you think the safeguards proposed for the use of drone electronic effectors are appropriate?
 - Yes
 - No, please explain why
 - Don't know

- Question 68: Do you think any other safeguards should be considered for the use of drone electronic effectors?
 - Yes, please explain what you would like these safeguards to be
 - No, please explain why
 - Don't know

7.39 The Government is considering the development of a clear policy framework governing the use of drone electronic effectors, and set minimum operator training standards. This could include publishing guidance on drone technology and the importance of a layered response, in a way which is proportionate to the threat. It could also include guidelines on the development of a concept of operations for using drone electronic effectors, including rules of engagement and guidance on the collateral damage study caused by certain types of electronic effectors to assist organisations in determining the most appropriate technology to choose and in developing their concept of operations.

- Question 69: Do you think anything else should be done to assist organisations in meeting the defined safeguards?
 - Yes, please explain why
 - No, please explain why
 - Don't know

Testing drone detection technology and drone electronic effectors

7.40 To enable military personnel, the police, prison staff, Government officials, private security managers and commercial guard forces to deploy, and recommend the deployment of, drone detection technology and drone electronic effectors to mitigate the safety and security risks posed by drones, this technology must have been sufficiently tested. This technology testing is essential to understand the capabilities and limitations of each available system, and the appropriate deployment. Manufacturers of drone detection and drone electronic effector technologies also need to test equipment in a controlled environment to ensure that it meets the identified requirements and performs as expected.

7.41 There are two main mechanisms for testing drone detection technology and drone electronic effectors: laboratory testing can assess the technical requirement and evaluate whether the product functions as specified in its design specification; and field testing is required to ensure technologies work in situ and meet the operational requirements of a specific site. Field testing might take place at both rural and urban test ranges to assess whether the technology is fit for purpose in diverse or complex environments.

7.42 Testing drone detection technology and drone electronic effectors is required to enable current or further activities for one or more of the following purposes:

- In the interests of national security;

- For the purpose of preventing or detecting crime;
- For the purpose of safeguarding the economic well-being of the UK;
- In the interests of public safety;
- For the purpose of preventing death or injury to a person;
- For the purpose of preventing damage to property;
- For the purpose of maintaining prison security or good order and discipline;
- For the purpose of understanding collateral damage, i.e. the potential to impact on other systems operating in the same frequency band in the surrounding area; and/or
- For the purpose of understanding what happens to the drone once this technology is activated.

- Question 70: Do you think the requirements identified for the testing of drone detection technology and drone electronic effectors are appropriate?
 - Yes
 - No, please explain why
 - Don't know

7.43 The Government recognises that to minimise the risks of testing these technologies a number of safeguards must be put in place. It is proposed that the following possible safeguards could be enforced when testing counter-drone technology:

- There is a clear purpose and scope for the testing of drone detection technology and drone electronic effectors;
- Testing is only permitted on Government authority;
- Where applicable, a full risk assessment is conducted in line with Health and Safety legislation;
- A Memorandum of Understanding with the relevant regulatory bodies is put in place where appropriate, covering dispute resolution mechanisms and resolving difficulties arising from the malfunctioning of technology during testing;
- Any data captured during the testing of drone detection technology or drone electronic effectors is managed in accordance with the appropriate legislation, e.g. the Data Protection Act;
- Depending on the nature of the testing, organisations warn the public (use of public communications, community engagement and signage) that testing is taking place;
- There is appropriate insurance in place;
- For drone electronic effectors, testing only takes place in a Government defined controlled environment;
- For drone electronic effectors, appropriate equipment is used to monitor the collateral damage.

- Question 71: Do you think the safeguards identified for both the testing of drone detection technology and electronic effectors are appropriate?
 - Yes
 - No, please explain why
 - Don't know
- Question 72: Would you like any other safeguards to be considered to enable the testing of drone detection technology or drone electronic effectors?
 - Yes, please explain what you would like these safeguards to be
 - No, please explain why
 - Don't know

8. Commercial Drone Scenario Modelling

Introduction

- 8.1 To inform the impact assessments accompanying this consultation we have produced some potential scenarios of future drone use. The emerging nature of the market, and short period for which we have data means we are unable to produce robust forecasts or targets, however these scenarios give us an idea of the possible extent of UK drone use if historical trends in drone registration continue. We have adopted the approach detailed below for simplicity in the absence of an existing well defined method. These scenarios are under development and based on a significant number of assumptions. The aim of this section is to provide respondents with the opportunity to provide feedback on our methodology, rather than a publication of official estimates.

Approach

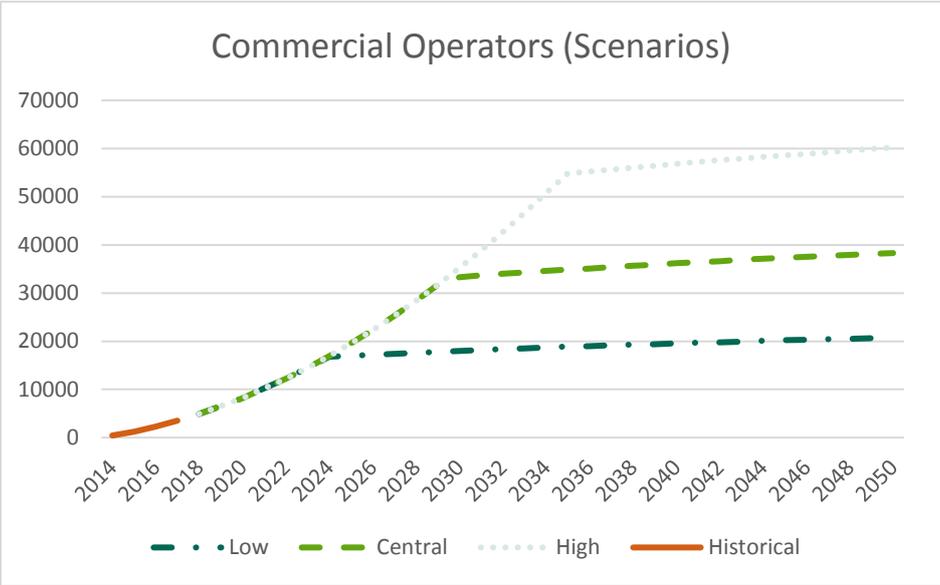
- 8.2 Since 2013 commercial drone operators have been provided with permissions by the CAA to undertake commercial operations. We used the growth we have seen in these permissions to see how commercial drone use might increase if historical trends continue.
- 8.3 There is a widely observed “s-curve” in technology adoption. Initial slow growth is driven by a few "early adopters", followed by a rapid adoption as a technology becomes mainstream. Eventually, growth slows and continues only through late adopters and finding new uses for the technology.
- 8.4 To reflect this s-curve we fit a simple trend to the historical data that shows the growth of permissions at an increasing rate. To reflect the eventual slowdown in growth, we identify a point in the future at which we expect market saturation to occur and significantly reduce the growth rate after this point.

Commercial Users

- 8.5 To reflect the increasing rate of new commercial permissions observed in the data, we have used a quadratic trend in all of our scenarios. By continuing this trend into the future we can see how commercial drone use would develop if the rate of growth continues to increase as it has between November 2014 and November 2017. Using this type of trend means growth continues at an ever increasing rate. We therefore need to consider market saturation to avoid a scenario with an unrealistic number of drone users.
- 8.6 Using the SESAR European Drones Outlook Study (a report by the technological branch of the EU’s Single European Skies initiative) we have identified a range of

possible saturation points within 10 to 20 years.²⁸ Once this point is reached we reduce the growth rate by 90%. This percentage is arbitrary but ensures our scenarios reflect the pattern of growth expected by the technology s-curve. This abrupt change is a simplification and the rate of growth is likely to change more subtly over a longer period. We would welcome input through this consultation on both when saturation is likely to occur and how much growth is likely to slow after this point.

8.7 The above assumptions enable us to create the scenarios in the chart below



8.8 Each scenario follows the same path until the market saturation point is reached. The low and high scenarios show uncertainty by varying saturation points from December 2024 to December 2035 compared to June 2030 in the central case. Beyond this point, growth continues at one tenth of what continuing the trend would predict. This means that the scenarios continue to diverge, as those that reach market saturation later apply percentage growth to a higher starting point.

8.9 The high scenario being more than three times higher than the low scenario in 2037 shows the uncertainty in this modelling. We welcome views on how realistic these scenarios appear. We would be particularly interested in hearing from those who have produced their own scenarios or forecasts.

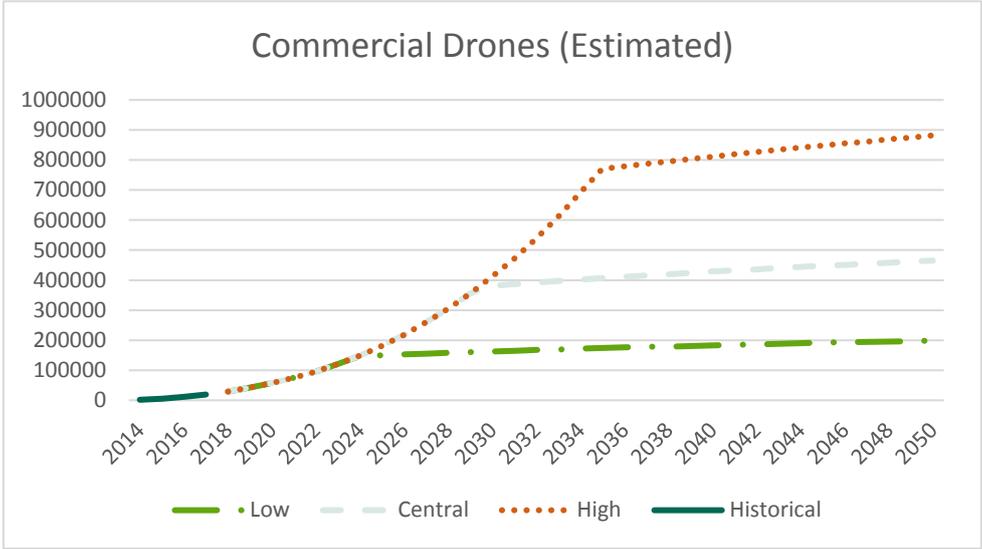
Commercial Drones

8.10 The chart above shows scenarios of commercial drone users. To create scenarios for the number of commercial drones we scale the high central and low user scenarios by assumed numbers of drones per commercial user. These assumptions are taken from responses to the January 2017 Drone Consultation. These begin at 5.6 drones per business in 2017 rising to 10.4 in 2028. We believe these figures overestimate the number of drones. This is because the organisations that responded to the consultation are likely to be more engaged in drone activities than the wider commercial drone user base. There is also uncertainty due to the response types from that consultation. In this consultation we ask respondents to consider both their own experiences and the drone economy as a whole. We welcome evidence and

²⁸ SESAR stands for Single European Sky ATM (Air Traffic Management) Research.

forecasts of the current and future number of drones used by firms across the economy.

8.11 Noting the issues with the underlying assumption used, we can generate the scenarios for number the of commercial drones shown in the chart below



- Question 73: How many drones do you expect to operate
 - In the next year
 - In 2023
 - In 2028
 - In the long run
- Question 74: Are the scenarios for the number of commercial users:
 - realistic
 - overestimates
 - underestimates
 - Why?
- Question 75: Are the scenarios for the number of commercial drones:
 - realistic
 - overestimates
 - underestimates
- Why?
- Question 76: Please explain why you rate the following assumptions as accurate or weak:
 - Growth in commercial drone users will continue according to the quadratic trend that best fits historical data.
 - Market saturation will most likely occur in 2030, with 2024 and 2035 representing low and high estimates respectively.
 - The average commercial user currently has 5.6 drones and this will rise to 10 by 2037.

- Question 77: What do you estimate the average number of drones per commercial user to be?
 - In the next year
 - In 2023
 - In 2028
 - In the long run
- Question 78: How many drones do you estimate the average non-commercial drone user owns?
- Question 79: If you are willing to share forecasts of commercial or non-commercial users or drone numbers, please provide details.

What will happen next

A summary of responses received, including the next steps, will be published within three months of the consultation closing. Paper copies will be available on request.

If you have questions about this consultation please contact:

dronesconsultation@dft.gov.uk

Or

The Drones Policy Team

Technology & International Aviation (TIA) Division

Aviation Directorate

Department for Transport

33 Horseferry Road

London

Annex A: Impact assessment

- A.1 The impact assessment is to be found as an attachment on the gov.uk page for this consultation document.
- A.2 When responding to the consultation, please comment on the analysis of costs and benefits, giving supporting evidence wherever possible.
- A.3 Please also suggest any alternative methods for reaching the objective and highlight any possible unintended consequences of the policy, and practical enforcement or implementation issues.

Annex B: Full list of consultation questions

Minimum age requirement for Drone Operators

- Question 1: Do you see any advantages to the introduction of a minimum age for SUA (small drone) operators?
 - Yes
 - No
 - Don't know
- If yes, what advantages?
- Question 2: Do you see any disadvantages to the introduction of a minimum age for SUA (small drone) operators?
 - Yes
 - No
 - Don't know
- If yes, what disadvantages?
- Question 3: do you agree with the Government's proposal that a minimum age of 18 should be introduced for SUA (small drone) operators?
 - Yes
 - No
- If no, why not?
- Question 4: Do you believe that the introduction of a minimum age of 18 for SUA (small drone) operators will have a positive or negative impact?
 - Positive
 - Negative
 - No impact
- Why?

Restrictions on small drone flights near protected aerodromes

- Question 5: What other areas do you feel the review should cover?
- Question 6: Do you believe that the 1km restriction zone around a protected aerodrome is sufficient?
 - Yes

- No (please explain)
- Question 7: Do you feel that a restriction zone of a different shape would be more appropriate? If yes, state the shape, its dimensions, and why.
 - Yes
 - No

Model Aircraft Flying Associations and the impact of drone legislation

- Question 8: Do you have any proposals for solutions to minimise the impacts on safe model aircraft flying that we could consider?

Mandating and/or regulating a Flight Information and Notification System(s) (FINS(s))

- Question 9: Do current drone information apps provide enough support to ensure the safe and appropriate use of drones?
 - Yes
 - No
 - Don't know
- Why?
- Question 10: Do you think there is a need to mandate the use of a FINS(s) for certain types of drone activity?
 - Yes
 - No
 - Don't know
- Why?
- Question 11: Should the government explore options to achieve similar policy aims, but without mandating the use of a FINS(s)?
 - Yes
 - No
 - Don't know
- Why?
- Question 12: Do you agree with the requirement to use a FINS as outlined by the government?
 - Yes
 - No
- Why?
- Question 13: What do you think should be the maximum mass of a drone for which its user should have to use a FINS(s), if such a requirement were to be introduced?

- 20kg
- 50kg
- 100kg
- Over 100kg
- Why?
- Question 14: Should there be a requirement to file a pre-flight notification on the FINS(s) before flying a drone?
 - Yes
 - No
- Why?
- Question 15: What do you think should be the minimum allowed time, prior to take-off, for filing a pre-flight notification on the FINS(s)?
 - File the notification at point of take-off?
 - File the notification no less than 5 minutes before take-off.
 - File the notification no less than 30 minutes before take-off.
 - File the notification no less than 1 hour before take-off.
 - File the notification no less than 3 hours before take-off.
 - Other
- Why?
- Question 16: What do you think should be the maximum allowed time, prior to take-off, for filing a pre-flight notification on the FINS(s)?
 - File the notification at point of take-off
 - File the notification no more than 5 minutes before take-off.
 - File the notification no more than 30 minutes before take-off.
 - File the notification no more than 1 hour before take-off.
 - File the notification no more than 3 hours before take-off.
 - File the notification no more than 24 hours before take-off.
 - File the notification no more than a week before take-off.
 - Other
- Why?
- Question 17: It is proposed that remote pilots should not have sole responsibility in relation to the use of a FINS. Do you agree?
 - Yes
 - No
 - Why?
- Question 18: Should there be a duty on FINS providers to display accurate information?
 - Yes

- No
- Don't know
- Question 19: Should it be an offence for a FINS provider to display inaccurate data to drone users?
 - Yes
 - No
 - Don't know
- Question 20: What do you believe should be approved for the public to use:
 - A single FINS?
 - Multiple FINSs?
- Why?
- Question 21: In your opinion what should the FINS(s) cover? :
 - all of the UK
 - select regional information, but together multiple FINSs would provide full UK coverage
 - Other
- Why?
- Question 22: Besides poor signal, no battery on the electronic device, maintenance or crashing do you think there are other scenarios which could restrict access to the FINS(s)?
 - Yes
 - No
 - Don't know
- What scenarios?
- Question 23: If real time access to the FINS(s) cannot be gained do you believe the drone flight should be allowed?
 - Yes
 - No
- Question 24: Do you think there should be an exception from using real time data on the FINS(s) if access is restricted by:
 - poor signal
 - no battery on device
 - the FINS crashing
 - the FINS being offline for maintenance
 - Other
- Why?
- Question 25: If real time access to a FINS cannot be gained, how should this be managed?

- Allow drone flight in certain scenarios
- Allow drone flight in designated geographically zoned low risk areas, but not in higher risk areas
- Allow drone flight using offline maps and data from the FINS(s)
- Other
- Why?
- Question 26: Which organisation do you believe is best suited to regulate the FINS(s)?
 - Civil Aviation Authority
 - NATS (the UK air navigation service provider)
 - Department for Transport
 - Other
- Why?
- Question 27: In line with government strategy should anonymised drone data from the FINS(s) be shared with the industry to drive technological development?
 - Yes
 - No
 - Don't know
- Why?
- Question 28: For the purposes of carrying out their function, to which organisation or organisations should a FINS provider have to provide data if requested?
 - Department for Transport
 - Civil Aviation Authority
 - Police
 - Intelligence and Security Services
 - Border Force
 - National Crime Agency
 - HM Prisons and Probation Service
 - Other
 - None of the above
- Why?
- Question 29: There would be a duty on any FINS(s) provider(s) to provide information to a list of organisations specified in legislation. The specific organisation may only request information in order for them to carry out their function. Potential organisations may include, but are not limited to: The CAA, Department for Transport, UK Police, Security and Intelligence Services.

Do you agree it should be an offence for a FINS system provider to withhold information from specific organisation if a valid request for data is made?

- Yes
- No
- Don't know
- Why?
- Question 30: Do you believe certain organisations should have some level of instant, or near instant, access to all data from the FINS(s)?
 - Yes
 - No
- Question 31: Which organisation do you believe should have some level of instant, or near instant, access to all data on the FINS(s)?
 - Police
 - Intelligence and Security Services
 - Border Force
 - National Crime Agency
 - HM Prisons and Probation Service
 - Other
 - None of the above
- Why?
- Question 32: Do you believe there should there be a charge to the drone user to use a FINS?
 - Yes
 - No
- Why?
- Question 33: If a FINS provider decided to charge for using the system, should the Government, have the ability to control the maximum cost that could be charged?
 - Yes
 - No
 - Don't know
- Why?
- Question 34: Do you think there is a need to have a Special Administration Regime to manage the risk of insolvency for FINS providers?
 - Yes
 - No
 - Don't know
- Why?
- The following questions are for technology providers or companies considering being involved in the development of a FINS, to increase understanding of this new market:

Question 35: If an approach is chosen that uses multiple FINSs, in your opinion would it be better to have:

- All FINSs transfer information to a single back end system?
- Multiple FINSs transferring information between each other directly?
- Why?
- Question 36: How would you consider funding a FINS?
 - Charge the drone user
 - Charge to the industry
 - Use adverts
 - Have additional add-ons that can be purchased
 - Other
- Why?
- Question 37: Would you anticipate a yearly subscription fee for users of the FINS(s)?
 - Yes
 - No
- If yes, how much?
- Question 38: Are you a technology provider or a company considering being involved in the development of a FINS?
 - Yes
 - No
- Question 39: Would you consider bidding for the work to provide a FINS?
 - Yes
 - No
- Why?
- Question 40: Would you be interested in attending a Government focus group session with other potential sector technology providers?
 - Yes
 - No
- Question 41: Should the Government work with model aircraft flying associations to consider ways in which the policy could be shaped to minimise the impact of any new legislation relating to FINS(s) for this group?
 - Yes
 - No

Police Powers Relating to Drones and Fixed Penalty Notices

- Question 42: Do you agree that the police require new powers in relation to the misuse of drones?
 - Yes

- No
- Don't know
- Why?
- Question 43: Do you agree that the police should be able to require the production of evidence from drone users:
 - Where there is a reasonable suspicion of an offence being perpetrated;
 - Or where compliance with a legal requirement is being checked?
 - Yes
 - No
 - Don't know
 - Why?
- Question 44: The proposal is that for those unable to produce the relevant evidence at the request of a police constable, they will have 7 days in which to produce it at a police station.
 - Do you agree with the proposal to grant a 7 day grace period to produce this evidence?
 - Yes
 - No
 - Don't know
 - Why?
- Question 45: Do you agree the police should be able to obtain information to check that the following have complied with the law::
 - A drone user
 - A drone operator
 - A remote pilot
 - the person who made the drone available for use
 - Yes
 - No
 - Don't know
 - Why not?
- Question 46: Do you agree that the police require powers to instruct a remote pilot to land a drone, if there is a reasonable suspicion of the commission of an offence.
 - Yes
 - No
 - Don't know

- Why?
- Question 47: Do you agree that the police require powers to instruct a remote pilot to land a drone if a constable believes that:
 - It will protect persons from harm, harassment, alarm or distress;
 - It will protect persons occupying any premises from nuisance;
 - It is causing an annoyance relating to the occupation of a premise;
 - It will protect public order;
 - It will protect property from damage;
 - It would assist in exercising the functions of a police constable.
 - Yes
 - No
 - Don't know
- Why?
- Question 48: Do you agree the police should have the power, when a drone and/or its components are suspected of being involved in the commission of an offence to enter and search premises with a warrant?
 - Yes
 - No
 - Don't know
- Why?
- Question 49: Do you agree the police should have the power, when a drone and/or its components are suspected of being involved in the commission of an offence, to seize and retain the drone and/or its associated components?
 - Yes
 - No
 - Don't know
- Why?
- Question 50: Do you agree the police should have the power to access electronically stored information from the drone or its components if a constable reasonably suspects that it:
 - is evidence in relation to an offence; or has been obtained in consequence of the commission of an offence and
 - that it is necessary to do so in order to prevent it being concealed, lost, tampered with or destroyed?
 - Yes
 - No
 - Don't know
- Why?

- Question 51: Do you agree the police should have the power to require any information stored on the drone or its associated components to be duplicated in a legible form that can be taken away if a constable believes:
 - that it is evidence in relation to an offence or it has been obtained through committing an offence and
 - it is necessary to prevent concealment, loss, tampering or destruction of the data?
 - Yes
 - No
 - Don't know
 - Why?
- Question 52: Are there other powers you feel the police should have in relation to drone misuse?
 - Yes
 - No
 - Don't know
- What powers and why?
- Question 53: These proposed powers are only being considered for police constables. Do you believe any of the proposed powers should also be extended to:
 - Prison officers?
 - Police community support officers?
 - Council enforcement officers?
 - Other?
 - Yes
 - No
 - Why
- Question 54: Do you agree that Fixed Penalty Notices (FPN) are a suitable alternative to prosecution for certain drone-related offences?
 - Yes
 - No
 - Don't know
- If no, why not?
- Question 55: Do you agree if a person is unable to produce the required evidence within 7 days of a police constable's request they should receive an FPN?
 - Yes
 - No
 - Don't know
- Why?

- Question 56: Do you agree that drone users not complying with a police officer's instruction to land a drone should receive a FPN?
 - Yes
 - No
 - Don't know
- Why?
- Question 57: Do you agree that the FPN cost should be between £100 and £300?
 - Yes
 - No
 - Don't know
- Question 58: The power to issue FPNs is only being considered for police constables. Do you believe the power to issue a FPN should also be given to:
 - Police community support officers?
 - Council enforcement officers?
 - Other?
 - Yes
 - No
 - Don't know

Counter-Drone Technology

- Question 59: Do you think the operational purposes identified for the use of drone detection technology are appropriate?
 - Yes
 - No, please explain why
 - Don't know
- Question 60: Do you think the safeguards identified for the use of drone detection technology are appropriate?
 - Yes
 - No, please explain why
 - Don't know
- Question 61: Are there any other safeguards for the use of drone detection technology you think we should consider?
 - Yes, please explain what you would like these safeguards to be, and why
 - No, please explain why
 - Don't know
- Question 62: Do you think anything else should be done to assist organisations in meeting the defined safeguards?
 - Yes, please explain what should be done to assist organisations in meeting the defined safeguards.

- No, please explain why
- Don't know
- Question 63: Do you think the safeguards identified to enable deferred authority are appropriate?
 - Yes
 - No, please explain why
 - Don't know
- Question 64: Would you like any other safeguards to be considered to enable deferred authority?
 - Yes, please explain what you would like these safeguards to be
 - No, please explain why
 - Don't know
- Question 65: Do you think the operational purposes identified for the use of drone electronic effectors are appropriate?
 - Yes
 - No, please explain why
 - Don't know
- Question 66: Should any other studies be conducted to minimise the safety risks associated with deploying electronic effectors in the UK?
 - Yes, please explain what these studies should focus on
 - No, please explain why
 - Don't know
- Question 67: Do you think the safeguards proposed for the use of drone electronic effectors are appropriate?
 - Yes
 - No, please explain why
 - Don't know
- Question 68: Do you think any other safeguards should be considered for the use of drone electronic effectors?
 - Yes, please explain what you would like these safeguards to be
 - No, please explain why
 - Don't know
- Question 69: Do you think anything else should be done to assist organisations in meeting the defined safeguards?
 - Yes, please explain why
 - No, please explain why
 - Don't know
- Question 70: Do you think the requirements identified for the testing of drone detection technology and drone electronic effectors are appropriate?

- Yes
- No, please explain why
- Don't know
- Question 71: Do you think the safeguards identified for both the testing of drone detection technology and electronic effectors are appropriate?
 - Yes
 - No, please explain why
 - Don't know
- Question 72: Would you like any other safeguards to be considered to enable the testing of drone detection technology or drone electronic effectors?
 - Yes, please explain what you would like these safeguards to be
 - No, please explain why
 - Don't know

Commercial Drone Scenario Modelling

- Question 73: How many drones do you expect to operate
 - In the next year
 - In 2023
 - In 2028
 - In the long run
- Question 74: Are the scenarios for the number of commercial users:
 - realistic
 - overestimates
 - underestimates
- Why?
- Question 75: Are the scenarios for the number of commercial drones:
 - realistic
 - overestimates
 - underestimates
- Why?
- Question 76: Please explain why you rate the following assumptions as accurate or weak:
 - Growth in commercial drone users will continue according to the quadratic trend that best fits historical data.
 - Market saturation will most likely occur in 2030, with 2024 and 2035 representing low and high estimates respectively.
 - The average commercial user currently has 5.6 drones and this will rise to 10 by 2037.

- Question 77: What do you estimate the average number of drones per commercial user to be?
 - In the next year
 - In 2023
 - In 2028
 - In the long run
- Question 78: How many drones do you estimate the average non-commercial drone user owns?
- Question 79: If you are willing to share forecasts of commercial or non-commercial users or drone numbers, please provide details.

Annex C: Consultation principles

The consultation is being conducted in line with the Government's key consultation principles. Further information is available at <https://www.gov.uk/government/publications/consultation-principles-guidance>

If you have any comments about the consultation process please contact:

Consultation Co-ordinator
Department for Transport
Zone 1/29 Great Minster House
London SW1P 4DR
Email consultation@dft.gsi.gov.uk

Annex D: Situational hierarchy between an SUA operator and remote pilot of an SUA

- D.1 This annex lays out examples of how the roles of SUA operator and remote pilot - as defined in the 2018 Amendment Order to the Air Navigation Order 2016 - can interplay in practice. In particular, the way in which a SUA operator could also be a remote pilot, on condition that they meet the competency requirements as defined. In this case, they would be both the drone operator and remote pilot.
- D.2 Several examples are provided below, demonstrating the relationship between an operator and remote pilots in a non-commercial setting.

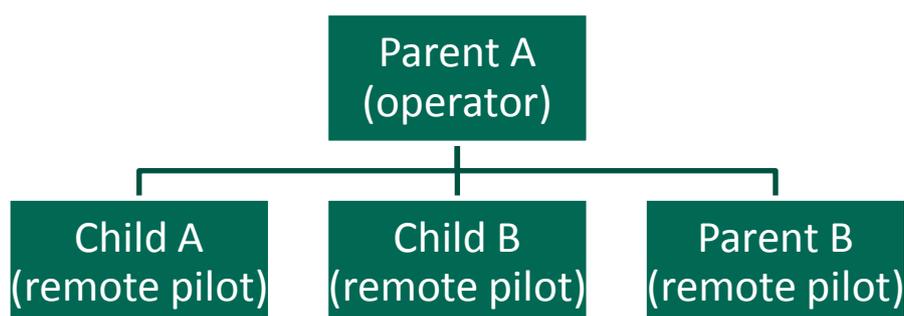


Figure 1 - In this situation the parent would be the drone operator. The parent's children would be the remote pilots (two children and another parent).



Figure 2 In this situation, the operator is also the remote pilot. This may occur when an individual purchases a drone for their own personal use, and does not intend anyone else to use the drone.

- D.3 The following two examples demonstrate the relationship between the operator and remote pilots in a commercial setting.

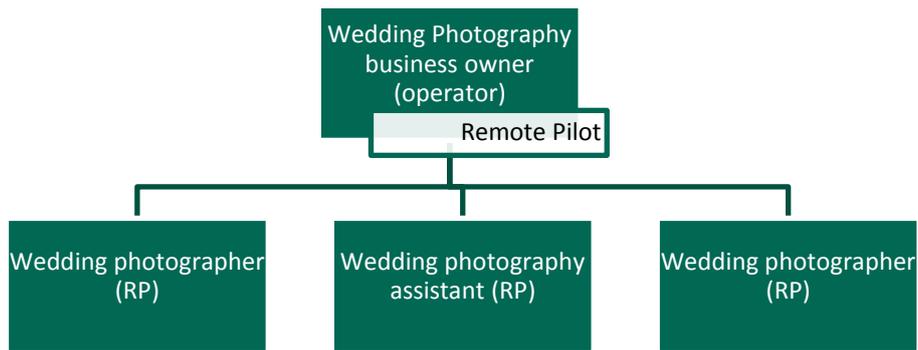


Figure 3 - In this situation, the wedding photography business owner is the operator, but as they also attend wedding to take photos using a drone, they are also a remote pilot. The other employees of the business are remote pilots.

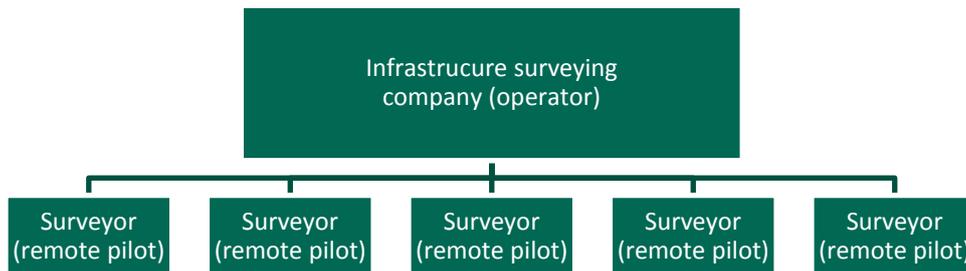


Figure 4 In this situation, the infrastructure surveying company would be the operator, with a nominated individual in the company assuming the responsibilities of the role. Employees of the company (in this case, five surveyors) would be the remote pilots.

D.4 In the case of an organisation taking on the role of the operator, a nominated person who would take on specific responsibilities on behalf of that organisation, such as ensuring remote pilots maintain their required level of competence.

Annex E: List of protected aerodromes

E.1 A list of some of the UK's protected aerodromes, as detailed in chapter 3, is below. Please be aware that this list is not exhaustive. If you are unsure about whether an aerodrome is covered by the 1km restriction included in the Air Navigation Order, please contact the aerodrome operator.

ICAO Code	Airport Name	Aerodrome type	ICAO Code	Airport Name	Aerodrome type
EGPD	Aberdeen/Dyce	EASA Certified Aerodrome	EGXU	Linton-on-Ouse	Government
EGJA	Alderney	National Licenced	EGLC	London City	EASA Certified Aerodrome
EGSL	Andrewsfield	National Licenced	EGKK	London Gatwick	EASA Certified Aerodrome
EGYE	Barkston Heath	Government	EGLL	London Heathrow	EASA Certified Aerodrome
EGPR	Barra	National Licenced	EGLW	London Heliport	Heliport
EGNL	Barrow/Walney Island	National Licenced	EGGW	London Luton	EASA Certified Aerodrome
EGSM	Beccles	National Licenced	EGSS	London Stansted	EASA Certified Aerodrome
EGBF	Bedford	National Licenced	EGAE	Londonderry	National Licenced
EGAA	Belfast Aldergrove	EASA Certified Aerodrome	EGQS	Lossiemouth	Government
EGAC	Belfast City	EASA Certified Aerodrome	EGMD	Lydd	EASA Certified Aerodrome
EGPL	Benbecula	EASA Certified Aerodrome	EGCC	Manchester	EASA Certified Aerodrome
EGUB	Benson	Government	EGCB	Manchester Barton	National Licenced

EGKB	Biggin Hill	EASA Certified Aerodrome	EGYM	Marham	Government
EGBB	Birmingham	EASA Certified Aerodrome	EGDI	Merryfield	Government
EGLK	Blackbushe	National Licenced	EGOQ	Mona	Government
EGNH	Blackpool	EASA Certified Aerodrome	EGDN	Netheravon	Government
EGDM	Boscombe Down	Government	EGNF	Netherthorpe	National Licenced
EGHH	Bournemouth	EASA Certified Aerodrome	EGNT	Newcastle	EASA Certified Aerodrome
EGGD	Bristol	EASA Certified Aerodrome	EGHQ	Newquay	EASA Certified Aerodrome
	Brize Norton	Government	EGAD	Newtonards	National Licenced
EGCK	Caernarfon	National Licenced	EGEN	North Ronaldsay	National Licenced
EGEC	Cambletown	National Licenced	EGBK	Northampton	National Licenced
EGSC	Cambridge	EASA Certified Aerodrome	EGWU	Northolt	National Licenced
EGFF	Cardiff	EASA Certified Aerodrome	EGSH	Norwich	EASA Certified Aerodrome
EGNC	Carlisle	EASA Certified Aerodrome	EGBN	Nottingham	National Licenced
EGLJ	Chalgrove	National Licenced	EGEO	Oban	National Licenced
EGBC	Cheltenham Heliport	Heliport	EGVO	Odiham	Government
EGHR	Chichester/Goodwood	National Licenced	EGSV	Old Buckenham	National Licenced
EGEL	Coll	National Licenced	EGLS	Old Sarum	National Licenced

EGEY	Colonsay	National Licenced	EGTH	Old Warden	National Licenced
EGHA	Compton Abbas	National Licenced	EGTK	Oxford	EASA Certified Aerodrome
EGWC	Cosford	Government	EGEP	Papa Westray	National Licenced
EGBE	Coventry	EASA Certified Aerodrome	EGFP	Pembrey	National Licenced
EGTC	Cranfield	EASA Certified Aerodrome	EGPT	Perth	National Licenced
EGPG	Cumbernauld	National Licenced	EGSF	Peterborough	National Licenced
EGLD	Denham	National Licenced	EGPK	Prestwick	EASA Certified Aerodrome
EGDB	Derby	National Licenced	EGKR	Redhill	National Licenced
EGCN	Doncaster/Sheffield	EASA Certified Aerodrome	EGNE	Retford	National Licenced
EGPN	Dundee	EASA Certified Aerodrome	EGTO	Rochester	National Licenced
EGTU	Dunkeswell	National Licenced	EGES	Sanday	National Licenced
EGNV	Durham Tees Valley	EASA Certified Aerodrome	EGCF	Sandtoft	National Licenced
EGSU	Duxford	National Licenced	EGPM	Scatsta	EASA Certified Aerodrome
EGSR	Earls Colne	National Licenced	EGHE	Scilly Isles	National Licenced
EGNX	East Midlands	EASA Certified Aerodrome	EGCJ	Sherburn-in-Elmet	National Licenced

EGED	Eday	National Licenced	EGBS	Shobdon	National Licenced
EGPH	Edinburgh	EASA Certified Aerodrome	EGKA	Shoreham	EASA Certified Aerodrome
EGTR	Elstree	National Licenced	EGCV	Sleap	National Licenced
EGAB	Enniskillen/St Angelo	National Licenced	EHGI	Southampton	EASA Certified Aerodrome
EGTE	Exeter	National Licenced	EGMC	Southend	EASA Certified Aerodrome
EGEF	Fair Isle	National Licenced	EGSG	Stapleford	National Licenced
EGTF	Fairoaks	National Licenced	EGPO	Stornoway	EASA Certified Aerodrome
EGLF	Farnborough	EASA Certified Aerodrome	EGER	Stornsay	National Licenced
EGCL	Fenland	National Licenced	EHPB	Sumburgh	EASA Certified Aerodrome
EGPF	Glasgow	EASA Certified Aerodrome	EGFH	Swansea	National Licenced
EGBJ	Gloucestershire	EASA Certified Aerodrome	EGBM	Tatehill	National Licenced
EGJB	Guernsey	National Licenced	EGHO	Thrupton	National Licenced
EGFE	Haverfordwest	National Licenced	EGPU	Tiree	National Licenced
EGNR	Hawarden	EASA Certified Aerodrome	EGXZ	Topcliffe	Government
EGWE	Henlow	Government	EGDJ	Upavon	Government

EGNJ	Humberside	EASA Certified Aerodrome	EGXW	Waddington	Government
EGPE	Inverness	EASA Certified Aerodrome	EGNO	Warton	National Licenced
EGPI	Islay	National Licenced	EGNO	Warton	Government
EGNS	Isle of Man	National Licenced	EGUW	Wattisham	Government
EGJJ	Jersey	National Licenced	EGBW	Wellesbourne Moutford	National Licenced
EGBP	Kemble	National Licenced	EGCW	Welshpool	National Licenced
EGQK	Kinloss	Government	EGFA	West Wales/Aberporth	National Licenced
EGPA	Kirkwall	EASA Certified Aerodrome	EGEW	Westray	National Licenced
EGHC	Lands End	National Licenced	EGLM	White Weltham	National Licenced
EGKH	Lashenden Headcord	National Licenced	EGPC	Wick	EASA Certified Aerodrome
EGNM	Leeds Bradford	EASA Certified Aerodrome	EGNW	Wickenby	National Licenced
EGCM	Leeds East	National Licenced	EGBO	Wolverhampton	National Licenced
EGNP	Leeds Heliport	Heliport	EGTB	Wycombe Air Park	National Licenced
EGXE	Leeming	Government	EGHG	Yeovil	National Licenced
EGHF	Lee-on-Solent	National Licenced	EGDY	Yeovilton	Government

EGBG	Leicester	National Licenced
------	-----------	----------------------

EGET	Lerwick/Tingwall	National Licenced
------	------------------	----------------------
