Law Commission

Reforming the law

Aviation Autonomy
Final Report

CP 1586

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Law Commission of England and Wales

Aviation Autonomy Final Report

Report on a reference under section 3(1)(e) of the Law Commissions Act 1965

Presented to Parliament by the Lord Chancellor and Secretary of State for Justice by Command of His Majesty

May 2026

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Abbreviations

AAM: advanced air mobility

AI: artificial intelligence

AMC: acceptable means of compliance

AMS: Airspace Modernisation Strategy

ANO: Air Navigation Order 2016

AOC: air operator certificate

ARU: autonomous radar unit

ATM/ANS: air traffic management and air navigation services

ATMUAA: Aircraft Traffic Management and Unmanned Aircraft Act

ATS: air traffic services

BVLOS: beyond visual line of sight

C2 link: command and control link

CAA: Civil Aviation Authority

CAP: civil aviation publication

CAT: commercial air transport

CIS: common information service

CNS: communication, navigation, and surveillance

DAA: detect and avoid

EASA: European Union Aviation Safety Agency

GM: guidance material

ICAO: International Civil Aviation Organisation

JARUS: Joint Authorities for Rulemaking on Unmanned Systems

MSO: multiple simultaneous operations

SARPs: Standards and Recommended Practices

SDR: special drawing right

SERA: Standardised European Rules of the Air

SORA: Specific Operations Risk Assessment

TMZ: temporary mandatory zone

TRA: temporary reserved area

UAS: uncrewed aircraft system

UTM: uncrewed aircraft systems (UAS) traffic management

UTMSP: UTM service provider

VLOS: visual line of sight

VTOL: vertical take-off and landing aircraft

Glossary

Advanced air mobility ("AAM"): a generic term for a collection of new and emerging technologies intended for use for aviation transportation. It includes both crewed and uncrewed aircraft, used both in urban areas and for regional transport. In the context of this project, the term is usually used to refer to VTOL aircraft.

Air Navigation Service Provider ("ANSP"): a provider of air navigation services, including air traffic services.

Air traffic control ("ATC"): this is a type of ATS provided for the purpose of preventing collisions and ensuring the efficient flow of traffic. ATC services are provided by ground-based air traffic controllers who monitor and actively manage air traffic and ensure separation of aircraft in a given volume of airspace.

Air traffic management and air navigation services ("ATM/ANS"): the collection of air traffic management and air navigation services, as well as services which augment signals emitted by satellites of core constellations of GNSS for the purpose of air navigation; flight procedures design; and services consisting in the origination and processing of data and the formatting and delivering of data to general air traffic for the purpose of air navigation.

Air traffic services ("ATS"): this a generic term meaning variously flight information service, alerting services, air traffic advisory service, air traffic control service.

Air waybill: this is a document used in cargo operations as evidence of carriage of goods contract.

Airspace modernisation strategy ("AMS"): organised into the three parts, the AMS sets out the CAA's strategic vision for airspace modernisation up to 2040.

Airworthiness: defined in Annex 8 to the Chicago Convention as "the status of an aircraft, engine, propeller or part when it conforms to its approved design and is in a condition for safe operation".

Assimilated law. this is the term used to refer to what was previously known as "retained EU law". It is domestic law copied from EU law as it stood on the date of the UK's withdrawal from the European Union, 31 January 2020. Since withdrawal, changes to EU law do not impact assimilated law, nor do changes made to assimilated law impact EU law.

Autonomous operation: an operation during which an unmanned aircraft operates without the remote pilot being able to intervene.

C2 (command and control) link: data link between a remotely piloted aircraft and ground station.

Cabin crew: members of the aircrew who attend to passengers.

Chicago Convention: Convention on International Civil Aviation signed in Chicago on 7 December 1944. Sets out the core principles in relation to international civil aviation.

Civil Aviation Authority ("CAA"): this is the UK's regulatory body for civil aviation.

Civil aviation publication ("CAP"): documents published by the CAA, containing guidance, information or instructions relating to civil aviation. Each CAP is assigned a number, such as CAP2530: *Airspace Fundamentals and the Future of Flight*.

Civil aviation: private, commercial and diplomatic or state flights transporting cargo and passengers.

Command unit: this is the equipment or system of equipment to control the aircraft remotely. It is often called the ground station.

Commercial air transport ("CAT"): operations conducted for the purpose of transporting passengers, cargo or mail for remuneration or other valuable consideration.

Controlled airspace: airspace classes A to E. In controlled airspace, air traffic services are provided by air traffic controllers and aircraft and its pilot must be of a certain standard. Permission to enter controlled airspace must be acquired from air traffic control (with the exception of a VFR aircraft entering class E airspace) and air traffic control instructions must be followed.

Detect and avoid ("DAA"): refers to the capability of the UAS to see, sense or detect conflicting traffic or other hazards and take the appropriate action.

Digital Flight Rules ("DFR"): a set of flight rules proposed by NASA in 2020 to accommodate and facilitate new advances in aviation.

Discovery and synchronisation service ("DSS"): a means by which UTM providers can exchange data mandated by several UTM technical standards.

Drone: used generally to describe smaller uncrewed aircraft which are unoccupied and can be remotely piloted or autonomous.

European Union Aviation Safety Agency ("EASA"): an agency of the EU responsible for civil aviation safety amongst EU member states.

Flight crew: any crew member acting as pilot, flight navigator, flight engineer or flight radiotelephony operator. Note that the latter three roles have been made obsolete by technology, with remaining responsibilities falling under the pilot's role.

Global Navigation Satellite System ("GNSS"): a constellation of satellites that provides positioning, navigation and timing services globally.

Hybrid aircraft: aircraft which can be operated by both an onboard and remote pilot.

Instrument flight rules ("IFR"): the rules applicable when the pilot flies an aircraft primarily by reference to aircraft instruments. IFR particularly enable pilots to fly in adverse conditions such as fog, rain or nighttime.

Integrated airspace: airspace in which uncrewed aircraft can operate with crewed aircraft without segregation.

International Civil Aviation Organisation ("ICAO"): a UN agency responsible for setting international civil aviation standards. Membership consists of the 193 signatories to the Chicago Convention.

Joint Authorities for Rulemaking on Unmanned Systems ("JARUS"): a group of experts with regulatory expertise representing 63 countries, plus EASA and EUROCONTROL. JARUS provides recommendations and guidance material in relation to UAS with the aim of harmonising the regulation of UAS internationally.

Machine learning: a type of AI involving algorithms whose performance can change and improve as they are exposed to data.

Multiple simultaneous operations ("MSO"): multiple uncrewed aircraft which are under collective control and are in flight simultaneously.

NATS (En Route) plc ("NERL"): the UK's sole provider of area control (or en route) services for civil aviation.

Pilot: the person who can manipulate the flight controls of aircraft during flight.

Pilot-in-command: the pilot responsible for the flight and its safe conduct. The pilot-in command may be the sole pilot or one of several pilots.

Remote pilot: the person responsible for operating the flight of an uncrewed aircraft, either manually or, when the uncrewed aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time.

Remotely piloted uncrewed aircraft systems: aircraft and associated equipment where there is a pilot that is able to intervene in the aircraft's operation, but the pilot is not on board the aircraft.

Rules of the air: common rules that aircraft must follow when in flight. This is the equivalent to the maritime rules of the road – the Collision Regulations (COLREGS).

Sandboxing: a service offered by the CAA wherein new innovations are examined for the purpose of complying with regulations and obtaining exemptions to demonstrate their products and services in a live environment. This helps identify regulatory gaps and risks.

Special Drawing Rights ("SDRs"): an international currency unit created by the International Monetary Fund and used in international regulations covering mandatory aircraft insurance.

Specific Operations Risk Assessment ("SORA"): This is an internationally recognised methodology for approving operations in the Specific category. The UK version of this methodology is called "UK SORA."

Standards and Recommended Practices ("SARPs"): Specifications adopted by ICAO and contained within annexes to the Chicago Convention.

Temporary reserved area (“TRA”): a special use airspace structure used to enable BVLOS operations to take place in the short to medium term before full integration.

Uncontrolled airspace: Class G airspace. There is no obligation to be in contact with an air traffic controller or flight information service officer and air traffic services may not always be available.

Uncrewed aircraft system (“UAS”): uncrewed aircraft, together with any associated equipment.

Uncrewed aircraft systems (UAS) traffic management (“UTM”): a specific aspect of air traffic management which manages unmanned aircraft system (UAS) operations safely, economically and efficiently through the provision of facilities and a seamless set of services in collaboration with all parties and involving airborne and ground-based functions.

Uncrewed aircraft: aircraft with no pilot on board, including remotely piloted and autonomous aircraft systems.

U-space: the implementation of UTM in the EU.

UTM service provider (“UTMSP”): a legal or natural person providing a UTM service, either individually or bundled.

Vertical take-off and landing aircraft (“VTOL”): a heavier-than-air aircraft, other than aeroplane or helicopter, capable of performing vertical procedures by means of more than two lift/thrust units and certified for use by one or more occupants.

Visual flight rules (“VFR”): the rules applicable when the pilot relies primarily on sight to fly aircraft. As such, pilots can only fly under VFR in clear visual meteorological conditions.

Assimilated law list

This appendix lists the main assimilated regulations referred to in this paper. The full reference adopted is given first, followed by the short form of the title.

UK Regulation (EC) 549/2004 laying down the framework for the creation of the single European sky.

- UK Regulation (EC) 549/2004 (the “Framework Regulation”)

UK Regulation (EC) 550/2004 on the provision of air navigation services in the single European sky.

- UK Regulation (EC) 550/2004 (the “Service Provision Regulation”)

UK Regulation (EU) 748/2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations.

- UK Regulation (EU) 748/2012 (the “Initial Airworthiness Regulation”)

UK Regulation (EU) 1321/2014 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these tasks.

- UK Regulation (EU) 1321/2014 (the “Continuing Airworthiness Regulation”)

UK Regulation (EU) 923/2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation.

- UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air (“UK SERA”)

UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations.

- UK Regulation (EU) 965/2012 (the “Air Operations Regulation”)

UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight.

- UK Regulation (EU) 2017/373 (the “ATM/ANS Implementing Regulation”)

UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency.

- UK Regulation (EU) 2018/1139 (the “Basic Regulation”)

UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems.

- UK Regulation (EU) 2019/945 (“UAS Delegated Regulation”)

UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft.

- UK Regulation (EU) 2019/947 (“UAS Implementing Regulation”)

Part 1: Introduction

To the Right Honourable David Lammy MP, Lord Chancellor and Secretary of State for Justice

Chapter 1: Introduction

1.1 This report marks the conclusion of our review of the law relating to aviation autonomy and contains our recommendations for reform of the law which applies in England and Wales.

ABOUT THE PROJECT

1.2 The scope of this review is governed by the terms of reference agreed with the Department for Transport and the Civil Aviation Authority ("CAA"). These are:[1]

(1) To review existing aviation legislation in order to identify gaps, blockers or uncertainties to the safe deployment of highly automated and autonomous systems[2] in aviation, and to propose related law reform measures.

(2) To consider in particular the allocation of responsibilities to humans and what happens where functions are performed by highly automated and autonomous systems, and about issues arising in relation to civil and criminal liability where allocation of responsibilities change.

(3) To focus on the following use cases:

(a) Drones. We have interpreted this as meaning smaller uncrewed aircraft which are unoccupied and can be remotely piloted or autonomous;

(b) Advanced Air Mobility. Advanced Air Mobility ("AAM") is an umbrella term for a collection of new and emerging technologies intended for aviation transportation. We have specifically explored electrical vertical take-off and landing vehicles ("VTOLs") providing short journeys for up to ten people.

(c) Air Traffic Management and Air Navigation Services ("ATM/ANS"). In light of the above two use cases, we have focussed on ATM/ANS *as provided to uncrewed aircraft* (which we refer to as uncrewed aircraft systems traffic management, or "UTM").

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1 Our full terms of reference are set out in appendix 1 to this report.

2 These two terms are defined further below and in chapter 4 of this report. When we talk about "aviation autonomy" we are referring collectively to both types of systems.

1.3 Because of our terms of reference, the focus of our review has been the use of high automation and autonomy in uncrewed aircraft systems ("UAS") rather than in traditional crewed aircraft.

1.4 The terms of reference do not restrict us to consideration of UAS operating in a particular type of airspace. It is likely that the specific use case for drones and VTOLs will dictate the type of airspace the operations take place in. We note that the CAA in its Airspace Modernisation Strategy says the following:

> Remotely piloted aircraft systems will want to make use of lower levels, both inside and outside controlled airspace, with an increasing number looking to use higher levels for longer-distance, beyond visual line of sight operations.[3]

In this report we have therefore not limited our consideration of the issues to one particular type of airspace. Where our consideration of a particular issue does relate to a specific type of airspace, however, we make that clear.

1.5 The following areas are explicitly outside of the scope of our terms of reference:

(1) Defence;

(2) Cybersecurity and terrorism;

(3) Land use; and

(4) Labour relations.

The UK's Future Flight Challenge

1.6 This review was funded in part by the Future Flight Challenge: a collaborative research and development programme funded by industry and the UK Government, delivered, in particular, by Innovate UK and the Economic and Social Research Council (a part of UK Research and Innovation). The programme aims to develop the aviation ecosystem required for the introduction of "electric sub-regional aircraft, advanced air mobility vehicles and drones into the UK". The programme has involved working with industry, academia, government, and regulators. Our review is therefore part of a package of measures, including industry trials, designed to support the introduction of remotely piloted and autonomous aircraft in the UK, such as VTOLs and drones.

Project timeline

First consultation paper

1.7 Our first consultation paper[4] was published in 2024 and focussed on reforms to enable highly automated and autonomous UAS flight to take place safely, lawfully, and with appropriate legal mechanisms for attributing criminal and civil liability if things

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3 Civil Aviation Authority ("CAA"), *Airspace Modernisation Strategy 2023-2040 Part 1: Strategic objectives and enablers* (February 2024) (CAP 1711) para 2.12.

4 Aviation autonomy (2024) Law Commission Consultation Paper No 261.

go wrong. We consulted on the provisional proposals set out in the consultation paper from 26 February 2024 to 28 June 2024 and received 55 responses.[5]

Second consultation paper

1.8 Our second consultation paper[6] was published in 2025 and focussed on the reforms needed to enable the safe provision of air traffic management and air navigation services ("ATM/ANS") to uncrewed aircraft systems. We consulted on the provisional proposals set out in the paper from 16 April 2025 to 18 July 2025 and received 24 responses to the consultation.[7]

1.9 This report makes recommendations on issues covered in both consultation papers and takes account of responses received during both consultation periods.

Devolution

1.10 Our current assumption is that any new legislation governing the subject matter of this report would be enacted at Westminster. However, in accordance with the Sewel Convention, the UK Parliament will not normally legislate for devolved matters without the agreement of the devolved legislatures. Devolved competence in Wales therefore needs to be taken into account.

1.11 The Senedd Cymru (Welsh Parliament) may pass legislation so long as it does not relate to a matter reserved to the UK Parliament. Aviation, air transport, airports and aerodromes are areas that are reserved. However, there are three exceptions to these reservations, in relation to which the Senedd can legislate:

(1) financial assistance to providers or proposed providers of air transport services or airport facilities or services;

(2) strategies by the Welsh Ministers or local or other public authorities about provision of air services; and

(3) regulation of the carriage of animals on aircraft for the purposes of protecting human, animal or plant health, animal welfare or the environment.[8]

1.12 Our remit does not extend to Scotland or Northern Ireland: we can only make recommendations in respect of England and Wales. However, we acknowledge that the issues relating to autonomy in aviation apply across the UK.

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5 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

6 Aviation autonomy: Consultation paper 2 on uncrewed aircraft systems traffic management (2025) Law Commission Consultation Paper No 271.

7 Law Commission, Aviation autonomy: Responses to the second consultation (2026) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/.

8 Government of Wales Act 2006, sch 7A(125).

TERMINOLOGY

1.13 A list of relevant terms for this report is set out in our glossary, but there are several key terms which it is useful to highlight and explain at the outset of the report.

Autonomy

1.14 For the reasons set out in chapter 4 of this report, we use the definition of autonomy which already exists in domestic law: an operation during which an unmanned aircraft operates without the remote pilot being able to intervene.[9] In effect, this means a UAS operation which is completely independent of human control. We adopt this definition to provide a clear legal line between highly automated and autonomous operations.

High automation/highly automated

1.15 There is no legal definition of highly automated. We use it to refer to automation of aircraft capabilities beyond what is currently common in aviation, and in particular where this affects roles of humans involved in their operation. Examples include drone flight beyond the visual line of sight of a remote pilot ("BVLOS"), or multiple simultaneous operations, where one remote pilot is in charge of many drones flying at the same time. The distinction between highly automated and autonomous operations is discussed in chapter 4 of this report.

Uncrewed aircraft systems ("UAS")

1.16 When we refer to UAS in this paper we use the definition (albeit the definition for the gendered equivalent, un*manned* aircraft systems) which already exists in domestic law:

> any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board.[10]

This definition covers both autonomous and remotely piloted aircraft. Although the term precludes a pilot from being on board an aircraft, it does not necessarily mean that there are no humans, such as crew members, on board.[11]

Gender-neutral terminology

1.17 There are some references in this report to "un*manned* aircraft systems" and "un*manned* aircraft systems traffic management". The bulk of domestic and assimilated aviation legislation uses "unmanned" rather than "uncrewed" and so any references we make to the legislation mirrors the language used there.

1.18 Our approach for the purposes of this report has been to adopt gender-neutral terminology where possible. This approach is consistent with the recently updated

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9 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 2(17).

10 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 3(30).

11 Aviation autonomy (2024) Law Commission Consultation Paper No 261, ch 2 paras 2.46 to 2.50.

British Standards Institution Flex 1903: Future flight systems – Vocabulary.[12] We do not intend to pre-empt terms used in the drafting of subsequent legislation.

Remotely piloted uncrewed aircraft systems

1.19 As is explained further below, this report is divided into four parts. In part 2 we make recommendations in the main relating to remotely piloted UAS operations. These can be passenger-carrying (for example VTOLs) or non-passenger carrying (for example drones). In part 3 we set out our recommendations relating to the longer term which, in the main, relate to autonomous UAS operations, that is operations without a remote pilot.

Uncrewed aircraft systems traffic management ("UTM")

1.20 We have adopted a gender-neutral version of the definition of UTM used by the International Civil Aviation Organisation in its common framework on UTM:

> a specific aspect of air traffic management which manages unmanned aircraft system (UAS) operations safely, economically and efficiently through the provision of facilities and a seamless set of services in collaboration with all parties and involving airborne and ground-based functions.[13]

1.21 In summary, UTM is the term we use for the provision of ATM/ANS to UAS. UTM is considered further in chapters 9 and 11 of the report.

THE NEED FOR THIS REVIEW: ENABLING SAFE AND LEGAL ADVANCES

1.22 As of 30 June 2024, there were 601,980 active registered drone flyers and operators in the UK.[14] Of the 236,709 active operators, 229,140 are individuals, and 7,569 are organisations.[15] Drones are therefore already being flown in relatively high numbers in the UK, by a mixture of private individuals and organisations. Some of these drones are already being flown beyond the visual line of sight of the remote pilot[16] and likely to use high levels of automation.[17] All of these flights are facilitated by the existing domestic legal framework relating to uncrewed aircraft systems, which is discussed further in chapter 3 and referred to throughout this report.

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12 British Standards Institution, *BSI Flex 1903 v 2.0 2024-06, Future flight systems – vocabulary* (June 2024) para 3.1.138.

13 International Civil Aviation Organization ("ICAO"), *Unmanned Aircraft Systems Traffic Management (UTM) – A Common Framework with Core Principles for Global Harmonization* (4th ed 2023) p 3.

14 See CAA, *Annual Safety Review 2023* (September 2024) (CAP 3035) p 22. The role of the operator, as opposed to the pilot, is discussed in chapter 5 of this report.

15 See CAA, *Annual Safety Review 2023* (September 2024) (CAP 3035) p 22.

16 For example, Sees.ai is conducting BVLOS flights in order to inspect power lines, see PwC, *Skies Without Limits (v 3)* (2024) p 40, https://www.pwc.co.uk/intelligent-digital/drones/skies-without-limits-2024.pdf.

17 As set out in our first consultation paper, operating a drone beyond visual line of sight usually requires a high level of automation because the pilot will be unable to spot obstacles or other aircraft. Instead, the drone itself will need the technical capability to recognise objects in its path and take action to avoid a collision (a function known as "detect and avoid"). See CAA, *Unmanned Aircraft System Operations in UK Airspace – Policy and Guidance* (April 2024) (CAP 722) para 2.1.3.

1.23 While the existing framework may be able safely to facilitate relatively nascent UAS operations taking place in the UK at present, there are anticipated developments in the industry which – in order to be safely accommodated – will require changes or additions to the existing law. For example:

(1) The CAA expects that BVLOS flight will "expand rapidly in the coming years".[18] The UK's Future of Flight Action Plan envisages routine BVLOS operations at scale by 2027.[19] The CAA's most recent BVLOS roadmap refers to enabling routine BVLOS operations for key government priority uses by 2027.[20]

(2) Stakeholders have told us that, for various reasons, they want remote pilots to be allowed to oversee multiple flights at the same time (we refer to this as "multiple simultaneous operations" or "MSO"):

> In order for this form of future of flight to be viable, we must be operating multiple VTOLs at the same time, with a high throughput at vertiports and other hubs. If we have one pilot to one VTOL it will make the business far too costly and not viable to sustain. We need to be flying multiple flights an hour from a vertiport, without the need for a pilot per VTOL/drone (as pilots are costly), to ensure this is an affordable service for all, and isn't isolating large segments of the market.[21]

We are aware of one on-going trial of this type of operation in the UK at present.[22] Elsewhere, commercial operators are already using multiple simultaneous operations on a routine basis.[23]

(3) In the medium term, operators are seeking to provide passenger-carrying remotely piloted UAS services. Commercial companies such as Wisk are currently seeking certification from the US Federal Aviation Administration for passenger-carrying UAS. Other companies, such as E-Hang, have conducted multiple test flights of uncrewed passenger-carrying aircraft in Spain.[24] There are no passenger-carrying UAS operations in the UK yet.

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18 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) p 6.

19 Department for Transport, *UK Future of Flight Action Plan* (March 2024) p 15.

20 CAA, *Future of Future of Flight: BVLOS Roadmap* (October 2025) (CAP 3182) p 3.

21 SLiNK-Tech Ltd response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 520, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

22 Georgina Ramin, "Boeing continues autonomous flight trials in the UK" (2024) https://www.boeing.co.uk/news-releases/2024/boeing-continues-autonomous-flight-trials-in-the-uk.

23 For example, drone delivery company Manna is conducting operations in Ireland in which remote pilots are responsible for flying multiple drones at the same time, see Manna, *Air delivery is here*, https://www.manna.aero/.

24 Charlotte Bailey, "EHang makes first uncrewed eVTOL flight in Europe" (2025) https://aerospaceglobalnews.com/news/ehang-makes-first-uncrewed-evtol-flight-in-europe/.

(4) In the longer term, operators may want to carry out autonomous operations where there is no remote pilot able to intervene. No such operations have been authorised in the UK as of yet.

1.24 Bearing in mind the type of industry developments that are anticipated, this report seeks to identify omissions in the existing legal framework which need to be addressed in order safely to enable advances in highly automated and autonomous UAS. For example:

(1) In chapter 7 we consider the existing framework relating to passenger-carrying remotely piloted UAS and make recommendations as to supplementary legal provisions required to ensure that the removal of the pilot from a passenger-carrying aircraft does not result in a gap in responsibilities.

(2) In chapters 8 and 11 we consider the rules of the air and how the existing rules, which are based on the premise that there is a human pilot on board an aircraft, potentially prevent highly automated and autonomous UAS operations. We discuss how rules which are currently designed for human input, such as the rules on voice communications and emergency scenarios, need to be developed.

(3) In chapter 9 we identify a significant gap in the existing framework relating to UTM provision. We consider that the existing framework for ATM/ANS is not sufficiently agile to accommodate the services which are likely to be needed by UAS operators. In order to address this, we recommend legislative change to accommodate the certification of UTM service providers.

(4) In chapter 10 we identify gaps in the existing system relating to the use of autonomous UAS. We make recommendations to ensure that responsibilities are appropriately allocated once a human is completely out of the loop.

1.25 Safety is of paramount importance in the aviation sector. When things go wrong, there is a risk to life both to passengers and also those on the ground. Without developing the existing law in order to address these difficulties, and ensuring that responsibilities are allocated clearly, advances in relation to highly automated and autonomous UAS operations cannot be facilitated safely. This applies equally to UAS operations as to crewed ones and, for this reason, the CAA's policy in relation to UAS operations is that:

> Civil UAS operating in the UK must meet at least the same safety and operational standards as manned aircraft when conducting the same type of operation in the same airspace. As a result, when compared to the operations of manned aircraft of an equivalent class or category, UAS operations must not present or create a greater hazard to persons, property, vehicles or vessels, either in the air or on the ground.[25]

[25] CAA, *Unmanned Aircraft Systems Operations in UK Airspace – Policy and Guidance* (April 2024) (CAP 722) para 1.1.1.

This principle of equivalence of safety and operational standards underpins the recommendations we make in this report.

1.26 The principle of equivalence of safety and operational standards does not mean there will never be times when things go wrong. Another area of focus for this review is therefore to ensure that if and when things do go wrong, there are appropriate mechanisms in place to hold those responsible to account. In chapter 12 of this report we review the law on civil liability as it relates to highly automated UAS operations and UTM provision and make recommendations for reform. We also consider reforms needed to the law on civil liability in relation to autonomous UAS and the impact of artificial intelligence.

1.27 In chapter 13 we make recommendations for reform of the criminal law in relation to highly automated and autonomous UAS operations and ATM/ANS provision.

1.28 Our recommendations in this report are also intended to enable the safe accommodation of highly automated and autonomous UAS within the UK's civil aviation law framework – and therefore to support innovation. Without implementation of the recommendations in this report, it will not be possible legally and safely to make advances in this area. Our report therefore aims to enable safe advances in this area.

1.29 A further theme running through this report is the iterative process through which innovation can be safely enabled. As new technology is developed, specific provisions can be incorporated into regulations through the use of regulatory sandboxes. These ensure that regulations are tailored to specific types of UAS, facilitating innovation whilst ensuring equivalent safety.

Equitable access to airspace

1.30 Airspace is a valuable and finite resource. In regulating UK airspace, and the flight procedures used within it, the CAA is obliged to ensure that the needs of all airspace users are reflected on an equitable basis.[26] During the course of this review, and in particular during both consultation periods, we have noted the particular tension in certain areas between the needs of the drone and Advanced Air Mobility community, and the existing aviation community. In making recommendations in this report we have been mindful of the variety of airspace users and the need to balance airspace use.

THE STRUCTURE OF OUR REPORT

1.31 In part 1 of this report, we provide an introduction to the project (chapter 1), set out the key context for reform (chapter 2), and explain the structure of current aviation regulation (chapter 3).

1.32 We also discuss the dividing line between high automation and autonomy, which frames the remainder of the report (chapter 4). We recommend that there be a clear legal line between remotely piloted and autonomous operations. To this end, we

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[26] See Civil Aviation Authority (Air Navigation) Directions 2023, direction 3(c) which requires that the CAA "seek to ensure that the amount of controlled airspace is the minimum required to maintain a high standard of air safety and, subject to overriding national security or defence requirements, that the needs of all airspace users are reflected on an equitable basis".

recommend that the line currently found in UK UAS regulations be retained: that all operations where a human can intervene are classed as remotely piloted operations, and those where there is no ability for a human to intervene are classed as autonomous operations. We also make recommendations relating to the role of the remote pilot.

1.33 The report is then divided into three further parts along anticipated development timelines for automated and autonomous technologies. Part 2 covers recommendations that we anticipate will be needed in the short to medium term, as well as ones that relate to highly automated remotely piloted UAS operations. In part 3 we set out longer-term recommendations relating, in the main, to autonomous UAS operations. In part 4 we discuss civil and criminal liability for both remotely piloted and autonomous UAS operations, as well as issues arising in relation to the carriage of dangerous goods.

Part 2: Recommendations for highly automated remotely piloted UAS operations and the short to medium term

1.34 In part 2 we make recommendations for reform relating to remotely piloted UAS operations in the short to medium term. As is discussed in further detail in chapter 8, we anticipate that UAS operations will at this stage be accommodated alongside other airspace users through the use of temporary reserved areas, rather than fully integrated with other crewed and uncrewed aircraft.

1.35 Chapter 5 introduces the specific context of remotely piloted UAS operations. Chapter 6 sets out potential barriers to the accommodation of remotely piloted UAS operations in the short to medium term, looking at issues common to non-passenger carrying and passenger-carrying UAS operations. Although we do not recommend any changes to the law, we explain why it would be useful for the CAA to prepare, in due course, guidance on operational responsibilities for BVLOS operations in the specific category, and for multiple simultaneous operations.

1.36 In chapter 7 we set out recommendations for reform which relate specifically to passenger-carrying remotely piloted UAS operations. These recommendations mostly relate to practical matters that arise in relation to passengers when there is no longer a pilot on board the aircraft (e.g. ensuring passengers are not too intoxicated as they board).

1.37 In chapter 8 we discuss the rules of the air in the context of the accommodation phase of the Department for Transport and CAA's Airspace Modernisation Strategy (which is itself discussed further in chapter 2). We also consider the role of electronic conspicuity and detect and avoid systems in remotely piloted UAS operations in the accommodation phase. We do not make any recommendations for reform in this chapter and consider that, for the short to medium term, the current approach is sufficient.

1.38 In chapter 9 we set out recommendations for the reform of the current ATM/ANS framework which will enable remotely piloted UAS operations in the short to medium term. More specifically we make recommendations about certification of UTM service providers, and enforcement mechanisms available to the CAA. We recommend legislative change to accommodate UTM, given its distinct nature from other forms of

ATM/ANS. This may be achieved either by adding in new provisions to current regulations, or through the enactment of a separate regulation. We also set out detailed consultee feedback to assist future policy development in relation to UTM and ATS cooperation.

Part 3: Recommendations for autonomous UAS operations and the longer term

1.39 In part 3 we consider the future, including autonomous use cases. We anticipate that in the longer term, and in light of UK policy aims (as discussed in chapter 11), some UAS operations will be integrated into the same airspace as other UAS and crewed operations, but that there could still be some use of temporary reserved areas.

1.40 In chapter 10 we consider autonomous UAS operations. We discuss the main problems arising from the lack of a pilot and recommend that, for specific category operations, some of the responsibilities of remote pilots set out in existing legal frameworks could be transferred to operators at the pre-deployment stage. We also use the specific example of VTOLs to discuss how some of the responsibilities of remote pilots might be reallocated.

1.41 In chapter 11 we discuss the longer-term policy aim of enabling UAS to operate in completely unsegregated airspace. We discuss safety requirements and the rules of the air in order to provide information needed to facilitate the making of policy choices to ensure safety.

Part 4: Civil and criminal liability

1.42 In chapter 12 we explore whether and how civil liability needs to be adapted to account for remotely piloted and autonomous UAS operations. Finally, in chapter 13, we set out how the criminal law needs to be adapted to account for remotely piloted and autonomous UAS operations.

1.43 In chapter 14 we set out our recommendations for reform in full.

THANKS AND ACKNOWLEDGEMENTS

1.44 During this project we have carried out two rounds of consultation and have held more than 150 meetings with individuals and organisations. We are grateful to all those who have taken the time to contribute at consultation events, meetings or by responding to our consultation papers.

THE TEAM WORKING ON THE PROJECT

1.45 The following members of the Public Law and Law in Wales Team have contributed to this project: Henni Ouahes (team manager), Connor Johnston (senior lawyer); Connor Champ and Fiona Couzens (lawyers); Alex Ewing, Ethan George and Stuti Srivastava (research assistants); Eleanor Bennett (former legal assistant). We have also been assisted by Dr Nicholas Hoggard (lawyer in the Criminal Law Team).

Chapter 2: Context for reform

2.1 This chapter outlines several key factors which inform the recommendations in this report: the international and domestic legal context, the policy context and the technological context.

2.2 We explore each of these factors in turn further below. All have contributed to the approach taken to the structure of this report, in particular the division of the report along anticipated development timelines for automated and autonomous technologies.

2.3 In part 2 of this report, we set out recommendations for reform which we consider necessary in the short to medium term. Those recommendations for reform relate to technology that is either available now, or which we understand will be available in the medium term. These recommendations are broadly aimed at enabling uncrewed aircraft system ("UAS") to be conditionally accommodated safely alongside conventional aircraft.

2.4 In part 3 of this report we set out options and recommendations for reform in the longer term, dealing in the main with the reforms that are needed safely to accommodate autonomous UAS in non-segregated airspace. Where we set out options rather than recommendations, we highlight key policy decisions to be made ahead of reform.

THE INTERNATIONAL LEGAL CONTEXT

2.5 Any reform to the domestic law on aviation must take into account the international law backdrop. It has long been recognised that an effective international aviation system is not possible without co-ordination and the adoption of harmonised rules.[1] A multilateral convention was adopted as early as 1919[2] and was followed by the seminal Convention on International Civil Aviation 1944 ("the Chicago Convention"), which created the International Civil Aviation Organisation ("ICAO") and established the basic architecture for international civil aviation that persists today.[3] For many years, aviation law in the UK was also governed by European Union ("EU") law.

2.6 The development of harmonised rules for aviation is important because it ensures that the same rules and principles relating to key matters of safety apply irrespective of where an aircraft is being flown. Harmonisation also facilitates air travel by reducing the burden of following different regulatory approaches in different states.

2.7 A detailed account of the structure of aviation regulation, including the international dimension, is set out in chapter 3 of this report. The key consequence for our project

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1 Havel and Sanchez note that: "International jurists had been at work on the problem of regulating transborder aerial movements since as early as 1900 when the French jurist Paul Fachille suggested that a code of air navigation be created by the Institut de Droit International." B Havel and G Sanchez, *The Principles and Practice of International Aviation Law* (2014) p 30.

2 Convention Relating to the Regulation of Aerial Navigation 1919 (Paris Convention).

3 Chicago Convention, Ninth Edition (2006).

is that international standards are effectively binding upon the UK, and recommendations made in this report are necessarily shaped by the international legal framework for aviation.

2.8 As is discussed further in chapter 3, there are some international standards relating specifically to UAS operations, but many more areas where UAS-specific standards do not yet exist. In some contexts, where there are no applicable UAS-specific standards, the relevant international standards for crewed aviation apply,[4] and the UK continues to be required to act compatibly with those. Where there are no relevant applicable standards for crewed aviation to be applied, or it is considered that UAS-specific standards are required ahead of international standards being developed,[5] the UK must be mindful of the likelihood of future international standards and the need to implement and ensure compliance with them.

2.9 It follows that when approaching the task of reforming domestic law before international standards are developed, prioritising safety – as we do in this report – will increase the chances that the UK's reformed domestic legal framework will meet any international standards introduced in the future. That will mean a lower risk of the need for substantial further reform to the law on UAS operations in order to reflect international standards. Furthermore, setting standards at a domestic level gives the UK an opportunity to play a leading role in influencing future international standards.[6] These considerations have shaped our approach to reform in this project.

THE DOMESTIC LEGAL CONTEXT

2.10 On the domestic level there is an existing legal framework for aviation generally and a relatively new legal framework specifically for UAS. We discuss these frameworks in chapter 3. As we said in our first consultation paper, the current domestic legal framework for UAS operations has much to commend it, but there are some gaps which need to be addressed. The provisions in the framework relating to autonomous operations are incomplete. We discuss this further in chapter 10. There is also no domestic law relating specifically to uncrewed aircraft systems traffic management ("UTM"). In chapter 9 we set out our recommendation for legislative change in relation to the certification of UTM providers. Where there are no domestic legal provisions relating specifically to UAS operations, we have considered whether the existing provisions relating to crewed aircraft are sufficient. The consequence for this report of the domestic legal context is that our recommendations supplement the existing framework rather than replace it. We do not consider that an entirely new legal framework for UAS operations is necessary.

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4 For example, Annex 6 to the Chicago Convention, Part IV, First Edition, 2024 p xvii states that where aspects of RPAS operations are not addressed in Part IV, RPAS should be operated consistently with SARPs in Parts I-III for crewed aircraft, where appropriate.

5 UTM is an example of this – we discuss this in chapter 9 of this report.

6 It is clear, for example, in Annex 6 to the Chicago Convention, Part IV have been influenced by the EU's regulatory framework for UAS and in particular, the risk based framework of open, specific and certified categories of operation is acknowledged in the forward (p xviii).

THE POLICY CONTEXT

2.11 There are two specific aspects of Department for Transport ("DfT") and Civil Aviation Authority ("CAA") policy that have informed our approach to this paper. The first is the UK's medium-term approach of using special use airspace to assist with the transition from segregated UAS operations to integrated operations, during what the CAA terms the "accommodation phase".[7] The second is the CAA's iterative approach to policy development in this area. We deal with each in turn.

"Accommodation" of UAS and longer-term integration

2.12 One key policy question relating to the regulation of UAS operations is whether UAS should be expected to share airspace with other aircraft (integration) or whether there is a need for UAS to fly in airspace with no other aircraft present (segregation). This question is one of policy for the UK Government and the CAA, and is connected with wider policy decisions about airspace management which are outside our terms of reference. These decisions do, however, have implications for the way we have structured this report, which we discuss further below.

2.13 We discuss the concepts of segregation, accommodation and integration further in chapter 8 of this report.

Airspace Modernisation Strategy 2023-2040

2.14 The CAA's Airspace Modernisation Strategy ("AMS") published in 2023 sets out a:

> Co-ordinated strategy and plan for the use of all UK airspace for air navigation up to 2040, including for the modernisation of such airspace.[8]

2.15 One of the key objectives of the AMS is to:

> take account of the latest developments in innovation and technology, placing integration of all airspace users at the core of the strategy, including accommodating new types of vehicle, like remotely piloted aircraft systems, advanced air mobility and spacecraft.

2.16 The AMS is also a way of ensuring alignment with ICAO's Global Air Navigation Plan., Although this plan is not binding upon the UK, alignment is important since it promotes interoperability of systems and harmonisation of procedures.[9]

Short-term accommodation and longer-term integration

2.17 Alongside the publication of the AMS, the CAA also published its policy on Airspace Requirements for the Integration of Beyond Visual Line of Sight Unmanned Aircraft

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7 Civil Aviation Authority ("CAA"), *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) paras 2.7 to 2.14.

8 CAA, *Airspace Modernisation Strategy 2023-2040 Part 1: Strategic objectives and* enablers (February 2024) (CAP 1711) para 1.1.

9 CAA, *Airspace Modernisation Strategy 2023-2040 Part 1: Strategic objectives and enablers* (February 2024) (CAP 1711) para 3.4. For more information on the Global Air Navigation Plan, see International Civil Aviation Organization ("ICAO"), *GANP Portal*, https://www4.icao.int/ganpportal/.

("Airspace Policy Concept").[10] The document sets out a pathway for the safe integration of beyond visual line of sight ("BVLOS") UAS within unsegregated airspace. At the time the policy was written (April 2023) BVLOS operations were on the whole only able to take place in danger areas and temporary danger areas: airspace constructs where UAS are segregated from all other airspace users by other airspace users being blocked from entering.[11]

2.18 The document sets out key stages of transition from this type of segregation towards integration of uncrewed aircraft. The intermediate phase is the "accommodation" phase, a concept that the CAA has borrowed from ICAO which defines it as:

> The condition when an UA can operate along with some level of adaptation or support that compensates for its inability to comply within existing operational constructs.[12]

2.19 In the accommodation phase, temporary reserved areas[13] ("TRAs") will be used to:

> define the specific airspace management arrangements and flight operation procedures necessary to 'accommodate' UA operations, whilst enabling managed access to permitted airspace users.

It is therefore envisaged that TRAs will form the basis of a middle path between segregation and integration: other airspace users are in theory able to fly in the same airspace alongside UAS, provided they observe certain conditions.[14] The CAA's Airspace Policy Concept notes that both detect and avoid, and electronic conspicuity (concepts explained further in chapter 8) are likely to be critical enabling technologies for the accommodation phase, and that TRAs will often be overlaid by a transponder mandatory zone.[15]

2.20 The CAA's Airspace Policy Concept explains that the accommodation phase is intended to facilitate trialling and testing through "limited, managed integration", with

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10 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533). See also CAA, *Future of Flight: BVLOS Roadmap* (October 2025) (CAP 3182).

11 UK Regulation (EU) 923/2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation, art 2(65).

12 CAA*, Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 2.9. See ICAO, *Remotely piloted aircraft system (RPAS) concept of operations for international IFR (instrument flight rules) operations*, para 1.4.1.

13 CAA, *Policy for the Establishment of Special Use Airspace* (February 2024) (SARG Policy 133) in which TRAs are defined as: "airspace that is temporarily reserved and allocated for the specific use of a particular user during a determined period of time and through which other traffic may or may not be allowed to transit in accordance with the air traffic management arrangements notified for that volume of airspace".

14 For example, that access be managed through an ANSP, see CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 3.7.

15 CAA, *Airspace Modernisation Strategy 2023-2040 Part 1: Strategic objectives and enablers* (February 2024) (CAP 1711) footnote 61 says: "Transponder mandatory zone (TMZ) is the term we are currently using to capture the need for the airspace user to have an electronic conspicuity capability. Although we use the word "transponder", the intention is that entry to a TMZ would allow for a wide range of options for other, affordable forms of cooperative surveillance, rather than mandating a transponder".

other airspace users, and that the eventual aim is for TRAs to be removed so that UAS can be fully integrated into unsegregated airspace, first in controlled airspace and then in uncontrolled airspace.[16]

2.21 Although the use of TRAs will broadly be applied for BVLOS UAS operations during the accommodation phase, the Airspace Policy Concept document makes clear that it will not be possible to use TRAs for some operations, for example those where the operator is unable to comply with the relevant rules of the air for the specific category. In those cases, segregation will remain necessary. The document also makes clear that TRAs will not be necessary for some BVLOS UAS operations, for example those which take place within atypical airspace.[17]

2.22 It is envisaged in the Airspace Policy Concept that integration of UAS operations will be achieved when:

> The BVLOS UAS is capable of operating in the same environment as other airspace users, without the need for additional requirements to be placed upon them to address their specific operating characteristics. Essentially, the BVLOS UAS must be able to comply with, or demonstrate equivalence with, the applicable requirements. For example, the ability to establish and maintain two-way radiocommunications with an air traffic services provider using approved equipment with the appropriate licences.

The ruleset for this phase is under development, in order to identify those requirements which are necessary and proportionate.

Where are we now

2.23 It appears that we are at the relatively early stages of the accommodation phase described above. Information provided to us by the CAA confirms that as of February 2026 there is one existing TRA in place relating to UAS operations, and within that TRA there is only one UAS operator, as opposed to multiple airspace users interacting with each other. In the two years preceding this there have been an additional two TRAs approved for the purposes of UAS operations (and one of those relates to a police trial). In contrast, as of February 2026, there were six danger areas in place for the segregated operation of UAS, and 13 had been approved during the preceding two years.[18] Our understanding from discussions with the CAA is that operators are finding it difficult to demonstrate that they can operate safely with other airspace users so as to be given authorisation for an operation in a TRA.

2.24 Given the limited numbers of approvals of UAS operations within TRAs to date, and the fact that the CAA intends to use practical experience gleaned from the accommodation phase to inform the transition to the integration phase, it appears likely that the accommodation phase will last for some time. The CAA's own

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16 CAA, *Future of Flight: BVLOS Roadmap* (CAP 3182) (October 2025) p 13.

17 For more information on atypical airspace see CAA, *Unmanned Aircraft Operations in an Atypical Air Environment: Policy Concept* (October 2024) (CAP 3040).

18 Figures provided by the CAA, February 2026.

milestones for integration of lower airspace continue beyond 2030,[19] though it hopes that at least some UAS operations without TRAs will be able to take place from 2027.[20]

Iterative policy development

2.25 The AMS makes clear that the regulator's current approach to UAS policy development is an iterative process. Part 3 of the AMS sets out the various key strands of policy work relating to integration of UAS, and says:

> The Future Air Traffic Management and Air Navigation Services (F-ATM/ANS) is a sub-programme of the Integrating Lower Airspace programme. It brings together workstreams on electronic conspicuity (EC), detect and avoid (DAA), unmanned aircraft system (UAS) traffic management (UTM), ground infrastructure (GI) and command & control link (C2 link) (see Figure 1). Each of these workstreams will provide a level of risk mitigation to enable the safe integration of Beyond Visual Line of Sight (BVLOS) UAS. Developing them through a cohesive programme ensures they will work effectively both independently and collectively. Delivery of these enabling activities will be iterative, with concept of operations/policy concepts developed and then tested through trials and industry engagement to validate them before being updated.[21]

2.26 The CAA's Airspace Policy Concept confirms this approach and says:

> Our intention is that this airspace policy concept be trialled by appropriate industry stakeholders so that it may be refined and, in time, implemented as CAA policy … at this stage, the concept described herein is considered to have trial status. The CAA will assess and refine the concept based on feedback from appropriate industry stakeholders who will be invited to trial this airspace policy concept through our Regulatory Sandbox.[22]

2.27 The result is that policy positions which are key to the integration of UAS are still being developed by the CAA, and will continue to be in development for some years (in particular given that, as we set out above, there have been relatively few BVLOS operations approved to date which can inform this iterative approach to policy development). Examples of the status of key policy documents include:

(1) The CAA's initial technical concept of operations on electronic conspicuity which was published in July 2025 and states:[23]

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19 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed August 2025) (CAP 1711b) Appendix A.

20 CAA, *Future of Flight: BVLOS Roadmap* (CAP 3182) (October 2025) p 9 and 13.

21 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed August 2025) (CAP 1711b) ch 1 para 1.8.

22 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) foreword and para 1.6.

23 CAA, *Electronic Conspicuity – Initial Technical Concept of Operations (EC ConOps)* (July 2025) (CAP 3140) p 11.

> [This] is an iterative document, and that this version is the first publicly available version which sets out the UK's current position on Electronic Conspicuity. The technical positions set out within this initial version are likely to evolve following consultation and extensive testing, before becoming policy at the end of 2027…As an early version, it does not cover all elements typically found in a complete Concept of Operations. These areas will be developed in future updates, shaped by stakeholder feedback and operational testing – resulting in changes to this and related documents.

The policy does not mandate Electronic Conspicuity but includes a call for evidence on a potential future mandate.[24]

(2) The CAA's detect and avoid policy concept consultation response summary was published in June 2025 and states:[25]

> The DAA Policy Concept is an operational, or 'live', policy meaning that it may be used in support of an UAS operational authorisation under UK Regulation (EU) 2019/947. The 'concept' status signifies that its use will be limited to a test phase, to ensure completeness and suitability of the requirements and further develop the AMC and GM ahead of scaled 'Business As Usual' applications … The next published update to the DAA Policy is currently scheduled for Q2 2026, with the 'Business as Usual' version scheduled to align with the aims of the Future of Flight Programme in 2027.

(3) During the course of this project we have been provided with two unpublished iterations of the CAA's policy concept on uncrewed aircraft systems traffic management but as of yet nothing has been published by the CAA on this key enabler to integration of UAS.[26] We understand that drafts of this policy concept document have also been shared with some industry stakeholders.

How this has informed our approach

2.28 It is clear from the above that full integration of BVLOS UAS operations is a longer-term aspiration. Before integration can be fully realised the CAA intends to learn regulatory lessons through sandboxing, and in turn make key policy decisions and develop finalised policy. In some cases, the CAA may be waiting for international developments before making final policy decisions.[27] This context has informed our decision to divide this paper along temporal lines which broadly map onto the accommodation and integration phases of the AMS. In part 2 of the paper we set out

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24 CAA, *Electronic Conspicuity – Initial Technical Concept of Operations (EC ConOps)* (July 2025) (CAP 3140) p 66. See also CAA, *Consultation on Electronic Conspicuity – Initial Technical Concept of Operations* (2025) https://consultations.caa.co.uk/safety-and-airspace-regulation-group/ec-conops/ which states that the CAA and Department for Transport are exploring the issue of a mandate separately from the technical policy.

25 CAA, *Detect and Avoid Policy Concept – Consultation Response Summary* (June 2025) (CAP 3127) paras 5.2 and 5.6.

26 Information received from the CAA, October 2025.

27 For example, it is implied that the CAA will wait for international developments relating to the Rules of the Air before the integration phase can be reached, see CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) paras 2.2 to 2.3.

short to medium-term recommendations based on operations that are likely to be taking place within the accommodation phase, and in a semi-integrated context. In part 3 of the paper, we set out recommendations relating to the longer term where UAS operations are likely to be taking place in a more integrated context. Where, owing to the iterative approach being taken by the CAA, there are key policy decisions that have not yet been made, the recommendations we make are higher-level.

THE TECHNOLOGICAL CONTEXT

2.29 Finally, technological uncertainty is also a relevant contextual factor for this project. UAS are not a single category: there is a range of existing and potential aircraft, and an even wider range of existing and potential use cases.[28] There is also a range in the level of automation that can be deployed in vehicles. There is no real certainty or consensus among stakeholders about which aircraft are going to come to market and when.

2.30 In our terms of reference for this project we said that we would examine issues relating to highly automated and autonomous UAS operations. It is not entirely clear that autonomous UAS – in the existing legal sense of the word – will ever exist, but if they do, they will clearly be a longer-term development and our recommendations in relation to them can only be relatively high-level at this stage. This is in part to do with uncertainty about the development of the technology, and in part because of the other longer-term issues in play in this report as set out above (for example iterative policy development by the CAA). This has informed our decision to deal with recommendations relating to autonomy in part 3 of our report.

2.31 We selected use cases for this project based on information about UAS which appeared close to market at that time: drones and vertical take-off and landing vehicles ("VTOLs"). The Department for Transport has said that crewed VTOLs could be in operation as early as 2028.[29] As to uncrewed VTOLs, however, some stakeholders have told us that their introduction could be well into the next decade,[30] and that converted crewed aircraft could take to the skies sooner. For this reason, and to make our report as versatile as possible, we have moved away from organising recommendations according to the specific type of vehicle. Instead, in chapter 6 of this report, we set out recommendations for reform common to all types of remotely piloted UAS. In chapter 7 we make recommendations specific to passenger-carrying UAS.

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28 For example, see chapter 1, para 1.23.

29 The CAA aim to have the regulatory framework and operational systems in place that enable initial commercial passenger Advanced Air Mobility flights in the UK by the end of 2028 (CAA, *Future of Flight: BVLOS Roadmap* (CAP 3182) (October 2025) p 3). See also "Over £20 million to help drones and flying taxis to take to UK skies" (2025) https://www.gov.uk/government/news/over-20-million-to-help-drones-and-flying-taxis-take-to-uk-skies; and https://assets.publishing.service.gov.uk/media/67ebd3f49eae202448299ad9/letter-from-dft-dsit-to-caa.pdf.

30 Department for Transport *UK Future of Flight Action Plan* (2024) forecasts that demonstrations of "autonomous" eVTOLs i.e. those without a pilot could begin in 2030. European Union Aviation Safety Agency ("EASA") does not foresee advanced levels of automation in aircraft being approved until at least 2035 and the most advanced automated use cases not until 2050 or beyond (EASA, *Artificial intelligence roadmap 2.0* (May 2023) p 27).

CONCLUSION

2.32 In this chapter we have set out four factors unique to this project and discussed how each has informed our approach to this report: the international law context, the domestic law context, the policy context and the technological context. All of these factors are revisited throughout the remaining chapters of this report.

Chapter 3: Structure of aviation regulation

3.1 The regulation of civil aviation is complex. There are multiple sources: multilateral treaties; bilateral agreements signed between the UK and other states; technical standards developed by international bodies; EU derived regulations; domestic law; and so-called soft law[1] documents which inform how safety rules are applied in practice. Together, the various sources create a comprehensive regulatory scheme for civil aviation in the UK.

3.2 In this chapter we discuss the main sources of civil aviation regulation. There are three sections: the first section focuses on international law; the second section covers domestic aviation law; and the third section examines the wider regulatory context for civil aviation in the UK. This includes the role of the regulator, how breaches of regulation are corrected, how the state ensures lessons are learned from accidents, and the role of operators in establishing mechanisms for regulatory compliance.

INTERNATIONAL AVIATION REGULATION

3.3 In the UK's legal system, only domestic law creates directly enforceable legal rights and obligations. Ratifying a treaty is not enough to make it part of domestic law.[2] In practice, however, international law heavily influences aviation law in the UK.

3.4 States use treaties to coordinate international air travel, making it safer and easier. The most important aviation treaty is the Chicago Convention 1944. Almost every state in the world has ratified the Chicago Convention and it is considered to be the primary source of civil aviation law. Much of domestic aviation regulation – particularly aviation safety regulation – was made to give effect to the requirements of the Chicago Convention.

The Chicago Convention

3.5 The Chicago Convention governs the rights and obligations of states with respect to international civil aviation.[3] It sets down baseline rules and principles to facilitate safe international air travel. Central to the Chicago Convention is the recognition in article 1 that states have complete and exclusive sovereignty over the airspace above their

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1 The European Union Aviation Safety Agency ("EASA") has used "soft law" to describe acceptable means of compliance ("AMC") and guidance material ("GM"). See EASA, *Overview: Agency Rules (Soft Law) library*, https://www.easa.europa.eu/en/document-library/agency-rules-overview. These types of documents are also used in the UK for regulating civil aviation.

2 For an authoritative summary of this principle, see *R (Miller and another) v Secretary of State for Exiting the European Union* [2017] UKSC 5, [2018] AC 61 at [56], [167] and [244].

3 The Convention is only applicable to "civil aircraft" and does not apply to "state" aircraft: art 3(a). "State aircraft" is not a term defined in the Convention, but art 3(b) provides that aircraft used in military, customs and police services are deemed to be state aircraft.

territory.[4] States remain able to regulate aviation within their territory,[5] but article 12 requires states to keep their regulations consistent "to the greatest possible extent," with the standards and recommended practices established under the Convention.[6]

3.6 Standards and recommended practices ("SARPs") are the main mechanism for establishing aviation safety regulation at the international level. The body responsible for developing SARPs is the International Civil Aviation Organisation ("ICAO").[7] SARPs are found in annexes to the Chicago Convention. Currently, there are 19 annexes covering a range of matters from rules of the air, to air traffic services, to the operation and airworthiness of aircraft. These annexes are updated and amended as required. In this report, we refer frequently to SARPs.

3.7 SARPs comprise both standards and recommended practices. Standards are specifications where compliance is recognised as "necessary" for the safety or regularity of international air navigation. If a state cannot comply, article 38 of the Chicago Convention requires it to notify ICAO's governing council, of which the UK is currently a member.[8]

3.8 In contrast, recommended practices are specifications where compliance is "desirable," rather than necessary. States are only required to *endeavour* to conform with recommended practices.[9]

3.9 In practice, states have strong incentives not to depart from SARPs due to their status in the international aviation community as the "gold standard" for aviation safety.[10] This is why, in the UK, the Civil Aviation Authority ("CAA") is required to act consistently with the obligations placed on the United Kingdom under the Chicago Convention and to consider whether it is necessary to amend UK aviation legislation to ensure appropriate implementation of an ICAO provision.[11] It may be possible, however, for the UK to comply with a standard by going beyond its requirements, provided that in doing so it does not fail to comply with a different standard.

3.10 In addition to SARPs, ICAO produces supplementary documents which contain further safety requirements. One example is the Technical Instructions for the Safe Transport

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4 The concept of state sovereignty over airspace had already been recognised in the Paris Convention relating to the regulation of aerial navigation (1919), art 1.

5 Chicago Convention, Ninth Edition (2006), art 11.

6 Chicago Convention, Ninth Edition (2006), art 12. The Convention also makes clear in art 11 that states must apply their laws and regulations in a non-discriminatory fashion.

7 Chicago Convention, Ninth Edition (2006), arts 54(l) and 90.

8 The UK currently serves on the Council as a "State of chief importance in air transport". See *Update on the International Civil Aviation Organization Council elections 2025* (2025) https://www.gov.uk/government/news/international-civil-aviation-organisation-council-2025-update.

9 The distinction between standards and recommended practices can be found in the definitions contained in annexes to the Convention. See for example, Annex 3 to the Chicago Convention, Twentieth Edition, 2018, including amendment 81 p viii.

10 B Havel and G Sanchez, *The Principles and Practice of International Aviation Law (*2014) p 63.

11 Civil Aviation Authority (Chicago Convention) Directions 2007 paras 6 and 7.

of Dangerous Goods by Air.[12] Another is the Procedures for Air Navigation Services which provide instructions on the procedures required for air navigation services.[13] Neither have the status of a SARP, but ICAO recommends that all states follow their provisions.[14]

International standards relating specifically to uncrewed aircraft systems

3.11 The Chicago Convention was adopted in 1944 and it is therefore no surprise that the Convention and related annexes do not fully account for uncrewed aircraft systems ("UAS").[15] ICAO is in the process of preparing updates to the annexes to the Convention which set SARPs specifically relating to UAS, but these are relatively limited at present and deal only with remotely piloted operations, as opposed to autonomous operations. Many of the standards do not become applicable until later this year. Key developments include:

(1) Amendments to Annex 1 on personnel licensing. Rules on licences relating to international remotely piloted aircraft systems operating in controlled airspaces and at aerodromes will be applicable from November 2026.

(2) Amendments to Annex 2 on rules of the air, including the addition of Appendix 4 on remotely piloted aircraft systems. Appendix 4 covers areas such as high-level operational rules and cross-refers to updates made in relation to remotely piloted aircraft systems ("RPAS") in annexes 6 and 8 (see below), most of which will apply from November 2026.

(3) Publication of part 4 to Annex 6 on the operation of aircraft which introduces standards and recommended practices for the operation of remotely piloted aircraft in the certified category.

(4) Amendments to Annex 8 on airworthiness of aircraft which introduce standards for certification and airworthiness of remotely piloted aircraft systems. These standards will apply from November 2026.

(5) Amendments to Annex 10 on aeronautical telecommunications which include a new volume (Volume VI) dealing with command and control links for RPAS, and a new Part 2 of Volume IV setting out standards for detect and avoid systems.

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12 International Civil Aviation Authority ("ICAO"), *Technical Instruction for the Safe Transport of Dangerous Goods by Air* (Doc 9284). See chapter 12.

13 ICAO, *Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM)* (16th ed 2016) (Doc 4444).

14 See for example, ICAO, *Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM)* (16th ed 2016) (Doc 4444) foreword para 3.1.

15 However, it is worth noting that article 8 of the Convention does deal with pilotless aircraft, and ICAO's RPAS manual confirms that uncrewed aircraft are covered by this definition, see ICAO, *Manual on Remotely Piloted Aircraft Systems* (2015) paras 1.2.4 to 1.2.7.

3.12 Many of the Annexes refer to ICAO's RPAS manual which, although not binding, provides "guidance on technical and operational issues applicable to the integration of RPA in non-segregated airspace and at aerodromes".[16]

Areas where no international standards for UAS exist

3.13 There are therefore many areas where no UAS-specific international standards exist. Some key areas identified in this report where no specific standards exist, but where we anticipate they will eventually be needed, are as follows:

(1) Aspects of the rules of the air including emergencies, rights of way and communications. These issues are discussed further in chapter 8;

(2) Operational requirements relating to autonomous UAS operations, which we discuss further in part 3 of this report;

(3) Standards relating to uncrewed aircraft systems traffic management ("UTM"), which we discuss further in chapters 9 and 11.[17]

3.14 For obvious reasons, international standards take many years to prepare, and it is not clear exactly when formal standards and recommended practices relating to the above areas will be published.

Other international instruments

3.15 As well as the Chicago Convention, the UK has ratified several other aviation treaties. One example is the Montreal Convention 1999, which establishes a regime to govern liability of air carriers for death or injury to passengers, and delay and damage in respect of cargo and baggage.[18] Another is the 1970 Convention on Unlawful Seizure of Aircraft which requires states to make the offence of hijacking punishable by severe penalties.[19]

Bilateral agreements

3.16 The UK benefits from several bilateral aviation safety agreements, memorandums of understanding and working arrangements with other countries.[20] These agreements, amongst other things, facilitate cooperation between national aviation authorities on airworthiness, environmental testing, maintenance and aviation personnel. These

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16 ICAO, *Manual on Remotely Piloted Aircraft Systems* (2015) para 1.4.

17 While there has been work on this at the international level, there are no formal standards yet, see: ICAO, *Unmanned Aircraft Systems Traffic Management (UTM) – A Common Framework with Core Principles for Global Harmonization* (4th ed 2023).

18 See chapter 12.

19 See chapter 13.

20 Civil Aviation Authority ("CAA"), *International Co-operation*, https://www.caa.co.uk/commercial-industry/aircraft/airworthiness/organisation-and-maintenance-programme-approvals/bilateral-agreements/what-is-a-bilateral-agreement/.

agreements reduce duplication of regulatory activity and allow for the reciprocal acceptance of certificates and approvals.[21]

3.17 In relation to new types of passenger-carrying aircraft, the UK has agreed with the aviation authorities of the US, Canada and New Zealand to update bilateral agreements to take account of advanced air mobility.[22]

DOMESTIC AVIATION LAW

Assimilated law

3.18 For many years, a key source of aviation regulation in the UK was EU law. The position changed following the UK's exit from the EU which means law made by EU institutions is no longer part of the UK's legal system.

3.19 The EU Withdrawal Act 2018 established a framework for preserving EU law within domestic law after the UK's exit from the EU. Much aviation regulation which formerly took effect in the UK as EU law now forms part of domestic law. This body of law was previously known as "retained EU law," but since the end of 2023 has become "assimilated law".[23]

3.20 The principal assimilated aviation regulation is UK Regulation (EU) 2018/1139 (the "Basic Regulation").[24] The annexes of the Basic Regulation set out essential requirements in relation to several aviation fields such as airworthiness, aircrew, aerodromes and air traffic controllers.

3.21 These essential requirements are then elaborated on in "implementing" and "delegated" acts, which were formerly adopted by the European Commission under powers granted to it by either the Basic Regulation or its predecessor regulation.[25] The implementing and delegated acts provide more detail on how the essential requirements are to be met. For example, UK Regulation (EU) 965/2012 (the "Air Operations Regulation")[26] builds on the essential requirements relating to air operations in Annex V of the Basic Regulation.

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21 As an example, the bilateral aviation safety agreement between the UK and US allows for reciprocal acceptance for airworthiness approvals. It can be found here: CAA, *Bilateral Aviation Safety Agreement – Executive Agreement* (2022) https://www.caa.co.uk/our-work/publications/documents/content/cap2386basa/.

22 National Aviation Authorities Network, *Roadmap for Advanced Air Mobility Aircraft Type Certification* (April 2025) https://www.casa.gov.au/sites/default/files/2025-06/roadmap-for-advanced-air-mobility-aircraft-type-certification.pdf p 19.

23 Retained EU Law (Revocation and Reform) Act 2023, s 5.

24 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency.

25 The Basic Regulation repealed and replaced Regulation (EC) No 216/2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency.

26 Some implementing and delegated regulations currently in force were first adopted under the predecessor to the Basic Regulation: Regulation (EC) No 216/2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency.

3.22 Outside of the Basic Regulation, there are other assimilated laws which regulate civil aviation. One example is UK Regulation (EC) 785/2004 (the "Insurance Regulation") which imposes mandatory insurance requirements on air carriers and operators.[27]

3.23 As part of the treaty governing the UK's relationship with the EU post-withdrawal, both parties have agreed certain obligations aimed at ensuring cooperation in the areas of air transport and aviation safety.[28] With these obligations in mind, the development of EU aviation regulation and the work of the EU Aviation Safety Agency is referred to this report where relevant.

Domestically enacted law

3.24 Prior to aviation becoming an EU competence, the UK Parliament had a long history of regulating civil aviation dating back to the 1910s. Today, the principal domestically enacted aviation legislation is the Civil Aviation Act 1982.

3.25 Section 1(1) of the 1982 Act sets out the remit of the Department for Transport regarding civil aviation. It charges the Secretary of State with the following duty: [29]

> organising, carrying out and encouraging measures for: the development of civil aviation; the designing, development and production of civil aircraft; the promotion of safety and efficiency in the use thereof; research into questions relating to air navigation; and safeguarding the health of persons on board aircraft.

3.26 In addition, the Act sets out the role of the CAA: the UK's independent aviation regulator.[30] The CAA has a wide range of functions[31] but broadly speaking, it is responsible for the economic regulation of the aviation industry, air safety regulation, airspace regulation and aviation consumer protection.[32]

3.27 One of the main powers to regulate aviation is contained in section 60 of the 1982 Act. This enables His Majesty by Order in Council to make regulations for implementing the Chicago Convention and SARPs, and "generally for regulating civil aviation."[33] The most important of these orders is the Air Navigation Order 2016 (the "ANO").[34]

3.28 The ANO's provisions address a wide range of matters relating to aviation safety and aircraft navigation. It deals with subject matters such as the registration of aircraft; the airworthiness of aircraft; operational rules including the duties of the pilot in command;

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27 UK Regulation (EC) 785/2004 on insurance requirements for air carriers and aircraft operators. See chapter 12.

28 Trade and Co-operation Agreement 2021, arts 417 to 458.

29 Civil Aviation Act 1982, s 1(1A).

30 The CAA was first established by the Civil Aviation Act 1971. It is a body corporate, not a servant or agent of the Crown.

31 These functions are described in s 3 of the Civil Aviation Act 1982. Functions are also set out in the Airports Act 1986 and the Transport Act 2000.

32 This summary of the CAA's functions comes from: The Work of the Civil Aviation Authority, Report of the House of Commons Transport Committee (2005-06) HC 809.

33 Civil Aviation Act 1982, s 60(2).

34 SI 2016 No 765.

rules about air traffic services; licensing of flight crew and air traffic controllers; and requirements for aerodromes.

3.29 In addition to laying down safety rules, the ANO is the main source of criminal law relating to aviation safety. Article 265 of the ANO creates criminal offences for the breach of numerous articles of the ANO and for breaches of other regulations, including some rules contained in assimilated aviation safety legislation.[35]

3.30 Apart from the Civil Aviation Act 1982, there are several other domestic enactments which are noteworthy. The Transport Act 2000 deals with the economic regulation of air traffic services and gives the CAA the power to publish information and advice.[36] The Aviation Security Act 1982 contains more serious criminal offences related to aviation, such as the offence of hijacking, which is punishable by life imprisonment[37] and classified as a terrorism offence.[38]

3.31 Although not a form of domestically enacted law, common law principles are also relevant. For example, claims may be made in negligence following an aviation accident, and the common law of nuisance is relevant to landowners wishing to restrict the noise of overflights.[39]

Domestic legal framework relating specifically to UAS

3.32 There are two key existing regulations for Uncrewed Aircraft Systems ("UAS") which were made under the Basic Regulation: UK Regulation (EU) 2019/945 (the "UAS Delegated Regulation)[40] and UK Regulation (EU) 2019/947 (the "UAS Implementing Regulation").[41] As delegated and implementing acts respectively, both of these regulations are now assimilated law.

3.33 The UAS Delegated Regulation deals with requirements regarding the design and production of UAS. The UAS Implementing Regulation sets out rules governing the operation of UAS.

3.34 The regime divides operations into three categories based on the nature and risk of an operation: open, specific and certified. Operations falling into the open category are considered the lowest risk and do not require prior authorisation. Flights must be within the line of sight of the remote pilot. Autonomous operations are not permitted. Operations in the specific category present a greater risk and require authorisation by the CAA before the operation can take place. Operations in the certified category require the certification of the UAS and the operator and, where applicable, licensing

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35 It also establishes offences and penalties for breaches of regulations made under the ANO.

36 Transport Act 2000, s 90.

37 Aviation Security Act 1982, s 1(3).

38 Section 1 of the Terrorism Act 2006 makes it an offence to encourage people to commit, prepare or instigate certain offences under the Aviation and Security Act 1982. These are listed in schedule 1(5) of the Terrorism Act 2006 and include hijacking (section 1).

39 See chapter 12.

40 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems.

41 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft.

of the remote pilot.[42] Operations fall into this category if they carry people or high-risk dangerous goods. The ANO applies in full to the certified category.[43] The rules are the same as those applicable to crewed aviation.[44] Parts of the ANO apply to operations in the open and specific category but they are on the whole exempt.[45]

THE WIDER REGULATORY CONTEXT

The role of the CAA

3.35 The CAA supplements aviation regulation by publishing acceptable means of compliance, guidance material and other forms of guidance. These soft law documents help the aviation industry and other interested parties understand and apply the law.

Assimilated regulations: Acceptable Means of Compliance and Guidance Material

3.36 Assimilated aviation regulations are often accompanied by acceptable means of compliance ("AMC") and guidance material ("GM"),[46] which build on rules contained in legislation. These were formerly produced by EU Aviation Safety Agency but since the UK's exit from the EU, the CAA is responsible for adopting new AMC and GM.[47]

AMC

3.37 AMC specify how to comply with regulation. For example, the UAS Implementing Regulation requires that a remote pilot operating in the open category must have the ability to maintain control of the uncrewed aircraft.[48] AMC builds on this requirement by indicating that the remote pilot should be focused on the operation of the aircraft, as appropriate; not operate the aircraft while also operating a moving vehicle; and operate only one aircraft at a time.[49]

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42 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 3. Remote pilots in other categories are subject to less stringent requirements than licensing. In the open category, a "flyer ID" is required, while the specific category imposes competency requirements on pilots.

43 Unless exempted by the CAA under SI 2016 No 765, art 266.

44 For completion, it is worth noting that the Air Navigation Order 2016 has specific rules for UAS that are moored, tethered or towed (see arts 92 and 265E).

45 SI 2016 No 765, art 23(1)(c).

46 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 76(3).

47 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 76(3).

48 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.060(2)(d).

49 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 UAS.OPEN.060(2)(d).

3.38 Following an AMC is presumed to establish compliance with the law but it is not the only possible way to fulfil regulatory requirements. Alternative means of compliance may also be proposed.[50]

GM

3.39 GM provides explanatory and interpretation material on the meaning and intended application of rules contained in aviation regulations. For example, the UAS Implementing Regulation requires that remote pilots in the open category do not perform duties when unfit to do so due to injury, fatigue, medication or sickness.[51] GM elucidates this requirement by stating that, whilst there are no specific medical standards to fly in the open category, remote pilots should apply the same considerations they would before driving a car or cycling on the road.[52]

3.40 Although not binding, GM is likely to be considered by the courts when looking at issues related to aviation regulation.[53]

Civil Aviation Publications ("CAPs")

3.41 In addition to AMC and GM, the CAA also publishes CAPs with a view to providing:

> a) guidance and clarification on the means of achieving compliance with global, and UK regulatory requirements;
>
> b) where applicable, details of any additional UK national requirements; and
>
> c) additional details regarding procedures and administrative processes to complement the applicable UK Regulations (and the Acceptable Means of Compliance and Guidance Material to the Regulations).[54]

3.42 CAPs can be particularly useful for making complex regulation more accessible. For example, the Manual of Air Traffic Services condenses relevant assimilated legislation, domestic requirements, SARPs and Procedures for Air Navigation Services into a single document.[55]

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50 EASA, *Acceptable Means of Compliance (AMC) and Alternative Means of Compliance (AltMoC)* https://www.easa.europa.eu/en/document-library/acceptable-means-compliance-amcs-and-alternative-means-compliance-altmocs. Although this description of AMC is produced by EASA, the same rules on AMC apply to the UK.

51 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.060(2)(a).

52 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, GM1 UAS.OPEN.060(2)(a).

53 For an example of a court considering guidance material, see *Peires v Bickerton's Aerodromes Ltd* [2017] EWCA Civ 273, [2017] 1 WLR 2865 at [18] and [54].

54 Text taken from foreword of CAA, *Aeronautical Data Quality – Guidance for the provision and maintenance of aeronautical data and aeronautical information in UK Aeronautical Information Products Civil Aviation Authority* (May 2024) (CAP 1054) p 6.

55 CAA, *Manual of Air Traffic Services* (October 2025) (CAP 493).

Dealing with breaches of aviation law

3.43 When aviation laws are breached, the CAA has regulatory enforcement powers to require corrective action. These enforcement powers are the main way in which the CAA deals with safety failures.

Regulatory enforcement

3.44 Regulatory enforcement is any activity carried out "to remedy a breach, or suspected or potential breach, of rules applicable to civil aviation."[56] Enforcement ranges from informal discussions to issuing "findings", which are formal notices requiring an aviation actor to take corrective action.[57] Depending on the level of concern, the CAA can increase its regulatory scrutiny by placing an aviation actor "on notice" if it believes the actor's safety performance is deteriorating. It can also identify an actor as requiring "special attention" if the actor is undergoing complex development or significant operational changes which raise concerns.[58]

3.45 Where non-compliance gives rise to an unacceptable loss of safety, the regulator can suspend or vary a certificate, licence or approval, thereby restricting what an aviation actor can do. If the CAA determines the actor will not return to compliance in the near future, it may revoke the certificate, licence or approval.[59]

Prosecution

3.46 Aviation follows a "just culture" approach. This means that personnel are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training.[60] One of the purposes of just culture is to promote openness and encourage those in the aviation sector to engage with the regulator when they find themselves in breach of their obligations.

3.47 "Just culture" means prosecutions are not common in the field of aviation. However criminal sanctions are available for breaches of aviation regulation and prosecutions are likely to be pursued in cases of wilful violation or gross negligence.[61]

3.48 The CAA, in addition to the Crown Prosecution Service, can bring criminal proceedings for aviation offences.[62] When the CAA does prosecute, it must follow the Crown Prosecution Service Code for Crown Prosecutors, which states a prosecution may only be brought if there is a reasonable prospect of securing a conviction and it is

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56 CAA, *Airspace Regulation Enforcement Guidance* (May 2015) (CAP 1074) p 5.

57 CAA, *Airspace Regulation Enforcement Guidance* (May 2015) (CAP 1074) pp 5 to 8.

58 CAA, *Airspace Regulation Enforcement Guidance* (May 2015) (CAP 1074) p 7.

59 CAA, *Airspace Regulation Enforcement Guidance* (May 2015) (CAP 1074) p 8.

60 UK Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation, art 2(12).

61 Civil Aviation Authority, *Just Culture,* https://www.caa.co.uk/general-aviation/the-ga-unit/just-culture/. See chapter 13.

62 Civil Aviation Act 1982, s 20(1A). The CAA does not have the power to launch prosecutions in Scotland, where regulators do not have powers of prosecution.

in the public interest.[63] Prosecutions are generally publicised by the CAA both to promote transparency and as a deterrent.[64]

Learning lessons

3.49 "Just culture" also requires the aviation industry continuously to learn lessons to improve safety.[65] This entails both a proactive approach to identify and prevent safety hazards resulting in an accident and, if an accident does occur, a robust reaction to determine what the causes were and how to prevent a similar accident from happening again.[66]

Reporting

3.50 To identify hazards, the CAA requires information on safety-related incidents and deficiencies. For this reason, UK Regulation (EU) 376/2014 (the "UK MOR Regulation")[67] imposes mandatory duties to report certain "occurrences" to the CAA.[68] The duty to report occurrences applies to a range of actors, including pilots, manufacturing and maintenance personnel, air traffic controllers and flight information officers, airport safety staff, and ground handling personnel.[69]

3.51 Article 2(7) of the UK MOR Regulation defines an "occurrence" as:

> any safety-related event which endangers or which, if not corrected or addressed, could endanger an aircraft, its occupants or any other person and includes in particular an accident or serious incident.

3.52 Those occurrences that may represent a significant risk to aviation safety and fall within any of four listed categories must be reported. The four categories are:

(1) the operation of aircraft;

(2) technical conditions, maintenance and repair of aircraft;

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63 As set out in Crown Prosecution Service ("CPS"), *Code for Crown Prosecutors* (2018) https://www.cps.gov.uk/publication/code-crown-prosecutors. See also, *Safety and Airspace Regulation Enforcement Guidance* (May 2015) (CAP 1074) pp 8 and 9.

64 CAA, *Regulatory Enforcement Policy* (October 2012) (CAP 1326) p 6. A recent example related to a pilot who failed to maintain radio communication with air traffic control during a flight, triggering the declaration of a security incident which led to the aircraft being intercepted by the RAF. The pilot was fined £4,511. See CAA, *Commercial pilot fined after RAF intercepted flight* (2025) https://www.caa.co.uk/newsroom/news/commercial-pilot-fined-after-raf-intercepted-flight/.

65 C Hodges, *Outcome-based cooperation: in communities, business regulation, and dispute resolution* (2022) p 396.

66 See UK Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation, recital 5.

67 UK Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation.

68 UK Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation, art 4(2).

69 Summarised list from UK Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation, art 4(6).

(3) air navigation services and facilities; and

(4) aerodrome and ground services.[70]

3.53 We refer to reporting requirements in the context of UAS throughout this report.

Accident investigation and safety recommendations

3.54 When an accident does occur, it is important to establish the cause so that lessons can be learned to prevent the same kind of accident from happening again. This is why the Chicago Convention requires states to institute an investigation into any aviation accidents occurring within its territory which involve death, severe injury or which indicate a serious technical defect in air navigation facilities.[71]

3.55 The state's investigation authority conducts aviation accident investigations.[72] In the UK, the Air Accident Investigation Branch ("AAIB") fulfils this role.[73] The sole objective of an investigation by the AAIB is to prevent accidents and incidents. It is not to apportion blame or liability.[74] This is in line with "just culture" and aims to encourage those in the aviation sector to cooperate with investigations.[75] Even so, the AAIB has substantial powers to conduct its investigation, including the power to call and examine witnesses,[76] and failing to cooperate puts one at risk of criminal prosecution.[77]

3.56 The result of an AAIB investigation will be a final report, containing factual information, analysis, conclusions and safety recommendations.[78] The latter is aimed at improving safety to reduce the likelihood of the same type of accidents happening again. Whilst safety recommendations are not binding, the recipient must respond within 90 days.[79] The AAIB will then reply within 60 days stating whether it considered the reply adequate and if it disagrees with a decision to take no action, it will explain why.[80]

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70 UK Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation, art 4(1).

71 Chicago Convention, Ninth Edition (2006), art 26.

72 Annex 13 to the Chicago Convention, Twelfth Edition,2020, including amendment 18, 3.2.

73 Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2018 SI No 321, reg 7.

74 Annex 13 to the Chicago Convention, Twelfth Edition, 2020, including amendment 18, 3.1.

75 For a summary of how the AAIB supports just culture, see the commentary of Edis J in *The British Broadcasting Corporation, The Press Association v The Secretary of State for Transport, The British Airline Pilots Association* [2019] EWHC 135 (QB), [2019] 4 WLR 23 at [5].

76 UK Regulation (EU) 996/2010 on the investigation and prevention of accidents and incidents in civil aviation, art 11(2)(f).

77 Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2018 SI No 321, pt 2.

78 Annex 13 to the Chicago Convention, Twelfth Edition, 2020, including amendment 18, appendix 1.

79 UK Regulation (EU) 996/2010 on the investigation and prevention of accidents and incidents in civil aviation, art 18(1).

80 UK Regulation (EU) 996/2010 on the investigation and prevention of accidents and incidents in civil aviation, art 18(2).

3.57 Safety recommendations are addressed to a range of actors in the aviation sector, including the CAA. For example, in response to a fatal accident in 2021 involving a pilot who became disoriented in a cloud, the AAIB recommended the CAA publish guidance for general aviation pilots to respond to unexpected weather deterioration. In response, the CAA published a leaflet with guidance for pilots who inadvertently fly outside of visual meteorological conditions. [81]

3.58 Since 2019, the AAIB has been responsible for monitoring the implementation of safety recommendations.[82] Furthermore, any entity receiving a safety recommendation is required by law to monitor the progress of any action taken in response.[83] This ensures recommendations are not ignored or poorly implemented.

The role of operators

3.59 To comply with regulation, operators must establish systems and processes to maintain safety. Here, we focus on two ways operators ensure they comply with regulation: the operations manual and management systems.

Operations manual

3.60 The Air Operations Regulation imposes a duty on operators to maintain an operations manual ("OM").[84] The OM is how the operator demonstrates to the CAA that a particular operation will be conducted in accordance with regulations. It is a document or set of documents which contains all instructions, information and procedures necessary for how the aircraft should be operated and for how operations personnel are to perform their duties.[85]

3.61 The OM will typically contain information on the operator's management system, flight time limitations, operating procedures, security procedures, performance limitations and personnel qualification requirements.

3.62 A key legal responsibility of the operator is to ensure "every flight must be conducted in accordance with the provision of the operations manual."[86] Furthermore, many regulatory requirements in the Air Operations Regulation refer to the OM. For example, ORO.FC.100 states that flight crew numbers cannot be reduced below the number specified in the OM.[87]

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81 Air Accidents Investigation Branch, *Annual Safety Review* (2024) p 82.

82 *What is a safety recommendation?* (2018) https://www.gov.uk/government/publications/what-is-a-safety-recommendation/what-is-a-safety-recommendation.

83 UK Regulation (EU) 996/2010 on the investigation and prevention of accidents and incidents in civil aviation, art 18(4).

84 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, Annex III, ORO.MLR.100.

85 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, Annex V point 8.2.

86 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, Annex III, ORO.GEN.110(b).

87 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, Annex III, ORO.FC.100(b).

3.63 The scope of the OM and the level of oversight the CAA attaches to it depends on the type of operation. For example, commercial air transport operations[88] are required to have a more detailed OM than non-commercial operations.[89] Commercial air transport operators must also submit their OM to the CAA when applying for an air operator certificate and require prior approval when amendments to the OM would change the scope of the air operator certificate or key elements of the management system.[90] For non-commercial operators, there is less oversight but operators must keep the OM up to date and incorporate any amendments or revisions required by the CAA.[91]

3.64 In the context of UAS operations, operators in the specific category may be required to submit an OM as part of their application for operational authorisation if warranted by the risk and complexity of the operation.[92] We discuss the OM in the context of passenger-carrying remotely piloted operations in chapter 7.

Management system

3.65 Operators are also required to implement and maintain a management system to promote safety. This system must include (amongst other things): clearly defined lines of responsibility and accountability; safety philosophies and principles; the continuous identification, evaluation and monitoring of aviation safety hazards; training; documentation processes; and compliance monitoring.[93]

3.66 Key to ensuring that safety is upheld at an organisational level is an "accountable manager", who is ultimately responsible for establishing and maintaining an effective management system.[94] It is expected that this will be the person who has overall responsibility for the organisation, which will either be the CEO or someone who has direct access to the CEO and the necessary funding allocation.[95]

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88 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, AMC 3 ORO.MLR.100.

89 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, AMC 2 ORO.MLR.100.

90 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, Annex III, ORO.GEN.130(a).

91 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, Annex III, ORO.MLR.100(e) and (i).

92 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.030(3)(e). We discuss this further in part 2 of the report.

93 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, Annex III, ORO.GEN.200.

94 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, ORO.GEN.210.

95 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, GM1 ORO.GEN.210.

3.67 Other regulated actors in the aviation sector have similar duties to operators for upholding safety. For example, air traffic management/air navigation service providers are required to implement and maintain a management system.[96]

3.68 The UAS Implementing Regulation generally does not require operators to maintain a management system.[97] However, we examine in this report whether VTOL operators should be required to implement management systems to uphold safety (see paragraphs 7.36 onwards).

CONCLUSION

3.69 In summary, civil aviation is a highly regulated field encompassing rules set at the international and domestic level, including assimilated safety legislation derived from the EU, and soft law produced by the CAA. In subsequent chapters, we explain how this system of aviation regulation applies to uncrewed aircraft with some modifications depending on the nature of the operation.

3.70 In making the recommendations in this report we have been mindful of the international context of aviation regulation. We have aimed to strike a balance between developing domestic regulation to keep pace with ongoing advances in aviation and developing standards which will not contravene later international developments.

3.71 As described in this chapter, a key aspect of regulating civil aviation is a robust safety culture that encompasses regulatory enforcement, hazard reporting and independent investigations into accidents. The CAA have stated that UAS are expected to meet at least the same safety and operational standards as equivalent crewed operations.[98] The recommendations in our report have been made with this in mind.

3.72 Notwithstanding the emphasis on safety in aviation regulation, things do sometimes go wrong, and compensatory and punitive systems are needed to provide accountability in these circumstances. In part 4 we make recommendations relating to civil and criminal liability in the context of UAS.

3.73 When recommending reform of liability regimes for UAS, our approach is underpinned by the principle that the safety of UAS should be equivalent to that of crewed aviation.[99]

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96 UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, Annex III, ATM/ANS.OR.B.005.

97 The Regulation does require operators under a light UAS operator certificate (LUC) to have a management system: UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.LUC.030. LUCs are not currently issued in the UK.

98 CAA, *Unmanned Aircraft System Operations in UK Airspace- Policy and Guidance* (April 2024) (CAP 722) para 1.1.1.

99 CAA, *Unmanned Aircraft Systems Operations in UK Airspace – Policy and Guidance* (April 2024) (CAP 722) para 1.1.1.

Chapter 4: The line between remotely piloted and autonomous operations

4.1 Throughout the course of this report, we distinguish between remotely piloted operations and those that are autonomous. We also recognise that there may be many uncrewed operations that are "highly automated", requiring minimal involvement from a human pilot or operator (but still involving a human). In our first consultation paper we discussed the difficulties that can arise when trying to describe varying levels of automation.

4.2 In this report we refer to "autonomous" and "remotely piloted" operations using the definitions already provided by UK Regulation (EU) 2019/945 ("UAS Delegated Regulation") and UK Regulation (EU) 2019/947 ("UAS Implementing Regulation"). As discussed in chapter 1, we have structured the recommendations using these concepts of operation.[1] Essentially, autonomous operations are those where a human cannot intervene to change the flight of the aircraft, whilst remotely piloted operations are those where a remote pilot operates the controls of the aircraft, or monitors its course and remains able to intervene and change its course at any time.

4.3 Consultees expressed a strong desire for clear terminology to describe automation in aviation. They drew our attention to different technical taxonomies for describing automated functions. Consultees also provided some examples of scenarios involving automation which they felt challenged the current definitions of autonomous and remotely piloted operations. Almost all consultees agreed that for remotely piloted operations, the role of the remote pilot should be clarified in law.

4.4 We agree with consultees that having clearly defined terms to describe uncrewed operations is essential. We recognise that there are many ways that aircraft functions and capabilities might be categorised. This being the case, there is also a range of views about how remotely piloted and autonomous functions for uncrewed aircraft should be described. Some consultees have also suggested that various autopilot features on crewed aircraft could be described as autonomous. However, as we set out in this chapter, our task in reviewing the regulatory framework is not to appraise technical descriptions of aircraft features but to ensure that the law is clear.

4.5 It is particularly important to clarify the legal distinction between an autonomous operation and a remotely piloted one. This is essential for legal certainty. It should always be clear to pilots, operators and other relevant parties who is responsible for an operation.

4.6 In our view, the current definitions of autonomous and remotely piloted operations in the UAS Delegated and Implementing Regulations provide a bright line which ensures that the law is clear. In this chapter we explain our conclusion, with reference to issues raised by consultees. We also recommend that the law governing remote pilots is clarified in three respects. Firstly, that it is possible for a remote pilot to serve as the

[1] See chapter 1, para 1.33.

commander of a commercial aircraft. Secondly, that where regulation applicable to uncrewed aircraft systems ("UAS") refers to "pilot" or "pilot-in-command", this also includes "remote pilot" or "remote pilot-in-command". Thirdly, there is the possibility that automation allows a single remote pilot to control many aircraft simultaneously. We recommend that, if such operations are authorised, UAS regulations should be amended to make clear that a remote pilot can serve as the pilot for multiple aircraft simultaneously.

4.7 We then discuss the future development of the remote pilot role. We consider the possibility of a new legal actor, the "flight supervisor". We also recommend that the UK Government consider in-flight transitions, allowing a transfer of responsibility from an autonomous aircraft to a remote pilot.

4.8 Finally, we consider that our approach relying on a clear legal distinction between remotely piloted and autonomous operations should be accompanied by legal clarity about the scope of the definition of operator within the relevant regulations. This is especially important because the move towards autonomous operators will result in increased responsibilities being placed on the operator. We therefore conclude the chapter by recommending that a "UAS operator" is also an "operator" within the meaning of the applicable regulations.

DISTINGUISHING "AUTONOMOUS" OPERATIONS

4.9 Aviation is a sector which already uses a high degree of automation. The term "autopilot" is synonymous with aviation and describes a range of automated systems that are used by pilots to assist them when flying aircraft.

4.10 Currently, these autopilot functions require that there be a human pilot-in-command of the aircraft. Under the current legal framework, it is the pilot who is the primary actor with responsibility for the operation of the aircraft. The term often used in legislation is pilot-in-command ("PIC"). The PIC is ultimately in charge of the flight and must ensure its safe conduct.[2] Even though the PIC might, practically speaking, have a very low workload when an automated feature is engaged, they are ultimately responsible for overseeing its use.

4.11 But technological advances, including those in artificial intelligence ("AI"), are expected to further advance the automation of aviation systems. As we described in chapter 1, it is anticipated that this will lead to uncrewed aircraft which operate without the need for human control: these aircraft are often referred to as "autonomous". In reality, however, the term autonomous is often a high-level assessment of a complicated set of automated features and performance outcomes. Consequently, it can be difficult to draw a clear line between remotely piloted and autonomous aircrafts. Nevertheless, in order to ensure effective legal regulation, a clear line needs

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2 In practice, the source of a pilot's obligations in the UK will depend on whether they are flying a Part 21 or non-Part 21 aircraft. The role of the pilot for non-Part 21 aircraft is dealt with largely by the Air Navigation Order 2016. For Part-21 aircraft, requirements can be found in the UK Regulation (EU) 2018/1139 (the "Basic Regulation") the UK Regulation (EU) 1178/2011 (the "Aircrew Regulation") and the UK Regulation (EU) 965/2012 (the "Air Operations Regulation"). We should also note that the PIC may be the only pilot on an aircraft, or one of several pilots. For commercial air transport operations, an operator is required to designate one pilot among the flight crew as the PIC.

to be drawn because autonomous operations represent a conceptual leap. On one side there are highly automated functions that are intended to be used to aid, assist or be overseen by a human pilot. On the other side there are systems which are not intended to have anyone in charge or responsible for their operation.

4.12 In this chapter we seek to clarify where the line between these types of operation should be drawn from a legal perspective. Superficially, there may be very little to differentiate highly automated systems and autonomous systems. However, crossing the legal line between remotely piloted and autonomous operations is significant because it means that the responsibility shifts away from a human PIC to other legal actors such as the operator or manufacturer.

4.13 The demarcation between remotely piloted and autonomous operations is also important for other purposes, including the creation of operational requirements, applicable rules of the air and accident investigation. For these reasons as well, it is important that regulation is clear.

Taxonomies and frameworks for automation

4.14 It is generally recognised that automation exists on a spectrum, dictated by the amount of interaction an automated system is designed to have with human actors. Systems which require minimal interaction are said to be "highly" automated whilst those which require intensive oversight are less automated. Aircraft have many different systems, all of which may operate with varying levels of automation.

4.15 In recent years, many taxonomies and frameworks have emerged which can be used to describe or classify the level of automation of aircraft systems. Consultees to our first and second consultation papers highlighted the value of these frameworks for describing automation and autonomy in aviation. Examples of these taxonomies and frameworks include: the US Department of Defense UAS Levels of Autonomy; EASA AI Roadmap; MITRE degree of pilot control of unmanned aircraft and flight deck automation; ASTM TR1-EB; and the JARUS levels of automation.

4.16 Some of these taxonomies and frameworks describe automation in terms of an automated system's features, whilst others describe the pilot's expected interaction with aircraft systems. Most use a combination of both to classify the level of automation.

4.17 A good example of one of these taxonomies is the JARUS framework of levels of automation. Its full title is the Joint Authorities for Rulemaking of Unmanned Systems ("JARUS") methodology for evaluation of automation for UAS operations.[3]

4.18 The JARUS methodology sets out a scheme for evaluating levels of automation in aviation systems, this scheme is set out below in table 4.1.[4] The JARUS levels range from level 0 (manual operation) to level 5 (full automation). JARUS provides criteria for

[3] JARUS is a group of aviation experts with regulatory expertise representing 68 countries, plus European Union Aviation Safety Agency and EUROCONTROL. JARUS provides recommendations and guidance material in relation to UAS with the aim of harmonising UAS regulation internationally. See Joint Authorities for Rulemaking on Unmanned Systems, http://jarus-rpas.org/.

[4] Joint Authorities for Rulemaking of Unmanned Systems, *JARUS methodology for evaluation of automation for UAS operations* (April 2023) p 21.

each level and illustrates these levels with examples of specific system functions (such as sustained aircraft manoeuvre control). It also states what the "fallback" position is in the event of failure.

4.19 The methodology suggests there is an "authority divisor" between levels 0 – 2, where the human is "in control" and levels 3 – 5, where the machine is "in control".[5]

4.20 The taxonomy also uses the phrases "human-in-the-loop", "human-on-the-loop" and "human-off-the-loop". These are commonly used when discussing levels of autonomy and express different types of human/machine collaboration:

(1) Human-in-the-loop. Here a human must interact with a system before the system can perform an action.

(2) Human-on-the-loop. The system can perform actions with or without human oversight; a human can provide guidance or override an action.

(3) Human-off-the-loop. No human is monitoring the system control; a machine provides inputs and evaluates outputs to manage system parameters.

[5] Joint Authorities for Rulemaking of Unmanned Systems, *JARUS methodology for evaluation of automation for UAS operations* (April 2023) p 19.

JARUS: Automation levels of an individual function supporting UAS flight operations						
Levels / Criteria	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
	Manual operation	Assisted operation	Task reduction	Supervised automation	Manage by exception	Full automation
Human-machine learning	Human led	Human in-the-loop	Human in-/on-the loop	Human in-/on-on the loop	Human on the loop	Human off the loop
Fallback (integrity thresholds exceeded)	Human	Human	Human	Human	Fallback ready human (operator/ATS)	Machine (limited or segregated operations)
Levels / System function examples	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
Sustained aircraft manoeuvre control	Human	Human and machine	Machine (managed by human)	Machine (supervised by human)	Machine	Machine
Object and event detection and response (OEDR)	Human	Human	Machine (managed by human)	Machine (supervised by human)	Machine	Machine
Communication with external systems (ground and airspace systems)	Human	Human	Human OR machine (managed by human)	Machine (supervised by human)	Machine	Machine

Table 4.1 – the JARUS methodology for automation with system function examples

4.21 Another example of an automation framework is EASA's AI Roadmap 2.0 which classifies AI applications in aviation into three levels, which are shown below in table 4.2. Similar to the JARUS framework, as the levels increase, the level of human involvement in the system decreases.[6] They reflect broadly the staged approach to automation that the aviation industry is expected to take when deploying AI applications.

Level 1 AI: assistance to human	Level 2 AI: human/machine teaming	Level 3 AI: more autonomous machine
Level 1A – Human augmentation Level 1B – Human cognitive assistance in decision and action selection	Level 2A – Human and AI-based system cooperation Level 2B – Human and AI-based system collaboration	Level 3A – The AI-based system performs decisions and actions, overridable by the human Level 3B – the AI-based system performs non-overridable decisions and actions (eg to support safety upon loss of human oversight)

Table 4.2 – EASA AI roadmap 2.0 automation levels

4.22 A final example, the ASTM framework, takes a slightly different approach to describing automation. It divides the performance of different functions and tasks into:

(1) onboard and remote aircraft systems,

(2) onboard and remote humans, and

(3) any other system or entity.

Percentages are allocated to each actor to represent the division of responsibility and the total for each task must add up to 100%. The example given by the framework uses onboard navigation systems. If an onboard navigation system is "100% autonomous", then a person operating the aircraft may not need to be trained in traditional navigation.[7]

4.23 The ASTM framework allows for complete flexibility in the allocation of responsibility for the performance of any given task or function. This responsibility does not need to

6 European Union Aviation Safety Agency, *Artificial intelligence roadmap 2.0* (May 2023) figure 4.

7 ASTM TR1-EB, *Autonomy Design and Operations in Aviation Terminology and Requirements Framework* (2019) p 8.

be the same for different functions within the same aircraft.[8] The responsibility allocation for a function may also change depending on the mode of flight.[9]

Taxonomies, policy and legal rules

4.24 Automation frameworks and taxonomies are useful for comparing different automated systems but are not sufficient as a foundation for legal rules. There are three main reasons for this.

4.25 Firstly, the primary purpose of most taxonomies and frameworks is not to regulate automated systems or to ascribe liability when they are used. The JARUS methodology explicitly states that it does not discuss "details of the legal aspects" of automation but rather that "liability is a matter relating to how regulations are handled within different jurisdictions".[10] The ASTM framework explains that it is intended primarily to facilitate the development of further ASTM standards, helping standards committees produce a "consistent and cohesive body of standards".[11]

4.26 Because their primary purpose is not to regulate, automation frameworks and taxonomies tend to be descriptive rather than normative: outlining the characteristics of increased automation rather than prescribing requirements for different types of aircraft operation.[12] Notably, the JARUS methodology describes autonomous operations but does not have an "autonomous" level of automation, instead it considers autonomy to be:

> an emergent effect of a collection of increasingly automated functions. As the level of automation increases across a set of interacting functions autonomy may emerge.[13]

4.27 Furthermore, taxonomies like JARUS also frequently qualify the term "autonomous" with descriptors such as "highly," "fully," and "entirely" without further explanation, underscoring their descriptive rather than prescriptive nature.

4.28 The second reason why taxonomies and frameworks cannot easily be converted into regulation is because regulation must reflect more than just the level of automation. Regulation requires additional policy questions to be considered: for example, when should a human be considered a pilot? What should a pilot be required to do in relation to automated aircraft? If the aircraft is effectively "in control" who should be responsible? Should aircraft carrying passengers be treated differently?

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8 ASTM TR1-EB, *Autonomy Design and Operations in Aviation Terminology and Requirements Framework* (2019) p 9.

9 ASTM TR1-EB, *Autonomy Design and Operations in Aviation Terminology and Requirements Framework* (2019) p 8.

10 JARUS, *JARUS methodology for evaluation of automation for UAS operations* (April 2023) p 33.

11 ASTM TR1-EB, *Autonomy Design and Operations in Aviation Terminology and Requirements Framework* (2019) p 2.

12 Some frameworks, such as the ASTM framework, explicitly state that they are not intended to be normative.

13 JARUS, *JARUS methodology for evaluation of automation for UAS operations* (April 2023) p 14.

4.29 Finally, taxonomies tend to focus on individual tasks or functions being used onboard an aircraft. However, instead of operating at the level of "functions", regulation ultimately requires an assessment and determination of the overall capacity of an aircraft and its supporting systems (ie whether it is "autonomous" or requires human supervision).

Frameworks and policy

4.30 Whilst automation frameworks cannot easily be turned into legal rules, they very clearly set out a hierarchy of automation which should be considered by policymakers. Further to this, almost all frameworks envisage automation increasing to the point where no human intervention is needed for various functions. As the JARUS framework explains:

> at the far end of the spectrum is a fully automated function. At this level of automation, the machine is fully responsible for function execution, and the human awareness of dynamic operational parameters is limited or non-existent.[14]

4.31 Both JARUS and ASTM adopt a definition of autonomous systems which conceives of them having "the ability and authority of decision making, problem-solving and/or self-governance". This definition of autonomy also speaks to systems which are characterised by their ability to operate without human oversight.

4.32 This concept of autonomy, with the human not providing input, has clearly informed current UK policy for uncrewed operations. In guidance for uncrewed operations the Civil Aviation Authority ("CAA") adapts the JARUS methodology and describes automated UAS systems as falling into two categories:

(1) Highly automated – those systems that still require inputs from a human operator (e.g., confirmation of a proposed action) but which can implement the action without further human interaction once the initial input has been provided; and

(2) High authority automated systems – those systems that can evaluate data, select a course of action and implement that action without the need for human input.[15]

4.33 Further to this, the guidance indicates that high authority automated systems will allow for "autonomous" uncrewed aircraft:

> the concept of an "autonomous" UAS is a system that will do everything for itself using high authority automated systems. It will be able to follow the planned route, communicate with Aircraft Controllers and other airspace users, detect, diagnose and recover from faults and operate at least as safely with continuous human

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[14] Joint Authorities for Rulemaking of Unmanned Systems, *JARUS methodology for evaluation of automation for UAS operations* (April 2023) p 24.

[15] Civil Aviation Authority ("CAA"), *Unmanned Aircraft System Operations in UK: Airspace – Policy and Guidance* (April 2024) (CAP 722) para 4.5.1.

involvement. In essence an autonomous UAS will be equipped with high authority control systems that can act without input from a human.[16]

4.34 For the purposes of this report, what can be usefully taken from the various taxonomies and frameworks is a hierarchy of automation in aviation. At the upper end of this hierarchy is a concept of operation which is delineated by a lack of human input and oversight.

4.35 From a legal perspective, the need for a clear line between autonomous and remotely piloted aircraft stems from the need to allocate responsibilities and duties effectively to ensure UAS can operate as safely as crewed aircraft. A key feature of the current regulations is the role of the PIC. Consequently, there is a need to delineate between requirements of human input where a human is the PIC and autonomous operations where this is not the case.

4.36 This key delineation is a component of current UK policy on uncrewed operations which divides automated operations into those which are "highly automated" but still require human input and those which are "autonomous" and do not. It is also reflected in current regulation for "unmanned" aircraft. Autonomous operations are also distinguished in regulations by the lack of human oversight and input, or more specifically, the lack of a remote pilot.

The existing legal definitions of "remotely piloted" and "autonomous" operations

4.37 In the UK an "unmanned aircraft" means "any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board".[17] Regulation therefore divides uncrewed operations into two different types: those with a remote pilot and autonomous operations.

4.38 Remotely piloted operations are simply those with a remote pilot. In the UK the definition of a remote pilot is:

> a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time.[18]

4.39 This is similar to the definition included in Annex 1 to the Chicago Convention:

> A person charged by the operator with duties essential to the operation of a remotely piloted aircraft and who manipulates the flight controls, as appropriate, during flight time.[19]

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16 CAA, *Unmanned Aircraft System Operations in UK: Airspace – Policy and Guidance* (April 2024) (CAP 722) para 4.5.1.

17 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 3(1).

18 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 3(27). See also Schedule 1 to the Air Navigation Order 2016 SI 2016 No 725.

19 Annex 1 to the Chicago Convention, Fourteenth Edition, 2022, including amendment 178, ch 1.

4.40 If a person is responsible for the safe conduct of a flight, by either controlling the aircraft or by monitoring its course and remaining able to intervene and change its course, then that person is a remote pilot. This person will remain the remote pilot even if the aircraft is flying "automatically".[20] The existing definition of remote pilot therefore requires a relatively low level of direct involvement with the flight controls.

4.41 The second type of uncrewed operations allowed for by regulation are "autonomous operations". The UAS Implementing Regulation contains the following definition of autonomous operations: "An operation during which an unmanned aircraft operates without the remote pilot being able to intervene."[21]

4.42 The guidance material for the UAS Implementing Regulation clarifies that it is the remote pilot's *inability* to intervene that distinguishes an operation as autonomous:[22]

> An autonomous operation should not be confused with an automatic or automated operation, which refers to an operation following pre-programmed instructions that the UAS executes while the remote pilot is still able to intervene in the flight.

4.43 This definition of an autonomous operation is not unique to the UK and the EU. For example, in Canada, "autonomous", in the context of remotely piloted aircraft systems, is defined as meaning that "the system is not designed to allow pilot intervention in the management of a flight".[23]

4.44 Considering the definitions together, we can separate remotely piloted operations from those that are autonomous by the ability, or inability, of a pilot to intervene. This provides a clear line for legal regulation which focuses on whether duties and responsibilities should be placed on a human pilot or on the person responsible for the autonomous system flying the aircraft without human intervention. Autonomous operations refer to those where the pilot is unable to intervene. If the pilot is able to intervene, this is a remotely piloted aircraft.

4.45 These definitions create a high bar for autonomous operations but, conversely, a low threshold for remotely piloted operations. Essentially, any remote intervention by a responsible person in the course of an aircraft's flight, would mean that this person is a remote pilot and the operation was not autonomous. For this reason, in our first consultation paper we examined the role of the remote pilot and asked whether the current definition should be retained.

THE DEFINITION OF THE REMOTE PILOT

4.46 The role of the pilot encompasses control of the flight of an aircraft but also wider operational considerations. A pilot is responsible for other aspects of operation such as the overall safety of the flight, airworthiness, the reporting of accidents, and, for

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20 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 3(27).

21 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 2(17).

22 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, GM1 art 2(17).

23 Canadian Aviation Regulations (SOR/96-433), Part IX, Division I, 900.01.

relevant operations, the safety of passengers and cargo. Under current legal regulations, any individual who can intervene to pilot a UAS is a remote pilot, regardless of the level of automation of the UAS. Should this still be the case for highly automated UAS where the pilot may not be piloting the UAS for some or most of its operations?

4.47 In our first consultation paper we considered what should be done with the various responsibilities of the pilot which do not relate to the piloting task itself. We asked whether responsibility for the overall operation should continue to be centralised in one individual. We highlighted that some stakeholders envisage that, in the future, the role of the remote pilot might evolve into a new legal actor – the "supervisor" – who would have responsibility for some operational aspects of an autonomous flight. We return to the discussion of the supervisor role below at paragraph 4.129.

4.48 As a starting point we asked consultees whether the current definition of remote pilot should be retained – that is, whether a person overseeing an aircraft flying automatically, who monitors its course and is able to intervene and change its course at any time, should continue to be classified as a remote pilot. We asked this question in relation to both of our use cases, vertical take-off and landing vehicles ("VTOLs") and drones, which were examined separately in our first consultation paper. In our view, it remained important that an individual who is able to control or intervene in the flight of an aircraft should still retain the overall responsibility for the operation of the aircraft.

Consultation analysis

4.49 There was overwhelming support for continuing to classify a person overseeing a VTOL flight and remaining able to intervene in the course of the flight as a remote pilot. For example, the Association for Uncrewed Vehicle Systems International said:

> Yes, as the core duties of the pilot in command are decision making and oversight, not the direct manipulation of controls or performance of other [delegable] tasks, the person described would still qualify as the pilot in command of the aircraft. Neither the location of the individual nor their lack of direct control manipulation changes their role of "pilot."[24]

4.50 Consultees also recognised that classifying a person overseeing a VTOL flight as a pilot provided clarity for the purposes of responsibility and accountability for the aircraft's operations.[25]

4.51 Most consultees also agreed with our provisional proposal to retain the current definition of a remote pilot for drones. Those that did so tended to answer straightforwardly with little additional comment. As described by one consultee, this was because the definition was "common sense" and we should not seek to

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[24] Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[25] Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

overcomplicate the issue.[26] Others simply thought the current definition was flexible enough to encompass all roles envisaged under increased automation.[27]

4.52 Some consultees who agreed with the provisional proposal also highlighted additional operational responsibilities which should be considered by the Law Commission when considering the role of the "remote pilot." BT Group, for example, thought that legislation should allow for flexibility in terms of the operations and proximity of the pilot.[28]

Discussion and recommendations

4.53 In our view, for operations that are not autonomous, the current definition of remote pilot provides clarity about responsibility for UAS operations that involve automation. As discussed above, the current definition of remote pilot requires a relatively low level of direct involvement with the flight controls.[29] As consultees noted, the current definition is flexible in that it encompasses a wide range of automation which still requires a responsible human to supervise.

4.54 Consultees also told us that it made sense to continue to vest the overall operational responsibilities in the person who can intervene in the course of the flight of an aircraft. This ensures that there is clear responsibility and accountability for all aspects of the operation of an aircraft.

4.55 Given the continuing need for legal clarity and the majority support for our provisional proposal for both drones and VTOLs, we recommend that the current definition of remote pilot should be retained.

Recommendation 1.

4.56 We recommend that the current definition of remote pilot set out in the UK UAS Delegated Regulation 2019/945 should be retained.

The remote pilot as the pilot-in-command of an aircraft

4.57 The PIC is one of the key actors in the regulation of aviation and holds many responsibilities, which we described in our first consultation paper.[30] The Air Navigation Order 2016 ("ANO 2016") defines the PIC as "the pilot designated by the operator as being in command and charged with the safe conduct of its flight, without

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26 Apian response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 23, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

27 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

28 BT Group response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 109, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

29 See para 4.40.

30 See Aviation Autonomy (2024) Law Commission Consultation Paper No 261 ch 6, paras 6.11 to 6.99.

being under the direction of any other pilot in the aircraft".[31] The PIC is responsible for the "operation and safety of the aircraft and for the safety of all crew members, passengers and cargo on board".[32]

4.58 For the purpose of commercial air transport operations, the PIC is termed the "commander".[33] Commanders of commercial air transport operations are responsible for:

(1) the safety of all crew members, passengers and cargo on board, as soon as the commander arrives on board the aircraft, until the commander leaves the aircraft at the end of the flight; and

(2) the operation and safety of the aircraft:

(a) for aeroplanes, from the moment the aeroplane is first ready to move for the purpose of taxiing prior to take-off, until the moment it finally comes to rest at the end of the flight and the engine(s) used as primary propulsion unit(s) is (are) shut down; and

(b) for helicopters, when the rotors are turning.[34]

4.59 Therefore, the role of the commander has two aspects: ensuring the safe operation of the aircraft itself and ensuring the safety of people and cargo onboard. Where a commercial air transport operation involves multiple pilots, the operator is required to designate one pilot among the flight crew as the PIC (and therefore act as the commander of the aircraft).[35]

4.60 Insofar as UAS operations are concerned, the PIC (or commander) is most likely to be relevant to UAS operating in the certified category – the highest risk operations.[36] This is because UAS in the open and specific categories are subject to the detailed operational rules set out in the UAS Regulations, which place responsibilities directly on the "remote pilot", as defined above, rather than the PIC. In contrast, operational

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31 SI 2016 No 765, sch 1.

32 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, annex V, para 1.3.

33 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex I, para 96.

34 Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex IV, CAT.GEN.MPA.105(a)(1) and (2). A commercial air transport operation is defined in the UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 3(24) as "an aircraft operation to transport passengers, cargo or mail for remuneration or other valuable consideration".

35 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, annex V, para 8.6. The requirement applies to commercial air transport and other operations subject to a certification or declaration requirement performed with aeroplanes, helicopters or tilt rotor aircraft.

36 As we explain in chapter 5, operations are in the certified category if they (1) involve an uncrewed aircraft with a characteristic dimension of 3m or more being flown over assemblies of people; or (2) involve the transport of people; or (3) involve the carriage of dangerous goods, that may result in high risk for third parties in case of accident. UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 6(1)(b).

rules for UAS in the certified category are embryonic: the UAS Implementing Regulation specifies that "applicable operational requirements" in UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air ("UK SERA"), the UK Regulation (EU) 965/2012 (the "Air Operations Regulation") and the UK Regulation (EU) 1332/2011 (the "Common Airspace Usage Requirements Regulation") apply[37] – but no further guidance is given.

4.61 In the absence of existing regulation about the operational requirements for UAS in the certified category, in our first consultation paper we took as our starting point the responsibilities of a pilot of a traditional crewed aircraft. We focused in particular on a commander of a commercial air transport operation because we anticipate that in the future, commercial UAS operations could be conducted in the certified category – for example by VTOLs.[38] We proposed that the law should make clear that a remote pilot is capable of being the commander of a commercial air transport operation for the purposes of the Air Operations Regulation.

4.62 There was overwhelming support for our provisional proposal to align the responsibilities of the remote pilot with those of the commander in the Air Operations Regulation. Consultees recognised that the duties of the PIC were concerned with decision-making as opposed to manipulating controls, meaning that they were sufficiently similar to the role of a remote pilot. Consultees also noted that this would facilitate clarity and equivalent safety with crewed aircraft.

4.63 Joby Aviation provided an example of such a response:

> Yes, the core duty of a pilot in command (PIC) is decision making, not manipulation of controls. Neither the location of the pilot nor the number of items they must monitor during a flight change the need for a certificated individual to be in "command" of the flight. A pilot is in command of a flight regardless of the level of automation the aircraft has, or if they are seated in the aircraft or at a ground control station.[39]

4.64 In addition to stakeholder agreement, the Annexes to the Chicago Convention have also recently been updated to contain a definition of a remote PIC: "the remote pilot designated by the operator as being in command and charged with the safe conduct of a flight".[40] Our provisional proposal, therefore, aligns with the development of the remote pilot in international aviation law.

4.65 This is not to say that the remote pilot would be able to function as a commander in exactly the same way as the PIC of a crewed aircraft. It is clear that there are several aspects of the traditional pilot's role that a remote pilot will find difficult to replicate. We set out the key adjustments that we provisionally consider to be necessary in chapters 7 and 10.[41] But as a starting point, it is important that the law should be clear that the

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37 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7(3).

38 See chapter 5, para 5.5(3) for discussion on certified category operations.

39 Joby Aviation response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 270, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

40 Annex 1 to the Chicago Convention, Fourteenth Edition, 2022, including amendment 178, ch 1.

41 See chapters 7 and 10.

remote PIC of a commercial aircraft will have the same overall responsibilities of a commander, even if practically speaking these will be fulfilled in different ways.

4.66 While we have focused on the responsibilities of a commander, the same logic applies outside of commercial operations. Thus, wherever the ANO 2016 applies to remotely piloted operations, in principle, references to the pilot or PIC should include the remote pilot or remote PIC.[42] This should also be the case where the applicable requirements in UK SERA, the Air Operations Regulation and the Common Airspace Usage Requirements apply to remotely piloted operations.[43] It is likely that a court would already take this approach to the interpretation of the words pilot or PIC. However, we make a recommendation to this effect because it is important to ensure that there are no legal gaps that would allow a remote pilot to escape the imposition of a duty solely on the basis that the relevant regulation referred to "pilot" rather than "remote pilot" – where it would otherwise be desirable that they were subject to such a duty.

Recommendation 2.

4.67 We recommend that in a commercial air transport operation a remote pilot as defined in the UK UAS Delegated Regulation 2019/945 should have the responsibilities of the commander of an operation within the meaning of the UK Air Operations Regulation 965/2012.

Recommendation 3.

4.68 We recommend that where the Air Navigation Order 2016 applies to UAS operations, references to "pilot" and "pilot-in-command" should include "remote pilot".

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42 For instance, the PIC is under a general duty (for both commercial and non-commercial operations) to ensure the safety of all crew members, passengers and cargo on board: Air Navigation Order 2016, SI 2016 765, article 68(c). This duty should also apply to the remote PIC of a UAS, where appropriate. Likewise, where the ANO 2016 places criminal liability on the PIC of an aircraft, this should include the remote PIC (where applicable): Air Navigation Order 2016 SI 2016 765, article 265(1) – see chapter 13 for further discussion.

43 As explained above at para 4.60, these are the operational rules applicable to UAS operations in the certified category, which are still at an embryonic stage of development.

Recommendation 4.

4.69 We recommend where the applicable requirements in UK SERA 923/2012, the UK Air Operations Regulation 965/2012 and the UK Common Airspace Usage Requirements 1332/2011 apply to UAS operations, references to "pilot" and "pilot-in command" should include "remote pilot".

Piloting multiple aircraft

4.70 Until recently one pilot controlling multiple aircraft has not been a practical possibility. Automation brings with it the prospect that a remote pilot could oversee multiple aircraft at the same time. These types of operations are often referred to as multiple simultaneous operations ("MSO").

4.71 The British Standards Institution have identified two types of MSO:

(1) operations where uncrewed aircraft operate relative to each other; and

(2) operations where uncrewed aircraft are independent of each other.[44]

4.72 The first type of MSO describes a group of aircraft which have been programmed to fly together in a particular manner. When undertaken with drones, the resulting flying group is sometimes referred to as a "drone swarm". Currently, the most common use of drone swarms is for entertainment purposes, most notably light shows. Drones are programmed to fly in a synchronised manner in various aerial formations.

4.73 The second type of MSO describes aircraft which might operate independently but still subject to collective control. For example, a fleet of drones may be used to deliver different goods to multiple locations, but all be under the control of a single remote pilot.

4.74 There are many proposed use cases for MSO. For example, teams of drones might be used to survey infrastructure or for environmental monitoring.[45] It is also possible that swarms might be used for emergency response in some circumstances.[46]

Uncertainty in the law

4.75 Piloting multiple aircraft is not, generally speaking, prohibited in the law. This is likely because it has simply not been physically possible until now. We are aware of only one specific prohibition against piloting multiple aircraft: Acceptable means of

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44 British Standards Institution, BSI Flex 1903 v 1.0 2023-08, Future flight systems – vocabulary (August 2023), para 3.1.65.

45 Somerset Council, *Somerset chosen to pioneer drones project*, 8 October 2025, https://www.somerset.gov.uk/news/somerset-chosen-to-pioneer-drones-project/.

46 Ausino, E and others. "Drone Swarms in Fire Suppression Activities: a conceptual framework" (2021) 5(1) Drones 17, https://doi.org/10.3390/drones5010017.

compliance for the UAS delegated regulation indicate that it is not allowed in the open category.[47]

4.76 This creates uncertainty about whether a remote pilot can serve as the pilot of multiple aircraft. Although drone swarm operations have previously been approved in the specific category for light shows, these operations are within VLOS and are therefore relatively low risk. More generally, there is a lack of detailed provisions to address any of the unique characteristics of this type of operation in the specific or certified categories.[48]

4.77 It is an open question whether the volume of a remote pilot's responsibilities will mean that in practice they will be unable to pilot more than one aircraft at time. The requirements placed on remote pilots assume a certain level of control over the aircraft and make them responsible for the safe flight of the UAS. A remote pilot is charged with "monitoring its course and remaining able to intervene and change its course at any time". Whilst this may be possible for smaller scale MSO, it may become increasingly difficult for larger more complex MSO.

4.78 Given the uncertainties in relation to MSO, in our first consultation we asked whether the law should permit remote pilots to act as a pilot for more than one UAS at a given time.

4.79 The majority of consultees were in favour of the law permitting remote pilots to act as the pilot for more than one UAS at the same time, especially in relation to VTOLs. Several consultees saw this as vital for future advanced air mobility use cases.

> … It should be permitted for the individual serving as pilot in command to be responsible for more than one aircraft at a time, VTOL or otherwise. This is essential for the advanced air mobility industry to be able to deliver on its promise to make aviation more accessible to more people in more localities.[49]

4.80 We also asked whether the definition of a remote pilot was compatible with MSO. We received very mixed views on the topic, but more consultees than not thought that the current definition of remote pilot would be compatible.

> .. If the drones are not autonomous, but are highly automated then the definition of remote pilot should still be applicable. It may be necessary for the remote pilot to have support from others to carry out tasks to meet this responsibility (e.g. pre flight

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47 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 UAS.OPEN.060(2)(d).

48 Though there is CAA guidance on drones swarms within visual line of sight. See CAA Unmanned Aircraft Systems Rotary Wing Swarm Operations – Visual Line of Sight – Requirements, Guidance and Policy (December 2022) (CAP 722E).

49 Boeing response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 68, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

checks of the aircraft) but the responsibility could still reasonably lie with the remote pilot.[50]

4.81 The CAA also thought the current definition of a remote pilot was compatible and that the regulatory framework provided by the UAS Implementing Regulation could accommodate MSO.

4.82 Some consultees did however note that additional guidance and clarification might be necessary for pilots in command of MSOs. For example, Thomas Levermore agreed that the definition was compatible but believed that the requirement of "'remaining able to intervene ... at any time' needs clarifying in the context of multiple simultaneous operations". Some, like Skybound Rescuer, also thought that enhanced training and certification for remote pilots, specific to MSO, would be necessary.

4.83 Several consultees did not agree that the current definition of a remote pilot was compatible with MSOs. For the most part, these consultees disagreed because they took a long-term outlook on the role of the remote pilot and its development.

4.84 In its response, Boeing suggested that whilst applying the existing definition may be sufficient in the short term, it would increasingly become unrealistic for the law to treat a single individual as responsible for a fleet of highly automated aircraft due to the increased delegation of the remote pilot's responsibilities.[51] Similarly, ARPAS-UK and an anonymous consultee thought that the concept of a remote pilot might work at present but eventually it may be better to reevaluate the role of the remote pilot.[52]

4.85 We understand that many consultees foresee the PIC being developed into more of a systems management role, with the role of the human pilot largely being to oversee or supervise MSOs. We also understand that this is a more long-term ambition; we discuss why we do not think recommending a new supervisory role is appropriate at this stage below at paragraph 4.130.

Remote pilots and MSO

4.86 There are many unanswered questions about how MSO will work in practice. In our view, before MSO could be approved there would need to be additional safeguards and regulations to ensure that MSO are safe. These would likely include:

(1) in the certified category, certification standards, both for the aircraft involved and for command units;

(2) specific pilot licensing and appropriate training, this could include a new rating for passenger-carrying MSO and those involving drones; and

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50 UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

51 Boeing response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 68, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

52 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

(3) operational rules which reflect the particular challenges of passenger-carrying MSO.

4.87 Specific procedures and operator requirements for MSO would also need to be developed. We consider some of these operational aspects of MSO in chapter 6 and chapter 7 of this report where we consider the operations of UAS in general.

4.88 The development of these procedures and regulations will likely need to be undertaken over a longer period time and informed by practical experience with MSO.

4.89 However, it is possible that a remote pilot in charge of a MSO may be able to fulfil their core obligations under UAS regulations. Although additional procedures and automation may be required, it is foreseeable that a remote pilot remains able to operate the controls of aircraft in a MSO, effectively monitor their course, remain able to intervene and change their course at any given time. In our view, where a pilot is able to do this, and when there are relevant regulations and operational conditions in place to ensure the operation is safe, we believe that the definition of a remote pilot is compatible with MSO. We acknowledge that this might be more feasible for smaller scale MSOs and increasingly difficult to prove as operations scale with more UAS.

4.90 Nonetheless, most consultees were against imposing a limit on the numbers of aircraft that a remote pilot could command. Consultees stressed that the regulators should allow MSO based on an assessment of performance and risk on a case-by-case basis. Some suggested that the overall risk profile, rather than the absolute numbers of aircraft in MSO should be the metric used for approval. The CAA itself thought that safety cases, which would present evidence for the overall safety of an operation, could be used to approve MSO in future.[53]

4.91 Ultimately, whether MSO are approved will be a matter for the regulator. However, in our view, if MSO are authorised, clarifying that a remote pilot can serve as the pilot for multiple aircraft would provide greater legal certainty. It would mean that both those approving and those operating MSO would be in no doubt about the roles and responsibilities of persons involved. Greater legal certainty might also encourage more trials of MSO, which will be vital for gathering evidence for the overall safety of MSO.

Recommendation 5.

4.92 We recommend that if MSO are authorised, UAS regulations should be amended to make clear that a remote pilot can serve as the pilot for multiple aircraft simultaneously.

[53] CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

THE FUTURE ROLE OF THE REMOTE PILOT

4.93 Remotely piloted operations may require minimal involvement from the pilot, yet they still have a pilot who is able to intervene in the course of the flight. The bright line between remotely piloted and autonomous operations is, as defined in the UAS regulations, the ability of the remote pilot to intervene in the course of the flight.

4.94 Although the majority of consultees agreed that the definition of a remote pilot should remain the same as in the UAS regulations, some consultees felt that there should still be a role for human pilots or "supervisors" even for autonomous operations.

4.95 Several stakeholders also envisaged that human pilots would be required in some scenarios where an aircraft operating autonomously encountered an adverse or emergency scenario. For example, Ramin Norouzi of Dronzit Aerospace said:

> While we anticipate that all the flight phases of our autonomous eVTOL will be accomplished automatically without any human intervention, it is likely that from time to time, abnormal/emergency circumstances will arise that can't be handled by the autonomous systems of the aircraft. Such events will demand the intervention of our remote pilots.[54]

4.96 Similar comments were made by Vertical Aerospace, another eVTOL developer.[55]

4.97 But the Royal Aeronautical Society ("RAeS") explained why they thought the issue might not be straightforward:

> Any aircraft has a degree of autonomy (i.e. joy-stick reversion to a neutral point could be deemed as a degree of autonomy). It is therefore likely that there will be automatic or autonomous emergency overrides to remote piloting. Accordingly, there is a continuum between purely remote piloting and true autonomy, and any particular aircraft could be anywhere on that line, and in different phases of flights (or in emergencies) jump to somewhere else on that line. The legal framework needs to be able to address this.[56]

4.98 Notably the RAeS thought that the emergency overrides might work both ways with the human taking control from an autonomous system and vice versa. They emphasised that there would be a continuum between "purely remote piloting" and "true autonomy" and they foresaw that control might shift many times for a variety of reasons throughout the course of an operation. For this reason, they proposed a new definition of autonomy:

> operating independently of human control and able to make decisions using information obtained from onboard sensors and systems and offboard sources of

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54 Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

55 Vertical Aerospace response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 574, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

56 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

information but can be capable of responding to a remote pilot's – or other appropriate external control – when required.[57]

RAeS explained that

> This definition encompasses flights when there is no human intervention from pre take-off to after landing, and flights where a remote pilot can be in control for certain sectors of the flight and then hands control to the autonomous system for other sectors.[58]

4.99 As discussed above, there are a range of taxonomies that can be used to delineate between remotely piloted and autonomous operations. However, legal regulation needs to draw a bright line in order to allocate duties and responsibilities correctly to ensure safety. In addition, there is a need for the law to be clear and relatively easy to apply. Consequently, legal regulation will classify operations as remotely piloted and autonomous. However, as consultees note, an operation consists of many systems, each of which may have different degrees of autonomy.

4.100 The ability of a remote pilot to override an otherwise autonomous operation and intervene means that it can be challenging, conceptually, to draw a clear line between autonomous and remotely piloted operations. It is also difficult to determine when a particular operation is best definitely as a remotely piloted or autonomous operation under the provisions of the UAS implementing Regulation. Nevertheless, there is a need for regulations to provide a clear line. The best means through which to ensure a clear and accurate legal distinction between autonomous and remotely piloted operations is to investigate another concept which we raised in our first consultation paper, namely an operation which might transition from a remotely piloted operation to an autonomous one.

Transitions between autonomous and remotely piloted

4.101 In our first consultation paper we highlighted that the UAS Implementing Regulation is silent on the possibility of transitioning between autonomous and remotely piloted phases of an operation. We noted that it was conceivable that there may be use cases where this was desirable. We envisaged these phases of flight to follow the current definitions found in the UAS Implementing Regulation. An autonomous phase would continue to be one where the remote pilot could not intervene and a remotely piloted phase would allow the remote pilot to intervene at any time.

4.102 As consultee responses highlighted, transitions could be used to allow a remote pilot when an autonomous aircraft encountered unusual circumstances or an emergency which it could not deal with by itself.

4.103 This way of operation has been adopted for some types of automated vehicles. The Automated Vehicles Act 2024 allows for automated vehicles on public roads to move

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57 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

58 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

between a self-driving mode and modes that require a human driver.[59] But if an "authorised self-driving feature" is engaged, the vehicle must issue a "transition demand" to hand back control to the user-in-charge of the vehicle.

4.104 In our first consultation paper we explained that any change in status between a remotely and autonomously piloted phase of an operation would need to be signalled clearly to a remote pilot. Similar to self-driving vehicles, if an autonomous systems were to "hand back" control to a remote pilot there would need to be a timely "transition demand" to enable the remote pilot to react to the change in operation.[60] We also considered that the aircraft would have to be able to continue to operate safely even if the remote pilot failed to respond to the transition demand.

4.105 In the absence of detailed industry discussion on the point of transition, we asked whether the law should permit an aircraft to transition between remotely piloted and autonomous flight during the course of a single operation. We asked this question in relation to both VTOLs and drones.

4.106 A majority of consultees thought that such transitions should be allowed for VTOLs and drones. In addition to emergency scenarios, consultees thought it would be important to be able to transition from remotely piloted operations to "autonomous" ones if the remote pilot lost their communication link with the uncrewed aircraft. For example, the VTOL developer Vertical Aerospace said

> in lost link scenarios, where communication between the remote pilot and the aircraft is disrupted, the ability for the aircraft to autonomously continue its flight or safely land is vital.[61]

4.107 Another VTOL developer, Joby Aviation also believed transition "may be appropriate and or necessary in emergencies and failures in ground control communications."[62] The Association for Uncrewed Vehicles were also of the view that transitions may be necessary in emergency situations.[63]

4.108 One consultee highlighted that such transitions would be similar to the transitions that happen between autopilot functions and human pilots today:

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59 Automated Vehicles Act 2024, s 7.

60 Transition demand is the term used section 7 of the Automated Vehicles Act 2024 in relation some automated road vehicles which require a user-in-charge while an authorised self-driving feature is engaged. It describes a demand communicated by equipment of a vehicle, when the authorised self-driving feature is engaged, to indicate that the user-in-charge of vehicle must assume control of the vehicle by the end of a period of time beginning with the communication of the demand. We also used this term in our first consultation paper in chapters 6 and 7 of our first consultation period when describing what processes might be needed if a UAS were to switch between autonomous and remotely piloted phases of flight.

61 Vertical Aerospace response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 574, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

62 Joby Aviation response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 270, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

63 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

> The power to switch modes is surely one of the most powerful capabilities of novel AAM systems. There is, in principle, little difference between the use of an autopilot on a conventional aircraft. However, it needs to be clear what responsibilities remain when the aircraft is in autonomous mode and in what circumstances the RP will resume remote piloting. This needs to be set at the operational level.[64]

4.109 The CAA were also in favour of allowing uncrewed VTOLs to transition and believed provisions:

> could be addressed at regulatory level, for example, permitted when a safety case is demonstrated, leaving the option to allow it with some stringent conditions at a later date.[65]

Clarity about who is in charge

4.110 Any transition from an autonomous operation to a remote pilot would require clarity about who is in charge of the operation at any given point in time. There are strong safety reasons for this. If a human pilot is to take over responsibility from an autonomous system, or vice-versa, there should be no ambiguity about the nature of responsibility and when it begins and ends. There were several consultees who raised this as an issue that would need to be addressed if transitions were allowed. UTM developer Altitude Angel emphasised this in its response:

> As long as it is clearly defined if the drone is operating remotely piloted or autonomously then we would support such a regime. There may be good reasons to transition from autonomy to remotely piloted while in flight and this should not be forbidden, as long as safety is not compromised.[66]

4.111 One consultee, Professor George Lleoudas from the Hillary Rodham Clinton School of Law, suggested that "remote drone pilots undergo comprehensive, recurring safety training, including on transition issues" to maintain safety.[67] Another, Chris Daniels of Flare Bright thought that, ultimately autonomous systems would mature and prove safer than human pilots and thought that transitions from the machine should only be allowed as an exception.[68]

4.112 There are also legal reasons why a transition would need to be clear. Any transfer from an autonomous operation, where no intervention was possible, to one which

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64 Anonymous 4 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 663, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

65 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

66 Altitude Angel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 10, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

67 George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

68 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

operates with a remote pilot, would also entail a change in legal liability. This was an issue highlighted by the US Federal Aviation Authority ("FAA"):[69]

> The question of whether law should permit switching between remotely piloted and autonomous operations raises challenges with liability. Due to the nature of a communication link, there is always a period of "autonomous" operations. We will need operators to demonstrate effective transition of flight authority between the pilot and the automated systems.[70]

4.113 Kate Staples also indicated that the Law Commission should consider liability for transition modes, suggesting we should consider how the "regulatory point of focus" would shift away from the individual pilot to the entity organising the flight.[71]

4.114 However, the RAeS raised the possibility that for some use cases it could be legally and technically infeasible to differentiate between remote and autonomous modes of operation:

> there shouldn't be a transition time associated with this, nor [should it] necessarily [be] seen as a different legal status at different points in the transition. Control by a remote pilot to fully automated autonomous operations is not a binary switch, but a continuum and it will be virtually impossible to define in the future where any drone is on this continuum at any point in time. [72]

Allowing transitions

4.115 As we described earlier, current regulation classifies whole operations rather than individual phases of a flight. If a pilot can intervene in the course of a flight then that operation is not autonomous.

4.116 Consultees generally agreed though that human intervention in the course of an autonomous flight might be desirable, or necessary, especially in emergency circumstances. If necessary, then perhaps truly autonomous flight, as currently conceived of in regulation, is not possible. There will always be some human intervention, even if this is reserved for emergency or other exceptional situations. An alternative possibility is that the legal definition of autonomous operations might be appropriately amended to allow for the transfer of responsibility between phases of piloted and autonomous flight (and vice versa). This would enable transitions between remotely piloted and autonomous operations, where legal duties and responsibilities are clearly transferred between remote pilots and those responsible for autonomous operations.

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69 The FAA ("Federal Aviation Administration") is the U.S. government agency responsible for regulating and overseeing all aspects of civil aviation, including air safety, air traffic control, and aircraft certification.

70 FAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 233, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

71 Kate Staples response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 303, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

72 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

4.117 As already discussed, “transition demands” are allowed in Great Britain in the case of self-driving motor vehicles. The Automated Vehicles Act 2024 sets out in detail the requirements for a transition to the driver and their liability.[73] In our view allowing transition between remotely piloted and autonomous phases of flight would be possible if the appropriate conditions for a transfer were set out clearly.

4.118 However, arriving at the appropriate conditions for a transfer is not straightforward and would require substantive policy development. There is more variation in aviation in terms of use cases than there is for automated motor vehicles. Small drones operating in low-risk environments would be likely to separate consideration from large VTOLs carrying passengers in urban environments. The appropriate conditions for a transition in each of those use cases may be very different. Human factors would also need to be taken into account. The level of safety during a transition would need to be maintained, with appropriate consideration of the time it takes for the human pilot to gain situational awareness. Any benefit to having a pilot take over, or hand off to an automated system, would need to be balanced against the potential safety risks.

4.119 As some consultees also highlighted, from a legal perspective, it would be imperative to ensure clarity about what phase of flight an aircraft is in and the exact responsibilities of the human pilot in each phase. Once again, this might differ depending on the use case. However, any transfer of responsibility from a remote pilot to an autonomous system would also have implications for liability. It is for this reason that we are also of the view that the transition conditions would need to be described in detail. If the autonomous system were to hand back control to a human pilot the alerting process for the remote pilot may also need to be set out in regulations, as it is for automated vehicles.[74]

4.120 We are conscious that there has been very little discussion within the aviation industry or by aviation regulators on uncrewed aircraft switching between remotely piloted and autonomous phases of flight. The issue requires careful consideration of potential use cases as well as human factors which are outside our expertise. This being the case we are not presently in a position to recommend a general change to the law to allow for this change of state. There is currently insufficient information to determine what requirements would be needed to ensure safety and an effective transfer of responsibilities.

4.121 However, it is possible that in the future a policy decision may be made by government to allow aircraft operations to switch between remotely piloted and autonomous phases of flight. We would expect that specific operations involving such switching would be subject to approval by the CAA. In our view, if such a policy decision is made, and such operations are approved, UAS regulations should be amended accordingly so as to ensure legal certainty for all parties involved. Any such amendment should also be accompanied by supplemental guidance and frameworks, explaining the exact conditions for such a transfer, and setting out clearly who is legally responsible for the operation of the aircraft before, during and after a transition.

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73 Automated Vehicles Act 2024, s 7.

74 Automated Vehicles Act 2024, s 7.

Recommendation 6.

4.122 We recommend that if switching between autonomous and remotely piloted phases of flight is permitted, if, UAS regulations should be amended accordingly so as to ensure legal certainty for all parties involved, any such amendment should be accompanied by supplemental frameworks setting out:

(1) the conditions for such a transfer; and

(2) who is legally responsible for the operation of the aircraft before, during and after a transition.

Long term: a flight supervisor?

4.123 Although autonomous operations are already provided for in the UAS regulations, most of the discussion to date has envisaged having some level of continuing human involvement in advanced air mobility use cases. For example, the FAA envisages that even at a mature stage of VTOL operations, a remote PIC will be necessary for urban air mobility. At the mature stage, the FAA's concept of operations suggests that the "aircraft automation level" will be what they describe as "Human-over-the-Loop" meaning that a human passively monitors a system and is informed by automation whether action is required and if so, what.[75]

4.124 A "concept of operations" published by Boeing and Wisk focuses on automated urban air mobility, by which they mean a subset of advanced air mobility concentrating on lower-altitude operations within urban environments. The concept envisages a "fleet operations centre" (not necessarily in the same place that passengers will board and disembark) which will accommodate various staff involved in operations, including fleet managers and remote hospitality personnel.[76] The concept of operations envisages fleet managers would be responsible for scheduling and planning of operations whilst remote hospitality personnel would communicate with passengers before, during and after the flight.

4.125 Notably, the Boeing and Wisk concept of operations also envisages a new role, that of the "multi-vehicle supervisor". This supervisor would be responsible for overseeing the operational status of multiple aircraft and also communicating with other relevant parties such as air traffic control.[77]

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75 FAA, *Urban Air Mobility Concept of Operations* (April 2023) p 7, https://www.faa.gov/sites/faa.gov/files/Urban%20Air%20Mobility%20%28UAM%29%20Concept%20of%20Operations%202.0_0.pdf.

76 Boeing and Wisk, *Concept of operations for uncrewed urban air mobility – v 2* (2023) p 24, https://wisk.aero/wp-content/uploads/2023/12/Concept-of-Operations-for-Uncrewed-Urban-Air-Mobility-v2.0.pdf.

77 Boeing and Wisk, *Concept of operations for uncrewed urban air mobility – v 2* (2023) pp 28 and 29, https://wisk.aero/wp-content/uploads/2023/12/Concept-of-Operations-for-Uncrewed-Urban-Air-Mobility-v2.0.pdf.

4.126 Consultees responding to our first consultation also saw that, in the future the remote pilot may evolve into more of a "supervisor" or system manager role, potentially managing many aircraft at the same time. For example, Sceye suggested the following:

> As technology advances towards greater automation and more complex systems, having a human in the loop may become unnecessary or even adversely impact safety. We therefore submit that it would be appropriate to distinguish between the traditional concept of a 'remotely piloted aircraft' associated with the role of 'remote pilot' from the concepts of 'managed automated aircraft' associated with the 'system management organization' of the operator, responsible for safely managing the system.[78]

4.127 Sceye also thought there would be a shift from the remote pilot to managed automation, potentially with system-specific roles being required.[79]

4.128 Several other consultees also agreed. The Association for Uncrewed Vehicle Systems International noted that "different terms and legal/oversight constructs may be needed for operations in which "remote pilot" is not appropriate".[80]

Our view: the "supervisor" role

4.129 Our view is that the "flight supervisor" role as envisaged by stakeholders such as the FAA and Boeing/Wisk would currently fall within the existing definition of remote pilot. This is because, while the aircraft would be flown automatically, the person overseeing it would have the ability to override the system where necessary. This ability to intervene (even if only by exception) means that that the person overseeing the flight would be classified as a remote pilot.

4.130 An alternative to treating the person overseeing the flight as a "remote pilot" would be to create a new legal role for "flight supervisors". This, however, is not the approach we have adopted for three reasons. Firstly, we consider that, at present, it would be difficult to distinguish between a "flight supervisor" and a "remote pilot". The difference would probably lie in the degree of control of the aircraft, but selecting a point on the spectrum of control would inevitably be arbitrary. There is a range of degrees of control, and it may be impossible to draw a clear bright line between a pilot and a supervisor. The certainty required by the law is best found in the division between any form of human oversight and no human oversight, reflecting whether responsibility for safety should fall with a human pilot, or the developer of code piloting the drone. Secondly, continuing to describe the oversight role as a "remote pilot" also has the benefit of consistency with the existing UAS regulatory regime, and the framework of

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78 Sceye response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 470, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

79 Sceye response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 470, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

80 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

the Chicago Convention. Lastly, it does not seem to us necessary to create an entirely new legal role when the current role of remote pilot is sufficient.

4.131 One disadvantage which we highlighted in our first consultation paper, is that describing someone who is not constantly operating the flight controls as a pilot may risk misleading members of the public. Our view, however, is that this potential drawback does not outweigh the advantages highlighted above. Legal certainty requires a clear line of responsibility to ensure safety. It may also be possible to provide information to ensure the public are not misled.

4.132 At this point in UAS development we also consider it important that persons overseeing automated systems flying aircraft should be subject to the same stringent oversight as pilots. Being the commander of an aircraft is a difficult task. Even where the responsibility of the commander is only to intervene in limited circumstances, knowing when to intervene, and how, will be critical. Under the current regulatory framework for pilots, the CAA can exercise control over who may pilot each given system which is presented for approval by the CAA. Individual consideration can be given to use cases in the specific category. For aircraft in the certified category, a pilot would be required to undertake comprehensive training on an ongoing basis.

4.133 Finally, we are of the view that it would be impossible at this nascent stage of development to define the legal characteristics of this new actor for all use cases. More evidence and practical experience with remotely piloted and autonomous operations is needed before this role can be appropriately distinguished from that of the remote pilot. The iterative development of legal standards, as technology progresses, ensures equivalent safety with piloted aircraft whilst facilitating innovation.

4.134 For the above reasons we do not consider that there should be a new legal actor at this point in time.[81]

4.135 We recognise though that there are some conceptions of the "flight supervisor" role that do not relate to the piloting or control the aircraft at all, particularly in the context of autonomous operations. These supervisors could be responsible for communicating with passengers and for undertaking pre-flight checks such as providing safety briefings. We return to this conception of the "flight supervisor" in chapter 10 of this report.[82]

AN INCREASED ROLE FOR THE OPERATOR

4.136 One consequence of the approach we have outlined above is that, when the operation becomes an autonomous one, responsibility will shift towards the operator. With this in mind, it is particularly important to ensure that the role of the operator is clear in law. We discuss this further in chapter 7 and we discuss the increased responsibilities that may be placed on the operator of an autonomous operation in chapter 10. We conclude this chapter by briefly discussing the definition of UAS operator and recommending that this role be clarified, both in the ANO 2016 and in respect of the operational requirements applicable to certified category operations. This clarification

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81 See also chapter 10, paras 10.86 to 10.95.

82 See chapter 10, paras 10.86 to 10.95.

should ensure that a shift towards greater autonomy does not obscure the legal responsibilities of the various actors involved. It is important that it should always be clear to pilots, operators and other relevant parties who is responsible for an operation – part of this is making sure that there are no legal gaps or uncertainties in terms of whether an actor is considered to be an operator.

4.137 The main reason that this arises as an issue is because there are separate definitions of "operator" and "UAS operator" in the ANO 2016. The definition of "operator", in article 4, is focused on the person managing an aircraft;[83] whereas the definition of "UAS operator", in schedule 1,[84] is focused on the person operating a UAS.

4.138 To eliminate any uncertainty, we recommend that, where the ANO 2016 applies to UAS operations, the definition of "operator" should include "UAS operator". This mainly concerns certified category operations, but there are a limited number of requirements in the ANO 2016 that apply to open and specific category operations.[85] While the drafting of the amendment is a matter for Parliamentary Counsel, we note that any amendment to implement our recommendation would have to take into account the fact that UAS in the open and specific category are currently exempt from the application of article 4.[86]

4.139 A similar issue arises in respect of the operational requirements applicable to UAS in the certified category.[87] As outlined above, the UAS Implementing Regulation specifies that "applicable operational requirements" in UK SERA, the Air Operations Regulation and the Common Airspace Usage Requirements Regulation apply.[88] As these regulations were drafted with crewed aircraft in mind, they refer to the "operator." To avoid any uncertainty, we recommend that it is clarified that, where the applicable requirements of these regulations apply to UAS operations, "operator" should include "UAS operator".

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83 Article 4 provides that: "subject to paragraph (2), references in this Order to the operator of an aircraft are, for the purposes of the application of any provision of this Order in relation to any particular aircraft, references to the person who at the relevant time has the management of that aircraft." Paragraph 2 is a provision addressing the narrow circumstances of charter/hire/loan agreements

84 UAS operator is defined in schedule 1 as "any person operating or intending to operate one or more UAS." Schedule 1 is given effect by article 2.

85 Operations in the open and specific category are exempt from most of the provisions of the ANO: article 23(1)(c) and (2). Article 23(3) lists the provisions that do apply.

86 Article 23 exempts UAS in the open and specific category from most of the ANO, including article 4. Accordingly, any amendment to clarify that "operator" includes "UAS operator" would have to also amend article 23 to ensure that – in respect of the small number of requirements in the ANO that apply to UAS in the open and specific category – article 4 applies. This could simply be a case of, for example, adding article 4 to the list of articles in the second part of article 23.

87 This issue does not arise for UAS in the open and specific categories because the operational requirements for these operations are almost exclusively contained in the UAS regulations. As explained in chapter 5, these regulations use "operator" and "UAS operator" interchangeably, but it is self-evident (given the scope of the regulation) that "operator" includes "UAS operator".

88 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7(3).

Recommendation 7.

4.140 We recommend that, where the Air Navigation Order 2016 applies to UAS operations, the definition of "operator" should also include "UAS operator".

Recommendation 8.

4.141 We recommend that, where the applicable requirements of UK SERA 923/2012, the UK Air Operations Regulation 965/2012 and the UK Common Airspace Usage Requirements 1332/2011 apply to UAS operations, the definition of "operator" in these regulations should include "UAS operator".

CONCLUSION

4.142 In our view the definitions in the current regulatory framework provide a clear line between the remote pilot and autonomous operations. Given that highly automated features may be difficult to distinguish from autonomous features, the ability of a human to intervene remains a vital distinction. Retaining the current definition of a remote pilot ensures that responsibility for the safe conduct of a flight continues to rest with a clearly identifiable individual whenever intervention is possible. For autonomous operations, where no such intervention can be made, responsibility necessarily shifts towards other legal actors, most importantly the operator.

4.143 At the same time, increased automation raises important questions about future use cases, including MSO and the potential evolution of the remote pilot into a supervisory role. There may also be circumstances in which transitions between remotely piloted and autonomous phases are desirable. These possibilities require careful policy development, clear operational safeguards and consideration of safety, liability and human factors. For now, we conclude that maintaining legal clarity through the existing definitions, accompanied by targeted amendments to clarify the roles of the remote pilot and operator where necessary, offers the most reliable basis for the development of uncrewed aviation.

Part 2: Recommendations for highly automated remotely piloted UAS operations and the short to medium term

Chapter 5: Introduction to remotely piloted operations

5.1 In this part of the report we set out short to medium-term recommendations relating to remotely piloted uncrewed aircraft system ("UAS") operations that are likely to be taking place in the "accommodation phase" of the Civil Aviation Authority's ("CAA") Airspace Modernisation Strategy. UAS operations in the accommodation phase are likely to be conditionally accommodated alongside conventional and other airspace users in temporary restricted areas.

5.2 In order to assist the reader in situating some of the gaps that we discuss in this part of the report, which our recommendations seek to fill, we set out below an overview of the key elements of remotely piloted UAS operations. This is not a comprehensive account of the law, which is discussed in more detail in later chapters, but a summary of the key aspects.

KEY ASPECTS OF A REMOTELY PILOTED UAS OPERATION

Category of the operation

5.3 The first key element of a remotely piloted UAS operation is the "category" of the operation. The approach taken in the existing domestic legal framework for UAS[1] is that the applicable rules and procedures should be proportionate to the nature and risk of the operation. The category of operation – as determined by the nature and risk of the operation – affects the specific rules and requirements that apply.

5.4 There are three categories of UAS operation: open, specific and certified. We describe each in turn.

(1) Open category operations:[2] operations in this category are considered to pose the lowest risk and have the least stringent requirements. There is a cumulative list of criteria for an operation to fall within the open category; if any are not met, then the operation cannot fall within the open category. The criteria include the UAS:

(a) being kept within the visual line of sight of the pilot;

(b) not carrying dangerous goods; and

(c) having a maximum take-off mass of less than 25 kilograms.

Operations in the open category are split into three sub-categories, recently re-named, from A1-A3, to: "over people (A1)", "near people (A2)" and "far from

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1 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems; and UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft.

2 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 4.

people (A3)".[3] UK Regulation (EU) 2019/947 (the "UAS Implementing Regulation") states that the subcategories divide operations on the basis of operational limitations, requirements for the remote pilot, and technical requirements for the UAS.[4] The CAA states that the revised names for the sub-categories: "Aim to reflect the key operational differences between each sub-category – i.e. the distance to uninvolved persons".[5]

(2) Specific category operations:[6] where any of the requirements for the open category are not met, and the operation does not fall within the certified category (see below), an operator must obtain specific authorisation for the operation from the CAA. The specific category is a residual category for operations which do not fall within the open or certified categories.

(3) Certified category operations:[7] this category covers the highest risk operations. If the operation involves flying over assemblies of people, the carriage of people, or the carriage of dangerous goods, then it will fall within the certified category. For operations in this category the UAS and the operator must be certified.[8] If the risk of an operation intended for the *specific* category cannot be managed without certification of the UAS and the operator – and potentially the licensing of the remote pilot – then it would also fall within the certified category.[9] The rules and requirements for operations in the certified category are intended to mirror those for crewed aviation.

One key point to note is that it is not yet possible for certified category operations to take place. This is owing to various gaps in the legislative framework which we discuss further below and throughout this part of the report.

How do these categories apply to our UAS use cases?

5.5 Drones, our first use case, can be used in any of the three operational categories.[10] In this part of the report, we often discuss operation of drones beyond the visual line of sight ("BVLOS"). This type of operation cannot take place in the open category so where we refer to BVLOS operations, this means an operation in either the specific or certified category. Our recommendations make clear to which of those categories we are referring.

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3 The Unmanned Aircraft (Amendment) Regulations 2025 SI No 1106, sch 3.

4 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex UAS.OPEN.010(1).

5 Civil Aviation Authority ("CAA"), *Consultation: Review of UK Unmanned Aircraft Systems (UAS) Regulations* (November 2023) (CAP 2610) para 2.6.

6 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 5.

7 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 6.

8 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 3(c).

9 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 6(2).

10 See chapter 1, para 1.2(3).

5.6 Any passenger-carrying remotely piloted UAS operation, which includes operations involving vertical take-off and landing vehicles ("VTOLs") (our second use case), would fall within the certified category. Wherever we discuss issues specific to passenger-carrying remotely piloted UAS in this report, we are therefore referring to rules and requirements in the certified category.

Key actors

5.7 Most of the legal responsibilities relating to remotely piloted UAS operations are divided between two key actors: the remote pilot and the operator.

Remote pilots and operators

5.8 The pilot is a key actor in aviation (both crewed and uncrewed) and holds many responsibilities. We discuss the definition and overarching responsibilities of the remote pilot in chapter 4. The more precise duties and responsibilities of the remote pilot depend on the category and type of operation.[11] We elaborate on this further below.

5.9 The other key actor in a remotely piloted UAS operation is the operator. We discuss the definition of the operator in chapter 4. An operator is required for operations in all three categories of UAS operation. The duties of the operator depend upon the category of the operation, as explained further below. The operator may sometimes be the same person as the remote pilot of an uncrewed aircraft. This is more likely to be the case for operations of a personal, as opposed to a commercial, nature. Operators of certified category operations must be certified themselves (in addition to the certification of the UAS).[12]

Pre-deployment issues

5.10 In this section we look at the following pre-deployment matters (that is, matters which take place ahead of operations):

(1) ensuring that the UAS used is designed and produced in accordance with relevant requirements and is certified (where relevant);

(2) ensuring that the appropriate operational authorisation has been obtained from the CAA; and

(3) operator responsibilities.

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11 For example, if the operation is carrying passengers, we recommend that the remote pilot has similar responsibilities to the commander of a commercial air transport operation, such as being responsible for the safety of passengers, see chapter 4.

12 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 3(c).

Design and production, airworthiness and certification

Open category

5.11 The UK Regulation (EU) 2019/945 ("UAS Delegated Regulation") sets out design requirements applicable to UAS in the open category.[13] It establishes and describes seven "classes" of UAS, recently re-named UK0 to UK6.[14] Once a UAS has passed a conformity assessment, the UAS Delegated Regulation requires manufacturers to draw up a certificate of conformity and affix a class marking indicating the class into which the UAS falls. Domestic class marking requirements for UAS have applied since 1 January 2026.[15] Before 1 January 2028, the UAS Implementing Regulation will apply to EU UAS (UAS which comply with product requirements in the Delegated Regulation as it has effect in the EU) as if they were UAS complying with the UK Delegated Regulation. This will allow EU UAS to be operated in the "open" category.[16] The continued use of UAS placed on the market before 1 January 2026, which did not comply with class-marking requirements (legacy UAS), is permitted.[17]

Specific category

5.12 UAS intended for use in specific category operations are generally not subject to class marking or certification[18] but are required to feature technical capabilities set out in the operational authorisation issued by the CAA[19] (in relation to which, see further below).

Certified category

5.13 Under article 40 of the UAS Delegated Regulation, the design, production and maintenance of a UAS must be certified if:

> (a) It has a characteristic dimension of 3 metres or more and is designed to be operated over assemblies of people; (b) it is designed for transporting people; (c) it is designed for the purpose of transporting dangerous goods and requires a high level of robustness to mitigate the risks for third parties in case of an accident; or (d) it is intended to be used in the "specific" category of operations defined in Article 5 of Implementing Regulation (EU) 2019/947 and in the operational authorisation to be issued by the CAA, following a risk assessment provided for in Article 11 of

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13 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, arts 2(1), 4 and annex, parts 1 to 5, 16 and 17.

14 The Unmanned Aircraft (Amendment) Regulations 2025 SI No 1106, sch 3, part 1.

15 As a result of amendments made to the UAS Delegated Regulation by The Unmanned Aircraft (Amendment) Regulations 2025 SI No 1106.

16 Explanatory Memorandum to The Unmanned Aircraft (Amendment) Regulations 2025 SI No 1106, para 5.25.

17 Explanatory Memorandum to The Unmanned Aircraft (Amendment) Regulations 2025 SI No 1106, para 5.28.

18 Specific category UAS can be subject to certification if the CAA considers that the risk of the operation cannot be adequately mitigated without certification (UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 40(1)(d)).

19 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 40(3).

Implementing Regulation (EU) 2019/947, considers that the risk of the operation cannot be adequately mitigated without the certification of the UAS.

5.14 UAS in the certified category are subject to "applicable requirements" of various airworthiness regulations for crewed aircraft.[20] However, the "applicable requirements" for the certified category have not yet been specified. In practice, certification of the aircraft is not possible at present. We discuss airworthiness and certification of UAS further in chapter 6.

5.15 In chapter 6 we also discuss the issue of certification of the command unit for the UAS: "the equipment or system of equipment to control unmanned aircraft remotely…which supports the control or monitoring of the unmanned aircraft during any phase of flight".[21]

Operational authorisation

Open category

5.16 UAS operations within the open category do not require any prior authorisation from the CAA.[22]

Specific category

5.17 For operations in the specific category, the operator has to apply for specific operational authorisation from the CAA. This involves submission of a risk assessment that includes an explanation of proposed mitigating measures to keep the UAS operation safe in all phases of flight.[23]

5.18 Since April 2025 the default way to apply for operational authorisation in the specific category has been to use the UK Specific Operations Risk Assessment ("UK SORA"), which is based on the internationally recognised methodology developed by the Joint Authorities for Rulemaking on Unmanned Systems.[24] We discuss UK SORA further in chapter 6. There are a limited number of specific category operations which require applications outside of, or in addition to, UK SORA.[25] Also, for visual line of sight operations with a take-off mass of under 25kg, and within 150 metres of any residential, commercial, industrial or recreational areas, it is possible to use a pre-defined risk assessment outside of UK SORA which:

> significantly reduces the administrative burden on both the operator and the CAA for simple, repeatable type operations. A UAS Operator provides a 'shortened'

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20 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 40(2).

21 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 2(26).

22 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 3(a).

23 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, arts 5(1), 11 and 12.

24 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 art 11. See CAA, *UK SORA-based Operational* Authorisations, https://www.caa.co.uk/drones/specific-category/uk-sora-based-operational-authorisations/uk-sora-based-operational-authorisations/.

25 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 art 11, para 1.2.

application to the CAA…Accompanying any PDRA based authorisation will be a set of prescriptive conditions an operator must comply with.[26]

5.19 Once received, the CAA must evaluate the risk assessment and mitigating measures proposed by the operator, and if it decides to grant an operational authorisation, this should detail the specific conditions and limitations which apply to the UAS operation.[27] The CAA is required to specify whether the authorisation relates to a single operation or a number of operations specified in time or location or both.[28]

Certified category

5.20 For UAS operations in the certified category, both the UAS and the operator need to be certified by the CAA.[29] As explained above, the certification specifications for UAS in the certified category have not yet been published. It is also not clear what requirements will be placed upon the operator in order to obtain certification.

Operator responsibilities

5.21 For remotely piloted UAS operations, the responsibilities of the operator are largely concerned with pre-deployment matters ahead of the operation and flight.

Open category

5.22 The general responsibilities of the operator of open category operations include: developing operational procedures adapted to the type of operation and risk involved;[30] designating a remote pilot;[31] ensuring that the remote pilot is familiar with the manufacturer's instructions provided by the manufacturer of the UAS, competent to perform their tasks, and fully familiar with the operator's procedures.[32]

5.23 The operator of an open category operation also has some additional responsibilities which are specific to the sub-category of the operation. In the interests of brevity, we do not set out the responsibilities relating to the various sub-categories here.

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26 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, GM1 art 11, and see also CAA, *Unmanned Aircraft Systems Specific Category Operations – Pre-defined Risk Assessment Requirements, Guidance & Policy* (April 2024) (CAP 722H).

27 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 12.

28 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 5(4)(a).

29 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 3(c).

30 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.050(1).

31 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.050(3).

32 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.050(4).

Specific category

5.24 Many of the responsibilities of the operator for specific category operations overlap with those in the open category but are more numerous and on the whole are more detailed, especially in terms of the procedures to be established.[33]

5.25 The responsibilities of the operator for *all* operations in the specific category include:[34] establishing procedures and limitations adapted to the type of intended operation and the risk involved eg procedures to ensure the safety of operations and measures to protect against unlawful interference; designating a remote pilot for each flight; ensuring that the remote pilot has the competency to perform tasks in line with training identified in the operational authorisation; ensuring that personnel – other than the remote pilot – involved in the operation have completed relevant training and have been informed of the operations manual;[35] ensuring that operations are carried out in accordance with the operational authorisation; keeping an up-to-date record of unusual technical or operational occurrences; and maintaining the UAS in a suitable condition for safe operation.

5.26 In addition to these responsibilities which apply across all specific category operations, additional responsibilities can be imposed upon the operator by virtue of the operational authorisation. Article 12 of the UAS Implementing Regulation makes clear that after evaluating the risk assessment and mitigating measures proposed by the operator, any operational authorisation granted by the CAA should detail: the specific conditions and limitations that apply to the UAS operation; the required competency of the operator and remote pilots;[36] the operational limitations and conditions of the operation, and the mitigation measures that the operator has to apply.[37] The additional responsibilities imposed will therefore be determined on a case-by-case basis.

5.27 Acceptable means of compliance issued by the CAA also requires the operator in the specific category to consider the applicable operational requirements from UK Regulation (EU) 923/2012 ("UK SERA") and incorporate relevant requirements within their operations manual as necessary (the effect being that the operator will then be mandated to follow these requirements).[38]

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33 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.050.

34 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.050.

35 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.030(3)(e) says that the application for an operational authorisation in the specific category shall include an operations manual when required by the risk and complexity of the operation. According to annex V of the UK Regulation (EU) 2018/1139, an operations manual contains: all necessary instructions, information and procedures for all aircraft operated and for operational personnel to perform their duties.

36 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 12(4)(b).

37 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 12 (4)(c)(iii) and (iv).

38 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 art 7(2).

Certified category

5.28 The UAS Implementing Regulation provides that certified operations are subject to applicable requirements of UK Regulation (EU) No 965/2012 (the "Air Operations Regulation"); and UK Regulation (EU) No 1332/2011 (the "Common Airspace Usage Requirements Regulation").[39] The "applicable requirements" of the above regulations have not yet been specified. It is therefore not clear what the pre-deployment responsibilities of the operator of certified category operations will be. In chapter 7 we make recommendations about certain pre-deployment responsibilities of the operator in the context of passenger-carrying UAS operations.

Operational requirements

5.29 Operational requirements, by which we mean requirements and responsibilities relating to all stages of an operation (including preparation for flight, during flight and post flight), vary according to the category of the operation.

Open category

5.30 Some of the general operational requirements for the open category, which are not directed at a particular individual, include: maintaining the UAS within 120 metres from the closest point of the surface of the earth, the requirement for a particular level of competency of the remote pilot and requirements regarding particular characteristics of the UAS.

5.31 Below we discuss the "applicable requirements" of the UK SERA[40] in relation to the specific and certified categories of operations. We discuss rules of the air more generally in chapter 8 of the report. Unlike the specific and certified categories, none of the requirements in UK SERA are explicitly applied to operations in the open category.

Responsibilities of the remote pilot

5.32 The remote pilot has responsibilities both before and during flight. Before the flight, the remote pilot has responsibilities relating to the condition of the UAS[41] and the operating environment, including checking for the presence of obstacles.[42] The remote pilot has further obligations to check the mass of the UAS[43] and to obtain updated information on any relevant restricted areas operation.[44]

5.33 During the operation, the remote pilot has obligations such as: not to perform duties when unfit, for example because of injury or illness; to keep the UAS within the visual

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39 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7(3).

40 UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air.

41 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.060(1)(d).

42 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.060(1)(c).

43 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.060(1)(e).

44 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.060(1)(b). Relevant restricted areas are defined in article 2(37).

line of sight; to comply with the operator's procedures where available; to maintain control of the aircraft and to operate the UAS in accordance with the manufacturer's instructions.[45]

5.34 Acceptable means of compliance to the UAS Implementing Regulation makes it clear that in the open category the remote pilot should only operate one aircraft at a time.[46]

Specific category

5.35 There is a general requirement that operations in the specific category must comply with operational limitations set out in the operational authorisation from the CAA (as referred to above).[47]

5.36 As discussed above, specific category operations are also subject to "applicable requirements" in the UK SERA.[48] Acceptable means of compliance issued by the CAA requires the operator in the specific category to consider the applicable operational requirements from UK SERA and incorporate relevant requirements within their operations manual. The CAA can also apply additional rules of the air as part of the operational authorisation. In terms of the "applicable requirements" set out in the acceptable means of compliance, what are effectively mandatory requirements (in relation to which, see the discussion in chapter 8) include the requirement not to operate an aircraft in a negligent or reckless manner (SERA.3101) and the requirement not to operate an aircraft in such proximity to other aircraft as to create a collision hazard (SERA.3205). Other "applicable requirements" include rules on collision avoidance (SERA.3201) and rights of way (SERA.3210).

Responsibilities of the remote pilot

5.37 The responsibilities of the remote pilot of specific category UAS operations are broadly similar to those for open category operations set out above. Additional responsibilities include: ensuring that information about the operation has been made available to the relevant air traffic service unit and other airspace users as required by the operational authorisation or requirements of a geographical zone;[49] avoiding any risk of collision with any crewed aircraft; and discontinuing a flight when continuing it may pose a risk to other aircraft, people, animals, environment or property.[50] In chapter 6 of this report we discuss some potential additions to these requirements, in the context of multiple simultaneous operations.

5.38 Competency requirements for remote pilots of specific category operations are generally set out in the operational authorisation for the specific category operation,

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45 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.060(2).

46 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 UAS.OPEN.060(2)(d).

47 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7(2).

48 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7(2).

49 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.060(2)(d).

50 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.060(3)(b).

but a list of minimum competencies are set out in the UAS Implementing Regulation and include: the ability to apply operational procedures (normal, contingency, and emergency, flight, pre-flight and post-flight inspections); problem solving and decision-making; workload management; and coordination or handover.[51]

Certified category

5.39 As stated above, the UAS Implementing Regulation provides that certified operations are subject to applicable requirements of the Air Operations Regulation and the Common Airspace Usage Requirements Regulation.[52] The "applicable requirements" of the above regulations have not yet been specified. Nor are there currently any provisions covering competency of remote pilots for operations in the certified category.

5.40 In chapter 7 of this report we discuss some of the operational requirements for passenger-carrying *crewed* aircraft and make recommendations about certain requirements that we think should be applied to passenger-carrying remotely piloted UAS operations in the certified category. In the meantime, there remains a lack of certainty as to operational requirements for this category.

5.41 The UAS Implementing Regulation also provides that UAS operations in the certified category shall be subject to the applicable operational requirements of UK SERA.[53] As of yet – and in contrast to the specific category – there are no applicable requirements set out in acceptable means of compliance. It is therefore not possible to know which requirements are applicable. There is added complexity for certified category operations because these operations are subject to the provision of the Air Navigation Order 2016 which states that – apart from three specific circumstances[54] – it is an offence to fail to comply with the rules of the air.[55]

5.42 The lack of applicable requirements for certified category operations, both in relation to pre-deployment matters, and operational matters, are a barrier to operations in the certified category, and as far as we are aware there have been no authorisations approved in this category as of yet. In chapter 7 of our report we discuss this further, and make recommendations to fill some of the gaps in the legal framework, for example relating to the responsibilities of the operator and the remote pilot for certified category operations where passengers are carried.

Uncrewed aircraft systems traffic management

5.43 Depending on the nature and type of the operation, the category of the operation, and the type of airspace that the UAS is flying in, some form of air navigation services or air traffic management may be required for the UAS operation (which we refer to as uncrewed aircraft systems traffic management or "UTM"). The purpose of UTM is to

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51 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 8(2).

52 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7(3).

53 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7(3).

54 SI 2016 No 765, art 249(3).

55 It is an offence to contravene, permit the contravention or fail to comply with rules of the air prescribed by the Secretary of State (SI 2016 No 765, art 249(2)). It also an offence to contravene certain requirements of UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air set out in sch 13.

manage UAS operations safely, economically and efficiently through the provision of facilities and a seamless set of services in collaboration with all parties and involving airborne and ground-based functions.[56] We discuss UTM in further detail in chapter 9 of this report.

CONCLUSION

5.44 The pre-deployment and operational requirements and responsibilities for remotely piloted UAS operations vary significantly depending on the category of the operation. Above we set out a summary of the key requirements for each category and highlight some problems with the existing law. In the chapters that follow we discuss those problems, and others, in further detail and make recommendations for law reform.

[56] International Civil Aviation Organization, *Unmanned Aircraft Systems Traffic Management (UTM) – A Common Framework with Core Principles for Global Harmonization* (4th ed 2023) p 3.

Chapter 6: Remotely piloted UAS operations

6.1 In this chapter we focus on potential obstacles to the accommodation of remotely piloted UAS in the short to medium term. Discussion of, and recommendations relating to, autonomous UAS operations are set out in part 3 of the report.

6.2 The issues discussed in this chapter are, on the whole, common to both passenger-carrying and non-passenger carrying forms of remotely piloted UAS and we therefore discuss them together here. Where our discussion in this chapter relates to an issue specific to non-passenger carrying remotely piloted UAS, we make that clear. In chapter 7 of the report, we then make recommendations for reform relating specifically to passenger-carrying remotely piloted UAS.

WHAT WE MEAN BY REMOTELY PILOTED UAS

6.3 We use this term to cover both passenger-carrying and non-passenger carrying UAS which are remotely piloted, as opposed to autonomous. Remotely piloted UAS operations can take place within all three operational categories described in chapter 5, but passenger-carrying remotely piloted operations have to take place within the certified category, and beyond visual line of sight ("BVLOS") operations must take place within either the specific or certified category. We make clear which operational category applies in the context of our discussions in this chapter.

6.4 In chapter 4 of the report, we recommend that the definition of a remote pilot as contained in existing legislation should be retained. That definition is:

> a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change its course at any time.

6.5 As acknowledged in chapter 4, this definition requires a relatively low level of direct involvement with the flight controls, and there is no suggestion that the remote pilot's monitoring of the operation must be continual, or active. The current definition of a remote pilot means that a wide range of operations falls within it, including ones which require very little involvement from the remote pilot. The discussion in this chapter applies to the whole spectrum of remotely piloted UAS operations.

POTENTIAL GAPS AND BARRIERS IDENTIFIED IN OUR CONSULTATION PAPERS

6.6 There already exists a relatively new domestic legal framework for UAS which covers remotely piloted UAS operations. In our first consultation paper we noted that there is much to commend the existing legal framework, and there are detailed rules covering remotely piloted UAS operations in the open and specific categories.

6.7 We consider that the rules relating to remotely piloted UAS operations in the open category are largely satisfactory.

6.8 In relation to the specific and certified categories, we identified in our first consultation paper the following potential gaps and barriers relating to remotely piloted UAS operations:

(1) the rules and requirements relating to BVLOS operations, and

(2) the rules and requirements relating to operations where one pilot is responsible for multiple UAS at the same time, which we refer to as multiple simultaneous operations.

6.9 We also identified a further issue specific to the certified category. This concerns airworthiness and certification.

6.10 In this chapter we look first at the pre-deployment issue of airworthiness and certification of UAS first, and consider whether there is a need to modify related regulations. We then consider issues arising at the deployment stage of a UAS, looking at BVLOS operations and multiple simultaneous operations.

PRE-DEPLOYMENT ISSUES: AIRWORTHINESS AND CERTIFICATION

6.11 In chapter 4 of our first consultation paper, we discussed airworthiness and certification in detail. Below is a summary of the key principles.

(1) Requirements for the airworthiness of civil aircraft are derived from Annex 8 of the Chicago Convention and are implemented in the UK through UK Regulation (EU) 2018/1139 (the "Basic Regulation")[1] (for part 21 aircraft), the Air Navigation Order[2] (for non-part 21 aircraft) as well as UK Regulation (EU) 748/2012 (the "Initial Airworthiness Regulation"), UK Regulation (EU) 2015/640 (the "Additional Airworthiness Specifications Regulation") and UK Regulation (EU) 1321/2014 (the "Continuing Airworthiness Regulation").

(2) Initial airworthiness regulations include procedures for the approval of the design of aircraft, airborne systems and equipment. If a design is approved by a contracting state to the Chicago Convention, then a "type certificate" will be issued. Type certification describes the approved design and certifies that it meets the appropriate initial airworthiness requirements of the issuing State.[3]

(3) The certification of a type design does not mean that all aircraft of that design are automatically approved. Individual aircraft must also be certified as airworthy.[4] A certificate of airworthiness will be issued to aircraft which conform to the relevant type certificate.

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1 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency.

2 SI 2016 No 765.

3 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 11.

4 UK Regulation (EU) 1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 14.

(4) UAS used for operations in the open category are not required to be certified. In chapter 5 we discuss the system of class-markings for UAS used in open category operations.

(5) UAS intended for operations in the specific category are not subject to class marking or certification but are required to feature technical capabilities set out in the operational authorisation issued by the Civil Aviation Authority ("CAA").[5]

(6) UAS operations in the certified category[6] and UAS intended for use in operations in the specific category where, following a risk assessment the CAA considers that the risk of the operation cannot be adequately mitigated without the certification of the UAS,[7] are subject to applicable certification requirements set out in the Initial Airworthiness Regulation, the Additional Airworthiness Specifications Regulation and the Continuing Airworthiness Regulation.[8] There is no guidance yet as to which requirements are "applicable".

Adapting airworthiness and certification regulation for UAS

6.12 In our first consultation paper we noted that there are no certification specifications[9] for UAS meaning that at present it is not possible to certify a UAS for initial airworthiness.

6.13 Further, although UK Regulation (EU) 2019/945 ("UAS Delegated Regulation") states that "applicable" certification requirements of three existing airworthiness regulations should apply to UAS, there is no clarity yet as to which requirements are "applicable", presenting a further barrier to certification.

6.14 Existing standards for certification – both the high-level requirements, and the detailed certification specifications – were designed with conventional forms of aircraft in mind. There are risks specific to UAS that need to be accounted for, such as an increased risk of ground damage because of operations taking place at lower altitude, and an increased risk of mid-air collision by adding UAS to the urban environment. We suggested that this may mean measures specific to UAS are required to ensure safety.

6.15 In our first consultation paper, we noted that the EU Aviation Safety Agency ("EASA") proposed to create a comprehensive regulatory framework for airworthiness and certification to address the issues presented by UAS. In 2023 EASA published an

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5 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 40(3).

6 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 40(1)(a) to (c).

7 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 40(1)(d).

8 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 40(2).

9 Certification specifications are technical standards used for certifying that designs for aircraft or parts of aircraft are airworthy. Certification specifications effective in the UK can be found here: Civil Aviation Authority ("CAA"), *Certification Specifications,* https://regulatorylibrary.caa.co.uk/cs/Content/Certification%20Specifications%20Home.htm.

opinion setting out amendments to the EU's current regulatory framework.[10] We drew attention to two of EASAs proposals relating to hybrid aircraft and command units.

6.16 The opinion contemplated manufacturers being able to modify crewed aircraft to create hybrid aircraft which could be operated with or without an onboard pilot. EASA suggested that the hybrid aircraft would then be listed on a single type certificate, allowing a single certificate of airworthiness to be issued for the individual aircraft, rather than multiple certificates.[11] Our understanding is that this would simplify the initial airworthiness certification of these aircraft.

6.17 EASA also suggested changes in relation to "command units".[12] Command units describe equipment used to control a UAS remotely and are central to the operation of UAS. Currently, for any UAS requiring certification, the command unit would be assessed as part of the overall system and not as a separate component. EASA proposed to introduce a dedicated type certificate for command units, enabling a command unit to be assessed together with or separately from its aircraft.

6.18 Since we published our first consultation paper, the European Commission has adopted a package of regulations implementing the recommendations within EASA's 2023 Opinion.[13]

What we asked

6.19 We sought views in our first consultation paper on how the framework for airworthiness and certification might need to be adapted or developed in light of highly automated and autonomous aircraft. More specifically, we asked whether provisions should be adopted which allow for the certification of hybrid aircraft and the separate certification of command units as proposed in EASA's 2023 Opinion.

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10 European Union Aviation Safety Agency ("EASA") Opinion No 3/2023, *Introduction of a regulatory framework for the operations of drones- Enabling innovative air mobility with manned VTOL-capable aircraft, the initial airworthiness of unmanned aircraft systems subject to certification, and the continuing airworthiness of those unmanned aircraft systems operated in the 'specific' category* (August 2023).

11 EASA Opinion No 3/2023, *Introduction of a regulatory framework for the operations of drones- Enabling innovative air mobility with manned VTOL-capable aircraft, the initial airworthiness of unmanned aircraft systems subject to certification, and the continuing airworthiness of those unmanned aircraft systems operated in the 'specific' category* (August 2023) p 13.

12 "Command units" are defined in UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 2(26) as "the equipment or system of equipment to control unmanned aircraft remotely … which supports the control or the monitoring of the unmanned aircraft during any phase of flight, with the exception of any infrastructure supporting the command and control (C2) link service". The new terminology of "control and monitoring unit" (CMU) would be defined as "the equipment to control and monitor unmanned aircraft remotely" as defined in article 3(32) of Regulation (EU) 2018/1139; EASA Opinion No 3/2023, *Introduction of a regulatory framework for the operations of drones- Enabling innovative air mobility with manned VTOL-capable aircraft, the initial airworthiness of unmanned aircraft systems subject to certification, and the continuing airworthiness of those unmanned aircraft systems operated in the 'specific' category* (August 2023) pp 21 and 22.

13 EASA, *European Commission adopts regulatory package, giving go-ahead for VTOL operations and air taxis,* 10 April 2024, https://www.easa.europa.eu/en/newsroom-and-events/news/european-commission-adopts-regulatory-package-giving-go-ahead-vtol.

6.20 We asked a separate question relating to the challenges raised by artificial intelligence in this context. That question is discussed in chapter 10 which covers autonomous UAS operations.

Consultation analysis

Certification of UAS in general

6.21 Respondents generally considered that highly automated UAS could be accommodated through the introduction of new certification specifications and acceptable means of compliance issued by the CAA, rather than through changes to the legal framework. Boeing noted that the certification of UAS:

> does not […] require a significant shift in the airworthiness regulations themselves. The safety intent of the existing airworthiness requirements is applicable and sufficient from a regulatory basis perspective.[14]

6.22 This view was echoed by subject matter experts at an airworthiness and certification workshop held as part of the consultation process.[15] The consensus was that the current regulatory framework was adequate from a legal point of view and that while there was a need for certification specifications and means of compliance to be developed, this was not a matter for law reform.

6.23 However, not all respondents shared this view. Skybound Rescuer felt that "a totally new set of airworthiness & certification regulations need to be created rather than seeing it as current ones being adapted or developed to suit".[16]

Hybrid aircraft

6.24 The majority of consultees who discussed hybrid aircraft were in favour of EASA's proposal to enable their certification using a single type certificate.

6.25 Several consultees viewed this approach as a means to simplify the certification process. Vertical Aerospace said:

> We believe provisions will need to be adopted that allow for both the certification of optionally piloted and uncrewed or unoccupied versions of conventional aircraft. Vertical supports modifying the framework so that a single type certificate covers both the optionally piloted and uncrewed configurations of the same aircraft. This will simplify the certification process and ensure consistency across different operational modes.[17]

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14 Boeing response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 68, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

15 A discussion with CAA subject matter experts in airworthiness and certification discussion took place on 20 June 2025.

16 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

17 Vertical Aerospace response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 574, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

Altitude Angel and Apian agreed, while Consortiq, Thurling Aero Consulting, and the Association of Uncrewed Aircraft Systems International all felt that specific provisions should be adopted.[18]

6.26 Other consultees supported the proposal due to the business advantages it may introduce. NATS pointed out that: "alignment would seem helpful to UK operators and manufacturers also active in the EU".[19]

The US Federal Aviation Administration ("FAA") agreed.[20]

6.27 In contrast, Ramin Norouzi of Dronzit Aerospace was against the proposal, writing:

> I believe UAS have significantly different use cases, technology demands, design implications, and safety requirements compared to manned aircraft, making it impractical and inefficient for manufacturers to modify manned aircraft and create hybrid versions. Thus, contrary to the EASA's August 2023 Opinion, I do not foresee such modifications becoming widespread enough to warrant the development of type certification specifications for hybrid versions. In fact, I believe that simplifying the initial airworthiness certification process of UAS by introducing a single certificate for modified manned aircraft would pose critical safety issues.[21]

6.28 A small number of consultees felt that the existing framework could accommodate certification of hybrid aircraft, making the proposal unnecessary. Boeing wrote that:

> the existing airworthiness regulations can already be applied to provide an airworthiness certification path for optionally piloted and uncrewed versions of existing and conventional aircraft, particularly for modifications to aircraft that already have a type design.[22]

Command units

6.29 The majority of consultees supported the separate certification of command units. Consortiq Limited said that it: "would be valuable to enable an ecosystem of parts to allow for specific aircraft builds for new applications".[23]

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18 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

19 NATS response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 346, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

20 FAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 233, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

21 Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

22 Boeing response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 68, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

23 Consortiq response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 194, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

6.30 Altitude Angel and SLiNK-TECH Ltd agreed, with the latter mentioning the commercial benefits of separate certification.[24]

6.31 The FAA raised concerns about separate certification and said:

> care should be taken that a command unit can sufficiently handle the aircraft it is piloting. In addition, many physical changes (such as actuators) will be needed, and will strongly depend on the aircraft. In this regard, as a command unit would need to be certified for a particular aircraft.[25]

Discussion

International Civil Aviation Organization amendment 108 to Annex 8 on airworthiness of aircraft

6.32 Certification requirements for the airworthiness of civil aircraft are set out at a high level in Annex 8 to the Chicago Convention. As explained in chapter 2, it is rare for member states – which includes the UK – to depart from standards and recommended practices contained within Annexes to the Convention. Further, the CAA – in exercising its statutory functions – is under a duty to act consistently with obligations placed on the UK under the Chicago Convention.[26]

6.33 The certification of remotely piloted aircraft has been addressed at an international level by Amendment 108 to Annex 8, which is expected to become applicable from 26 November 2026,[27] meaning changes would become binding at the international level at that time.[28] Amendment 108 introduces requirements relating to:

(1) remotely piloted aeroplanes and helicopters;

(2) remote pilot stations (referred to in UK domestic legislation as the command unit); and

(3) command and control links ("C2 links").[29]

The Amendment also provides a template certificate of airworthiness for remotely piloted aircraft.[30]

6.34 The airworthiness requirements introduced by Amendment 108 relating to remotely piloted aircraft systems cover topics common to both crewed and uncrewed aircraft, such as structural and operating requirements. There are also requirements unique to

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24 Altitude Angel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 10; SLiNK-TECH response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 520, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

25 FAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 233, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

26 The Civil Aviation Authority (Chicago Convention) Directions 2023, Direction 6.

27 Annex 8 to the Convention on International Civil Aviation, Thirteenth Edition, July 2022, part VIII.

28 We discuss what is meant by binding at the international level at paragraph 3.9 of chapter 3.

29 Parts XIII, IX, X of Annex 8 to the Convention on International Civil Aviation, Thirteenth Edition, July 2022.

30 Annex 8 to the Convention on International Civil Aviation, Thirteenth Edition, July 2022, figure 2.

remotely piloted operations, such as C2 links, detect and avoid, and emergency recovery.

The impact of Amendment 108

6.35 The practical impact of Amendment 108 for the purposes of this part of our report is that there are international standards which deal specifically with airworthiness and certification of remotely piloted aircraft systems which are expected to become applicable in the near future. The UK is unlikely to depart from standards and recommended practices contained within Annex 8 as amended, and it is our understanding that the UK does intend to implement the provisions relating to remotely piloted UAS.

Hybrid aircraft

6.36 Hybrid aircraft are not specifically addressed within Annex 8. However, it is likely that the domestic implementation of Amendment 108 will enable the certification of newly designed hybrid aircraft using a single type certificate. Once standards for remotely piloted UAS are introduced, the CAA could establish type certification bases[31] (the set of criteria governing the certification of a particular system or component) combining specifications for crewed and uncrewed aircraft. It is our understanding that this would enable a single type certificate to be issued for hybrid aircraft. Where aircraft is already certified and the manufacturer seeks to modify this, this could potentially be achieved through the existing process for changing a type certificate, though it would depend on whether the CAA finds that the change in design, power, thrust, or mass is so extensive that a substantially complete investigation of compliance with the applicable type-certification basis is required.[32]

6.37 It is unclear at this stage whether the certification of hybrid aircraft using a single type certificate will be commonly sought. We are grateful for stakeholder views on the future of this market and understand that many consider the developments regarding hybrid aircraft will simplify and bring clarity to the law in this area. We acknowledge that some consultees raised concerns regarding the safety of hybrid aircraft and note that it will be for the CAA, in agreeing certification bases, to ensure a level of safety equivalent to that of traditional crewed aircraft.

Command units

6.38 Implementing Amendment 108 at the domestic level will provide the foundations upon which command units can be separately certified. Part X to Annex 8, which was inserted as a result of Amendment 108, introduces standards for remote pilot stations

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31 UK Regulation (EU) 748/2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations, annex I, point 21.B.80.

32 UK Regulation (EU) 748/2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations, annex I, point 21.A.19.

which will enable the type certification of command units.[33] Consequently, it would be possible to certify a command unit either as part of or separately to a UAS.

6.39 Although tools now exist for the separate certification of command units and there was general support from consultees for the separate certification of command units, we note that some did express concerns about the safety of separate certification. The international legal framework now provides the possibility for the separate certification of command units, but the CAA will need to consider whether that approach ensures a satisfactory level of safety, or whether it will be necessary to continue to certify the command unit with the aircraft it serves in order to ensure that it can safely integrate with each individual aircraft.

6.40 In light of the above discussion, we do not consider it necessary to make any recommendations for reform of the legal framework in this area.

OPERATIONAL ISSUES

BVLOS operations

6.41 BVLOS operations are ones which take place beyond the visual line of sight of the remote pilot. In chapter 1 of this report, we referred to the UK Government's aim for routine BVLOS operations in the UK by 2027. At present, BVLOS operations can only take place within the specific and certified categories which – as explained in chapter 5 of this report – means that operational authorisation from the CAA or certification is required ahead of the operation. Below we consider whether – in order to facilitate the scaling-up of BVLOS operations, which by their nature require higher levels of automation[34] – certain BVLOS operations should be allowed within the open category, which does not require pre-operation authorisation. Later, we discuss the operational responsibilities for this type of operation in the specific and certified categories, and whether those responsibilities need to be clarified or supplemented.

BVLOS operations: Legal categorisation

6.42 In our first consultation paper, we suggested that requiring individual attention from the regulator for specific and certified category BVLOS and autonomous UAS operations could act as a barrier to the growth of the drone industry. We suggested that in the future, as the technology matures, and the CAA and industry gain more experience of these operations, the risk posed by such operations may change. We suggested that in practice, some BVLOS and autonomous operations may be low risk and suitable for the open category – that is, without pre-authorisation from the CAA – subject to appropriate requirements. [35]

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33 We understand that the CAA prefers the term "command unit" to describe the component of the remotely piloted UAS containing the equipment used to pilot the remotely piloted aircraft. See CAA, *Unmanned aircraft system operations in UK airspace: abbreviations and master glossary* (February 2025) (CAP 722D) p 25. This term is also used in the Basic Regulation.

34 Operating a drone beyond visual line of sight usually requires a high level of automation because the pilot (if there is one) will be unable to spot obstacles or other aircraft. Instead, the drone itself will often need the technical capability to recognise objects in its path and take action to avoid a collision (a function known as "detect and avoid").

35 Aviation Autonomy (2024) Law Commission Consultation Paper 261 paras 7.16 to 7.19.

6.43 We asked consultees for views on whether some low risk BVLOS and autonomous UAS operations should be accommodated in the open category. We asked for examples of use cases and what conditions might be attached to these types of operations if allowed in the open category. Although we are not generally discussing autonomous UAS operations in this part of the report, the responses to this question often did not distinguish between the two types of operation, so we discuss all responses here.

Consultation analysis

6.44 Just under half of consultees answered this question. There was no consensus on whether or not these operations should be allowed in the open category. Several of those who felt that these operations should not be permitted in the open category believed that BVLOS and autonomous UAS operations were too high risk. Apian said:

> The complexity associated with the conduct of safe BVLOS flights is evidence of why they should remain in the Specific or Certified categories…the safety risks of BVLOS extend way beyond only how the drone is controlled and the associated mitigations do require evaluation through a safety risk assessment.[36]

6.45 The CAA's position is that:

> Some BVLOS operations are already permitted in the open category. VLOS is specifically defined in the regulations, and operations such as first person view, or 'follow me' mode fall outside this definition. These are both by definition, BVLOS. We do not see the need to expand beyond these two examples BVLOS in the open cat is not required.[37]

6.46 Chris Daniels of Flare Bright and the Royal Aeronautical Society ("RAeS") felt that BVLOS operations are not inherently riskier than VLOS ones.[38] Nonetheless, the RAeS did not support allowing BVLOS operations in the open category, writing:

> For routine BVLOS to happen, Electronic Conspicuity, DAA, ATM systems, and full integration with the GA community will all need to exist. This should make future BVLOS operations safer than current VLOS drone operations but will clearly take time. Provisions should be made to re-assess BVLOS operations in the Open Category when the necessary infrastructure is established, and the risks are fully understood…there should be flexibility for the CAA in reassessing them within the respective categories depending on validated evidence of the applicable risk.[39]

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36 Apian response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 23, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

37 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

38 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

39 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

6.47 Amongst those who felt that some BVLOS and autonomous UAS operations could be accommodated in the open category now, consultees suggested that they could take place over low risk and atypical airspace including large estates in Scotland, over private property, low density areas or bodies of water with little boat traffic; and for asset inspection (Altitude Angel; British Gliding Association; Chris Daniels of Flare Bright; BT Group plc; Consortiq Limited; Light Aircraft Association; Clive Lewis of Midlands Aerospace Alliance; Royal Mail; Skybound Rescuer; Skyports; AUVSI).[40]

6.48 Suggestions about conditions to be attached to these use cases if operated in the open category included: continuous video feed (Altitude Angel); mass and speed restrictions (British Gliding Association); altitude restrictions (Skybound Rescuer; York Gliding Centre), geo-fencing (BT Group plc; Chris Daniels of Flare Bright; Skybound Rescuer), and emergency measures such as parachutes (Chris Daniels of Flare Bright); transient flight over people (AUVSI).[41]

Discussion

6.49 There have been two linked policy developments in this area which should make the specific category less cumbersome for lower-risk BVLOS and autonomous operations and should mitigate the problem set out in paragraph 6.42 to a certain extent.

6.50 The first development is that, generally speaking, it is now easier to conduct an operational risk assessment in the specific category. As explained in chapter 5, operators are required by article 11 of UK Regulation (EU) 2019/947 ("UAS Implementing Regulation") to conduct a risk assessment of their proposed operation, which is then evaluated by the CAA.[42] In April 2025, the CAA launched a digital risk assessment system – UK Specific Operation Risk Assessment ("UK SORA") – to expedite and streamline this approval process.[43] When an operator uses UK SORA to conduct their risk assessment, they are using an approved methodology and are assumed to be compliant with article 11.[44]

6.51 As part of the UK SORA process, applicants must follow a series of steps and enter specified information into the application.[45] For example, they must determine the

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40 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

41 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

42 Article 11 lays down 'rules for conducting an operational risk assessment'. Article 12 concerns the granting of the operational authorisation.

43 CAA, *UK Civil Aviation Authority Launches UK SORA: A Digital Risk Assessment System for unmanned aircraft systems*, https://www.caa.co.uk/newsroom/news/uk-civil-aviation-authority-launches-uk-sora-a-digital-risk-assessment-system-for-unmanned-aircraft-systems/. The UK SORA process has been adapted from JARUS. See Joint Authorities for Rulemaking on Unmanned Systems, *JARUS guidelines on Specific Operations Risk Assessment*, version 2.5 (2024).

44 The UK SORA process is set out in 'acceptable means of compliance' to article 11 of Regulation 2019/947. At para 1.13, it is stated that "At the time of publication, an application using the UK SORA methodology shall be assumed… [to be] compliant with [article 11]."

45 AMC1 to Article 11 UK Regulation (EU) 2019/947 lists 14 steps. It should be noted that UK SORA may not be used for operations outside the regulatory limitations of the specific category or operations outside the policy limits of UK SORA. Further, some operations, such as multiple simultaneous operations, operations

ground risk class,[46] air risk class[47] and submit operational details, including any mitigations that will be put in place.[48] On this basis, the UK SORA process helps to identify the overall risk of the operation,[49] as well as operational limits and operational safety objectives.[50]

6.52 The basic idea of UK SORA is therefore to help operators, and the CAA, to identify the risk of the proposed operation and reduce the risk to an acceptable level – and to do this in a consistent, transparent and structured way.[51] The intended benefit is that "both the applicant and [CAA] can allocate their available resources and time proportional to the risk of the operation."[52] For lower risk BVLOS and autonomous UAS operations, therefore, the resources and time spent on a risk assessment and obtaining approval should be lower than for more complex operations. Our view is that it is therefore not necessary for these types of operations to be accommodated in the open category. As of 31 August 2025, 45 applications had been made under this system and 14 approvals have been granted.[53]

6.53 The second relevant development is the CAA's policy on UAS operations in atypical air environments ("the AAE policy").[54] The AAE policy aims to enable operators to conduct BVLOS operations within a volume of airspace where – owing to proximity to specific ground infrastructure - it can reasonably be anticipated that there will be a greatly reduced number of conventionally piloted aircraft. For example, a drone inspecting a railway is likely to operate within an atypical air environment as it is less likely that it will encounter other aircraft in the relevant airspace.

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that require an airspace change or operations involving the carriage of dangerous goods, require additional applications. For further information see AMC1 to Article 11 para 1.2.

46 Ground risk is the risk of the UAS hitting a person on the ground and causing a fatality. See CAA, *Getting started with UK SORA*, https://www.caa.co.uk/drones/specific-category/uk-sora-based-operational-authorisations/getting-started-with-uk-sora/.

47 Air risk is the risk of a mid-air collision between the UAS and crewed aircraft. See CAA, *Getting started with UK SORA*, https://www.caa.co.uk/drones/specific-category/uk-sora-based-operational-authorisations/getting-started-with-uk-sora/.

48 Both air risk and ground risk mitigations: see steps 3 and 5 of UK SORA (AMC1 to art 11 paras 1.92 to 1.100 and 1.129 to 1.133).

49 The overall risk of the operation is known as the SAIL level - Specific Assurance and Integrity Level. See Step 6 (AMC to art 11 paras 1.134 and 1.3).

50 The acceptable level of safety is referred to as the Target Level of Safety (TLOS). See AMC1 to Article 11 para 1.10.

51 CAA, *UK Civil Aviation Authority Launches UK SORA: A Digital Risk Assessment System for unmanned aircraft systems*, https://www.caa.co.uk/newsroom/news/uk-civil-aviation-authority-launches-uk-sora-a-digital-risk-assessment-system-for-unmanned-aircraft-systems/.

52 Joint Authorities for Rulemaking on Unmanned Systems, *JARUS guidelines on Specific Operations Risk Assessment*, version 2.5 (2024) p 14.

53 Numbers provided to us by the CAA on 16 September 2025.

54 CAA, *Unmanned aircraft operations in an atypical air environment: policy concept* (CAP 3040) (October 2024).

6.54 The AAE policy should assist operators to apply for approval successfully under UK SORA because it makes it easier to evaluate the air risk of their operation.[55] Operations within atypical air environment are granted the lowest air risk classification score during the UK SORA assessment, which means they are subject to requirements proportionate to this lower risk.[56] This should then reduce the burden on applicants and expedite the approvals process. As of 13 August 2025, six applications have relied on the AAE policy, with at least one being approved.[57]

6.55 It follows that both developments are likely to improve the efficiency of gaining approval for low risk BVLOS and autonomous operations[58] in the specific category. Several suggestions from consultees for low risk BVLOS and autonomous operations, which they felt were suitable for the open category, would now likely fall within the CAA's AAE policy. For example, operations for asset inspection (such as railway tracks) and operations conducted over private property. [59]

6.56 While it is too early to fully evaluate the impact of these developments, we do not consider it necessary to make any recommendations for reform to allow BVLOS operations within the open category. Instead, the CAA could, in due course, review the efficiency of the process for gaining approvals for low risk BVLOS and autonomous UAS operations in the specific category when additional data is available in relation to the above two developments.

6.57 Finally, we note the CAA's comment about BVLOS operations already taking place in the open category. It is true that operations using the aid of an unmanned aircraft observer[60] or 'follow-me mode'[61] are technically not within the visual line of sight of the remote pilot.[62] However, our focus is on barriers to the growth of the drone industry, and therefore the consultation question was directed towards new or more advanced use cases which at present would fall within the specific category and have

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55 Para 1.117 AMC to article 11 of the UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft mentions AAE as a "key element" of assigning the air risk classification.

56 The CAA has stated that "use of an AAE enables an ARC-a air risk score in SORA": CAA, *Flying UAS BLOS in the Specific Category (UK CAA Guide for Industry)* p17. An "ARC-a" score means "minimal risk", which is the lowest possible (AMC1 to article 11 para 1.115).

57 Numbers provided to us by the CAA on 13 August 2025.

58 Although we note that the CAA's AAE policy does not explicitly cover autonomous operations, perhaps because autonomous operations are not anticipated in the near future.

59 These are listed as examples of AAE in CAA's guidance, see CAA, *Unmanned aircraft operations in an atypical air environment: policy concept* (CAP 3040) (October 2024), p 8.

60 Unmanned aircraft observer "means a person, positioned alongside the remote pilot, who, by unaided visual observation of the unmanned aircraft, assists the remote pilot in keeping the unmanned aircraft in VLOS and safely conducting the flight". See UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 2(24).

61 Follow-me mode "means a mode of operation of a UAS where the unmanned aircraft constantly follows the remote pilot within a predetermined radius". See UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 2(14).

62 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 4(1)(d). It is noteworthy that the definition of an "unmanned observer" in art 2(24) suggests the use of an observer does not preclude the operation from being considered VLOS.

to obtain operational authorisation. Operations using an uncrewed aircraft observer or follow-me mode do not fit this description.

BVLOS operations: Operational responsibilities

The problem

6.58 In our first consultation paper we highlighted the lack of detailed rules dealing with operational responsibilities for the specific category, in particular in relation to autonomous operations.[63] We also highlighted the lack of detailed rules about operational responsibilities in the certified category.[64]

6.59 We also noted the lack of clarity as to exactly which requirements from UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air ("UK SERA") apply to specific and certified category operations.[65] In summary, for the specific category, Acceptable Means of Compliance to the UAS Implementing Regulation sets out a small number of UK SERA provisions which are applicable (some are effectively mandatory; others are selected according to relevance – see chapter 8 for further discussion). The CAA can also attach other UK SERA provisions as a condition of operational authorisation.

6.60 For operations in the certified category, there is no guidance material or acceptable means of compliance elaborating on what the "applicable operational requirements" are.

6.61 In Consultation Question 37 of our first consultation paper, we sought views on what operational requirements should be applied to autonomous drone operations and drones that operate beyond visual line of sight in the specific and certified categories. In this chapter, we deal with responses as they relate to remotely piloted BVLOS operations, rather than autonomous operations, which are discussed in part 3 of the report.

Consultation analysis

6.62 32 people responded to Consultation Question 37, but there was little consensus about what operational requirements should be applied.

6.63 In its response, Apian said that this was a difficult question to answer:

> This is an incredibly difficult question to answer as there are different and complex concepts included in one question. There is the specific category where risks are identified and mitigated through a risk assessment process. The certified category is where risk then requires certification to mitigate and finally autonomy is completely different again. The operational requirements when conducting operations in those categories are complicated. Then added onto that is how we consider the

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63 Aviation Autonomy (2024) Law Commission Consultation Paper 261, paras 7.21 to 7.27.

64 Aviation Autonomy (2024) Law Commission Consultation Paper 261, paras 7.29 to 7.34.

65 Aviation Autonomy (2024) Law Commission Consultation Paper 261, para 7.35 to 7.40.

requirements of a regulation such as SERA and which of those would be considered 'applicable operational requirements'.[66]

6.64 Some respondents suggested that a consolidation of operational rules were needed. BT Group felt that:

> to ensure the safety of actual flying, there needs to be one clear set of operational requirements per category, so that drone operators have the easiest possible way to understand and follow the requirements.[67]

6.65 Conversely, several respondents felt that the existing framework was sufficient, at least in relation to the specific category. In relation to the operational requirements in the specific category, Drone Alliance Europe said:

> Operational requirements for autonomous drones that may be eventually developed, and for highly-automated drones and drones that operate beyond visual line of sight (BVLOS) should be risk-based and proportional to the specific operation. A one-size-fits-all approach would stifle innovation and potentially reduce safety… SORA methodology is designed to be applicable to all levels of automation under the JARUS guidelines on SORA 2.5.[68]

6.66 Royal Mail suggested that: "Operational procedure should be determined as part of a safety case application".[69] Skyports said:

> Drones can already operate in the Specific Category based on an approved safety case. Operational procedure should be left to the operator/applicant to determine as part of their safety case application that justifies to the regulator that their operation, whether it be autonomous, highly automated or manual, is safe.[70]

6.67 Although various stakeholders therefore thought that the current regime was satisfactory, some did specify operational requirements which they felt should apply. The FAA suggested that requirements should include: "right of way, collision avoidance, communication with ATC and with other pilots, and actions to be taken in the event of sustained loss of link with GCS".[71]

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66 Apian response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 23, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

67 BT Group response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 109, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

68 Drone Alliance Europe response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 205, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

69 Royal Mail response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 466, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

70 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

71 FAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 233, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

6.68 Ramin Norouzi of Dronzit Aerospace referred to similar operational requirements: "SERA.3201 – Collision Avoidance, SERA.3210 – Right of way, SERA.3215 – Lighting, and SERA Section 4 – Flight Plans".[72]

6.69 Other requirements suggested by consultees included: detect and avoid, electronic conspicuity, use of robust UTM services, aircraft position tracking, communication requirements, flight termination systems, geo-fencing, flight-path authorisation, standard operating procedures, operator certification and training, flight-data recording, emergency response procedures, high levels of communication, and noise-mitigation.

Discussion

6.70 This was a broad and open question seeking views on operational responsibilities for remotely piloted BVLOS operations and autonomous operations in both the specific and certified categories. Consultees were split as to whether the existing operational responsibilities were satisfactory, or whether operational responsibilities need to be clarified, consolidated or supplemented.

6.71 In our view, the main problem in relation to the operational rules in the specific category is the lack of detailed rules on autonomous operations. This is discussed further in part 3.

6.72 Insofar as remotely piloted BVLOS operations in the specific category are concerned, we agree with the consultees who felt that the existing regime is satisfactory. In relation to the rules of the air in particular, we conclude in chapter 8 of our report that in the short to medium term, the current approach taken to the specific category – applying applicable rules – is satisfactory. Our view is that the approach of applying operational requirements and limitations as part of the operational authorisation on a case-by-case basis for the specific category is also satisfactory, given the variety of use cases which can operate in that category, and the relative nascence of BVLOS operations. As we discuss further below, over time we would expect the CAA to publish guidance where themes emerge in terms of operational requirements commonly applied to certain types of operations in the specific category, for example multiple simultaneous operations.

6.73 Although some consultees suggested operational requirements which should apply to specific and certified operations, there was no consensus on these requirements, and some of them would already potentially apply in the specific category. For example, the specific rules of the air suggested by one consultee above are already set out in acceptable means of compliance as ones which can apply to BVLOS operations in the specific category if relevant.

6.74 Other suggestions for operational requirements included detect and avoid and electronic conspicuity. We discuss both of these in chapter 8 of the report. Although we do not make recommendations in relation to either, we note that it is likely that these will be required as part of operational authorisations in the specific category. We

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[72] Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

discuss the longer-term need for detect and avoid and electronic conspicuity, as part of an integrated sky, in part 3 of the report.

6.75 In relation to the certified category specifically, in our first consultation paper we noted that:

> the gaps in the certified category may be addressed to some extent by the implementation of standards and recommended practices developed by the International Civil Aviation Organisation ("ICAO"). We understand that several expert groups within ICAO are currently considering the regulatory framework around remotely piloted aircraft systems, advanced air mobility use cases as well as "unmanned" aircraft systems.[73]

6.76 Since the publication of our first consultation paper, there have been developments at the international level which we expect to shape domestic law regarding the operational requirements for certified category operations. In July 2024, the International Civil Aviation Organization published Part IV to Annex 6 to the Convention on International Civil Aviation.[74] This sets out high level requirements for the operation of remotely piloted aircraft and is applicable from 26 November 2026.

6.77 For present purposes, the significance of the new Part IV to Annex 6 is that it addresses several of the operational requirements suggested by consultees and highlighted above. The Annex deals with a number of things. These include detect and avoid capabilities[75] (and how this relates to the avoidance of collisions, including proximity and right of way),[76] communication requirements,[77] emergency response procedures,[78] operator certification and training,[79] establishment, assurance and termination of the C2 link,[80] and noise mitigation.[81] As outlined above, consultees suggested these as possible operational responsibilities for remotely piloted BVLOS operations. Annex 6 has now created standards which cover these responsibilities. Further, Part IV to Annex 6 makes clear that where standards have not yet been

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73 Aviation Autonomy (2024) Law Commission Consultation Paper 261 para 7.34. See ICAO, *Unmanned Aviation and Advanced Air Mobility,* https://www.icao.int/safety/ua/Pages/default.aspx.

74 Annex 6 to the Chicago Convention, Part IV, First Edition, 2024.

75 Annex 6 to the Chicago Convention, Part IV, First Edition, 2024, 6.20.

76 For example, most remotely piloted UAS must be equipped with an automated system which performs appropriate collision avoidance manoeuvres. See Annex 6 to the Chicago Convention, Part IV, First Edition, 2024, 6.20.2. In relation to detect and avoid capabilities, the Annex states that: "the operational requirements specified herein for conflicting traffic are intended to meet the requirements of Annex 2 for avoidance of collisions, including proximity and right-of-way."

77 Annex 6 to the Chicago Convention, Part IV, First Edition, 2024, addresses communication equipment at 7.1. The Annex also states, at 3.1.8: "operators shall ensure that remote flight crew members demonstrate the ability to speak and understand the language used for radiotelephony communications as specified in Annex 1."

78 Annex 6 to the Chicago Convention, Part IV, First Edition, 2024, 3.1.5 and 3.1.6.

79 Annex 6 to the Chicago Convention, Part IV, First Edition, 2024, addresses remote flight crew training programmes at 9.3.

80 Annex 6 to the Chicago Convention, Part IV, First Edition, 2024, 4.5.1.

81 Annex 6 to the Chicago Convention, Part IV, First Edition, 2024, 4.4.9.

developed, remotely piloted UAS should be operated in a manner consistent with the equivalent SARPS for crewed aviation in Parts I, II or III.[82]

6.78 As we note in chapter 3 of the report, it is rare for a state to depart from standards and recommended practices which are contained within Annexes to the Chicago Convention. If the UK does implement all of the standards and recommended practices contained within the forthcoming Part IV to Annex 6, we expect that this will resolve some of the gaps in the operational requirements for operations for the certified category.

6.79 In the meantime, in chapter 7, we make recommendations about certain operational requirements which should apply in the certified category for the purposes of passenger-carrying remotely piloted UAS operations.

6.80 Given that we consider the approach to operational rules in the specific category to be satisfactory, and given the changes at the international level in relation to operational rules that are likely to be implemented in relation to the certified category, together with the recommendations we make in relation to the certified category in chapter 7, we do not consider it necessary to make any recommendations on this topic in this chapter.

Multiple Simultaneous Operations ("MSO")

6.81 In chapter 4 of this report, we discuss legal uncertainty surrounding MSO and whether a remote pilot can serve as a remote pilot of multiple UAS in the specific and certified categories. We note that whether MSO are approved will be a matter for the regulator, but recommend that if they are, UAS regulations should be amended to make clear that a remote pilot can serve as the pilot for multiple aircraft simultaneously.

6.82 If the CAA does decide to authorise MSO, there are related operational considerations First, whether there should be an upper limit to the number of UAS that an individual can be responsible for at the same time, and second, whether there should be additional safeguards introduced for remote pilots piloting multiple UAS. We consider each of these issues in turn.

MSO: Should there be an upper limit to the number of UAS for which an individual remote pilot can be responsible for at one time?

The problem

6.83 In chapter 4 we note that while it might be feasible for the definition of a remote pilot to be compatible with smaller scale MSO, it might be increasingly difficult to effectively monitor the course of each UAS and remain able to intervene and change their course at any given time as operations scale with more UAS.

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[82] Annex 6 to the Chicago Convention, Part IV, First Edition, 2024, p xvii. The Annex states: "Additional Standards and Recommended Practices covering other aspects of RPAS operations will be developed as topics mature. In the interim, for those aspects that are not yet addressed in Part IV, but for which Standards and Recommended Practices already exist in parts I, II or III, it is intended that RPAS be operated in a manner that is consistent with those provisions, as appropriate."

6.84 We asked for views on whether there should be an upper limit to the number of drones and VTOLs for which an individual remote pilot can be responsible for at one time.[83]

Consultation analysis: Drones

6.85 Consultees who answered this question on the whole felt that there should be a limit, but few articulated a set number. Instead, many consultees suggested factors which should be taken into account when determining the upper limit.

6.86 Of those that did articulate a prescribed upper limit, NATS said that for early capability, the limit should be one drone to one pilot.[84] An anonymous respondent felt that the limit should be capped at one unless there was a safety case to mitigate risk.[85] Niall Greenwood of Neuron Innovations felt that the upper limit should be capped at five or six – the number they said Wing had been trialling – though accepted this could increase over time.[86]

6.87 The FAA said that there should be an upper limit and that "this would help to ensure that the pilot can respond to multiple failures should they occur".[87] The number of drones should depend on factors such as the level of autonomy, airspace congestion and testing. Others concurred that level of automation or autonomy should affect the upper limit. York Gliding Centre felt the number could be uplifted as technology advances.[88] Drone Major Group Limited's view was that the higher the level of control to the 'fleet manager', the lower the number of aircraft should be authorised.[89] NATS said: "for early capability the limit will be 1-1 but we should assume a future that allows full autonomy and therefore define the requirements for the full spectrum".[90]

6.88 Several consultees, such as Skyports and Royal Mail, felt it was for the operator to prove an MSO was safe on a case-by-case basis.[91] The CAA said the numbers allowed would be:

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83 Aviation Autonomy (2024) Law Commission Consultation Paper 261, CQs 39 and 27 respectively.

84 NATS response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 346, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

85 Anonymous 1 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 623, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

86 Niall Greenwood response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 360, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

87 FAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 233, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

88 York Gliding Centre response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 596, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

89 Drone Major Group response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 211, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

90 NATS response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 346, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

91 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; Royal Mail response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 466, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

subject to the safety case of the operation, the competency of the remote pilot, the flightworthiness of the aircraft, and the technology enabling the automated aspects. There are too many variables to put this into legislation.[92]

Consultation analysis: VTOLs

6.89 Similarly to above, while many consultees felt that there should be an upper limit, only a few consultees felt that there should be a prescribed number of VTOLs that a remote pilot could be responsible for. ARPAS UK said:

> until scaffolded solutions have been developed, and confidence in the all-weather aspects of eVTOLS, then there should be planned to have as a minimum – 1 pilot per 3 aircraft. This is a balance between emergency actions in a phase of flight, but also showcasing resilience across the operation.[93]

6.90 Some consultees suggested that the upper limit should be one for now. John Milner said it should be one unless proper procedures are developed and tested.[94] NATS said that for early capability the limit should be 1-1.[95]

6.91 Other consultees said that the number allowed should be assessed on a case-by-case basis and include consideration of, for example:

> the responsibilities of the PIC, the extent of automation and/or autonomy on board the aircraft, other operational risk mitigations that are in place, the likelihood of an off-nominal condition that could require additional attention from a human supervisor, and whether or not there are reversionary modes for automated/autonomous functions should all be taken into account when determining the acceptable aircraft-to-human pilot ratio for a given operation.[96]

6.92 Several consultees suggested a performance based approached should be used to determine the number of VTOLs that a remote pilot could be responsible for at any one time:

> For a more durable regulation, performance-based requirements that do not include a "bright line" limitation are preferable. As long as it can be credibly demonstrated that all aircraft are under "operational control" under reasonably expected conditions

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92 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

93 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

94 John Milner response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 289, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

95 NATS response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 346, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

96 Boeing response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 68, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

and contingencies, then multiple simultaneous aircraft oversight should be permitted.[97]

6.93 One consultee, Ramin Norouzi of Dronzit Aerospace, explicitly agreed with the suggestion in the consultation paper that this issue could be considered at the initial airworthiness stage and any upper limit be included in the flight manual.[98]

Discussion

6.94 Although more consultees than not felt that there should be an upper limit to the number of UAS for which an individual remote pilot can be responsible for at one time, most of those did not advocate for a fixed number to be prescribed. We agree that it would not be sensible to set a fixed upper limit in legislation, especially not at this early stage. A fixed upper limit would risk being arbitrary and could inhibit flexibility and innovation in relation to a relatively nascent, and significant, type of operation.

6.95 In relation to specific category operations, we are of the view that the number of UAS a remote pilot can be responsible for at any one time should continue to be assessed by the CAA on a case-by-case basis and set out in the operational authorisation. We consider that, given that the CAA will be approving applications, and have the benefit of seeing the information and the data from operations, the CAA is best placed to determine the factors to be taken into account when assessing the risks and safety of MSO and is best placed to decide the consequent ratio of pilots to UAS in the specific category, but we refer them to the useful list of factors to take into consideration as suggested by consultees and set out above.

6.96 Although we do not consider that a formal recommendation is necessary, we think it would be helpful for the CAA to issue guidance in relation to BVLOS MSO – as and when sufficient experience is gained from considering applications for operational authorisation (and we note the CAA's iterative approach to policy development as referred to in chapter 2) – to mirror the CAA's published guidance relating to VLOS drone swarms.[99] AUVSI, in its consultation response, said this:

> Guidelines to be used when evaluating an air carrier's procedures and conducting a risk assessment for M:N operations would be beneficial to both operators and regulators conducting oversight.[100]

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97 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

98 Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

99 CAA, *Unmanned Aircraft Systems Rotary Wing Swarm Operations – Visual Line of Sight – Requirements, Guidance and Policy* (December 2022) (CAP 722E).

100 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

We agree and think that it would be useful to include in that guidance a non-exhaustive list of the factors that are to be taken into account in determining applications for authorisation of MSO.

6.97 In relation to the certified category of operations, which MSO involving VTOLs would fall under, we do not make any recommendations at this stage. There was no widespread support at this stage for mandating that upper limits be set out in the operations manual, or that it should be considered at the initial airworthiness stage.

MSO: Additional safeguards for remote pilots responsible for multiple UAS

The problem

6.98 There are no detailed provisions or guidance dealing with the unique characteristics of the second category of MSO (where multiple UAS move independently of each other). At present, there are therefore no formal additional safeguards for operations where a remote pilot is responsible for more than one UAS.

6.99 We asked for views on what additional safeguards should be introduced for remote pilots responsible for multiple drones.[101] We asked a similar question in relation to MSO involving VTOLs.[102]

6.100 We suggested that safeguards could be implemented across the specific and certified categories through: certification for aircraft and command units; pilot-licensing and training, including a new rating for passenger-carrying MSO; operational rules reflecting the particular challenges of passenger-carrying MSO; updating the rules of the air; procedures for handovers of control in emergencies and staggering phases of flight so that not all UAS in the MSO were at the same point at the same time (for example take-off and landing).[103]

Consultation analysis: Drones

6.101 Some consultees, such as Skyports and Drone Alliance Europe, felt that there was no need for specific requirements in relation to MSO because there is already a requirement in the specific category of operations to prove the safety of an operation regardless of whether it relates to one drone or more.[104] Chris Daniels of Flare Bright felt that the regulatory framework should be able to address MSO without needing to refer to them specifically, and that:

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101 Aviation Autonomy (2024) Law Commission Consultation Paper 261, CQ 40.

102 Aviation Autonomy (2024) Law Commission Consultation Paper 261, CQ 28.

103 Aviation Autonomy (2024) Law Commission Consultation Paper 261 paras 6.114 to 117.

104 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; Drone Alliance Europe response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 205, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

> Permitting a principles-based legislative framework, rather than a rules-based framework is likely to be the best approach and future-proofs the legislation, in what is a very fast-moving technological area.[105]

6.102 The CAA said they:

> do not see this needing to be required in legislation. In AMC/GM, the CAA would review the requirements with respect to pilot competency, the operator (including emergency scenarios procedures), flightworthiness and C2 link. The robustness of the procedures and mitigations would be expected to be in keeping with the number of aircraft operated by a single pilot.[106]

6.103 Several consultees stated the view that prescriptive requirements would not be appropriate (AUVSI, Drone Alliance Europe), and Apian said:

> the CAA must be able to respond quickly enough to changes in industry to ensure they don't block innovation and progress with out of date requirements.[107]

6.104 Some consultees did suggest specific safeguards. Niall Greenwood of Neuron Innovations, BT Group and Thurling Aero Consulting all felt that higher (and specific) qualification and experience levels should be imposed for those piloting MSO.[108] Skybound Rescuer agreed with this but also added there should also be requirements regarding:

> Advanced Technological Systems (i.e. automated monitoring/AI assistance); Operational Limits/Maximum Drone Limit/Operational Time Limits; Monitoring and Supervision/Supervisory Roles/Periodic Audits; Robust Communication Links; Emergency Communication Protocols; Fatigue Management Plans…Double-crewing/redundancy, (having more than one pilot available to assume control in the event of an emergency). Systems where control can be handed to another available RP.[109]

6.105 Other factors mentioned by consultees included: emergency procedures (Ramin Norouzi of Dronzit Aerospace, Skyports, FAA, UKRI Future Flight Challenge), communication (Ramin Norouzi of Dronzit Aerospace), redundancy plans (Ramin Norouzi of Dronzit Aerospace), human factors issues such as fatigue management

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105 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

106 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

107 Apian response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 23, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

108 Niall Greenwood response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 360; BT Group response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 109; Thurling Aero Consulting response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 539, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

109 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

and processes for offloading tasks to others (NATS, RAeS, Skyports, Consortiq) (several comparing the position to workload management for ATCs).[110]

Consultation analysis: VTOLs

6.106 ARPAS UK and Clive Lewis of Midlands Aerospace Alliance agreed that additional training would be important.[111] Boeing and AUVSI agreed but felt that any specific training should not be prescriptive.[112]

6.107 Two linked issues raised by consultees were safeguards in relation to emergency situations, and offloading. The CAA said there should be:

> A method by which the operator can quickly bring in a 'relief' pilot or additional pilot in circumstances which may cognitively overload the remote pilot. Additional RP(s) available to allow more capacity for emergency situations so that one RP would then be able to deal with the emergency.[113]

6.108 Ramin Norouzi of Dronzit Aerospace raised similar concerns and said:

> Specific operational rules should detail how, in case of a VTOL needing the remote pilot's intervention and gaining control (for instance, due to emergency circumstances), the supervision of other aircraft under that remote pilot's supervision (i.e., the MVS) is temporarily transferred to other supervisors[114]

6.109 Joby Aviation, UKRI Future Flight Challenge, NATS, RAeS also raised the need for these types of safeguards.[115]

6.110 An anonymous consultee suggested (albeit in response to a different question on VTOLs) that MSO should not be allowed during the critical departure, cruise and arrival phases.[116] ARPAS UK said that remote pilots should not be allowed to

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110 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

111 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; Clive Lewis response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 184, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

112 Boeing response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 68, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

113 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

114 Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

115 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

116 Anonymous 2 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 631, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

remotely pilot more than one vehicle in the same phase of flight such as take-off and landing.[117]

6.111 Other suggestions included: highly advanced automation and collision avoidance systems, and redundancy in communications channels (Skybound Rescuer); new guidance on oversight of air carriers and a new regulatory structure to support review and oversight of procedures of individual operators not operating under an air carrier certificate (Joby Aviation).[118] The NPCC felt that modelling and testing ahead of regulation or legislation would be important.[119]

Discussion

6.112 There was no broad consensus about additional safeguards to apply to drone and VTOL MSO, should they be authorised, and how to deal with those within the legal framework.

6.113 In relation to drone MSO specifically, several consultees felt that there was either no need for additional safeguards to be articulated (because of the fact that operations in the specific category are assessed on a case-by-case basis and only approved if the level of risk is acceptable), or if specific safeguards were necessary for drones, that they should not be prescriptively set out in legislation.

6.114 Although there was no broad consensus, there was repeated reference in consultation responses to the importance of specific pilot training for MSO, procedures for offloading and managing workload, and emergency procedures. All of these things could be provided for in an operational authorisation under the specific category.

6.115 We consider that if the CAA does authorise MSO, then the current approach of approving operations on a case-by-case basis in the specific category is satisfactory, allows for flexibility, and prescriptive standards are not yet necessary. While we do not consider it necessary to make a formal recommendation at this stage we expect that, if the CAA does authorise MSO, then as it develops experience in approving this type of operation, and as common requirements applied to MSO emerge, it will be possible to set out in guidance – in the form of acceptable means of compliance or guidance material – the necessary additional safeguards for MSO.

6.116 It should be possible for the CAA to use the emerging commonly applied additional safeguards as the basis for operational requirements and standards for operator certification.

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117 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

118 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; Joby Aviation response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 270, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

119 NPCC response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 375, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

Concluding remarks on MSO

6.117 Other than the recommendation in chapter 4 – that if MSO are approved by the CAA, UAS regulations should be amended to make clear that a remote pilot can serve as the pilot for multiple aircraft simultaneously – we make no recommendations relating to MSO. Our analysis is that there are no gaps in the law and nothing within the legal framework which is blocking development of MSO. We anticipate that for the purposes of applications for operational authorisation in the specific category, guidance from the CAA will emerge over time which details any specific factors relevant to MSO approvals. Consideration will need to be given as to how that guidance is translated into requirements for the certified category.

Conclusion

6.118 Following consultation, and in light of international legal and domestic policy developments, we have taken the view that it is not necessary for us to make any recommendations for reform in this area (although the recommendations for reform in chapter 4 do overlap with the subject matter of this chapter). However, there are areas where we anticipate it would be useful for the CAA to prepare guidance in due course, for example in relation to operational responsibilities for BVLOS operations in the specific category, and MSO, should the CAA decide to authorise them. We also reiterate the broader issue of a lack of applicable requirements for operations in the certified category.

Chapter 7: Passenger-carrying remotely piloted UAS operations

7.1 In this chapter we look at issues which are specific to passenger-carrying remotely piloted Uncrewed Aircraft Systems ("UAS") operations, which we expect will be characterised as commercial air transport ("CAT") operations.[1]

7.2 Under the existing legislative framework for UAS, passenger-carrying remotely piloted UAS operations may only take place within the certified category.[2] As discussed in chapter 5 of the report, there are no detailed operational responsibilities set out for this category of operations yet, and no detail as to the requirements an operator needs to meet in order to obtain certification. UK Regulation (EU) 2019/947 ("UAS Implementing Regulation") simply says that operations shall be subject to applicable operational requirements of UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air ("UK SERA"), the UK Regulation (EU) 965/2012 (the "Air Operations Regulation") and the UK Regulation (EU) 1332/2011 (the "Common Airspace Usage Requirements Regulation"),[3] but no guidance has been provided as to which requirements are 'applicable'.

7.3 In this chapter, and in the absence of any rules relating to responsibilities of the remote pilot for uncrewed CAT operations, we take as our starting point the key responsibilities of the pilot-in-command of a crewed CAT operation (termed the commander).[4] We consider the adjustments that need to be made to those responsibilities when the pilot is no longer situated on board the plane with the passengers they are responsible for keeping safe.

7.4 It is important to note that not all operations in the certified category will involve the carriage of passengers. The recommendations made here will not necessarily apply to all use cases and operations in the certified category, though some may be of wider application. We are looking specifically at passenger-carrying operations because vertical take-off and landing vehicles ("VTOLs"), the second use case in our terms of reference, necessarily involve the carriage of passengers. It is likely that some of the recommendations we make here will be relevant to other forms of passenger-carrying remotely piloted UAS, but we focus on VTOLs because our terms of reference were

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1 See UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 3(24) which defines a commercial air transport operation as 'an aircraft operation to transport passengers, cargo or mail for remuneration or other valuable consideration'. We also expressed this expectation in our first consultation paper, see Aviation Autonomy (2024) Law Commission Consultation Paper 261, para 6.25.

2 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 6(1)(b)(ii).

3 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7(3).

4 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex I, para 96.

based on the understanding that VTOLs would be a likely use case in the near to mid future.

7.5 Some of the recommendations made in this chapter – in particular those relating to operators – are likely to apply to other types of CAT operations, for example those carrying cargo rather than passengers. We highlight the potential relevance of our recommendations to those types of operation but, as those use cases are not a focus of our terms of reference, we do not make recommendations specifically relating to those types of operations here.

7.6 The chapter is divided into two main parts. The first concerns pre-deployment issues such as certification of the operator, responsibilities of the operator and remote pilot licences. The second part of the chapter looks at operational issues such as flight preparation, conduct of flights, and accidents and reporting.

THE REMOTE PILOT AS COMMANDER

7.7 In chapter 4 of this report, we note that according to the Air Operations Regulation, commanders of CAT operations are responsible for:

(1) the safety of all crew members, passengers and cargo on board, as soon as the commander arrives on board the aircraft, until the commander leaves the aircraft at the end of the flight; and

(2) the operation and safety of the aircraft:

(a) for aeroplanes, from the moment the aeroplane is first ready to move for the purpose of taxiing prior to take-off, until the moment it finally comes to rest at the end of the flight and the engine(s) used as primary propulsion unit(s) is (are) shut down; and

(b) for helicopters, when the rotors are turning.[5]

7.8 In chapter 4 we recommend that it be made explicit that the remote pilot of a CAT operation should have the responsibilities of the commander of an operation within the meaning of the Air Operations Regulation, namely those key responsibilities for safety as set out above. In this chapter when we use the term “remote pilot”, we intend that to include a remote “commander” of a CAT operation.

7.9 In the remainder of this chapter we draw upon some of the more specific existing responsibilities of the commander, and operators, of CAT operations and make recommendations about which of those should apply to passenger-carrying remotely piloted UAS operations.

KEY ACTORS IN CREWED COMMERCIAL AIR TRANSPORT OPERATIONS

7.10 Above we set out the specific role of the commander in crewed CAT operations. In addition to the commander, there will also be an operator of commercial air transport.

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[5] UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex IV, CAT.GEN.MPA.105(a)(1) and (2).

Below at paragraph 7.49 we discuss the specific responsibilities of the operator in CAT operations.

7.11 In addition to the commander and the operator, there will probably be involvement of ground handling staff who are responsible for ground supervision, flight dispatch and load control, passenger handling, baggage handling, freight and mail handling, apron handling of aircraft, aircraft services, fuel and oil handling, and loading of catering.[6]

7.12 Another key actor in crewed CAT operations is cabin crew. Cabin crew perform duties related to the safety of passengers and flight[7] and as such they are subject to training and medical assessment.[8] Cabin crew often carry out duties including welcoming passengers onto the aircraft; demonstrating the use of safety equipment; checking passengers are seated and using seat belts ahead of take-off.

7.13 One theme which runs throughout this chapter is the relationship between key actors in CAT operations. Often, in the context of crewed operations, responsibilities of the commander will be met on a practical level by ground handling staff and cabin crew, with the legal responsibility remaining with the commander. In this chapter we discuss how the removal of the commander from the aircraft, and potentially the removal of cabin crew and ground handling staff, affect these relationships and where legal responsibilities should lie.

PRE-DEPLOYMENT ISSUES

Accessibility

7.14 One issue which is specific to passenger-carrying remotely piloted UAS is accessibility. In our first consultation paper, we discussed accessibility requirements in aviation and explained that these requirements do not extend to the design of the aircraft.[9] Instead, the focus in current accessibility regulation is on what additional help is required to allow a person with disabilities or reduced mobility to use that aircraft (albeit that additional help is often subject to safety requirements). We discussed UK Regulation (EU) 1107/2006 (the "Persons with Reduced Mobility Regulation") and how we consider that in principle VTOLs would be covered by that regulation. It includes requirements to provide assistance such as: communication of essential information concerning a flight in an accessible format, and carriage of up to two pieces of mobility equipment per passenger (subject to possible limitations of space aboard the aircraft, and with advance warning).[10]

7.15 Some assistance could be provided to passengers of remotely piloted VTOLs by ground handling staff, for example in relation to boarding and disembarking. Other

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6 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 3(23).

7 UK Regulation (EU) 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew, art 2(11).

8 UK Regulation (EU) 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew, arts 11 and 11a.

9 Aviation Autonomy (2024) Law Commission Consultation Paper 261, para 6.156.

10 Aviation Autonomy (2024) Law Commission Consultation Paper 261, para 6.154.

assistance could potentially be provided by cabin crew. However, it is not clear at this stage whether remotely piloted VTOLs will have cabin crew on board, and we are not aware of any business models which propose this. In those circumstances, in our first consultation paper we considered how it might be possible to incorporate accessibility standards at the pre-deployment, rather than the operational, stage. We identified two ways in which this might be possible: through initial airworthiness standards, and through licensing of operators. We discuss these possibilities below. Neither would result in a requirement that all VTOLs are accessible but should result in there being some accessible VTOLs available, as well as assistance for those with disabilities to access VTOLs.

Accessibility as part of initial airworthiness standards

7.16 We discuss the issue of initial airworthiness and certification for uncrewed aircraft (both non-passenger carrying and passenger-carrying) in detail in chapter 6 of the report. Here we discuss the possibility posed in our first consultation paper that accessibility standards could be incorporated into initial airworthiness standards for VTOLs. In our first consultation paper we noted that the advantage of this approach would be that passenger-only VTOLs designed and manufactured in the UK would be designed to fly safely with passengers with reduced mobility or disabilities from their introduction. Conversely, we recognised a potential drawback that having different standards in the UK from those recognised globally may put UK manufacturers at a disadvantage.

Consultation analysis

7.17 This was an open question and there was no real consensus among consultees about whether accessibility standards should be incorporated into initial airworthiness standards for remotely piloted VTOLs.

7.18 The Civil Aviation Authority ("CAA") Consumer Panel welcomed the Law Commission's approach of considering accessibility at multiple stages. In relation to accessibility at the initial airworthiness stage, they said:

> insofar as possible we feel accessibility standards for persons with disabilities and reduced mobility should be included within initial airworthiness standards.[11]

7.19 Vertical Aerospace felt that it would not be appropriate to incorporate accessibility standards into initial airworthiness:

> Initial airworthiness is not currently the regulatory mechanism that addresses passenger accessibility, instead it is regulated via operational rules and guidelines. Given this context, we propose that initial airworthiness standards for uncrewed VTOLs should not include accessibility standards for passengers with reduced mobility. Doing so would place an additional requirement on UK manufacturers to our foreign competitors.[12]

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[11] CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[12] Vertical Aerospace response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 574, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

7.20 Several consultees felt that addressing accessibility within initial airworthiness standards would take advantage of an opportunity to increase accessibility of air transport:[13]

> I believe accessibility standards for persons with disabilities and reduced mobility should be included in the initial airworthiness standards of the UK passenger-carrying VTOLs. In my opinion, having such distinct standards in the UK, as compared to those recognised globally, is not a potential drawback; rather, it is a necessary distinction for the UK to establish itself as a global leader, paving the way for other countries to follow suit.[14]

7.21 Other consultees felt that there is something unique about VTOLs which might make it difficult to address accessibility as part of initial airworthiness:

> The size of VTOL Capable Aircraft (i.e. 4 to 8 seats) and door aperture dimensions will unfortunately limit accessibility for some people with disabilities and reduce mobility… Inclusion of accessibility features into the basic design of VCA may not be appropriate to some VCA but could be accommodated in others.[15]

7.22 One group of consultees felt that this issue should not be governed by legislation.[16]

7.23 Another group said that accessibility standards should be optional.[17]

7.24 There was a broad range of views as to what accessibility standards should look like for VTOLs and suggestions included: the same accessibility standards for crewed aviation should apply (Drone Major Group);[18] standards should be the same for all passenger-carrying aircraft (Skyports);[19] requirements should be the same for all

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13 In addition to the quotation below, the US Federal Aviation Administration ("FAA"), Clive Lewis of Midlands Aerospace Alliance, UKRI Future Flight Challenge, Professor George Leloudas and Skybound Rescuer also emphasised the importance of this proposal to ensuring equitable access to airspace and air travel.

14 Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

15 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

16 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

17 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

18 Drone Major Group response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 211, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

19 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

aircraft (Association for Uncrewed Vehicle Systems International ("AUVSI"));[20] and requirements should be the same for all similarly situated aircraft (Joby Aviation).[21]

7.25 Finally, the CAA said that this should be subject to further consultation:

> Before introducing any accessibility standards within special conditions or certification specifications for passenger-only VTOLs, we would carry out further consultation with stakeholders and consider any responses through the prism of our own obligations under the Equality Act 2010. We are conscious of the necessity to have due regard to the Public Sector Equality Duty in respect of all relevant policies and decisions, and of how we are able to use our role as the regulator to effect positive change in this area.[22]

Discussion

7.26 There was no consensus amongst consultees about whether accessibility standards should be incorporated into initial airworthiness standards for uncrewed VTOLs. Although some recognised that incorporating accessibility standards would provide an opportunity to make air travel more accessible, and to make the UK a leader in this respect, others felt that – because of the particular features of a VTOL – trying to incorporate accessibility standards at the airworthiness stage could be difficult and potentially make VTOLs commercially unviable. There was therefore disagreement as to whether accessibility standards could and should be incorporated into the airworthiness stage, or at all.

7.27 The CAA is a public authority for the purposes of the Equality Act 2010[23] and is therefore subject to the Public Sector Equality Duty which requires a public body to have due regard, when exercising its functions, to the need to advance equality of opportunity between persons who share a relevant protected characteristic and persons who do not share it.[24] Disability is a relevant protected characteristic.[25] In developing a certification regime for remotely piloted VTOLs, the CAA should therefore take into account the need to advance equality of disabled persons, for example through accessible vehicles. This should, in turn, encourage accessibility by design for this new form of transport. We also note the CAA's commitment – as set out in its response to our consultation – to consult on this issue further as part of its public sector equality duties. In light of this, and the lack of consensus amongst consultees, we do not consider that a formal recommendation is necessary.

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20 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

21 Joby Aviation response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 270, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

22 Civil Aviation Authority ("CAA") response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/. The National Police Chiefs' Council ("NPCC") also highlighted the importance of the PSED in this area.

23 Equality Act 2010, sch 19 part 1.

24 Equality Act 2010, s 149(1).

25 Equality Act 2010, s 149(7).

Operator licensing and VTOL accessibility

7.28 The second way in which we suggested that accessibility standards might be incorporated was through operator licensing. Any firm operating an aircraft carrying passengers or cargo for remuneration needs an Operating Licence and shall not be permitted to carry by air passengers, mail and/or cargo for remuneration and/or hire unless it has been granted the appropriate operating licence.[26] We anticipate that operators of remotely piloted VTOLs, which by their nature will carry passengers, will therefore require an operating licence.

7.29 On the criteria for being granted an operating licence, the CAA's guidance says:[27]

> They relate principally to the place and nature of business; nationality of ownership and control; adequacy of financial resources; the holding of an Air Operator's Certificate; fitness; and passenger and third party insurance.

7.30 We suggested that accessibility standards could be incorporated within licences granted to uncrewed VTOL operators and gave the example of requiring that a certain proportion of an uncrewed VTOL fleet should be capable of carrying mobility equipment, or an assistance dog, should uncrewed VTOLs meeting such standards be available.

Consultation analysis

7.31 There was no broad consensus amongst consultees in response to this question. Various consultees re-iterated the comments they had made in relation to the question on accessibility and initial airworthiness standards (discussed above).

7.32 Both the CAA and the CAA Consumer Panel supported the idea:

> insofar as possible we feel the CAA should be able to include accessibility standards within the licences granted to uncrewed VTOL operators.[28]
>
> This would be a pragmatic approach as opposed to including it within the type certification. The operator can determine how to accommodate accessibility requirements.[29]

7.33 Several consultees emphasized the importance of inclusivity.[30] ADS Group and Chris Daniels of Flare Bright felt that the issue of accessibility is a commercial one rather than a legal one:

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26 UK Regulation (EC) 1008/2008 on common rules for the operation of air services, art 3(1).

27 CAA, *Licensing Airlines in the UK: the framework and criteria for granting Operating Licences, Route Licences and Air Transport Licences* (July 2008) (ORS1) part 1, para 11. See also UK Regulation (EC) 1008/2008 on common rules for the operation of air services, art 4.

28 CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

29 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

30 See Clive Lewis response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 184; Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first

this is a commercial question, rather than one that needs enshrining in law; an OEM should see the commercial benefit of designing a VTOL that accommodates a sizeable chunk of the market, and one that will only grow. Following existing laws is a sensible approach for now.[31]

7.34 Several consultees felt that there should not be specific or additional accessibility requirements for VTOL operators as part of licensing.[32]

Discussion

7.35 Similarly to the question on accessibility and initial airworthiness, there was no consensus amongst consultees as to whether accessibility standards should be included in the licensing regime for operators of uncrewed VTOLs. We discussed above the CAA's obligations to have due regard to advancing equality of disabled people when exercising its functions. Our view is that these obligations would apply similarly to the CAA's development of a licensing regime for operators of remotely piloted VTOLs, and as above, should encourage the design, development and introduction of VTOLs with needs of disabled people in mind.

Certification of the operator

7.36 We discuss the role of the operator in remotely piloted UAS operations more generally in chapter 5 of this report at paragraphs 5.21 to 5.28.

7.37 Operators of crewed CAT are required to be certified. This involves obtaining an air operator certificate ("AOC"). In chapter 6 of our first consultation paper we set out details of the existing process for obtaining an AOC.[33] In summary this involves the operator providing specified information and documentation to the CAA, including an operations manual,[34] providing details of its management system, demonstrating compliance with various operational requirements set out in other regulations, and showing that its organisation and management are suitable and properly matched to the scale and scope of the operation.

7.38 The UAS Implementing Regulation requires all operators of certified category operations to be certified.[35] In our first consultation paper we set out our provisional view that certification of operators of remotely piloted VTOLs is sensible. With no pilot physically in the aircraft, it will be important to make sure that operators are

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consultation (2025) p 478; UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545: https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

31 ADS Group response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 1, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

32 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

33 Aviation Autonomy (2024) Law Commission Consultation Paper 261, paras 6.100 to 6.102.

34 For detail on what an operations manual should include, see: UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex III, ORO.MLR.100 and related AMCs. In summary, the operations manual includes all the instructions, information and procedures for the aircraft operated and covers topics such as flight time limitations, and duty and rest periods.

35 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 3(c).

responsible persons who take the appropriate steps to promote safety. We said that the requirement for a safety management system is a particularly important tool in ensuring the safety of uncrewed aircraft.

Consultation analysis

7.39 30 consultees responded to our provisional proposal that operators of remotely piloted VTOLs should be certified. The vast majority of respondents (27 of 30) agreed, and the remaining three selected a response of 'other'.

7.40 Chris Daniels of Flare Bright and Royal Aeronautical Society ("RAeS") both emphasised the importance of certifying the operator in light of their views on the evolving role of the remote pilot:

> Yes, this is critical – the pilots will become less relevant to the process (as they will have less influence and power over decisions), so the operators need to fulfil a lot of the pilots' current roles.[36]

7.41 UKRI Future Flight Challenge and the CAA Consumer Panel raised a link between operator certification and public confidence:

> it will be important to make sure that operators are responsible persons who take the appropriate steps to promote safety via certification, which will need to be adapted to a crewed and non-crewed VTOL context. This will be important to ensure passenger confidence.[37]

7.42 Several consultees stated that certification should be proportionate to the type of operation and should not necessarily apply across the board for operations in the certified category.

7.43 Various consultees expressed views about the types of certification standards that should apply. Some felt that certification standards equivalent to those for crewed CAT operations should apply (Boeing, 2 anonymous consultees, Drone Major Group Limited, Light Aircraft Association, Altitude Angel).[38] Conversely, Skyports cautioned against this approach.[39]

Discussion and recommendation

7.44 The certification of operators of CAT is rooted in safety. This is recognised by the International Civil Aviation Organization ("ICAO") in its Manual of Procedures for Operations Inspection, Certification and Continued Surveillance, where it says:

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36 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

37 CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

38 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

39 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

> The AOC [air operator certificate] provides the basis for States to regulate the activities of operators and the means for a State to authorize an air operator to commence operations. The AOC, under the control of the issuing CAA, enables the CAA to exercise the continued safety oversight of the operator.[40]

7.45 As noted in our first consultation paper, certification requirements such as having safety management systems in place, and an operational manual, promote safety. In order to ensure equivalent safety between crewed and uncrewed operations, operators of remotely piloted passenger-carrying operations should also be certified.

7.46 We note that several consultees raised the issue of proportionality of certification standards for operators across the certified category. In this chapter we are focussing on CAT operations, and more specifically on passenger-carrying CAT operations, because of the express requirement in our terms of reference to consider VTOLs. We therefore do not make any recommendations about operator certification more broadly than for operators of remotely piloted VTOLs.

7.47 We note the comments from stakeholders regarding the specific certification standards that should apply to operators of remotely piloted VTOLs. Some suggested that standards equivalent to those for crewed operations should apply, others suggested that there needed to be a tailored approach according to the nature of the operation. While it is clear to us that the high-level obligation to obtain certification should apply to operators of remotely piloted VTOLs, our view is that the CAA is best placed to make decisions about the specific certification requirements for operators given its central role in ensuring aviation safety. It may be that standards equivalent to crewed operations apply, or it may be that VTOL specific, or even operation specific, standards are required. Our high-level recommendation leaves flexibility in relation to that, but we highlight the suggestions from consultees which may be helpful when the CAA and Department for Transport ("DfT") develop certification standards.

Recommendation 9.

7.48 We recommend that operators of remotely piloted VTOLs should be certified.

Responsibilities of the operator

7.49 The UK Regulation (EU) 2018/1139 (the "Basic Regulation") sets out various high-level responsibilities of the operator of crewed CAT operations. These are largely concerned with ensuring organisational procedures are in place to enable safe operations. We therefore consider these in the pre-deployment section of the chapter.

7.50 Key existing responsibilities for crewed CAT operations include:

(1) The aircraft operator must have the means necessary for the scale and scope of operations planned. This includes aircraft, facilities, management structure,

[40] ICAO *Manual of Procedures for Operations Inspection, Certification and Continued Surveillance* Doc 8335, Sixth Edition (2022), para 4.1.1.

personnel, equipment, documentation of tasks, responsibilities and procedures, access to relevant data and record keeping.

(2) The operator must use only suitably qualified and trained personnel. It must ensure this training is kept up to date.

(3) It must implement a management system to ensure safety and other essential requirements included in annex V to the Basic Regulation. This must include an occurrence reporting system.

(4) Operations must only take place in accordance with the operations manual.

(5) It must establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour.

(6) It must develop and maintain security programmes suitable for the aircraft and type of operation, including protection of electronic and computer systems to prevent intentional and non-intentional system interference.

(7) It must have a management system to prevent fatigue.

(8) It must ensure the continuing airworthiness of the aircraft, including by relying on continuing airworthiness organisations.

(9) It must make available a checklist system for use by crew in all phases of the operation, covering normal, abnormal and emergency conditions and situations. Procedures must be established for any reasonably foreseeable emergency situation.[41]

7.51 The responsibilities of the CAT operator are supplemented elsewhere, for example in the Air Operations Regulation.

7.52 Our provisional view expressed in our first consultation paper was that all of the responsibilities from the Basic Regulation listed above should be applied to operators of remotely piloted VTOLs. We asked whether consultees agreed.

Consultation analysis

7.53 There was strong support for replicating the above requirements for crewed operations. Most of the 9 responsibilities suggested had support from over 90% of the consultees who answered the question. Many people did not provide any text to expand on their answers, but of those who did, the following views were of note.

7.54 Several consultees emphasised the importance of replicating the responsibilities of operators of crewed commercial air transport.

[41] UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, annex V para 8.

7.55 One consultee, John Milner, said that replicating existing requirements was necessary, but suggested that specific requirements for operators of remotely piloted VTOLs will be needed.[42]

7.56 AUVSI agreed with our provisional proposal, but suggested that in the longer term, more responsibilities may need to fall to the operator as opposed to the remote pilot:

> Looking to scalable future operations, by expanding the responsibilities of the operating organization to encompass more of the traditional PIC responsibilities, then requiring those to be clearly delegated out to personnel that have been appropriately trained and vetted, greater flexibility and safety can be achieved.[43]

7.57 Some consultees made comments in relation to specific operator responsibilities listed in our provisional proposal. The CAA said:

> Yes. In 2, we would suggest "only suitably qualified and 'competent' personnel", instead of “trained” personnel. Training does not necessarily imply competence; the latter also requires experience.[44]

7.58 UKRI Future Flight Challenge suggested that the security programmes referred to in point 6 should include physical and cyber security for the remote pilot operations.[45] Clive Lewis of Midlands Aerospace Alliance, although in response to a later question, said that security programmes should cover the location of the remote pilot.[46]

7.59 Finally, Ramin Norouzi of Dronzit Aerospace, in relation to the final responsibility we proposed, said that:

> the establishment of procedures for emergency situations should not be limited to “reasonably foreseeable” ones. Considering the low flying altitudes of remotely piloted VTOLs in UAM operations, safety implications of emergency circumstances could be more severe. Hence, procedures must be established and provided as checklists even for abnormal and emergency conditions not deemed reasonably foreseeable. This includes establishing procedures for the required tasks in case of a-priori unknown abnormal circumstances.[47]

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42 John Milner response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 289, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

43 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/. PIC is a commonly used abbreviation for pilot-in-command.

44 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

45 UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

46 Clive Lewis response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 184 https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

47 Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

Discussion and recommendation

7.60 The high-level responsibilities we proposed for operators of remotely piloted VTOL operations are concerned with enabling safe operations. They are based on existing responsibilities for operators of crewed commercial air transport and replicating them would contribute to equivalent safety with crewed operations. There was broad support for replicating the high-level responsibilities of operators of crewed commercial air transport. For these reasons we proceed with our recommendation.

7.61 We note the comments from one consultee about the need for more specific responsibilities. We acknowledge that the high-level responsibilities will need to be supplemented by more specific requirements, as is the case with the current regime for operators of crewed commercial air transport. Given that remotely piloted VTOL operations are likely to be a medium-term endeavour, we consider that high level recommendations which leave flexibility to the CAA and DfT to formulate more detailed rules, as and when more information about the nature of these operations become available, is desirable. This will mean that specific consideration can be given to what operator responsibilities are required to ensure safe remotely piloted VTOL operations, and any other future passenger-carrying UAS.

7.62 In relation to the comments concerning some of the operator responsibilities we suggested, which are listed above, we note the CAA's suggestion that the second requirement be changed to 'competent' as opposed to trained. The wording we use in the provisional proposal mirrors the language in the Basic Regulation. Our view, therefore, is that it is sensible to maintain consistency with that Regulation as there is nothing specific to remotely piloted operations which undermines its applicability. Any requirements about particular levels of experience – for example different competencies for different types of VTOL operation, and for other types of passenger-carrying UAS – could be set out in the more specific responsibilities needed to supplement the high-level requirements.

7.63 We note the suggestions about the inclusion of physical and cyber security in point 6, and the suggestion that the location of the remote pilot be covered in the security programmes. These are likely to be relevant considerations for the CAA and DfT when formulating more specific responsibilities of the operator.

7.64 We think that operators of remotely piloted VTOLs should continue to be required to establish procedures for any reasonably foreseeable emergency situation, rather than expanding the requirement to cover non-foreseeable emergency situations. First, the language used in our recommendation mirrors that in the regulation for operators of crewed commercial air transport and our view is that this should ensure equivalent safety. Second, reasonable foreseeability is a recognised legal concept. What is reasonable will vary by context and therefore what is reasonably foreseeable in the context of a remotely piloted VTOL operation, for example taking into account flight at low altitude, will differ to that of a crewed operation. Third, it would be difficult to try and anticipate what is unknown and abnormal.

7.65 The shift of responsibilities towards the operator in the longer term is something that we discuss in more detail in part 3 of our report where we deal with autonomous operations.

Recommendation 10.

7.66 We recommend that operators of remotely piloted VTOLs should continue to be required:

(1) to have the means necessary for the scale and scope of operations planned;

(2) to use only suitably qualified and trained personnel;

(3) to implement a management system to ensure safety;

(4) to ensure operations only take place in accordance with the operations manual;

(5) to establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;

(6) to develop and maintain security programmes suitable for the aircraft and type of operation;

(7) to have a management system to prevent fatigue;

(8) to ensure the continuing airworthiness of the aircraft; and

(9) to establish procedures for any reasonably foreseeable emergency situation.

Additional responsibilities of the operator

7.67 We asked consultees for views on any additional responsibilities that operators of remotely piloted VTOLs should be required to fulfil.

Consultation analysis

7.68 We received a wide range of suggestions about additional responsibilities for operators of remotely piloted VTOLs. We have grouped these as far as possible, into the following areas:

(1) Continuing airworthiness: Boeing said:

> Operational suitability ensures that the certified intended functions and capabilities of the aircraft align with the expected roles and responsibilities of the pilot and other operator personnel. Continued operational safety ensures that the correct version of software is in use on each aircraft, that all maintenance and updates have been conducted appropriately, and that airworthiness can be ensured for each flight.[48]

[48] Boeing response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 68, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

The RAeS said that the operator should "ensure the continuing flightworthiness of the Control and Monitoring Unit, C2 datalink and communications systems."[49] The CAA and others raised a point about the significance of the communications link specifically.[50] UKRI Future Flight Challenge said that:

> operating with a remote pilot places a greater need on the communications systems used between the pilot and the aircraft and ground control station operation. Whilst the installation, ongoing provision and maintenance of these systems can be encompassed by the above, it may be sensible to investigate making specific requirements around these.[51]

ARPAS UK made a related point that operators should develop a multiple communication methodology with the aircraft.[52]

(2) Security programmes: develop and maintain security programmes suitable for the Control and Monitoring Unit (CMU), C2 datalink, communications with passengers and ATS providers, the facilities in which they are located, and type of operation (RAeS);[53] Security of remote pilot stations (CAA).[54]

(3) Accessibility and vulnerability: The CAA Consumer Panel said:

> Accessibility and vulnerability in a crewed/uncrewed VTOL context should also be considered as a potential additional requirement or embedded into existing requirements – particularly for points (2), (5) and (9). There should be clear definitions on the roles, responsibilities and interactions between the remote PiC, ground crew and operator – especially where some responsibilities are delegated… The CAA's performance framework for airline accessibility under Regulation (EC) No 1107/2006 should also be considered.[55]

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49 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

50 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

51 UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

52 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

53 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

54 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

55 CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

(4) Managing a continuous link to air traffic management ("ATM") (Chris Daniels of Flarebright; RAeS; Skybound Rescuer).[56]

(5) A duty to have regard to issues of privacy; noise and use of electromagnetic spectrum (Chris Daniels of Flarebright; RAeS).[57]

(6) Accident reporting and whistleblowing (CAA).[58] Connected with this, ARPAS UK said operators should:

> transparently demonstrate a just culture. Reason being as a new industry, one needs to be whiter than white and avoid any sort of impropriety or accusations of burying any sort of bad news.[59]

(7) Human Factors/Human Performance training, management and oversight (NPCC);[60] Human factors responsibilities beyond fatigue (UKRI Future Flight Challenge).[61]

(8) Training in relation to multiple simultaneous operations: Boeing said that:

> For concepts of operations that pair one remote pilot with multiple aircraft (1:N) or have a team approach where multiple remote pilots oversee multiple aircraft during different phases of flight (M:N), it is essential that the operating manuals and training adequately cover the necessary procedures.[62]

(9) Ensuring the remote pilot complies with all appropriate standards (British Gliding Association Limited; British Hanggliding and Paragliding Association).[63]

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56 See Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167; Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

57 See Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167; Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419 https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

58 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

59 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

60 NPCC response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 375, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

61 UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

62 Boeing response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 68, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

63 See British Gliding Association response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 78, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; British Hang Gliding and Paragliding Association response, Law Commission, Aviation

(10) Other suggestions made by one consultee each were: Cyber security compliance (CAA);[64] Monitoring weather conditions (Skybound Rescuer);[65] taking responsibility for integrating with existing aviation operations (John Milner);[66] continuous education and training to stay updated with the latest safety protocols (Skybound Rescuer).[67]

7.69 An anonymous consultee suggested that to a certain extent, this should be for the operator to determine:

> Operators should analyse what additional risk arises in their operation by virtue of the 'remoteness factor'. That additional risk may vary considerably depending on the nature of the operation. It is likely to identify extra steps, often on an operation-specific basis, which each operator should carry out.[68]

7.70 AUVSI made a similar point.[69]

Discussion

7.71 We received wide-ranging suggestions from consultees regarding additional responsibilities for operators of remotely piloted VTOLs. The recommendation we make above sets out nine responsibilities for operators of remotely piloted VTOLs which are high-level enough to apply to all operators of remotely piloted VTOLs. Our view is that many of the suggestions made by consultees above would fall under those high-level responsibilities.

7.72 The CAA noted in its consultation response that: "there are unknowns in this operating environment that will undoubtedly require addressing".[70] We agree with this statement. There are likely to be many more formal, and specific, responsibilities needed for operators of remotely piloted VTOL operations, but it is difficult for us to make recommendations about exactly what they should be at this stage. As we said in our first consultation paper, much will depend on how crewed VTOLs are regulated in the UK. Although the CAA is making progress in this respect, that regulatory

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autonomy: Responses to the first consultation (2025) p 91, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

64 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

65 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

66 John Milner response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 289, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

67 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

68 Anonymous 4 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 663, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

69 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

70 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

framework has not yet been developed.[71] Further, many of the rules which will be needed to supplement our high-level recommendations are likely to be technical ones about safety, which the CAA as regulator is best placed to decide. This is the backdrop to our discussion of suggestions for additional responsibilities. We deal with each group of suggestions in turn.

7.73 Suggestion 1: continuing airworthiness. Our recommendation about operator responsibilities above included a recommendation that operators ensure the continuing airworthiness of the aircraft. We note that stakeholders suggested that this should include the command unit, the data link and communications systems. In chapter 6 of this report we discussed ICAO amendment 108 to Annex 8 on airworthiness of aircraft and noted that this covers airworthiness of not only remotely piloted aircraft and helicopters, but also the command unit and the C2 link. We noted that it is our understanding that the UK will implement the standards and recommended practices into domestic law. It is therefore sensible that the operator should be responsible not only for the continuing airworthiness of the aircraft, but also of the command unit and the C2 link. We consider that the wording of our high-level recommendation above is broad enough to cover the command unit and the C2 link. This is the approach taken by ICAO: airworthiness of aircraft covers the command unit and the C2 link as well.

7.74 Suggestion 2: security programmes. We consider that our high-level recommendation to develop and maintain security programmes suitable for the aircraft and type of operation is broad enough to cover the command unit, the C2 datalink and other communications.

7.75 Suggestion 3: accessibility and vulnerability. We discussed accessibility earlier in this chapter where we noted our view that the Persons with Reduced Mobility Regulation would in principle apply to VTOLs. It therefore follows that operators of remotely piloted VTOLs should be subject to any airline accessibility framework introduced by the CAA, which would assist in making airlines accountable for upholding the rights of disabled persons and persons with reduced mobility.[72] In the operational issues part of this chapter, we make recommendations about the roles and responsibilities of key actors involved in passenger-carrying UAS operations and discuss the issue of delegation. We therefore do not consider that any further recommendations need to be made here. Above, we discuss the problem that accessibility requirements do not currently cover the design of aircraft, but make suggestions about how the CAA could, through complying with its duties under the public sector equality duty, improve accessibility in this respect.

7.76 Suggestion 4: managing a continuous link to ATM: There is no requirement for operators of crewed commercial air transport to manage a continuous link to ATM. There is a responsibility for operators to ensure that air traffic services (“ATS”) appropriate to the airspace and the applicable rules of the air are used for all flights

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71 See, for example CAA, *Advanced Air Mobility eVTOL Delivery Model* (CAP 3169) (September 2025).

72 See CAA, *Performance Framework for Airline Accessibility* (April 2023) (CAP 2486) for a discussion of the potential introduction of such a framework.

whenever available.[73] The consultees who made the suggestion about a continuous link to ATM did not elucidate upon the rationale for this, including whether there is anything specific to remotely piloted operations which means that a continuous link, rather than an obligation in similar terms to the existing one referred to, would be necessary. In any event, it is not clear to us at this stage whether remotely piloted VTOLs will require traditional ATM services and we therefore do not consider that a recommendation is appropriate at this stage. We discuss air traffic management and air navigation services for UAS further in chapter 9.

7.77 Suggestion 5: privacy, noise and electromagnetic spectrum. We discuss the issue of nuisance and trespass in chapter 12. We refer readers to that chapter for discussion of issues relevant to that suggestion, and while we agree that these are issues that operators should be mindful of, we do not consider that a formal recommendation is necessary above and beyond those made in chapter 12. There are wider policy issues raised by this point which require consideration by the DfT and the CAA.

7.78 Suggestion 6: accident reporting and whistleblowing. The CAA suggested that the operator should be responsible for occurrence reporting.[74] We discuss this suggestion further below at paragraphs 7.98 to 7.109. The CAA also suggested whistleblowing as an operator responsibility. ARPAS UK's comments about transparently demonstrating a just culture are connected to this. The CAA's guidance on safety management systems for crewed operations envisages that:

> The safety policy should actively encourage effective safety reporting by defining a just culture. This should define the line between acceptable and unacceptable performance and provide fair and just protection to all personnel.[75]

The guidance also says that just culture policy and supporting processes should be covered in the safety management system,[76] and that a confidential reporting system should be established to encourage safety reporting, with appropriate protection for the reporter.

7.79 We anticipate that, in a similar way to the crewed context, the CAA would issue guidance to supplement the operator's high-level responsibility to implement a safety management system. The guidance will be for the CAA to draft but, we anticipate it is likely that it would contain similar guidance on just culture in order to ensure equivalent safety. Given this, we consider that our high-level recommendation is sufficient and that it is not necessary in legislation to set out formal obligations regarding just culture and whistleblowing.

7.80 Suggestion 7: human factors management and training. The NPCC suggested that the operator should be responsible for human factors training, management and

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73 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex IV, CAT.OP.MPA. 100.

74 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

75 CAA, *Safety Management Systems (SMS) guidance for organisations* (February 2015) (CAP 795) p 6.

76 CAA, *Safety Management Systems (SMS) guidance for organisations* (February 2015) (CAP 795) p 11.

oversight.[77] We consider that this would likely be covered by the recommendation above that the operator be required to implement a management system to prevent fatigue. UKRI Future Flight Challenge suggested that the operator should have responsibilities in relation to human factors beyond fatigue.[78] We consider that broader human factors would probably be covered as part of the high-level obligation on the operator to implement a safety management system (as recommended above). The CAA's guidance on safety management systems for crewed operations says that:

> A safety management system is a systematic and proactive approach for managing safety risks. As with all management systems, SMS includes goal setting, planning, and measuring performance. An effective safety management system is woven into the fabric of an organisation. It becomes part of the culture; the way people do their jobs. Safety management goes beyond compliance with prescriptive regulations, to a systematic approach where potential safety risks are identified and managed to an acceptable level.[79]

As such, we do not consider that a separate recommendation is required in relation to this suggestion.

7.81 Suggestion 8: training relating to multiple simultaneous operations ("MSO"): this suggestion would likely be covered by our high-level recommendation that operators should use only suitably qualified and trained personnel. In chapter 6 of this report we discuss MSO. We note in that context that consultees felt that remote pilots should have specific training for MSO though, for the reasons set out there, we did not make a formal recommendation about this. We do not think it is necessary at this stage to set out any specific obligation regarding training for remote pilots of MSO, but our high-level recommendation leaves flexibility for more specific requirements to be formulated at a later date, perhaps once experience has been gained from any MSO that are approved in the specific category.

7.82 Suggestion 9: remote pilots and compliance with standards. Our view is that this suggestion would be covered by our recommendation above that the operator should ensure that operations only take place in accordance with the operations manual. Further, we recommend below that remote pilots should ensure that aircraft operating limitations will not be exceeded at any time during flight, and the remote pilot is also likely to be obliged to comply with relevant rules of the air. We therefore do not consider anything further is needed in this respect. The remote pilot will have their own obligations to comply with necessary operational rules.

7.83 Suggestion 10: miscellaneous. We think that cyber security compliance would fall within the scope of the recommendation that the operator develop and maintain security programmes; monitoring of weather conditions is likely to be the primary responsibility of the remote pilot (whose responsibilities are discussed further below at

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77 NPCC response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 375, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

78 UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

79 CAA, *Safety Management Systems (SMS) guidance for organisations* (February 2015) (CAP 795) p 2.

paragraphs 7.123 to 7.141); taking responsibility for integrating with existing aviation operations is linked to the provision of uncrewed aircraft systems traffic management and is discussed further in chapter 9; we think that education and training to stay updated with the latest safety protocols could be covered by the requirement to develop a safety management system, as recommended above.

7.84 In conclusion, we consider that our high-level recommendations leave flexibility for more specific rules to be developed in relation to the areas suggested by consultees as it becomes clearer what specific responsibilities are necessary. There is also the scope for various of these suggested obligations to be incorporated into the operations manual which, as discussed at paragraph 7.37 then effectively mandates those rules for operations.

Remote pilot licences

7.85 Pilots of crewed commercial air transport are required to hold a commercial pilot licence.[80] As we explained in our first consultation paper, we expect that licences for pilots of crewed VTOL will be introduced before uncrewed VTOLs come into service in the UK. In relation to this, the CAA, in its eVTOL Delivery Model, says:[81]

> Flying an eVTOL aircraft commercially will initially require a pilot to hold a commercial pilot licence (helicopter or aeroplane) and secure a type-rating specific to the aircraft to be flown... Ab Initio routes will require collaboration through ICAO and, if feasible, may be considered beyond 2030.

7.86 The CAA recently consulted on a policy framework for new types of VTOLs and in relation to pilot licensing, said:[82]

> We propose to use the existing licensing framework in UK Regulation (EU) 1178/2011, with appropriate amendments, to deliver a licensing pathway for the operation and integration of new types of VTOL aircraft into the UK aviation sector. We propose to enable a pilot licensing pathway for commercial and non-commercial operations using the principles of existing licensing requirements for Powered-Lift. We propose to use the basic framework of the Helicopter rating for Non-Conventional Helicopters.

7.87 In our consultation paper, we provisionally proposed that licences should be required for remote pilots of VTOLs. We proposed that so far as appropriate, licences for remote pilots of VTOLs should follow classes and ratings adopted for crewed VTOLs.

Consultation analysis

7.88 Twenty two people agreed with this proposal; two people disagreed and five selected a response of other. The majority of people who responded therefore agreed with the proposal for remote pilots to be licensed. In terms of the suggestion that these should,

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80 UK Regulation (EU) 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew, annex I subpart CPL.

81 CAA, *Advanced Air Mobility eVTOL Delivery Model* (Sept 2025) (CAP 3169) p 14.

82 CAA, Consultation: policy framework for new types of Vertical Take-Off and Landing (VTOL) aircraft (Nov 2025) (CAP 3186) p 5.

as far as possible, follow classes and ratings adopted for crewed VTOLs, consultees were divided.

7.89 Of those who selected 'yes' in response to the question, several articulated support for using relevant aspects of the licensing regime for crewed VTOLs (Skybound Rescuer, anonymous, British Gliding Association, British Hang Gliding and Paragliding Association, Ramin Norouzi of Dronzit Aerospace, Joby Aviation, Light Aircraft Association).

7.90 Others who answered 'yes' noted that there may need to be differences in the licensing regime for remote pilots of VTOLs. For example, Vertical Aerospace said:

> We support the existing ICAO classification system for pilot licensing but emphasise the importance of flexibility to accommodate the specific skills needed for remote operation of VTOL aircraft. Traditional stick and rudder skills are less relevant for remote operators, especially when dealing with highly autonomous aircraft. Whereas systems management and situational awareness tailored to remote operations become crucial.[83]

7.91 Several consultees who responded by selecting 'other' expressed doubt about the applicability of the licensing regime for pilots of crewed VTOLs to remote pilots of uncrewed VTOLs:

> In practice, there is minimal overlap between the manual skills needed to directly manipulate the onboard flight controls of an aircraft and to oversee the remote operation of a highly automated or autonomous aircraft from a ground-based command unit. Instead of traditional stick and rudder skills, remote pilots must be adept at systems management and oversight. Airspace awareness, flight planning, and voice communications are skills that are applicable to both conventional onboard and remote pilots. Experience gained in a conventionally piloted aircraft may or may not be relevant to remote operations, particularly for uncrewed aircraft with a high degree of automated or autonomous contingency handling. Thus, care should be taken when applying the same requirements to pilots for both crewed and uncrewed aircraft.[84]

7.92 Only two consultees answered 'no' to the question. AUVSI said:

> The skills that are needed to safely fly an aircraft while on board that aircraft, particularly those traditional stick and rudder skills assumed to be necessary to control an aircraft's flight path, are not relevant to the remote operator…Requiring traditional licencing for remote VTOL pilots is unnecessary, will exacerbate the

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[83] Vertical Aerospace response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 574, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[84] Boeing response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 68, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

existing pilot shortage, and will take valuable training time away from experience that is much more relevant to the remote operation of highly autonomous aircraft.[85]

7.93 Finally, Chris Daniels of Flare Bright and RAeS felt that the position may change as automation increases and that provisions should not be prescriptive.[86]

Discussion and recommendation

7.94 Pilot licensing ensures that pilots have the relevant practical and theoretical knowledge to conduct operations. Pilots of crewed CAT operations must hold a commercial pilot licence. In order to ensure equivalent safety for remotely piloted CAT operations, our view is that remote pilots should require a licence. The majority of consultees who responded to this question agreed that remote pilots should be licensed. We remain of the view that this recommendation should be made.

7.95 In relation to the applicability of the licensing regime for pilots of crewed VTOLs, we note the concerns raised by various consultees about the extent to which this will be relevant to the licensing of remote pilots and note in particular the practical differences in piloting a crewed and uncrewed VTOL as highlighted by consultees above.

7.96 While we agree that there are likely to be aspects of the licensing regime for crewed VTOLs which are less relevant for remote pilots of VTOLs, our view is that it is likely to be a good starting point. Only two consultees explicitly disagreed with this, and the others either explicitly agreed, or agreed that it would be relevant to a certain extent. The formulation of our recommendation is flexible enough to allow for relevant aspects of any existing regime for crewed VTOLs to be replicated, and for irrelevant parts to be disregarded. It will, in turn, allow for innovation by not requiring remote pilots to meet standards that are irrelevant to the remote piloting of VTOLs. The specific requirements will be for the CAA and DfT to determine in developing the licensing regime for remote pilots of uncrewed VTOLs.

Recommendation 11.

7.97 We recommend that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs.

Capability to detect and record information regarding accidents

7.98 A final pre-deployment issue, relating to the UAS itself, is ensuring that the UAS is capable of detecting and recording information regarding accidents.

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85 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

86 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

7.99 Part D of annex III to the Air Operations Regulation sets out equipment which must be carried by aircraft. One type of equipment listed is a flight data recorder.[87] The Air Operations Regulation states that for CAT operations, it is the commander's responsibility to check that flight recorders are working properly.[88]

7.100 In the operational issues part of this chapter (below), we discuss the reporting responsibilities of pilots of crewed CAT operations. We make a recommendation that the remote pilot of a VTOL should have the same reporting responsibilities. In order to assist with meeting these responsibilities, given that the pilot is not onboard the aircraft and so not directly aware of for example so-called near-misses, we proposed in our first consultation paper that a remotely piloted VTOL should be capable of detecting and recording information relating to accidents and near accidents, for the purposes of reporting.

Consultation analysis

7.101 29 people responded to this question and the majority (24) agreed with the provisional proposal; one disagreed, and four selected a response of 'other'.

7.102 Of the consultees who agreed with the provisional proposal, several did not expand on their answers other than to say the position should be the same as for crewed aircraft.

7.103 The CAA agreed with the proposal but said:

> The CAA will need to do more technical work to define what the detecting 'criteria' are. It may be different to current operations based on the operating models. The remote pilot may not have the visual and audio queues associated with bird strike, vibration etc and whilst the responsibility sits with the pilot, it is the operator who must ensure that such events are brought to their attention for reporting.[89]

7.104 An anonymous consultee who selected a response of 'other' set out a helpful discussion of why recording capabilities should be required in this context but not in the context of light aircraft:

> To the extent this is reasonably compatible with the technology, I agree. It is worth noting that light aircraft performing commercial operations are not required to carry FDRs etc, since the technology is not compatible. Some may question why, in principle, comparable advanced platforms carrying comparable numbers of passengers should be subject to a different regime simply because they are 'novel' or 'advanced'. The answer lies in two factors: first, that without a pilot on board there is a limit on the available evidence of what happened before an accident. Second, where highly automated technology is employed it may prove much easier to record data and if so the regulatory regime should take advantage of that capability. There

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87 See UK Reg (EU) 965/2012, annex IV, CAT.IDE. A.190 and CAT.IDE.H.190 which deal with the requirements for airplanes and helicopters respectively to be equipped with a flight data recorder, and the details of what is to be recorded.

88 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex IV, CAT.GEN.MPA.105(a)(10).

89 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

are likely to be many other advantages in terms of monitoring equipment performance or (if relevant) crew behaviour. We have heard intending operators of AAM equipment argue forcefully for a full OEM-backed equipment performance and health monitoring system and it does not seem a great step from that to gathering the type of data that an accident investigator would wish to have.[90]

7.105 The US Federal Aviation Administration, also selecting 'other' suggested that the type of information gathered by the recorder would be useful for legal purposes:

> Due to the new and novel aspect of a remotely piloted VTOL, data available during an accident investigation will be critical to determining root cause and having industry learn from those failures. Flight and ground data recorder (separate data recorders both onboard the aircraft and at the ground control station) would be needed to evaluate not only the commands understood by the aircraft systems but by the control station and remote pilot, if applicable, as well.[91]

7.106 Other views included that the requirement would increase public confidence (Skybound Rescuer);[92] that the requirement should be proportionate, for example it might not be possible for smaller vehicles (Clive Lewis of Midlands Aerospace Alliance);[93] that a system similar to the helicopter Health and Usage Monitoring System ("HUMS") would be appropriate (NPCC);[94] that consideration should be given to whether flight data recording is subject to its own regime for equipment integrity (anonymous).[95]

Discussion and recommendation

7.107 There was widespread support for this proposal. We note that the Initial Airworthiness Special Condition and Means of Compliance for VTOLs[96] as adopted by the CAA in 2024[97] requires that recorders are installed so as to ensure accurate and intelligible recording and appropriate safeguarding of data for accident investigation. Our view is that it is sensible to have a similar requirement for remotely piloted VTOLs. This capability will assist with accident investigation and provide remote pilots with information that they need in order to enable them to comply with similar reporting

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90 Anonymous 4 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 663, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

91 FAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 233, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

92 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

93 Clive Lewis response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 184, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

94 NPCC response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 375, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

95 Anonymous 4 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 663, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

96 European Aviation Safety Agency ("EASA"), *Special Condition Vertical Take-off and Landing (VTOL) Aircraft* (Doc No SC-VTOL-01) (July 2019) VTOL.2555.

97 CAA, *Adoption of EASA Special Condition Vertical Take-Off and Landing (VTOL) aircraft and the Means of Compliance* (ORS 9, Decision No 37) (14 March 2024) https://www.caa.co.uk/our-work/publications/documents/content/ors9-no-0037/.

conditions to pilots of crewed CAT operations (which is discussed further below). This in turn should assist with future safety.

7.108 We acknowledge the CAA's comment that technical work is required. We also note the comments above as to the potential use of electronic conspicuity and detect and avoid technology to meet this obligation. Our view is that the high-level formulation of our recommendation means that the technical detail, and the practicalities of complying with the requirement, can be worked out by the CAA and DfT in due course. Suggestions noted above at paragraph 7.106 such as for a system similar to HUMS, and that there be a separate regime for equipment integrity, can be considered at that stage.

Recommendation 12.

7.109 We recommend that a remotely piloted VTOL should be capable of detecting and recording information relating to accidents and near accidents.

7.110 Our recommendation is concerned with the capability to detect and record information. As is the case for crewed operations, there will need to be further rules about when it is necessary to use this capability.

7.111 Below we recommend that the remote pilot should be responsible for checking that specified instruments and equipment are installed and operative. We leave the detail of specific instruments and equipment to the CAA and DfT to decide, but one option might be to include detecting and recording equipment and systems within that list, thereby making it the remote pilot's responsibility to check that it is operational.

7.112 Finally, we note that it is likely that there will be a remote control centre, or an operations centre, where remote pilots are stationed. It may be that – in order to further aid investigations of accidents – the CAA and DfT may wish to consider whether recordings should be made of the remote pilot in that operations centre, if this is not captured by the on-board flight recorder.

OPERATIONAL ISSUES

7.113 In this part of the chapter, we make recommendations relating to the remotely piloted VTOL operation itself, namely the issues arising immediately prior to, during, and after flight.

7.114 An overarching theme in this part of the chapter is the division of responsibilities between the remote pilot, the operator, cabin crew and ground handling staff, and whether these need to change when the pilot is no longer on board the aircraft. As set out in the introduction to the chapter, in existing crewed CAT operations, there is already a high level of delegation from the commander to cabin crew and ground handling staff, but nevertheless the commander remains legally responsible for meeting these obligations. Where the commander is no longer located on board the aircraft, and cannot directly confirm that operational requirements are met, the significance of the delegation becomes greater. We therefore consider whether it

makes more sense for responsibilities to shift from the commander to another actor in these circumstances.

7.115 On the whole, given that most of the operational responsibilities of the commander which are discussed in this part of the chapter are closely connected with the safety of the operation – and given the commander's ultimate responsibility for the safety of flight as discussed at paragraph 7.7 above – we recommend that existing operational responsibilities of the commander should be replicated for the remote pilot.

Flight preparation

7.116 The Basic Regulation sets out the following responsibilities of the pilot-in-command which are then expanded upon in other parts of annex V:

(1) the aircraft is airworthy;

(2) specified instruments and equipment are installed and operative;

(3) the mass of the aircraft and centre of gravity location are such that the flight can be conducted within prescribed limits;

(4) all cabin baggage, hold luggage and cargo is properly loaded and secured; and

(5) aircraft operating limitations will not be exceeded at any time during flight.[98]

7.117 There are other responsibilities relating to flight preparation in the Basic Regulation but those in the above list are, in our view, the key responsibilities which should apply to remote pilots of VTOLs. The existing responsibilities in annex V of the Basic Regulation do not apply to UAS.[99]

7.118 In our first consultation paper we noted that the above checks are currently carried out either by the pilot of the crewed aircraft themselves, or through a mixture of information provided by the aircraft and ground staff.[100] Our provisional view was that these responsibilities should be replicated for the remote pilot. They could be fulfilled either by the remote pilot directly, or in a similar way to crewed operations, through a combination of information from the aircraft and ground staff. We considered that it was necessary to have one person, the remote pilot, ultimately responsible for these preparatory checks. We asked for views.

Consultation analysis

7.119 We received 28 responses to this proposal. Each of the five responsibilities suggested for the remote pilot received a high level of support.

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98 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, annex V, para 2(c).

99 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 29.

100 Aviation Autonomy (2024) Law Commission Consultation Paper 261, para 6.68.

7.120 There was broad recognition of the fact that delegation of these preparatory checks already takes place today in the context of crewed operations, and that the remote pilot will also need to do this.[101]

7.121 Some consultees felt that the remoteness of the pilot, and the consequent inability personally to check the information provided when these responsibilities are delegated, means that there needs to be more formal rules about delegation, and more training and assurance methods:

> it will be very important to ensure the relationship between the PiC and ground crew and allocated responsibilities are very clearly defined and regulated. It could be argued that ground staff/crew will have an even more important role than today's ground handling staff as the PiC will be relying on the 'eyes on the ground' to ensure all baggage and specialist equipment is properly loaded with due care and secured. Consideration should be given to more training and assurance methods around the role and responsibilities of ground crew/staff and operator's responsibilities.[102]

7.122 A minority of consultees felt that the remote pilot should not be responsible for these preparatory checks at all. Consortiq felt that it would make more sense for the operator to be responsible:

> I think this falls to the operator, not the remote pilot. The remote pilot should be checking whatever information is available to them to confirm those facts, but they don't ensure it (who is accountable vs responsible). What are the considerations for if the remote pilot is not located in the geographic vicinity of the aircraft?[103]

Discussion and recommendation

7.123 The key flight preparation responsibilities set out in this proposal are closely connected with safety of the flight. In the crewed context, these responsibilities currently lie with the commander as the actor responsible for overall safety of the operation, even though in practice there is often delegation to ground crew and the use of instruments to indicate that the requirements are met. In the context of remotely piloted CAT operations, the remote pilot as the commander remains the key individual responsible for safety (as per our recommendation at paragraph 4.67). In order to ensure equivalent safety to crewed operations, we recommend that the remote pilot should have ultimate responsibility for these pre-flight checks, even if practical assistance is provided by others, or by technology, in meeting these responsibilities. There was widespread support for this approach amongst consultees.

7.124 We note that a minority of consultees felt that the operator should be responsible for these checks. Although the operator is responsible for the management of the UAS, they would not necessarily be any more proximate to the UAS than the remote pilot and would still be likely to rely upon delegation to ground staff, or information from

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101 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

102 CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

103 Consortiq response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 194, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

instruments, to satisfy themselves that the requirements were met. Given this, and what we say above, we recommend that the responsibilities remain with the remote pilot.

7.125 More detailed rules or guidance are likely to be needed to supplement the responsibilities of the remote pilot, for example setting out the specified instruments and equipment which need to be checked on the VTOL.[104] It would be difficult to set out these more detailed requirements at this stage because they may be VTOL specific. We consider that the CAA is best placed to formulate those more specific requirements, and we draw the CAA's attention to the suggestions of stakeholders below – as part of the discussion on additional responsibilities of the remote pilot – about equipment and instruments that they think a remote pilot should be responsible for checking, such as C2 links.

7.126 As a result of the anticipated lack of proximity between the remote pilot and the VTOL, it is likely that the remote pilot will need to rely upon ground staff to a greater extent in carrying out the preparatory checks. It may be the case that over time, the technology on board VTOLs develops so that the VTOL can itself provide information about the checks, and there is less need for assistance from ground staff. While we think it remains sensible for the remote pilot to be legally responsible for the preparatory checks, it may be useful for guidance to be published which sets out how the remote pilot can satisfy themselves that pre-flight checks are met. This could include how the pre-flight inspection takes place, any limits to delegation, how information is relayed to the remote pilot, and what happens where the remote pilot has any doubts about the checks or information relayed. Our view is that this could be met either though formal guidance from the CAA, or by the operator as part of the operations manual.

Recommendation 13.

7.127 We recommend that the remote pilot of a VTOL should be required to ensure that:

(1) the aircraft is airworthy;

(2) specified instruments and equipment are installed and operative;

(3) the mass of the aircraft and centre of gravity location are such that the flight can be conducted within prescribed limits;

(4) all cabin baggage, hold luggage and cargo is properly loaded and secured; and

(5) aircraft operating limitations will not be exceeded at any time during flight.

7.128 In light of the above, we do not consider that legal responsibility needs to be extended to ground handling staff at this stage. The responsibilities remain with the key

[104] Under annex V point 2 c(iii) of the Basic Regulation, the pilot-in-command must be satisfied that certain instruments and equipment are installed in the aircraft and are operation. The list of instruments and equipment this applies to are set out in annex V point 5.

individual responsible for safety. There is no need to duplicate these legal responsibilities and our view is that making one person legally responsible promotes clarity and, in turn, safety.

7.129 In part 3 of our report we look at recommendations relating to the longer term and note the shifting role of the operator. It may be that over time, it becomes sensible to shift this type of responsibility to the operator but for the time being, and given the remote pilot's on-going central role in relation to safety of the flight, we consider it appropriate for the remote pilot to retain this responsibility.

Additional responsibilities of the remote pilot: flight preparation

7.130 We asked consultees whether there are any additional responsibilities that a remote pilot of a VTOL should be required to fulfil.

Consultation analysis

7.131 ARPAS UK felt that there should be no additional responsibilities for the remote pilot. They said:

> In fact the responsibilities need to dial down away to only focus on the operation of the flight and not the ancillary work.[105]

7.132 AUVSI said that any additional responsibilities should not necessarily be in legislation

> No additional responsibilities have been identified at this time. Utilization of the Operator's training program and manuals can ensure that any additional, aircraft- or operation- specific responsibilities are identified and appropriately fulfilled without regulatory expansion.[106]

7.133 Various consultees made suggestions about additional responsibilities for the remote pilot. Several related specifically to checks on instruments and equipment, for example, Clive Lewis of Midlands Aerospace Alliance suggested that remote pilots should be responsible for "the assurance of adequate data links for monitoring and control".[107]

7.134 Another theme related to flight authorisations and communications with ATS units was:

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105 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

106 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

107 Clive Lewis response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 184, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

ensuring that the necessary flight authorisations / approvals are in place and communication has been established with any relevant ATS units or other relevant service providers.[108]

7.135 RAeS made a broader point about the remote pilot's responsibility for operational planning:

> a remote VTOL pilot should be responsible for the operational planning (i.e weather conditions, airspace restrictions, the intended flight path, noise abatement procedures) and/or to ensure that appropriate flight conditions are available prior to the operation of the VTOL in the event the operational planning is done centrally.[109]

7.136 Other suggestions included responsibilities relating to:

(1) A legal method of ensuring they [passengers] do as they are told and are monitored throughout a flight to see that they are not compromising the safety of the flight in any manner.[110]

(2) Emergency landing procedures.[111]

(3) Monitoring and sharing weather conditions (Skybound Rescuer and the Met Office respectively).[112]

(4) Continuous education and training (Skybound Rescuer).[113]

(5) Ramin Norouzi of Dronzit Aerospace suggested:

> responsibility to oversee multiple aircraft alertly without degradation in decision-making capability, and the responsibility to effectively and efficiently interact with advanced systems currently not existing on conventional aircraft.[114]

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[108] NATS response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 346, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[109] Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[110] Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[111] Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[112] Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, Met Office response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 341, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[113] Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[114] Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

Discussion

7.137 While, as set out above, our view is that the list of specific instruments and equipment to be checked by the remote pilot should be formulated by the CAA and DfT, we highlight the suggestions made by stakeholders in this respect in response to our consultation question on additional responsibilities.

7.138 Several of the operational responsibilities suggested are governed by the rules of the air (communications with air traffic services, and flight plans and approvals or authorisations). Although these are sensible suggestions, for the reasons we discuss in chapters 8 and 11 of this report, we are not making recommendations about the application of particular rules of the air to operations in the certified category. However, we highlight to the CAA and DfT that there is support for these aspects of the rules of the air to be applied to passenger-carrying remotely piloted UAS operations.

7.139 Further, the suggestions covered by the rules of the air, and those relating to operational planning by the remote pilot are not issues which are specific to passenger-carrying remotely piloted UAS operations and while we highlight them to the CAA and DfT, they are broader issues which are outside the scope of this chapter. We discuss rules of the air in chapters 8 and 11, and operational issues relating to remotely piloted UAS more generally in chapter 6.

7.140 Other suggestions are dealt with elsewhere in this report. The maintenance of order on the flight is discussed at paragraphs 7.186 to 7.195, 7.207 to 7.216 and 7.226 to 7.232 below. Education and training of pilots would be covered by the recommendation at paragraph 7.97 above. Multiple simultaneous operations are discussed in chapter 6 of this report.

7.141 For the reasons above we do not consider that any additional recommendations are needed.

Conduct of flights

7.142 In this section of the chapter, we look at responsibilities relating to the conduct of the flight and in particular keeping passengers safe on board both during normal flight and in emergencies. We discussed these responsibilities in detail in chapter 6 of our first consultation paper and noted that commanders have particular responsibilities as a result of their involvement in commercial air transport and consequent carriage of members of the public.[115] Below is a summary of the key existing responsibilities:

(1) For CAT operations, the commander must not allow a person to be carried in the aircraft who appears to be under the influence of alcohol or drugs to the extent that the safety of the aircraft or its occupants is likely to be

[115] Aviation Autonomy (2024) Law Commission Consultation Paper 261, paras 6.33 to 6.42.

endangered.[116] They may also refuse to transport passengers if their carriage increases the risk to the safety of the aircraft or its occupants.[117]

(2) The pilot-in-command is responsible for ensuring that passengers are given a safety briefing[118] and for ensuring that they are seated and wear seat belts during taxiing, take-off and landing, and whenever else deemed necessary.[119]

(3) Section 94(2) of the Civil Aviation Act 1982 gives the commander powers to take reasonable measures against people on board the aircraft (including restraint) to: protect the safety of the aircraft or of persons or property onboard; maintain good order and discipline; disembark or deliver the person in question to a constable or immigration officer.

(4) Section 94(3) of the Civil Aviation Act 1982 allows any member of the crew of an aircraft when required by the commander, or any member of crew or other person on board the aircraft when requested or authorised by the commander, to render assistance in restraining a person, in circumstances where the commander would have authority to do so under section 94(2).

(5) Section 94(3) also allows a crew member or other person*, without* the authority of the commander, to take reasonable measures – including restraint – in relation to any person on board if they have reasonable grounds to believe that the measures are immediately necessary to protect the safety of the aircraft or of persons or property on board the aircraft.

7.143 Some of these responsibilities require adjustment where the pilot is not on board, or near the aircraft. Others require adjustment to take account of the fact that there may or may not be cabin crew on board remotely piloted VTOLs. We discuss this further below.

Carriage of passengers under the influence of drink or drugs

7.144 In our first consultation paper we proposed that the operator should be responsible for preventing passengers from boarding when: (1) they appear to be drunk or under the influence of drugs, and (2) their carriage would endanger the safety of the aircraft or other passengers. This is a change from the crewed commercial air transport context where the responsibility lies with the commander to not allow a person to be carried in the aircraft who appears to be under the influence of alcohol or drugs to the extent that the safety of the aircraft or its occupants is likely to be endangered. In our first consultation paper we explained that, although in practice it would be ground staff who prevented passengers from boarding, it made sense for the operator to have ultimate responsibility because it is not realistic to expect a remote pilot to be able to form an assessment of this before passengers embark. We noted that as VTOLs may not have any members of crew on board, it is particularly important to take pre-

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116 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex IV, CAT.GEN.MPA.105(a)(5).

117 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex IV, CAT.GEN.MPA.105(a)(6).

118 Air Navigation Order 2016 SI No 765, arts 73, 106 and 107.

119 Air Navigation Order 2016 SI No 765, art 71.

emptive action to reduce the risk that passengers might endanger the safety of the aircraft or other passengers.

Consultation analysis

7.145 28 people answered this question. 20 of those agreed and eight selected a response of 'other'.

7.146 AUVSI agreed with this proposal, in particular because of how they view the longer-term role of the operator:

> Officially assigning this responsibility to the operating organization more clearly recognizes that extent of delegation and may be a step towards a more scalable future in which organizational responsibility is expanded to more elegantly represent the needs of highly autonomous operations.[120]

7.147 The RAeS agreed with the proposal and said that duties requiring physical presence to ensure compliance should be allocated to air operator employees or contracted third parties. Skybound Rescuer made a similar point.[121]

7.148 A group of consultees – some who agreed with the statement and one who selected a choice of 'other' – said that the remote pilot should still be assured that these measures have been implemented (York Gliding Centre, British Gliding Association Limited and British Hang Gliding and Paragliding Association).[122]

7.149 Significantly, several consultees who agreed with the proposal said that notwithstanding the responsibility being on the operator, the remote pilot should be able to override the decision (and therefore effectively have ultimate responsibility):

> Yes, however, the remote pilot should always be able to refuse to carry passengers should they feel that someone who has boarded would pose such a threat, so whilst air operators are responsible, the remote pilot should retain the power to over-ride if they are not satisfied.[123]

7.150 Skyports, answering no to the question, expressed a similar view.

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120 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

121 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

122 York Gliding Centre response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 596; British Gliding Association response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 78; British Hang Gliding and Paragliding Association response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 91, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

123 UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

7.151 There were also several consultees who selected a response of 'yes', but whose expanded answers made clear they felt the responsibility should remain with the remote pilot, for example:

> It is still the PIC's responsibility to ensure that screening occurs, but just as is done today in conventional operations actual person to person validation can be conducted by/delegated to other crew, ground or air, and reported to the PIC. Confirming these functions have been completed before initiating flight should remain the responsibility of the PIC.[124]

7.152 Consultees provided various practical suggestions about how to prevent passengers from boarding where necessary, for example:

> the threshold for denying boarding to such passengers might be stricter due to the absence of on board crew to restraint them during flight…Given the potential risks of unruly and therefore unsafe passengers travelling in a small and enclosed cabin, Operators may wish to assess passenger suitability before issuing a ticket, and again prior to boarding. Provisions should be adopted for Operators to conduct pre-ticketing screening of passengers.[125]

> air operators perform breathalyser testing on passengers prior to boarding. As drunken behaviour with no persons on board is something that needs to be proactively addressed not at the in-flight resolution situation.[126]

7.153 Finally, two consultees raised an issue with "point to point" operations:

> The question implies a model where a passenger-carrying aircraft always has a representative of the operator at the boarding site. This seems to preclude point to point operations that don't use operator-controlled take-off/landing sites.[127]

Discussion and recommendation

7.154 Pre-emptive measures to avoid disruption on board are likely to take on new significance with the introduction of remotely piloted VTOLs which potentially have no cabin crew members on board. The responsibility for preventing carriage of passengers who could endanger the safety of the aircraft or other passengers, and prevent the maintenance of good order, is closely connected with the safety of the flight.

7.155 At present, ground handling staff are often those who in practical terms prevent carriage of drunk or unruly passengers, even though the ultimate responsibility lies

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124 Joby Aviation response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 270, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

125 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

126 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

127 FAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 233, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

with the commander. In our first consultation paper we proposed that, although in practice, ground handling staff would continue to assist practically with this responsibility, the ultimate responsibility should shift to the operator because it seemed unrealistic for a remote pilot to be able to form an assessment of this before passengers embark.

7.156 Although it initially appeared that there was broad support for the proposal, it became apparent that many consultees felt that the pilot should in fact retain overall responsibility for preventing carriage of unruly passengers, even if there was support for ground staff and operators to support the pilot in meeting this responsibility.

7.157 We have reflected further, and note that the wording of the existing obligations for crewed operations is concerned with preventing carriage and refusing transportation of unruly passengers,[128] rather than preventing their boarding, which is how the consultation question was worded. Ultimately, a commander of a remotely piloted flight could refuse to take-off if presented with evidence of unruly passengers on board a VTOL, and they therefore have ultimate control over whether an unruly passenger is transported or not. The remoteness of the commander should not be problematic. If ground staff were involved in the operation, then they could either refuse to allow passengers to board themselves (and notifying the commander of the same), or could explain the position to the commander (possibly using video footage) and seek authority to prevent boarding. This is often the case today. If ground handling staff were unable to prevent the passengers boarding, then if the commander were alerted to unruly passengers on board, they would have ultimate authority to refuse to begin the flight, given their ultimate responsibility for safety of the operation and of other passengers. In the light of this, we consider that it is in fact more appropriate for this responsibility to lie with the commander rather than the operator. The responses of consultees in substance supported this.

7.158 This approach is also consistent with our recommendations later in the chapter, in particular in relation to seat belts and safety briefings, and on reasonable measures and restraint.

Recommendation 14.

7.159 We recommend that the remote pilot should have a responsibility to not allow a person to be carried in the aircraft who appears to be under the influence of alcohol or drugs to the extent that the safety of the aircraft or its occupants is likely to be endangered.

7.160 We note the importance of pre-emptive measures in this context. We do not consider it necessary to make a formal recommendation in relation to such measures. These

[128] UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex IV, CAT.GEN.MPA.105(a) says the commander shall: (5) not allow a person to be *carried* in the aircraft who appears to be under the influence of alcohol or drugs to the extent that the safety of the aircraft or its occupants is likely to be endangered; (6) have the right to refuse *transportation* of inadmissible passengers, deportees or persons in custody if their carriage increases the risk to the safety of the aircraft or its occupants.

are matters for the CAA and DfT, and potential operators of uncrewed VTOLs, to consider.

7.161 We also note the concern raised about point-to-point operations, which are operations that do not use operator-controlled take-off and landing sites. While this does not affect our recommendation about where the responsibility for the requirement should lie, we acknowledge that these types of operation would present an additional practical challenge, since there would be no ground staff present to assist the remote pilot practically in meeting this obligation by providing a direct assessment of the passenger's presentation. If no ground staff are involved, the main way of meeting this safety obligation will no longer be available. If these types of operations are authorised in the future, thought would need to be given by the CAA and DfT as to how the remote pilot could obtain sufficient information to satisfy themselves about safety of the flight.

Safety briefing and fastening of seat belts

7.162 These functions are currently carried out by cabin crew rather than the pilot themselves, although – as set out above – the pilot-in-command remains legally responsible. In our first consultation paper we proposed that the remote pilot-in-command should remain responsible for the checks, and suggested (though did not propose) that where there is no crew onboard, they could be fulfilled by a mixture of remote or pre-recorded briefings, and by reviewing video footage of the passengers.

Consultation analysis

7.163 22 consultees supported our provisional, one consultee disagreed, and seven consultees selected a response of 'other'. The majority of consultees therefore supported the proposal.

7.164 Many of the consultees who agreed with the proposal said that the responsibilities of a remote pilot in this respect should align with the responsibilities of a commander of crewed CAT operations (British Gliding Association Limited, British Hanggliding and Paragliding Association, Drone Major Group Limited, Light Aircraft Association and two anonymous consultees).[129]

7.165 Various consultees offered practical suggestions about how the requirements could be met. These included:

(1) Delegation of these responsibilities to ground crew (AUVSI, Joby Aviation, Altitude Angel and Skybound Rescuer).[130] In relation to this, ARPAS UK (disagreeing with our proposal) said:

> So the operator should have this done by qualified ground crew prior to departure and similarly for landing, otherwise if the RPIC is giving the instruction and verifying compliance, especially within challenging landing

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[129] Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[130] Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

circumstances, the operator should remote link in to verify this and simply indicate (akin to Airbus Landing Memo) that the action is complete.[131]

(2) Recorded safety briefings (AUVSI and Joby Aviation).[132]

(3) Safety briefing information being sent to passengers to read in advance (SLiNK-TECH).[133]

(4) Live video footage (Ramin Norouzi of Dronzit Aerospace and RAeS)[134] and the ability to communicate with passengers in combination with the footage (RAeS).[135] In relation to this, SLiNK-TECH said:

> We're not sure how a remote pilot-in-command could ensure passengers are seated and wearing a seat belt during take-off and landing if they are based off site (only so much a verbal/video feed communication can provide).[136]

(5) Remote cameras (Joby Aviation).[137]

(6) Sensors (AUVSI, Clive Lewis of Midlands Aerospace Alliance, Joby Aviation);[138] more specifically seat load sensors and seat belt sensors (Ramin Norouzi of Dronzit Aerospace).[139]

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131 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

132 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; Joby Aviation response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 270, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

133 SLiNK-TECH response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 520, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

134 Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

135 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

136 SLiNK-TECH response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 520, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

137 Joby Aviation response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 270, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

138 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52; Clive Lewis response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 184; Joby Aviation response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 270, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

139 Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

(7) Seat latched signals being sent to the pilot (RAeS).[140]

7.166 UKRI Future Flight Challenge raised the difficulty of enforcement of wearing seat belts after take-off:

> There is some challenge in enforcing the wearing of seat belts after take-off as there is no physical crew onboard the aircraft, this would require the ability of the remote pilot (or other operational crew) to be able to communicate with the passengers to request compliance but ultimately enforcement would prove harder than on crewed aircraft. Therefore, the legal requirement and penalties for passengers to not endanger the safety of the aircraft, passengers or cargo should be made very clear on uncrewed aircraft.[141]

7.167 CAA Consumer Panel provided some useful thoughts in relation to accessibility:

> the panel queries whether remote or pre-recorded briefings go far enough? Any 'virtual' safety briefings must at the very least be interactive and allow passengers the ability to ask questions and seek assurance. This is particularly important for passengers with reduced mobility or who have specific medical or accessibility needs…Another obvious issue is how a 'virtual safety briefing' will be able to help passengers who need physical help with their seat belt or other types of special assistance…overall, we consider the lack of a physical presence or responsible person onboard a VTOL is a significant issue that should be addressed through further engagement with the CAA and developers.[142]

They also noted the importance of discussion with accessibility and disability groups.

Discussion and recommendation

7.168 This proposal was concerned with who should remain legally responsible for ensuring that there are safety briefings, and for ensuring that passengers are securely seated during taxiing, take-off and landing, and at other times when this is deemed necessary. Cabin crew and ground handling staff (to the extent that there are any) may assist with the practicalities of this requirement, but our view is that legal responsibility should rest with the remote pilot: they are ultimately responsible for safety, including the ability to refuse to take-off, or to terminate a flight.

7.169 In terms of the practicalities, we do not know whether there will be cabin crew on board a VTOL or not. If there are cabin crew on board, then the remote pilot could delegate responsibility to them in the same way as crewed CAT operations at present. Where there are no cabin crew on board, the position is less straightforward.

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[140] Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[141] UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[142] CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

7.170 We note the suggestion by various consultees that the safety briefing and the seat belt checks for take-off could be delegated to ground handling staff. This seems like a sensible suggestion, if the operating model for remotely piloted VTOLs includes the availability of ground handling staff (and we note what consultees said in response to an earlier question regarding point-to-point operations which involve no ground handling staff). We note the difficulties of enforcing the wearing of seat belts after take-off and during landing, if there are no cabin crew, and where ground handling staff would not be present, and therefore agree with UKRI's suggestion that the legal requirements and penalties should be emphasised to passengers.[143]

7.171 The practicalities of delivering the safety briefing, and how the remote pilot satisfies themselves of compliance with briefing and seat belt requirements are issues for consideration by the CAA and DfT.

7.172 We acknowledge the concerns expressed by the CAA Consumer Panel regarding accessibility of remotely piloted VTOL operations which have no cabin crew on board. At paragraph 7.15 above, we explain the increased accessibility and safety concerns associated with remotely piloted VTOL operations with no crew on board. It is for the CAA and DfT to decide whether to allow such operating models, and how to mitigate the increased associated risks.

7.173 We are primarily concerned with legal responsibility. Although there was a suggestion that the operator should be responsible for these checks, there was no widespread support for this proposition. Our view is that, while the exact practicalities need to be worked out, the responsibility for ensuring that a safety briefing is given, and for ensuring that passengers are seated and wear seat belts during take-off and landing, and whenever necessary in the interests of safety, should remain with the remote pilot. The limitations of ensuring these things would be no more easily overcome by the operator (who is also not present on the flight) and, given that this responsibility is crucial to safe flight, and that the commander has ultimate authority to refuse to take-off or to terminate a flight our view is that the remote pilot should be responsible. The details about how to meet this obligation in practical terms in the context of remotely piloted VTOLs could then be set out in, for example, acceptable means of compliance, or the operations manual.

[143] At paragraphs 6.37 and 6.38 of our first consultation paper, we set out the provisions of the Air Navigation Order 2016 which require passengers to obey lawful commands from the pilot-in-command; prohibit disruptive behaviour and other conduct which could endanger an aircraft; and create criminal offences for breaches of these provisions.

Recommendation 15.

7.174 We recommend that the remote pilot should be responsible for ensuring passengers are:

(1) given a safety briefing; and

(2) seated and wearing seat belts during taxiing, take-off and landing, and at such other times deemed necessary in the interests of safety.

Reasonable measures and restraint under the Civil Aviation Act 1982

7.175 In our first consultation paper we:

(1) Proposed that the remote pilot should have the power to take reasonable measures, including authorising the restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982. This would mean a remote pilot would have the power to require, authorise or request that any crew member on board restrain another passenger, and would have the power to authorise or request that any passenger on board restrain another passenger.

(2) Proposed that a person on board a VTOL aircraft (other than a crew member) should be able to take reasonable measures to protect the safety of the aircraft or of persons or property on board (therefore mirroring the position for crewed operations under section 94 of the Civil Aviation Act 1982). This would include the authority to use restraint of their own volition in addition to being authorised or requested to do so by the remote pilot (as per (1) above).

(3) Asked for views as to whether the powers of any crew member *on board* a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to take reasonable measures, including restraint, to: protect the safety of the aircraft or persons or property on board; maintain good order and discipline; or enable the crew to disembark or deliver a person. This would enable crew members to use restraint in circumstances where it was not practicable to obtain authority of the commander and would enable the crew to authorise and request use of restraint by others on board.

7.176 We did not address the issue of whether *remote* crew (by which we mean an individual who may fulfil some of the same functions as cabin crew, but remotely) should be able to authorise restraint of a passenger. Remote crew would, however, be in a position to relay details of the situation to the remote pilot and the remote pilot could then authorise restraint in accordance with (1) above directly, or ask the remote crew to relay that instruction.

7.177 It is not yet clear whether there will or will not be crew members on board remotely piloted VTOLs. In the paragraphs that follow, we consider both scenarios.

Reasonable measures and restraint: powers of the remote pilot

Consultation analysis

7.178 29 people responded to the proposal that the remote pilot should have the power to take reasonable measures, including restraint, as is the case for crewed operations at present. Of those, 23 agreed with the proposal. Four selected a response of other (but two of these were in essence agreement with the proposal), and two disagreed with the proposal.

7.179 Various consultees who agreed with the proposal noted that there may be practical difficulties and concerns with authorising restraint remotely, in particular where it would result in passengers being authorised by the remote pilot to take these measures themselves (which replicating the existing provisions would allow for). The CAA Consumer Panel said:

> While we agree this responsibility should be given to the remote PiC, and they could authorise passengers to act and provide instructions, the successful outcome of a situation that arises mid-air would be entirely dependent on the ability of the other passengers to resolve it. For an uncrewed VTOL (where there are no crew members physically on board), a range of potentially serious safety concerns could materialise such as terrorism activities, female safety, sexual harassment, an allergic reaction or other medical emergency where CPR is needed. It would not be reasonable to expect other passengers to resolve these situations solely based on the pilot's instructions. We believe this area needs further exploration and engagement.[144]

7.180 Other consultees who agreed with the proposal but raised the issue of practical difficulties included: Chris Daniels of Flare Bright, AUVSI, RAeS, Light Aircraft Association, Niall Greenwood of Neuron Innovations, John Milner, Vertical Aerospace, US Federal Aviation Administration and the CAA.[145] Several of these echoed the CAA Consumer Panel's point about practicality being a particular concern where there is no crew onboard.

7.181 Skyports, though selecting other, said:

> it is unclear how this would work in practice if there were no crew on board the aircraft to restrain the individual on the remote pilot's behalf, unless, of course, the restraint can be made remotely using technology.[146]

7.182 There were some suggestions relating to practical measures to be taken to enable this proposal. ARPAS UK and the CAA felt that passengers should be alerted to the possibility of being authorised to use restraint in a safety briefing.[147]

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144 CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

145 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

146 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

147 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; CAA response,

7.183 The RAeS suggested that although the power should sit with the pilot-in-command:

> the remote pilot in command should not be responsible for monitoring passenger behaviour. This should be done by another responsible person taking the place of cabin crew with authority to instruct passengers to behave…Provisions should be adopted to ensure that a) responsible person monitoring the cabin has real-time video of the passengers, b) can take reasonable measures to restore order, and c) the remote pilot can access the real-time video of the passengers upon notification of a disturbance, can communicate with the passengers, and authorise restraint if needed.[148]

7.184 Two consultees raised an issue about safeguarding vulnerable passengers. The CAA said:

> there needs to be measures to prevent the abuse of this power and to protect vulnerable passengers. This may need to be an operator responsibility as opposed to a PiC.[149]

The CAA Consumer Panel agreed with this.[150]

7.185 Finally, two consultees disagreed with the proposal. Clive Lewis of Midlands Aerospace and York Gliding Centre said that the authorisation of restraint should be the responsibility of cabin crew.[151]

Discussion and recommendation

7.186 There was widespread support for the proposal to give remote pilots the same powers as commanders of crewed operations under section 94 of the Civil Aviation Act 1982 to take reasonable measures, including authorising restraint of passengers. We acknowledge that this allows the authorisation of restraint in circumstances where the remote pilot is not capable of directly assessing the situation leading to the authorisation. However, we consider that it is a necessary safeguard for remotely piloted operations.

7.187 The provisional proposal was made on the basis that there may or may not be crew on board. If there were crew on board, the proposal would allow the commander to authorise, request or require a crew member to restrain a passenger in the same way that they are able to in crewed operations. In the context of remotely piloted VTOLs,

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Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

148 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

149 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

150 CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

151 Clive Lewis response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 184, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; York Gliding Centre response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 596, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

the remote pilot would always authorise restraint without direct knowledge of the situation. The CAA has confirmed that in most cases today, in the context of crewed aircraft, restraint is authorised by the commander from the flight deck without direct knowledge of the situation. Allowing remote pilots to authorise restraint from outside of the aircraft would therefore not be qualitatively different to the existing position.

7.188 Our proposal would also permit the remote pilot to authorise a passenger to restrain another passenger. It is already the case in the context of crewed operations that the commander may authorise a passenger to restrain another passenger,[152] although the CAA have told us that this would be unusual. We anticipate that the remote pilot would not authorise a passenger to restrain another passenger unless any cabin crew on-board were unable to provide this assistance. It is for the CAA and DfT to decide whether remotely piloted VTOL operations without crew on board should be authorised, given the concerns raised by stakeholders mentioned above at paragraph 7.166. In the event that remotely piloted VTOL operations without cabin crew are authorised, it is sensible to allow the remote pilot to authorise passengers to use restraint because otherwise there could be a situation where nobody on board could be authorised by the commander to take action to protect the safety of the aircraft or other passengers.

7.189 Although we make a recommendation below that passengers of remotely piloted VTOL operations should be given their own powers to take reasonable measures, including restraint, the power would be limited to circumstances where it would be impracticable to obtain authority from the remote pilot. In order to safeguard members of the public on flights it would be preferable for restraint to be authorised in the first instance by a remote pilot who is trained in matters of restraint, and has central responsibility for the safety of the flight.

Recommendation 16.

7.190 We recommend that the remote pilot should have the power to take reasonable measures, including authorising the restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982.

7.191 We note the suggestion that passengers should be briefed on the possibility of being authorised to restrain other passengers. We note that at present there is no reference, in safety briefings on crewed operations, to the possibility of a passenger being authorised to use restraint despite it being legally permitted. This may be because where there are trained cabin crew on board, passengers are likely to be called upon only as a last resort. We acknowledge, however, that if remotely piloted VTOL operations without cabin crew on board are authorised, there is a higher likelihood of passengers being called upon to do this in the first instance. Whether passengers on

[152] Civil Aviation Act 1982, s 94(3) states that "any other person on board the aircraft may, at the request or with the authority of the commander of the aircraft…render assistance in restraining any person whom the commander is entitled under subsection (2) above to restrain."

uncrewed operations should be told in advance is a matter for consideration by the CAA and the DfT.

7.192 We also think it would be sensible for passengers to be clearly notified of their legal obligations regarding conduct on flights – for example the requirement to wear seat belts – and penalties for breach of those provisions. This is a matter for the CAA and DfT to consider.

7.193 We acknowledge the concerns expressed by the CAA and CAA Consumer Panel about safeguarding vulnerable passengers if the remote pilot is given these powers.[153] We consider that this is a wider issue regarding remotely piloted passenger-carrying operations without cabin crew and discuss this further at paragraphs 7.217 and 7.218.

7.194 The RAeS suggested that an individual other than the remote pilot should monitor passenger behaviour, for example through real-time video.[154] This may be something that the CAA and DfT, as well as potential operators wish to consider further (though we note the privacy concerns raised by ARPAS UK in relation to this),[155] but we do not consider it strictly necessary for the purposes of enabling the above recommendation. Later in this chapter we discuss the need for passengers to be able to contact a member of crew at all times. We envisage that this could be the mechanism by which incidents are discussed with crew, and by which authorisation to restrain or take other reasonable measures is communicated.

7.195 Finally, we note that the two consultees who disagreed with our provisional proposal felt that the cabin crew should have authority to restrain passengers.[156] The above recommendation would allow crew members – to the extent that there are any – to take such measures when required, requested or authorised to do so by the remote pilot. Below we discuss the possibility of crew members being vested with the same powers as the commander, and so do not make any recommendation on that issue here.

Reasonable measures and restraint: powers of those other than pilots and crew

7.196 We proposed that a person on board a remotely piloted VTOL, other than a crew member, should be permitted to take reasonable measures, including restraint, to protect the safety of the aircraft or of persons or property on board. This would enable passengers to take such measures of their own volition, in addition to being allowed to restrain others on board when authorised or requested to do so by the remote pilot (as

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153 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

154 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

155 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

156 York Gliding Centre response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 596, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; Clive Lewis response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 184, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

per recommendation 16 at paragraph 7.190). This proposal would give passengers of remotely piloted VTOLs the same powers as passengers on crewed operations.

Consultation analysis

7.197 Responses to this proposal were mixed. 16 people agreed; 16 selected a response of 'other' and one disagreed.

7.198 The RAeS noted that this power already exists in relation to crewed operations.[157]

7.199 Skybound Rescuer considered that the common law, and section 3 of the Criminal Law Act 1967 would already provide authority to take reasonable measures:

> Under Common law anyone has the right to defend themself and their property using 'reasonable force', likewise under the CLA [Criminal Law Act] "A person may use such force as is reasonable in the circumstances in the prevention of crime, or in effecting or assisting in the lawful arrest of offenders or suspected offenders or of persons unlawfully at large".[158]

They also said that the terms 'reasonable measures' and 'protect the safety of the aircraft' in our proposal need to be defined. The RAeS, albeit in response to a later question, agreed and said:

> Some thought needs to be given as to what "reasonable measures" looks like and what practically can be done to maintain good order and discipline on a flight beyond pre-departure removal.[159]

7.200 Two consultees said that there would still be a need for authority to be granted by the remote pilot:

> Yes, so long as the action has been approved by the remote pilot, unless in the most extreme circumstances where this may not be possible.[160]

7.201 ARPAS UK felt that passengers would need to be given a safety briefing in relation to using reasonable measures.[161] Professor George Leloudas suggested that passengers may need training, and NATS said:

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157 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

158 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

159 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

160 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/. AUVSI said a person could receive delegation for this responsibility.

161 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

> It is unclear how this scenario would arise when there is no flight crew on board unless one of the passengers were trained and adequately briefed.[162]

7.202 Conversely, an anonymous consultee who agreed with the proposal queried whether a briefing on the possibility of using reasonable measures would necessarily help:

> If it is not notified, it will be rarely exercised, so it becomes a dead letter; if it is notified, it runs the risk that persons who are likely to take the law into their own hands will be encouraged to do so, with potentially undesirable consequences in situations which do not call for it.[163]

7.203 Others felt that passengers would need guidance at the time of the incident:

> It may well be the case that passengers have to put themselves at the risk of harm in order to do this, and this risk would need to be properly reflected in the support and instructions provided.[164]

7.204 Several consultees were concerned that allowing an individual to take reasonable measures in this way could be dangerous:

> there may be circumstances where such 'reasonable measures' could, by an individual without aviation knowledge & experience, actually endanger the safety of a remotely piloted VTOL.[165]

7.205 Conversely, an anonymous consultee said:

> Most persons on board are perhaps unlikely to have the specialist knowledge required or situational awareness required…However, in manned aviation there are many recorded occasions where 'non-pilots' have successfully intervened in the case of single pilot operations incapacitation. Put another way: In many cases they are likely to make things worse, in others they could perhaps save the day![166]

7.206 Several consultees – selecting both 'yes' and 'other'– felt that the law should recognise that passengers are not experts, and that passengers should therefore not be held to the same standards as pilots and cabin crew.

Discussion and recommendation

7.207 We note the Light Aircraft Association's response to this proposal which said:

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[162] NATS response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 346, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[163] Anonymous 4 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 663, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[164] CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[165] Anonymous 3 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 649, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[166] Anonymous 2 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 631, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

> It is not clear from the proposals who such a person or persons would be; what authority they would have and how this would relate to the responsibilities proposed elsewhere in respect of the PIC for the flight.[167]

7.208 This is a valid point and we think it would be helpful to elucidate the scope and implications of this proposal.

7.209 This proposal is concerned with passengers and any others on board who are neither the pilot nor crew. We discuss powers of the remote pilot and crew elsewhere.

7.210 The proposal would allow passengers of remotely piloted VTOLs to take reasonable measures of their own volition to protect the safety of the aircraft or of persons or property on board the aircraft, including restraint, where they have reasonable grounds to consider that it is immediately necessary. Recommendation 16 at paragraph 7.190 above would allow passengers to restrain other passengers upon the authority or request of the remote pilot for the broader range of purposes set out in section 94(2)(b)(i-iii) of the Civil Aviation Act 1982.

7.211 We note the suggestion that it would be helpful to define “reasonable measures to protect the safety of the aircraft”. These terms are not defined in existing legislation, perhaps because it is difficult to envisage and account for the specific emergency scenarios in which this authority may need to be used. Section 94 of the Civil Aviation Act 1982 says that the individual may only take measures without the authority of the commander “which he has reasonable grounds to believe are immediately necessary”. What is a reasonable measure, and what are reasonable grounds are likely to be determined on a case-by-case basis, and we consider that the provision is drafted broadly enough to take into account the concern raised by several consultees that passengers are not trained in restraint and conflict management. What is considered reasonable is a question of fact in all circumstances. Some consultees in response to these questions regarding restraint and reasonable measures raised concerns about the possibility of over empowering or emboldening passengers such that they take unnecessary measures. That risk may be increased if passengers are given a list of specific measures which would be reasonable in advance.

7.212 The Criminal Law Act 1967 concerns use of force to prevent crime or effect arrest. There could be other circumstances in which restraint is necessary to protect the safety of the aircraft or other passengers, for example if a passenger were having a seizure. We therefore consider it useful to replicate the broader authority in section 94 of the Civil Aviation Act 1982. This provision also relates more specifically to the aviation context.

7.213 We appreciate the concerns raised by some stakeholders about the risk to passengers of taking reasonable measures, the risk to vulnerable passengers, and the possibility of passengers making a situation worse. However, the wording of the provision and the need for ‘immediate necessity’ means that the provision is essentially a safeguard for situations where obtaining authority, and assistance from the remote pilot, is not possible, for example where time would not allow for this, or

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[167] Light Aircraft Association response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 320, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

where the communications link failed. In all other situations, where there was not an immediate necessity to act without authority from the remote pilot, the passenger should only take measures pursuant to authorisation or a request from the remote pilot in accordance with the powers under recommendation 16 above. Our recommendation makes clear that the power should only be used where it is impracticable to obtain authorisation from the remote pilot.

7.214 The powers concerned here relate to emergencies, and in particular situations where the remote pilot is not able to give direction. It is likely that in this scenario the passenger would be the only person capable of taking action to protect the safety of the aircraft or of persons or property on board. In our view, it is more desirable than not that in these circumstances passengers should be given these powers.

Recommendation 17.

7.215 We recommend that when it is impracticable to obtain authorisation from the remote pilot, a person on board a VTOL aircraft (other than a crew member) should be permitted to take reasonable measures, including restraint, which they have reasonable grounds to believe are immediately necessary to protect the safety of the aircraft or of persons or property on board.

7.216 It is a matter for the CAA and DfT as to whether passengers on uncrewed operations should be notified in safety briefings about the possibility of using restraint, and about their legal obligations regarding conduct on flights and associated penalties.

Reasonable measures and restraint: powers of crew

7.217 In our first consultation paper we asked for views as to whether the powers of crew *on board* a VTOL aircraft should be broadened to reflect those of the pilot-in-command under the Civil Aviation Act 1982 to: (1) take reasonable measures to protect the safety of the aircraft or persons or property on board; (2) maintain good order and discipline; or (3) enable the crew to disembark or deliver a person. Mirroring section 94(2) of the Civil Aviation Act 1982 for crew members would provide authority to crew to use reasonable measures – including restraint – for the above three purposes without the authority of the commander and would enable the crew to authorise and request the use of restraint by others on board. In our first consultation paper we considered this particularly useful where the communications link with the remote pilot were lost and the crew could not receive instructions.

7.218 As discussed above, we do not yet know whether or not remotely piloted VTOL operations without cabin crew will be approved. The following discussion is only relevant in the event that they are.

Consultation analysis

7.219 Consultees' responses were divided on this matter.

7.220 Several consultees felt that if there are crew on board a remotely piloted VTOL, their powers should be broadened to reflect the powers of the pilot-in-command under

section 94(2) of the Civil Aviation Act 1982 (UKRI Future Flight Challenge, Skybound Rescuer, British Gliding Association Limited, British Hang Gliding and Paragliding Association, Joby Aviation, Clive Lewis of Midlands Aerospace Alliance, John Milner and York Gliding Centre).[168]

7.221 Several consultees felt that crew should have the same powers and responsibilities as cabin crew under the existing regulations (Anonymous, NPCC and Drone Major Group Limited).[169] This would be narrower than what we are proposing, which is for crew to have their own freestanding authority to take reasonable measures including restraint.

7.222 Several consultees agreed that crew should have the broader powers of the pilot-in-command, but that use of the powers should be limited to where it is not possible to obtain authority from the pilot.

> However, it would be necessary to ensure that such responsibilities do not degrade those of the designated pilot-in-command. Consequently, it may be more appropriate for PIC responsibilities to be specifically delegated to the crew on board when appropriate or when communications are limited.[170]

7.223 In terms of other suggested limitations to the powers given to crew, ARPAS UK stated that the crew should not be able to use any flight control systems or meet piloting requirements using these powers.[171]

7.224 The Light Aircraft Association recommended that crew be given training on taking action under the powers.[172] The CAA Consumer Panel also felt training would be required, as well as clear lines of communication, contingency plans, and robust escalation mechanisms.[173] An anonymous consultee, albeit in response to an earlier question, said:

> that individual would need a level of training, analogous to that undertaken by an airline captain, of what the powers are, what would be regarded as appropriate circumstances to exercise them, and what is reasonable.[174]

7.225 The RAeS raised an issue about international law:

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168 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

169 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

170 Anonymous 3 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 649, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

171 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

172 Light Aircraft Association response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 320, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

173 CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

174 Anonymous 4 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 663, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

> In circumstances where there are crew on board a VTOL, an amendment of this nature will place the regulations concerning VTOL at odds with international law on unruly passengers. While the UK is not yet a party to the 2014 Protocol to Amend the Convention on Offences and Certain Other Acts Committed on Board Aircraft, it is a party to the 1963 Convention on Offences and Certain Other Acts Committed on Board Aircraft which provides that this power is vested in a pilot-in-command. Such broadening might require a consequential change to international law on this point. In circumstances where there is sufficient monitoring of the cabin (as detailed at (2) and at consultation answer 14(3)) there is no obvious reason why there needs to be a devolution in the powers attributed to a pilot-in-command towards crew. This power can remain with the pilot in command with instruction provided to the crew to action, as would happen in manned aviation.[175]

Professor George Leloudas raised a similar point, albeit in response to an earlier question.[176]

Discussion and recommendation

7.226 The Tokyo Convention and the related protocol has in substance the same provisions on this subject as section 94 of the Civil Aviation Act 1982.[177]

7.227 Neither the Convention nor the Protocol to amend the Convention envisage passenger-carrying remotely piloted UAS and they are not therefore of direct application to remotely piloted VTOL operations, although we recognise the importance and benefits of acting compatibly with standards for crewed aviation where possible.

7.228 The Convention, and section 94 of the Civil Aviation Act 1982, appear to envisage a situation where it may not be practicable for the commander to authorise restraint. This is implicit in the fact that crew and others on board are allowed to take reasonable measures, including restraint, without the authority of the commander when immediately necessary to protect the safety of the aircraft of persons or property on board.

7.229 Unlike the position in relation to the commander, the Convention and section 94 of the Civil Aviation Act 1982 do not give the power to crew to authorise restraint themselves, or to take reasonable measures for the other purposes listed in those instruments (namely to maintain good order and discipline, or to enable the disembarkation or delivery of a person). The power of the crew to take reasonable measures, including restraint, is therefore currently limited to only the most pressing

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175 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

176 George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

177 Convention on Offences and Certain Other Acts Committed on Board Aircraft 1963 ("Tokyo Convention") and the Protocol to Amend the Convention on Offences and Certain Other Acts Committed on Board Aircraft 2014 ("2014 Montreal Protocol").

circumstances; protecting the safety of the aircraft and those on board is more immediately necessary than maintaining discipline on board.

7.230 Consultees were split as to whether the crew's powers to take reasonable measures should be expanded. We are of the view that the powers should be expanded. The fact that the commander of crewed operations has the power to take reasonable measures in the broader range of circumstances set out in section 94(2) of the Civil Aviation Act suggests that it is necessary to use these powers from time to time. If crew members were not granted these powers, then in circumstances where the remote pilot was not able to communicate authority to take reasonable measures, for example because of a lost communications link, nobody would be in a position to exercise those powers. This argument could be made of crewed operations, in that there may be circumstances where a commander could not communicate authority, but this is likely to be the case more frequently in the context of remotely piloted operations because of the reliance on communications links. In the light of this, we think that the powers of the crew should be expanded. Our view is that the provision should be worded in a narrow way which provides crew members with the expanded powers only in circumstances where it is impracticable to communicate with the remote pilot.

Recommendation 18.

7.231 We recommend that the powers of crew members on board a remotely piloted VTOL should be broadened so that they reflect those of the commander under section 94 of the Civil Aviation Act 1982, to take reasonable measures, including restraint, as necessary:

(1) to protect the safety of the aircraft or persons or property on board;

(2) to maintain good order and discipline; or

(3) to enable the crew to disembark or deliver a person.

The powers should be limited to circumstances where it is impracticable to communicate with the remote pilot.

7.232 In our first consultation paper we did not discuss the position in relation to remote crew and reasonable measures and restraint. We do not consider it necessary to extend any of the powers in section 94 of the Civil Aviation Act 1982 to remote crew. The power to take reasonable measures in relation to all three circumstances set out in subsection 94(2) will be vested in the remote pilot in accordance with recommendation 16 above. Any crew members based remotely may be involved in relaying the authorisation for, and details of, reasonable measures to crew and passengers on board the VTOL, but do not need to be vested with powers themselves. In circumstances where the remote pilot cannot be reached, crew members and passengers on board will, in light of recommendation 18 above, be able to take reasonable measures, including restraint, to protect the safety of the aircraft or of persons or property on board.

Summary: reasonable measures and restraint

7.233 The result of recommendation 16 is that remote pilots will have the same powers to take reasonable measures as commanders have in crewed operations today. The remote pilot will have the power to authorise cabin crew (if there are any) to use restraint. The remote pilot will have the power to authorise passengers to use restraint, but we anticipate that will be unlikely unless there are no cabin crew on board, or they are unable to provide assistance. Without providing the remote pilot with these powers, there could be a situation where nobody on board could be authorised to take action needed to ensure the safety of the aircraft and other passengers on board. Recommendation 17 would allow passengers of remotely piloted VTOLs to take reasonable measures *of their own volition* to protect the safety of the aircraft or of persons or property on board the aircraft, including restraint, where they have reasonable grounds to consider that it is immediately necessary. This power will only apply where it is impracticable to obtain authority from the remote pilot pursuant to the powers in recommendation 16.

7.234 We do not know whether remotely piloted VTOL operations without cabin crew will be authorised. If they are, then recommendation 16 would allow for the remote pilot to authorise cabin crew to use restraint, as is possible today. Recommendation 18 expands the powers of cabin crew on remotely piloted VTOLs to give them greater powers than cabin crew have today. The recommendation would allow cabin crew to authorise restraint themselves, and to take reasonable measures for all three purposes listed in section 94 (to protect the safety of the aircraft and those on board; to maintain good order and discipline; or to enable the disembarkation or delivery of a person) rather than just the first purpose. The broader powers will be limited to circumstances where it is impracticable to communicate with, and obtain authorisation from, the remote pilot.

Contacting remote crew members

7.235 Linked to the issue of remote authorisation of reasonable measures and restraint, in our first consultation paper we proposed that passengers should be able to contact a remote member of crew at all times during an operation. We suggested that the crew would then be responsible for relaying messages to the pilot if necessary. This would help to ensure the safety of passengers on remotely piloted VTOLs where there is neither pilot nor crew member on board.

Consultation analysis

7.236 There was wide support for this proposal: 23 people agreed, five selected an answer of ‘other’, and nobody disagreed.

7.237 The CAA said that this would be vital for safeguarding.[178] Various consultees said that it was important for passenger and public confidence (Light Aircraft Association, UKRI Future Flight Challenge, Skybound Rescuer and ADS).[179]

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[178] CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[179] Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

7.238 The CAA Consumer Panel agreed with the proposal but envisaged that there might be circumstances when it would still be necessary to speak to the remote pilot.[180]

7.239 Several consultees raised the importance of ensuring the communications systems are in place to enable this:

> Aircraft operators would need to ensure that sufficient communications coverage of sufficient high quality is available throughout the flight.[181]

7.240 Two consultees suggested that the possibility of contacting a crew member should be covered in the passenger safety briefing.

7.241 One consultee, Chris Daniels of Flare Bright, selecting a response of 'other' felt that this is not a legal issue and said:

> I would expect people simply to not fly with a Carrier that doesn't offer this as a service – I feel this is something that market forces will dictate, rather than needing a law to cover it.[182]

Discussion and recommendation

7.242 Throughout this chapter we have discussed the potential safety and accessibility issues of authorising remotely piloted VTOL operations without cabin crew on board. There may be instances where a passenger needs to seek authority of the remote pilot to take a reasonable measure to protect the safety of the aircraft. In order to mitigate the issues and potential difficulties associated with uncrewed operations, and in order to facilitate the recommendations we make at paragraphs 7.190 and 7.231 above, we consider that it is important that passengers have the opportunity to contact a member of crew at all times. Our view is that the operator is best placed to facilitate this access given that crew members are their employees, and given that they have management of the aircraft. We therefore make the following recommendation.

Recommendation 19.

7.243 We recommend that operators should be required to ensure that passengers are able to contact a member of crew at all times during an operation.

7.244 We note the points raised by stakeholders regarding the need for robust communications systems, back-up systems, and the suggestion that passengers should be briefed on the ability to contact crew members. While we agree with these important points, we consider that these issues could be addressed in technical

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180 CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

181 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

182 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

standards and guidance and so do not consider it necessary to make any further formal recommendations.

Condition of the pilot

7.245 The pilot (along with the rest of the crew) must be sober and alert. The Air Navigation Order 2016 ("ANO 2016") specifically requires that:[183]

> a person must not, when acting as a member of the crew of any aircraft… be under the influence of drink or a drug to such an extent as to impair their capacity to so act.

7.246 The Basic Regulation prohibits crew members from performing duties on board when unfit because of the following wider range of factors: injury, fatigue, medication, sickness or other similar causes.[184] The Air Operations Regulation also prohibits performance of duties in these circumstances.[185] The ANO 2016 criminalises breach of the provision in the Air Operations Regulation.[186]

7.247 It is a criminal offence in the UK for a person to act as the pilot of an aircraft during flight when their ability to perform the function is impaired because of drink or drugs.[187] It is also an offence for a person to act as the pilot of an aircraft when the level of alcohol in their breath, blood or urine exceeds a prescribed limit.[188]

7.248 In our first consultation paper we noted that guidance material to the UAS Implementing Regulation advises that the above alcohol levels should apply to remote pilots in the specific category,[189] but this is not compulsory. We also noted the UK Government's intention to legislate to introduce alcohol limits for those operating a UAS when Parliamentary time allows.[190] This has not yet happened.

7.249 In our first consultation paper we provisionally proposed that: 1) It should be a criminal offence for a remote pilot of a VTOL to act in that capacity when their performance is impaired through drink or drugs, and 2) it should be a criminal offence for a person to act as the remote pilot of a VTOL when the level of alcohol in their blood, breath or urine is over a prescribed limit.

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183 SI 2016 No 765, art 242(2).

184 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, annex V, para 7.6.

185 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex IV, CAT.GEN.MPA.100(c)(1).

186 SI 2016 No 765, schedule 13, part 3, chapter 5.

187 Railways and Transport Safety Act 2003, ss 92 and 94. Section 92 refers to performing an "aviation function"; section 94 then defines this to include the pilot, along with other members of the flight crew.

188 Railways and Transport Safety Act 2003, s 93.

189 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, GM1 UAS.SPEC.060(1)(a).

190 Department for Transport, *Future of Transport Regulatory Review: Future of Flight response* (September 2023) pp 54 to 55.

Consultation analysis

Criminal offence to act as remote pilot when performance is impaired through drink or drugs

7.250 26 consultees agreed with this provisional proposal. Nobody disagreed, and one person selected a response of 'other'. Of those who answered the question there was overwhelming support for this provisional proposal.

7.251 Several consultees felt that the provisions in the Basic Regulation about other capacity limiting factors – as set out above – should be replicated in relation to remote pilots. The CAA said:

> We would expect that the same rules for a current commercial pilot should apply. This could also include fatigue, illness or other condition that could impair performance.[191]

Organisations making similar comments included: CAA Consumer Panel, York Gliding Centre, the British Hang Gliding and Paragliding Association, the British Gliding Association and the NPCC.[192]

7.252 Skyports suggested that crew to whom responsibilities of the pilot (as per the proposals in earlier questions in this chapter) are delegated should also be criminally liable. They said:

> Yes; however, the offence should be extended to other members of the crew to whom responsibility for some aspects of the aircraft operation [has] been delegated.[193]

Criminal offence to act as remote pilot when level of alcohol is over a prescribed limit

7.253 28 people agreed that it should be a criminal offence for the remote pilot to act as such when levels of alcohol are over a prescribed limit, as is currently the case for pilots of commercial crewed operations. One person selected a response of 'other'. Of those who chose to answer the question there was therefore overwhelming support for the proposal.

7.254 Most consultees did not elaborate on their responses other than to confirm that the position should mirror the rule for commercial crewed aviation. Skybound Rescuer noted that a prescribed limit provides:

> clear guidance to pilots and operators as to what is acceptable and provides a measurable standard by which authorities/investigators can prosecute and complete

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191 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

192 Law Commission, Aviation autonomy: Responses to the first consultation (2025) https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

193 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

'back-calculations' in the event an offender were to use the defence that they became intoxicated following the flight.[194]

7.255 Skyports once again suggested that the criminal liability position should be the same for crew members.[195]

Discussion and recommendations

7.256 There was widespread support for our two provisional proposals relating to the condition of the remote pilot. We also note that the CAA already considers the prohibition in section 92 of the Railways and Transport Safety Act 2003 to apply to remote pilots of certified category operations.[196] We consider that, in order to ensure equivalence of safety between remotely piloted and piloted CAT operations, this should be made explicit. We make the following recommendations:

Recommendation 20.

7.257 We recommend that it should be a criminal offence for a remote pilot of a VTOL to act in that capacity when their performance is impaired through drink or drugs.

Recommendation 21.

7.258 We recommend that it should be a criminal offence for a remote pilot of a VTOL to act in that capacity when the level of alcohol in their blood, breath or urine is over a prescribed limit.

7.259 We do not consider it necessary to recommend that the prohibition in the ANO 2016 (as set out above) on acting as a member of crew when under the influence of drink or a drug needs to be explicitly replicated in relation to remote pilots. This is because the ANO 2016 applies in full to UAS subject to certification.[197]

Prohibition in relation to other capacity limiting factors

7.260 We note that several consultees felt that the prohibition on performing duties when unfit because of the wider range of capacity limiting factors should be replicated for remote pilots of VTOLs.

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194 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

195 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

196 CAA, *Unmanned Aircraft System Operations in UK Airspace – Policy and Guidance* (April 2024) (CAP 722), para 5.2.5.2.

197 SI 2016 No 765, art 23(1)(c).

7.261 While we did not consult on this specific issue, we agree with the range of stakeholders who raised this: it would make sense to replicate the prohibition for remote pilots. We think that the related criminal sanctions for breach of the prohibition should also be replicated for remote pilots. Without replicating both of these things, remote pilots of CAT operations are subject to less rigorous standards than pilots of crewed operations, which would not be desirable.

Recommendation 22.

7.262 We recommend that remote pilots of VTOLs should be prohibited from performing duties when unfit due to injury, fatigue, medication, sickness or other similar causes, and that the existing related criminal sanctions for breach of this prohibition should be replicated for remote pilots.

Crew members and criminal offences

7.263 In our consultation paper, and our provisional proposals, we focussed on the condition of the remote pilot as opposed to crew members. We note that Skyports suggested that the criminal offences being extended to remote pilots should also be extended to cover crew members of VTOLs.[198]

7.264 The criminal offences set out in sections 92 and 93 of the Railways and Transport Act 2003 apply to those performing an "aviation function". Section 94 says that an aviation function includes acting as a pilot of an aircraft during flight and acting as a member of the cabin crew during flight.

7.265 In our view it is necessary to replicate the provisions of the Railways and Transport Act 2003 so that remote pilots are explicitly covered. However, we consider that crew of a remotely piloted VTOL would be covered by the existing provisions and that no reform is required in this respect.

Accidents and reporting

7.266 The Air Operations Regulation requires that commanders of CAT operations: submit a report to the competent authority where they have to manoeuvre the aircraft in response to an airborne collision avoidance system (ACAS) resolution advisory (RA); report any bird strikes causing significant damage to the aircraft or loss of malfunction of any essential services; and report to the air traffic services unit, as soon as workload allows, any potential bird hazards.[199] In our first consultation paper, we proposed that the remote pilot should be subject to the reporting obligations set out in the Air Operations Regulation.

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198 Skyports response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 506, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

199 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex IV, CAT.GEN.MPA.105(c) and (d).

Consultation analysis

7.267 Twenty five people answered this question and all responses supported this proposal.

7.268 Most consultees did not elaborate on confirming their support for the remote pilot having the same responsibilities as the commander in this context. However, one theme which arose was whether other actors in the remotely piloted VTOL operation should have responsibilities in relation to reporting.

7.269 The CAA agreed with the proposal in relation to the remote pilot, but said that:

> some of the activities normally carried out by a traditionally crewed pilot will be undertaken by ground staff at the vertiport. This could be extended to any other personnel associated with operating the aircraft.[200]

7.270 The CAA Consumer Panel agreed and suggested that:

> Consideration should be given to the role and responsibilities of ground staff at vertiports. If they are given an enhanced role with more responsibility this needs to be recognised in the framework, for example through appropriate training.[201]

7.271 Skyports raised a similar point about responsibilities of others involved in the remotely piloted VTOL operation, as did UKRI Future Flight Challenge who said:

> If an ACAS system triggers an avoidance manoeuvre it should be indicated to the remote pilot and hence, they would be able to report it. For bird strike it is possibly more complex as there would be a need for the aircraft or remote pilot to detect this occurrence and it is unclear how that could be enabled. That may require further discussions as to practicability with aircraft manufacturers. The decision on whether it has caused significant damage may need to be made with help of ground crew to inspect the vehicle. This therefore needs to be considered as part of operations to enable the remote pilot to fulfil the obligations. However, it does seem sensible that whatever the solutions employed to enable the responsibility that it does sit with the remote pilot to be responsible. Similarly, the flight recorders may need to be checked by ground crew and confirmed to the remote pilot, as per other pre-flight checks.[202]

7.272 In response to a different proposal about the VTOL being capable of flight recording, the RAeS and Chris Daniels of Flare Bright suggested that it should in fact be the operator who is responsible for reporting all incidents and near misses.

7.273 Both of these consultees also suggested that the air traffic management provider may have a responsibility:

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200 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

201 CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

202 UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

It is likely that the ATM provider will know of incidents before the Remote Pilot, and they might also share legal responsibility to report accidents and near misses of which they are or ought to be aware.[203]

Discussion and recommendation

7.274 We recommend at paragraph 7.109 above that a VTOL should be capable of detecting issues which could lead to an accident. The remote pilot would be alerted to any such issues and would be responsible for manoeuvring the VTOL in order to avoid collisions.

7.275 Our recommendation 12 above is that the VTOL should also be capable of recording information relating to accidents and near accidents. In the event that ground staff do have a role to play in inspecting the VTOL after the incident in order to assess the damage, the results of any such checks can be relayed to the remote pilot, and it makes sense in these circumstances for the responsibility to remain with the remote pilot.

7.276 We note the comments of the RAeS and of Chris Daniels of Flare Bright that the operator should be responsible for reporting, and that the air traffic management provider could have reporting obligations. We agree that it is sensible for these actors to have reporting obligations in addition to the remote pilot. We note that in the context of crewed operations the operator is already subject to reporting obligations for these types of occurrences.[204] Our view is that the existing obligation would cover VTOL operators, as commercial air transport operators. We therefore do not make any recommendations for reform relating specifically to the operator. Further, air traffic services providers are already subject to reporting requirements for these types of occurrences.[205] We do not consider that any recommendations for reform are required in relation to them.

Recommendation 23.

7.277 We recommend that the remote pilot of a VTOL should be subject to the reporting obligations currently applicable to pilots under the UK Air Operations Regulation 965/2012.

CONCLUSION

7.278 In this chapter we have discussed the key responsibilities of the key actors involved in passenger-carrying remotely piloted UAS operations. There will no doubt need to be more detailed and technical rules introduced to supplement our high-level

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203 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

204 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex III, ORO.GEN.160(a).

205 UK Regulation (EU) 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation, art 4(6)(d).

recommendations as more detail about the nature of uncrewed VTOL operations becomes available. Our high-level recommendations leave flexibility for the development of supplementary rules as and when more detailed information about remotely piloted VTOL operations becomes available.

7.279 Our recommendations draw on the key existing responsibilities for key actors involved in crewed CAT operations in order to ensure parity of safety. Adjustments have been made to take account of the fact that there is no pilot, and possibly no cabin crew, on board. In some instances, a greater level of practical delegation is required by the remote pilot than in the crewed context. Where that is the case, we have sought to ensure that there is clarity as to who has ultimate legal responsibility, in order to maximise safety.

Chapter 8: Accommodating remotely piloted UAS alongside crewed aircraft

8.1 This chapter considers what legal changes, if any, are required to ensure that remotely piloted uncrewed aircraft systems ("UAS") can be flown safely when accommodated alongside crewed aircraft. In chapter 2, we explained that, while some remotely piloted UAS are still segregated from other airspace users, the plan is to move into a phase in which they are operated alongside crewed aircraft in defined airspace structures.

8.2 The safe accommodation of remotely piloted UAS alongside crewed aircraft depends, above all, on the ability of remotely piloted UAS and other aircraft to avoid colliding with each other. The way in which aviation has traditionally dealt with collision avoidance is through application of "the rules of the air". As will be explained below, these rules play a critical role in aviation safety, but they are difficult to apply in full to remotely piloted UAS operations. This is less of an issue when remotely piloted UAS operations are segregated from other airspace users, but as remotely piloted UAS begin to be accommodated alongside crewed aircraft, there is a question about whether the rules of the air should be adapted to account for this. That is the focus of this chapter.

8.3 The first section explains the policy background to the sharing of airspace between remotely piloted UAS and crewed aircraft during the accommodation phase. The second section discusses the importance of the rules of the air when it comes to the sharing of airspace. The final section brings these two strands together and addresses the application of the rules of the air to remotely piloted UAS during the accommodation phase.

THE SHARING OF AIRSPACE: FROM SEGREGATION TO ACCOMMODATION

The challenges of sharing airspace

8.4 It is a guiding principle of UK aviation that airspace is a shared resource.[1] The Civil Aviation Authority ("CAA") has obligations to reflect the needs of all airspace users on an equitable basis when exercising certain functions.[2] Further, the CAA has stated that its aim is to have "UK airspace being as available and easy to access as possible".[3] This includes for new entrants, such as remotely piloted UAS.[4]

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1 Civil Aviation Authority ("CAA"), *UK Airspace Management Policy* (November 2025) (CAP 740) para 3.4. As explained below, this is with the exception of airspace that is segregated for safety reasons.

2 The Civil Aviation Authority (Air Navigation) Directions 2023, Direction 3(c). This includes when classifying or amending classification of UK airspace.

3 CAA, *Air Modernisation Strategy 2023-2040 Part 1: Strategic objectives and* enablers (February 2024) (CAP 1711) para 2.21.

4 CAA, *Air Modernisation Strategy 2023-2040 Part 1: Strategic objectives and* enablers (February 2024) (CAP 1711) para 2.19.

8.5 Nonetheless, the safe operation of remotely piloted UAS in the same volume of airspace as crewed aircraft is not straightforward. The sharing of airspace in this way comes with an increased risk of collision.

8.6 First, crewed aircraft are likely to find it harder to see remotely piloted UAS and therefore find it harder to avoid them. The CAA has acknowledged that "given the size of many UAS, other aircraft are highly unlikely to be able to visually acquire them in order to take effective avoiding action".[5]

8.7 Second, a remote pilot does not have the same "situational awareness" as a pilot on board the aircraft. This means that it is more difficult for the remote pilot to be aware of what is happening in the vicinity of the remotely piloted UAS.[6] In turn, they are less likely to be able to detect collision hazards and to take action to avoid these hazards. A remote pilot's situational awareness can be improved through the use of technology, such as detect and avoid capabilities.[7] But, as it stands, the state of technology is not "sufficiently mature or widespread" to demonstrate a capability of detecting and avoiding collisions equivalent to a pilot on board the aircraft.[8]

8.8 In light of these challenges, the CAA's initial approach has been to prevent remotely piloted UAS and crewed aircraft from sharing the same volume of airspace. As explained in chapter 2, remotely piloted UAS operations have generally taken place in what is known as segregated airspace. Segregated airspace is "airspace of specified dimensions allocated for exclusive use to a specific user(s)."[9] The allocation of airspace for the exclusive use of remotely piloted UAS is intended to significantly reduce the risk of collision with crewed aircraft.[10]

8.9 In the UK, the main ways in which UAS have been segregated from other users is through the use of danger areas (permanent or temporary) and temporary segregated areas.[11] Danger areas are airspace constructs of "defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times".[12] The establishment of the danger area itself does not actually prevent other aircraft from entering, but the establishment of a danger area is an indication that it would be

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5 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 1.2. See also CAA, *Air Modernisation Strategy 2023-2040 Part 1: Strategic objectives and enablers* (February 2024) (CAP 1711) para 2.16.

6 International Civil Aviation Organization ("ICAO"), *Manual on Remotely Piloted Aircraft Systems* (2015) para 10.7.1.

7 ICAO, *Manual on Remotely Piloted Aircraft Systems* (2015) para 10.8.4. See section below on the importance of electronic conspicuity.

8 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 1.2.

9 ICAO, *Unmanned aircraft systems (UAS)* (Cir 328 AN/190 2011); CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) p 12.

10 ICAO, *Unmanned aircraft systems (UAS)* (Cir 328 AN/190 2011) para 2.12.

11 CAA, *Unmanned Aircraft System Operations in UK Airspace – Policy and Guidance* (April 2024) (CAP 722) para 2.3.2.

12 UK Regulation (EU) 923/2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation, art 2(65).

dangerous to do so and remotely piloted UAS are generally given freedom of operation.[13] Temporary danger areas are used when an operation is planned outside an established danger area.[14]

8.10 A temporary segregated area is a similar concept. It is a defined volume of airspace used to segregate specific aviation activity safely.[15] Unlike danger areas, however, other traffic is prohibited from transiting through, rather than just being informed that it would be dangerous to do so. A temporary segregated area may be established, for example:

> when an aircraft intends to operate within a volume of controlled airspace but cannot comply with the requirements notified for that volume of airspace and must therefore be segregated from other aircraft operating within controlled airspace.[16]

The move away from segregation

Integration as a long-term goal

8.11 While the use of segregated airspace ensures that remotely piloted UAS have freedom of operation, there is a general recognition that segregation is not a desirable approach in the long term. At the international level, the International Civil Aviation Organization ("ICAO") has made it clear that the ultimate goal is to achieve 'integration' of remotely piloted UAS with crewed aviation.[17]

> RPAS are creating a new industry with large economic potential. They offer a vast range of capabilities and sophistication. Their associated technologies, designs, and operating concepts are evolving rapidly. It is within this context that States are being challenged with the safe and efficient integration of RPAS into environments shared by a highly regulated and well established manned aircraft industry…. The challenge is to integrate all of [the] diverse RPAS capabilities within the current aviation system without undue burden on current airspace users and service providers and without compromising safety.[18]

8.12 In the domestic context, integration is also the goal of the UK. In the Airspace Modernisation Strategy – published by the CAA and co-sponsored by the Department for Transport[19] – it is stated that: "the UK aspiration for BVLOS UAS is for routine

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13 CAA, *Unmanned Aircraft System Operations in UK Airspace – Policy and Guidance* (April 2024) (CAP 722) para 2.3.2.

14 CAA, *Unmanned Aircraft System Operations in UK Airspace – Policy and Guidance* (April 2024) (CAP 722) para 2.3.2.1.

15 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) p 13.

16 CAA Safety and Airspace Regulation Group, *Policy for the Establishment and Operation of Special Use Airspace* (February 2024) annex B.

17 ICAO, *Manual on Remotely Piloted Aircraft Systems* (2015) para 1.2.

18 *ICAO, Remotely piloted aircraft system (RPAS) concept of operations for international IFR (instrument flight rules) operations* para 1.

19 See Department for Transport, *Airspace modernisation* (22 October 2024) https://www.gov.uk/government/publications/airspace-modernisation/airspace-modernisation.

activity in unsegregated airspace."[20] As explained in chapter 2, the CAA has subsequently produced a policy document, Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft, that charts the path to achieving this integration. It focuses on "the airspace structures that…will safely enable the transition of BVLOS UAS operations from segregated to unsegregated airspace."[21] The policy envisages that integration of UAS will be achieved when:

> the BVLOS UAS is capable of operating in the same environment as other airspace users, without the need for additional requirements to be placed upon them to address their specific operating characteristics.[22]

The accommodation phase

8.13 It is clear that integration is the ultimate goal, but that distinct phases are required in order to reach that goal. As explained in chapter 2, we are currently in an intermediate stage of transition which the CAA labels the "accommodation phase".

8.14 The concept of the accommodation phase originally comes from the international level. ICAO has defined accommodation as:

> the condition when an RPAS can operate along with some level of adaptation or support that compensates for its inability to comply within existing operational constructs.[23]

8.15 The idea underpinning the accommodation phase is that it "allows for early RPA flights on a temporary and transitional basis and in limited numbers before the required technology, standards, and regulations are in place."[24] In the UK, this is achieved through the use of temporary reserved areas ("TRAs"). The purpose of TRAs is to

> provide an appropriate airspace structure with the flexibility to define the specific airspace management arrangements and flight operation procedures necessary to 'accommodate' UA operations, whilst enabling managed access to permitted airspace users.[25]

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20 CAA, *Air Modernisation Strategy Part 3: Deployment Plan* (2nd ed August 2025) (CAP 1711b), para 2.35.

21 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 1.4.

22 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) p 26.

23 ICAO, *Remotely piloted aircraft system (RPAS) concept of operations for international IFR (instrument flight rules) operations*, para 1.4.1.

24 ICAO, *Remotely piloted aircraft system (RPAS) concept of operations for international IFR (instrument flight rules) operations*, para 1.4.1.

25 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 2.9.

8.16 In TRAs, unlike in segregated airspace, other airspace users are in theory able to fly in the same airspace alongside UAS provided they observe certain conditions.[26] The CAA envisage that access to the TRA will be managed by an air navigation services provider and air traffic services will be provided.[27]

8.17 While, on the whole, TRAs will be used for beyond visual line of sight ("BVLOS") UAS operations during the accommodation phase, there may be some circumstances in which this is not the case; for example, where the proposed remotely piloted UAS operation cannot guarantee compliance with certain rules of the air relating to collision avoidance (see further below).[28] In these circumstances, segregation will remain necessary. TRAs will also not be necessary for remotely piloted UAS operations taking place within an "atypical air environment" – a volume of airspace in which it is highly unlikely that there will be any traditional forms of aviation because of its proximity to buildings or other ground infrastructure.[29]

8.18 The CAA makes clear that the eventual aim is for TRAs to be removed so that UAS can be fully integrated into unsegregated airspace: first in controlled airspace and then in uncontrolled airspace.[30] The accommodation phase is only intended to be an "initial, incremental step", and the idea is that it will begin to be closed "once it can be demonstrated that the developments are sufficiently mature and there is data available to support safety arguments."[31] However, as was discussed in chapter 2, it appears that we are still at the relatively early stages of the accommodation phase and, although the CAA hopes that at least some UAS operations without TRAs will be able to take place from 2027,[32] it is likely that the accommodation phase will continue for some time.

THE RULES OF THE AIR

The need for rules of the air

8.19 For the effective sharing of airspace, there needs to be an agreed set of rules regarding how flights are to be conducted. The underlying reason for this is simple: if all airspace users act in accordance with the same set of rules, then pilots can take actions in a structured and complementary way. The pilot of Aircraft A must know that the pilot of Aircraft B is going to give way to the right and vice versa.

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26 For example, that access be managed through an ANSP, see CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 3.7.

27 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 3.7.

28 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) paras 2.4 and 2.5.

29 For more information on atypical airspace see CAA, *Unmanned Aircraft Operations in an Atypical Air Environment: Policy Concept* (November 2025) (CAP 3040).

30 CAA, *Future of Flight: BVLOS Roadmap* (CAP 3182) (October 2025) p 13.

31 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) paras 2.13 and 2.14

32 CAA, *Future of Flight: BVLOS Roadmap* (CAP 3182) (October 2025) p 9 and 13.

8.20 In the aviation world, this set of rules is called "the rules of the air". We explained the background to the rules of the air in detail in our first consultation paper.[33] Ultimately, these rules are agreed at the international level and are contained in Annex 2 to the Chicago Convention. States are then required to establish their own rules of the air, which are heavily based on Annex 2.[34] In the UK, the rules of the air are contained in UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air ("UK SERA").[35] UK SERA is supplemented by the Rules of the Air Regulations 2015,[36] and some provisions in the Air Navigation Order 2016.[37] The UK rules of the air apply to all aircraft engaged in general air traffic operating into, within, or out of the United Kingdom.[38]

8.21 As explained in our first consultation paper, the rules of the air have a critical function in ensuring safety and, to this end, the requirements placed on pilots can be quite prescriptive.[39] The essence of the rules, however, is straightforward. They are operational rules concerned with safely managing the interaction between different airspace users. Above all, this means they are about preventing collisions.[40]

8.22 This core purpose of preventing collisions is reflected in some high-level rules. For example, an aircraft is prohibited from operating "in a negligent or reckless manner so as to endanger life or property of others".[41] Likewise, responsibility is placed on the pilot-in-command of an aircraft to "take such action…as will best avert collision,"[42] and

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33 See Aviation Autonomy (2024) Law Commission Consultation Paper No 261, ch 5.

34 Article 12 of the Chicago Convention 1944 requires contracting states to establish their own rules of the air, which are to be kept "uniform, to the greatest possible extent, with those established from time to time under [the Convention]." As we explained in our first consultation paper, the possibility of deviating from the standards promulgated in Annex 2 is limited. Deviation from the Annex 2 standards must be notified in accordance with article 38. See our first consultation paper, paras 1.64 and 5.18.

35 The rules themselves are found in the annex to the regulation.

36 SI 2015 No 840. The rules of the air in the UK were previously contained in the Rules of the Air Regulations 2007, which implemented the standards in Annex 2 to the Chicago Convention. When Regulation (EU) 923/2012 ("UK SERA") was implemented, the Rules of the Air Regulations 2015 were passed in order to revoke the 2007 Regulations and preserve some additional rules which were not found in the SERA Regulation.

37 Some provisions of UK regulation (EU) 965/2012 ("Air Operations Regulation") also set requirements which must be followed by the pilot-in-command of an aircraft.

38 UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air, art 1(2)(a).

39 Examples of such prescriptive rules include: the minimum flight altitude for certain conditions; the particular lights required to be displayed by aircraft; rules about protecting third parties; regulating unusual use cases (aerobatic and formation flights).

40 The CAA has said about the rules of the air that "at their most basic, they relate to the avoidance of collisions and the requirement to not operate in such proximity to other aircraft as to create a collision hazard. They then build into a more comprehensive 'rule set' that, typically, is impractical to apply to BVLOS UAS in its entirety." CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533), para 2.1.

41 UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air, annex, SERA.3101.

42 UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air, annex, SERA.3201.

it is mandated that "an aircraft shall not be operated in such proximity to other aircraft as to create a collision hazard."[43]

8.23 Beyond these high-level rules, there are more specific ways in which the rules of the air are designed to prevent collisions. Some important examples are:

(1) requiring pilots to utilise a particular set of flight rules depending on the meteorological conditions;[44]

(2) separating some aircraft in controlled airspace;[45]

(3) prescribing rules governing communication;[46]

(4) setting out "rights of way" rules (how and when one aircraft must give way to another aircraft);[47]

(5) allowing the pilot-in-command to depart from the rules where it is absolutely necessary in the interests of safety.[48]

How do the rules of the air apply to remotely piloted UAS?

8.24 Article 12 of the Chicago Convention requires states to ensure that "every aircraft flying over or manoeuvring within [a State's territory]" and "every aircraft carrying [a State's] nationality mark" complies with the rules of the air relating to that flight. UAS are considered to be aircraft manoeuvring within a state's territory.[49] The rules of the air therefore apply to all aircraft, crewed and uncrewed.

8.25 At the same time, there is general recognition that it is not feasible or practical to apply the full suite of the rules of the air to remotely piloted operations. The rules of the air were not originally developed with remotely piloted UAS in mind and many of the

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43 UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air, annex, SERA.3205.

44 Pilots must choose whether they are flying in accordance with 'visual flight rules' (VFR) or 'instrument flight rules' (IFR). Regardless of the type of flight rules chosen, a pilot must always follow a number of core 'general rules'. UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air, annex, SERA.2005. See paras 5.29 to 5.36 of Aviation Autonomy (2024) Law Commission Consultation Paper No 261.

45 The rules of the air determine the extent to which air traffic control services are provided to a particular flight. They also spell out what must be provided as part of that service. See Aviation autonomy: Consultation paper 2 on uncrewed aircraft systems traffic management (2025) Law Commission Consultation Paper No 271 ch 2.

46 The rules prescribe specific requirements about when and how various parties must communicate. See Aviation Autonomy (2024) Law Commission Consultation Paper No 261 paras 5.64 to 5.72.

47 See Aviation Autonomy (2024) Law Commission Consultation Paper No 261 paras 5.45 to 5.47.

48 UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air, annex, SERA.2010. See chapter 5 of our first consultation paper for further discussion.

49 Article 8 of the Chicago Convention addresses the regulation of "pilotless aircraft". The following text was endorsed by the 35th Session of the ICAO Assembly in 2004: "an unmanned aerial vehicle is a pilotless aircraft, in the sense of article 8 of the Convention on International Civil Aviation, which is flown without a pilot in-command on-board and is either remotely and fully controlled from another place (ground, another aircraft, space) or programmed and fully autonomous." ICAO, *Manual on Remotely Piloted Aircraft Systems, (*2015) paras 1.2.5 and 1.2.6. See also Annex 6, part IV to the Chicago Convention, foreword.

requirements are contingent on there being a human pilot on board the aircraft.[50] In our first consultation paper, we identified two potentially problematic areas: emergency situations and the rules governing communication.[51]

8.26 In consequence, the approach taken in the UK is that only the relevant requirements of UK SERA are applied to remotely piloted UAS operations.[52] This differs depending on the category of the operation in question, whether that is open, specific or certified.

8.27 Operations in the open category are not subject to the rules of the air.[53] As we explained in our first consultation paper, none of the requirements of UK SERA are deemed to be relevant because these operations are low risk, at lower altitudes and generally further away from uninvolved persons.[54]

8.28 In the specific and certified categories, only the "applicable operational requirements" of UK SERA apply.[55] This is essentially another way of saying that, for operations in these categories, only the relevant requirements apply. In relation to specific category operations, the CAA has issued "acceptable means of compliance" ("AMC") setting out which requirements are likely to be considered relevant and therefore applicable. Notably, there is no AMC relating to the certified category and so it is as of yet unclear what the applicable requirements are for operations in that category.

Applicable requirements for specific category operations

8.29 The AMC specifies a number of core rules of the air that apply to all specific category operations. These rules are all high-level enough to be applied across the wide variety of operations that might take place in the specific category; for example, the requirement not to operate an aircraft in a negligent or reckless manner. Notably, these rules could be applied to both remotely piloted and autonomous operations.

8.30 We note that AMC are not binding, and that it is open to operators to propose alternative means of compliance to the CAA.[56] However, our view is that the wording of the AMC to article 7(2) – as applying to 'all specific category UAS operations' – indicates that it is less likely that the CAA would agree to alternative means of compliance in relation to the applicable rules of the air, and that these particular rules are effectively mandatory.

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50 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 2.2.

51 This was not a comprehensive review. There are a number of other rules that may be difficult to apply to remotely piloted operations. It is not within our remit or expertise to conduct a comprehensive review of the rules of the air.

52 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7.

53 Article 7 of UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft does not specifically exempt the open category. It simply does not require it to comply with UK SERA in the same way that it does for operations in the specific and certified categories. The effect is the same.

54 Aviation Autonomy (2024) Law Commission Consultation Paper No 261 para 5.28.

55 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7.

56 We discuss the role of acceptable means of compliance in more detail in chapter 3 but see also CAA, *Alternative Means of Compliance* (June 2025) (CAP 1271), p5 on alternative means of compliance.

8.31 In addition to these effectively mandatory requirements that apply to all operations, there are a small number of requirements listed in the AMC that an operator might consider to be applicable depending on the characteristics of the specific category operation in question. These include the rule that nothing within the rules of the air relieves the pilot from the responsibility to take collision avoidance action, and requirements relating to rights of way, aircraft lighting, the use of coordinated universal time and the use of flight plans. These requirements are considered important enough to be listed, but unlike the effectively mandatory requirements, they may or may not be applicable depending on the characteristics of the operation in question. Requirements relating to the responsibility of the pilot-in-command, for example, would not be relevant to an autonomous operation.

8.32 The result of this "modified framework" is that operations in the specific category can be conducted with fewer rules of the air being applied. There are high-level rules that will always apply, and then a menu of options that are applied as necessary. The AMC makes clear that operators should consider the potentially relevant rules and decide which ones are relevant to their proposed operation. The CAA will then incorporate these rules into the operational authorisation, as well as making their own assessment as to which ones are applicable taking into account the risk assessment process.[57] The CAA can require additional rules of the air above and beyond those listed in the AMC to be adhered to as part of the authorisation of the operations.

THE RULES OF THE AIR IN THE ACCOMMODATION PHASE

8.33 As explained above, in the accommodation phase remotely piloted UAS will be operated alongside crewed aircraft in TRAs. There will therefore be some situations in which remotely piloted UAS are sharing the same airspace as crewed aircraft. Given the central importance of the rules of the air when airspace is being shared, the final section of this chapter considers whether the approach of modifying the rules of the air that apply to remotely piloted UAS operations ("the modified approach") – as outlined in the previous section – is suitable for the accommodation phase.

Suitability of the modified approach

8.34 In our first consultation paper, we considered whether it is necessary to adapt the rules of the air. The idea was to take a "systemic approach to adaptation" and so we looked at the issue in the round for both remotely piloted and autonomous operations. We did not specifically consider the suitability of the rules of the air for the purposes of the accommodation phase.

8.35 In this context, we presented three potential options for adaptation. These were: amending the current rules of the air;[58] continuing with the modified approach;[59] or developing a new set of rules.[60]

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57 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 art 7(2).

58 Aviation Autonomy (2024) Law Commission Consultation Paper No 261 paras 5.76 to 5.80.

59 Aviation Autonomy (2024) Law Commission Consultation Paper No 261 paras 5.81 to 5.88.

60 Aviation Autonomy (2024) Law Commission Consultation Paper No 261 paras 5.89 to 5.94.

Consultation analysis

8.36 A key theme emerged from the responses we received. Generally, consultees made a distinction between what is suitable in the short to medium term and what is suitable in the long term. While consultees were more doubtful about the suitability of the rules of the air for autonomous operations in the long term, the general consensus was that the modified approach to the rules of the air is adequate for remotely piloted operations in the short to medium term.

8.37 Ramin Norouzi of Dronzit Aerospace encapsulated this view:

> The applicable requirements approach is not straightforward but I believe is suitable to be used until a new set of rules is developed. The time required to develop a new set of rules is not necessarily a drawback, as it allows developing technologies to reach a safe deployable stage.[61]

8.38 Similarly, while Vertical Aerospace supported the development of a new set of rules in the long term, they said that:

> In the meantime – and given the long lead time to develop such a comprehensive set of new rules – additional applicability of certain existing SERA rules – as currently is the process in PRAS operational approvals, could be used to manage remotely piloted and autonomous operations.[62]

8.39 The importance of allowing time to develop a new set of rules was a key factor for many consultees. The Royal Aeronautical Society said it would be "problematic to attempt to adapt the current rules of the air whilst autonomous use cases are still in their relative infancy,"[63] and NATS considered it "too soon to say exactly how the rules might be adapted".[64]

8.40 A small number of consultees did not agree that the modified approach was suitable. Apian, for example, said that:

> continuing to apply 'applicable requirements' does not provide clarity and consistency. The UAS industry requires an approach applicable to all and not one based on each operation with decisions made by the CAA.[65]

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61 Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

62 Vertical Aerospace response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 574, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

63 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

64 NATS response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 346, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

65 Apian response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 23, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

Discussion

8.41 In light of the above, we do not make any recommendations for systemic reform of the rules of the air covering both remotely piloted and autonomous operations. Longer-term issues with the rules of the air are addressed in part 3 of the report. Insofar as the medium-term accommodation phase is concerned, we agree with the majority of consultees that the current modified approach is suitable. We have reached this view for several reasons.

8.42 First, the modified approach gives the CAA significant control in terms of the rules and procedures applicable to the operation in question. The operation will not be authorised unless it meets the requisite standard of safety. This is appropriate during a period in which many of the technologies are still being developed.

8.43 Second, insofar as the accommodation phase involves the sharing of airspace between crewed aircraft and remotely piloted UAS, this integration is carefully managed through the use of air traffic services. Any traffic entering the TRA will be managed by an air navigation service provider, with air traffic services provided with a view to ensuring separation.[66] This is appropriate for an intermediate phase.

8.44 Third, a flexible approach gives the space for learning to take place before a comprehensive ruleset can be developed. As mentioned above, this was a key theme emanating from discussions with consultees. The CAA has also placed importance on the trialling and testing of technologies and procedures during the accommodation phase.[67]

8.45 Fourth, most of the fundamental issues with the rules of the air that were identified in our first consultation paper related to autonomous operations rather than remotely piloted operations. Where we did ask specifically about remotely piloted operations, consultees did not respond with any significant legal concerns. As there is no prospect of autonomous operations in the medium term, the more fundamental challenges do not arise. This is particularly the case because, as we mentioned in chapter 4, during this period there will be a remote pilot who is responsible for complying with the rules.

8.46 Fifth, any reform of the rules of the air must take into account the international context. As explained in chapter 2, ICAO is in the process of preparing updates to the annexes to the Chicago Convention which set standards and recommend practices specifically relating to RPAS. There have already been amendments to Annex 2 on the rules of the air, including the addition of Appendix 4 on RPAS.[68] A flexible approach allows any relevant international developments to be taken into account.

Practicalities of the modified approach in the accommodation phase

8.47 We have concluded that the current approach of modifying the rules of the air is suitable for the medium term during the accommodation phase. In this context, two

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66 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533), para 3.7

67 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533), para 2.14

68 Most of these changes are due to become applicable from November 2026.

practical matters are worth discussing further. First, what the relevant requirements of UK SERA are likely to be in practice for remotely piloted UAS operations in the accommodation phase. Second, the practical importance of electronic conspicuity.

Likely relevant requirements of UK SERA

8.48 One of the virtues of the modified approach is that it allows for significant flexibility, with the operator and the CAA able to come to an assessment of the relevant requirements depending on the characteristics of a particular operation. Notwithstanding this, it is important to assess what some of the relevant requirements of UK SERA are likely to be for remotely piloted UAS operating in TRAs alongside crewed aircraft. This will give developers some measure of certainty about what will be required of them before they invest in operations.

8.49 The CAA has produced a policy document addressing this question. The Airspace Policy Concept sets out two requirements in UK SERA that are considered to be fundamental for the accommodation phase.

(1) SERA.3201, which places responsibility on the pilot-in-command to take such action, including collision avoidance manoeuvres based on resolution advisories provided by airborne collision avoidance system ("ACAS") equipment, as will best avert collision.

(2) SERA.3205, which requires that an aircraft shall not be operated in such proximity to other aircraft as to create a collision hazard.

8.50 Both of these requirements relate to collision avoidance and are considered to be absolutely necessary for safe flight in the accommodation phase. If a remotely piloted UAS cannot satisfy these basic requirements, then it will not be permitted to operate in anything other than segregated airspace.[69]

8.51 In addition to these two fundamental requirements listed in the policy paper, it must be remembered that the effectively mandatory requirements listed in the AMC to article 7 of UK Regulation (EU) 2019/947 ("UAS Implementing Regulation") also apply. For instance, a remotely piloted UAS operation in the accommodation phase will also be subject to the requirement relating to psychoactive substances.[70] The operator is also required to consider which of the other applicable operational requirements listed in the AMC – as discussed at paragraph 8.31 above should apply to the operation.

8.52 Beyond that, all that can be said is that the CAA can impose other requirements that are considered to be relevant to the operation, always bearing in mind the fundamental purpose of collision avoidance. This position is intended to reflect "the

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69 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 2.5

70 The other requirements listed in the AMC to article 7 are: SERA.3101 – requirement not to operate an aircraft in a negligent or reckless manner, so as to endanger life or property; SERA.3145 – requirement not to fly within a Prohibited or Restricted area, unless in accordance with the conditions of the area; SERA.3205 – Requirement not to operate an aircraft in such proximity to other aircraft as to create a collision hazard.

current limitations of today's technology and ruleset whilst providing a solution to deliver BVLOS UA operations within those constraints".[71]

The importance of electronic conspicuity in achieving collision avoidance

8.53 It is apparent from the above that remotely piloted UAS will not be accommodated alongside crewed aircraft unless they can satisfy basic requirements relating to collision avoidance.[72] It is worth briefly considering how remotely piloted UAS can achieve this in practice.

8.54 For crewed aircraft, the detection of collision hazards can be achieved by an on-board pilot who can see a hazard and take action to avoid it, known as 'see and avoid'. The equivalent capability for UAS is known as 'detect and avoid' ("DAA") – the concept of a UAS seeing, sensing or detecting a hazard and taking action to avoid it. DAA systems can be ground-based, air-based or a combination of both.[73]

8.55 Ensuring 'detectability' is a necessary ingredient of a DAA system. As explained by ICAO:

> the detectability and conspicuity of RPA will have to be sufficient to ensure timely identification by other airspace users and ATC in all phases of flight (including ground operations). Timely detection (by visual or electronic means) will ensure that the rules of the air can be applied safely.[74]

8.56 The CAA has identified this ability to detect and be detected as being a critical enabler of BVLOS remotely piloted UAS operations.[75] In particular, detectability by electronic means – referred to as "electronic conspicuity" – is key. Electronic conspicuity

> includes the devices fitted to aircraft that send out the information and the supporting infrastructure to help them work together; examples are airborne cooperative surveillance equipment, air traffic data displays, ground-based antennas and satellite surveillance system.[76]

8.57 The CAA has said that for electronic conspicuity to be most effective

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71 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 2.12.

72 CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 2.5.

73 ICAO, *Manual on Remotely Piloted Aircraft Systems* (2015) ch 10. See also CAA, *Detect and Avoid Policy Concept Consultation Document* (July 2024) (CAP 3015).

74 ICAO, *Manual on Remotely Piloted Aircraft Systems* (2015) para 10.3.3. See also CAA, *Detect and Avoid Policy Concept Consultation Document* (July 2024) (CAP 3015) para 3.8.

75 CAA, *Detect and Avoid Policy Concept Consultation Document* (July 2024) (CAP 3015) para 1.5.

76 CAA, *Air Modernisation Strategy 2023-2040 Part 1: Strategic objectives and* enablers (February 2024) (CAP 1711) p 20.

it needs 100% of users operating in a designated block of airspace to be using compatible electronic conspicuity devices, and to be able to be detected by others.[77]

8.58 For this reason, electronic conspicuity is considered to be key to operations in the accommodation phase.[78] The CAA's Airspace Policy Concept document has made clear that TRAs established during the accommodation phase will normally be overlaid by a transponder mandatory zone.[79] This means that aircraft will be required to carry transponders, giving them the ability to detect and be detected, or in other words, be electronically conspicuous.[80]

8.59 The importance of electronic conspicuity was also something that consultees fed back to us. The Association of Uncrewed Vehicles emphasised its importance, stating that it would be a "vital cornerstone" of any adaption to the rules of the air because "it will increase situational awareness and cooperation of airspace users in the surrounding airspace".[81] Another consultee also in favour of establishing electronic conspicuity in UK airspace,[82] and Chris Daniels of Flare Bright, responding in a personal capacity, said that "the first step is to mandate electronic conspicuity to agreed common standards for all air users (both manned and unmanned), and of all sizes and weights".[83]

8.60 It is not within the Law Commission's remit or expertise to make recommendations in respect of electronic conspicuity. That is a matter for the regulator.[84] Notwithstanding this, the feedback we received from consultees, as well as the CAA's own position, suggests that electronic conspicuity is likely to play a significant role during the accommodation phase. This important practical point should be taken into

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77 CAA, *Air Modernisation Strategy 2023-2040 Part 1: Strategic objectives and* enablers (February 2024) (CAP 1711) p 20. CAA, *Electronic Conspicuity – Initial Technical Concept of Operations 2025* (July 2025) (CAP 3140).

78 The CAA has said that "at this stage, electronic conspicuity is considered very likely to be an essential enabler for DAA and is therefore likely to be essential for operations within TRAs that are established for the purpose of integrating operations." CAA*, Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 2.11.

79 CAA*, Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533), para 3.8.

80 A TMZ is defined as "an airspace of defined dimensions wherein the carriage and operation of pressure-altitude reporting transponders is mandatory": UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air, annex, art 2(136).

81 Association for Uncrewed Vehicle Systems response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 52, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

82 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

83 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

84 We note that the CAA recently consulted on a technical concept of operations for electronic conspicuity which included a call for evidence in relation to a potential EC mandate. See CAA*, Electronic Conspicuity – Initial Technical Concept of Operations (EC ConOps) 2025* (July 2025) (CAP 3140), p 66.

consideration and gives a strong indication as to how compliance with the modified rules of the air will be achieved during this period.

8.61 Going forward, it is also very likely that – for the same reasons – electronic conspicuity will be key to the integration phase. This is discussed further in chapter 11.

CONCLUSION

8.62 This chapter has considered what legal changes, if any, are required to ensure that remotely piloted UAS can be flown safely when operated alongside crewed aircraft. This question arises because, while some remotely piloted UAS are still segregated from other airspace users, the plan is to move into an 'accommodation' phase in which they are, at times, operated alongside crewed aircraft in special airspace structures.

8.63 In this context, the "rules of the air" are of critical importance because they help manage the interaction between different airspace users when airspace is being shared. They are nonetheless difficult to apply in full to remotely piloted UAS. The current regulatory framework therefore modifies the application of the rules of the air to remotely piloted UAS and only applies the relevant requirements of UK SERA on a case-by-case basis.

8.64 We have concluded that this approach is suitable for the medium-term accommodation phase for the reasons explained at paragraphs 8.41 to 8.47. Furthermore, practically speaking, the CAA will not allow specific category operations unless operators can demonstrate how their operation will comply with the rules of the air relating to collision avoidance, and electronic conspicuity will play a key role in this.

8.65 Although we have concluded that the rules of the air are suitable for the accommodation phase, the considerations are different in the longer term, particularly in relation to autonomous operations. This is discussed further in chapter 11.

Chapter 9: Uncrewed aircraft systems traffic management (UTM)

9.1 In our second consultation paper we examined the provision of Air Traffic Management/Air Navigation Services ("ATM/ANS") to uncrewed aircraft systems ("UAS"), which we referred to as uncrewed aircraft system traffic management ("UTM") services.[1] These anticipated services will provide a range of information to UAS to ensure safe flight where there is no pilot on board the aircraft.

9.2 We outlined the current certification regime for providers of ATM/ANS, which ensures that services meet regulatory requirements. We also discussed how, like traditional services, it will be important to certify UTM service providers ("UTMSPs").

9.3 The current framework for ATM/ANS certification follows a tiered approach. Broad and high-level requirements are set out in the UK Regulation (EU) 2018/1139 (the "Basic Regulation") and prescriptive requirements are set out in an implementing regulation.[2] Broadly speaking, several proposed UTM services might align with current services, such that these services could be certified under the current framework. Certifying under the current regime might have the advantage of short-term ease, allowing some UTM services to be certified. Ultimately, we decided that the current framework would not be flexible enough to accommodate new UTM services and might also impose requirements which are unnecessary in the context of UTM.

9.4 We provisionally proposed that legislative change should be made to accommodate UTM services. This legislative change would ensure that UTM services could be certified and that UTM service providers were subject to appropriate and proportionate requirements. Consultees agreed with our assessment of UTM, and a majority agreed with our proposal that legislative change was necessary.

9.5 We also asked consultees for views on how UTM service providers should interact with air traffic services ("ATS") in controlled airspace. To avoid collisions and to manage traffic in these airspaces, it is important that service providers coordinate and do not provide conflicting information.

9.6 In this chapter, we set out the relevant background to the current certification regime for ATM/ANS providers. We then explain why proposed legislative change to accommodate UTM services is necessary, including why this has advantages over a possible solution of keeping the current regime combined with possible exceptions to enable the certification of UTM. Finally, we provide consultee views on how UTM service providers might coordinate with ATM/ANS providers to ensure safe operations in controlled airspaces.

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1 See chapter 1 at paras 1.20 and 1.21 for an explanation of this terminology.

2 See UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight.

THE CURRENT CERTIFICATION REGIME

9.7 Much of the current framework for ATM/ANS is derived from the Basic Regulation. The Basic Regulation requires that ATM/ANS comply with a list of essential requirements which are set out in annex VIII. These requirements differ depending on the specific service but are generally set at a high-level.

9.8 The Basic Regulation requires most providers of ATM/ANS to be certified.[3] This can be for a specific service or a bundle of services.[4] Certification ensures that services meet essential requirements found in annex VIII of the Basic Regulation.

9.9 UK Regulation (EU) 2017/373 (the "ATM/ANS Implementing Regulation") sets out in more detail how ATM/ANS providers should meet the essential requirements. This is further assisted by guidance material produced by the Civil Aviation Authority ("CAA"). The CAA will issue certificates where providers can demonstrate compliance with requirements set out in the ATM/ANS Implementing Regulation.

9.10 This hierarchy of legislation and guidance is best explained as follows:

(1) The Basic Regulation requires that data used as a source for aeronautical information must be of "sufficient quality, complete, current and provided in a timely manner".[5]

(2) A combination of rules within the ATM/ANS Implementing Regulation add further detail to this requirement. The ATM/ANS Implementing Regulation sets out general requirements for all service providers and specific requirements for individual specific types of ATM/ANS. For example, providers of Aeronautical Information Services must adhere to requirements contained in annex VI (part-AIS), whilst providers of meteorological services must follow annex V (part-MET). [6]

(3) Guidance in the form of acceptable means of compliance clarifies that the format requirements for any given data should be specified in formal arrangements.[7] This is then supported by further guidance produced by the

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3 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 41(1). The CAA may grant an exemption to certification for providers whose principal place of business is located outside the UK under certain conditions set out in art 41(6).

4 UK Regulation (EC) 550/2004 on the provision of air navigation services in the single European sky, art 7(3).

5 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, annex VIII, para 2.1.1.

6 See UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, GM1 ATM/ANS.OR.A.001.

7 UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, AMC1 ATM/ANS.OR.A.085(b)(8).

CAA (CAP 1054) which recommends parties agree to use the aeronautical information exchange model ("AIXM").[8]

9.11 When satisfied the relevant regulatory requirements are met, the CAA will issue a certificate to the service provider, setting out its rights and obligations and any conditions or limitations.[9] The certificate remains in force indefinitely, subject to continuing compliance with the requirements of the regulation.[10]

9.12 Certification is a continuous process, with services expected to meet the essential requirements on an ongoing basis. Providers can have certification revoked or suspended by the CAA if they fail to meet the requirements set out in the ATM/ANS Implementing Regulation.[11]

9.13 Under the ATM/ANS Implementing Regulation, the CAA has the power to issue limited certificates to ATM/ANS providers who provide, or plan to provide, certain categories of operation. They may also be issued to those providers that have a lower gross annual turnover, or to those that provide a smaller scale aerodrome flight information service. As an example, a provider which only provides services to general aviation (that is, non-commercial operations) can apply for a limited certificate. In practice, the issuance of such a certificate exempts a service provider from some certification requirements relating to financial and business matters. Limited certificates may also only be issued to services providers operating in airspace under the responsibility of the UK.[12]

CERTIFYING UTM SERVICE PROVIDERS

9.14 In our second consultation paper, we highlighted several types of UTM services which are envisaged as part of the CAA's concept of operations for UTM.[13] These were: a geo-consciousness service; a meteorological service; and conflict management services.[14] The concept of operations also envisages the need for a Flight Authorisation Service.

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8 CAA, *Aeronautical Data Quality – Guidance for the provision and maintenance of aeronautical data and aeronautical information in UK Aeronautical Information Products* (May 2024) (CAP 1054) para 5.37.

9 UK Regulation (EC) 550/2004 on the provision of air navigation services in the single European sky, art 7(4) and annex II. See also UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, annex II, AMT/ANS.AR.C.020(c).

10 UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, annex III, ATM/ANS.OR.A.025.

11 The CAA has broad powers to ensure that certification standards are maintained. These powers include the ability to enter the premises of service providers to examine any document, record or data. See UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, art 5.

12 UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, ATM/ANS.OR.A.010(a) to (c).

13 CAA, *UTM Concept of Operations v 1.0* (July 2025).

14 CAA, *UTM Concept of Operations v1.0* (July 2025) pp 10 to 12.

9.15 In some respects, these UTM services are similar to conventional ATM/ANS. For example, a conflict management service is broadly concerned with the provision of information to UAS for the purpose of avoiding collisions. This might be done by arranging and prioritising the routes and trajectories of UAS. It might also involve issuing separation instructions to UAS to minimise conflict risk and may also involve rerouting. These functions align with those performed by "air traffic control services" in respect of traditional aircraft. Air traffic control services are defined broadly in regulation as "services provided for the purposes of preventing collisions between aircraft and expediting and maintaining an orderly flow of air traffic".[15] Arguably this broad definition encompasses similar UTM services which would also be provided to ensure the avoidance of collision and to maintain order in the flow of air traffic for UAS.

9.16 The provision of "meteorological services" to UAS is another example of a UTM service that is arguably already encompassed by existing regulation. The CAA envisage a UTM meteorological service to be a service that provides individual operators/remote pilots or other UTM services with the meteorological information necessary for the performance of their respective functions.[16]

9.17 This existing definition of "meteorological services" found in the regulation is:

> those facilities and services that provide aircraft with meteorological forecasts brief and observations as well as any other meteorological information and data provided by States for aeronautical use.[17]

9.18 This definition in the existing regulation is potentially broad enough to include the functions envisaged as part of a UTM meteorological service.[18]

9.19 The broad definitions under the current regulation mean that many UTM services could be interpreted as aligning with current services. Certification of UTM service providers might then be achieved through the current regime by placing UTM services in existing categories of ATM/ANS.

9.20 Ultimately, we decided that specific legislative provision was needed for UTM services for three reasons.

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15 UK Regulation (EC) 549/2004 laying down the framework for the creation of the single European sky, art 2(1). This definition comes from Annex 11 to the Chicago Convention, Fifteenth Edition, 2018, including amendment 53, ch 1 and is replicated throughout key aviation regulations like UK Regulation (EU) 923/2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation, art 2(30).

16 See also Aviation autonomy: Consultation paper 2 on uncrewed aircraft systems traffic management (2025) Law Commission Consultation Paper No 271, para 2.84 for a brief description of meteorological services to UAS.

17 UK Regulation (EU) 549/2004 laying down the framework for the creation of the single European sky, art 2(29).

18 The CAA currently envisage meteorological services for UTM to be a "supplementary" service which "offer significant operations benefits" but are "not required for basic UTM compliance", CAA, *UTM Concept of Operations v 1.0* (July 2025) 3.6 - 3.7.

9.21 Firstly, the current certification regime would be under-inclusive in that it would fail to provide adequately for some UTM services which do not correspond well with current services. One example of a service envisaged by the CAA that might not easily fit within the current regulatory regime is the "network registration and identification service". This service will enable operators to register their UAS and provide any required data related to their UAS.[19] The system would also include an "enquiry" function enabling authorised stakeholders (for example, regulators or police services) to request registration data.[20]

9.22 In time, other new services may develop which are increasingly difficult to reconcile with the services as set out in current regulation.

9.23 One such example might be that of a discovery and synchronisation service ("DSS").[21] This concept of UTM envisages "open access frameworks" where service providers and operators exchange data to build up a more accurate picture of airspace at a given point in time. A DSS may not be provided by a single provider but may instead be made up of information provided by multiple UTMSPs submitting data which can be accessed by all. DSS standards are recognised as an acceptable means of compliance for providing U-space services in the EU,[22] but are not clearly contemplated by the UK's ATM/ANS certification regime.

9.24 The second reason we proposed legislative change was that the current certification regime might be over-inclusive. It could require UTMSPs to comply with measures intended for traditional ATM/ANS such as the management of human air traffic controllers. This would, in turn, deter UTMSPs from entering the market. During the course of our review, we met with several UTMSPs who were already planning to scale back or alter their intended services because the current regime was overinclusive.

9.25 The third reason we proposed legislative change was that some UTM services may run into issues where existing arrangements and regulations only permit one provider of these services to operate in a given volume of airspace. For example, existing regulation provides that there can only be a single ATS provider within specific airspace blocks.[23] A UTM provider certified as an ATS provider under the current regime could not operate in a volume of airspace where there was already an existing ATS provider for conventional aircraft. [24]

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19 CAA, *UTM Concept of Operations v1.0* (July 2025) p 12.

20 CAA, *UTM Concept of Operations v1.0* (July 2025) p 12.

21 The DSS was developed by ATSM as part of its "interoperability paradigm" consisting of Remote ID and UTM interoperability standards (ATSM standards F3411 and F3548). See Connected Places Catapult, *Implementing an Open-Access UTM Framework for the UK* (April 2021) p 25; and NATS, *OpenAir Consultation Phase 2 Report* (November 2024) p 12, para 4.3.5.

22 See U-space Regulation (EU) No 2021/664 Official Journal L 139 of 23.04.2021 p 161, AMC4 art 8(1) and GM1 art 10(6).

23 UK Regulation (EC) 550/2004 on the provision of air navigation services in the single European sky, art 8(1).

24 See Aviation autonomy: Consultation paper 2 on uncrewed aircraft systems traffic management (2025) Law Commission Consultation Paper No 271 paras 4.66 to 4.76.

9.26 Another issue with using the current regulatory framework to certify UTMSPs is that some services can only be provided by a single provider. Whilst some of these issues may be dealt with via guidance, all three together meant that, in our view, legislative change was required to accommodate the certification of UTMSPs.

OUR PROPOSAL

9.27 Our provisional view was that there needed to be some form of legislative change to accommodate the certification of UTMSPs. We were neutral as to whether that change should be made through amendments to the existing provisions, for example through a new annex to the ATM/ANS Implementing Regulation, or whether standalone provisions for UTM services would be more appropriate.

9.28 The main benefit of legislative change is that for those seeking to innovate and/or operate within the ATM/ANS sector, applying UTMSP specific rules may make it easier to identify relevant obligations. These rules could address the unique features of UTM, for example, some UTM services may involve the collection and dissemination of information from operators rather than a central provider.

9.29 Legislative change could also be tailored to cater for types of actors likely to provide UTM. These actors may be different to traditional ATM/ANS providers — they may be smaller or medium sized businesses rather than large organisations. Business plan requirements, which are part of certification, could be adjusted accordingly.[25]

9.30 Another benefit of legislative change is that it would give potential providers more certainty if UTM were specifically addressed. This might then foster the development of UTM and help enable UAS operations at scale in the UK.

Consultation analysis

9.31 Most responses agreed that some form of legislative change was necessary, and no responses disagreed with the proposal.

9.32 A frequent theme amongst those that agreed with our proposal was that UTM was fundamentally different from conventional ATM/ANS in several ways. For this reason, regulatory change would be needed. For example, one consultee said:

> the existing laws were primarily drafted with crewed aviation in mind, where the concept of centralized air traffic control and a limited number of high-value aircraft operating in a highly structured airspace predominated. In contrast, UTM is designed to manage a larger number of diverse UAS operations across a broader spectrum of use cases and in more dynamic, often less structured, environments. The services provided by UTMSPs encompass a wider array of functions, including but not limited to, strategic deconfliction, airspace authorization, interoperable data exchange, and potentially even dynamic airspace reconfiguration. These services often rely on highly automated systems and data processing, which differ significantly from the

[25] UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, annex III, ATM/ANS.OR.D.005.

human-centric, procedural approaches common in traditional ANSP and crewed operations.[26]

9.33 The Federal Aviation Administration ("FAA") also agreed with our assessment. The FAA noted that it was also considering regulatory reform in the U.S. to create a pathway to approval for suppliers of UTM services:

> The FAA recognizes that the airspace has grown past the limits of small unmanned aircraft systems' current regulations. In response, the FAA is currently engaged in a rulemaking effort that would dramatically expedite the introduction of BVLOS operations. The FAA sees BVLOS as the next step in incrementally integrating UAS into our national airspace. This action would create a defined regulatory approval pathway for third-party services, including UAS Traffic Management (UTM) service suppliers. This is intended to assist with simplifying and supporting current and future UTM Services.[27]

9.34 Drone Alliance Europe also raised an additional point, that a lack of legislative change might stifle innovation and growth.

> the current regulatory framework actively impedes growth and is ill suited to address the potential of the UAS industry.[28]

Limited certification

9.35 We also asked for consultee views about the CAA having more powers to issue limited certificates. During this review, several prospective UTM providers had expressed concerns that their intended services would not fit the current categories of ATM/ANS. Therefore, without legislative change, we anticipated a possible need for increased flexibility to certify novel UTM services. One possible means of achieving this is an expanded or enhanced version of "limited" certification, which we described earlier in the chapter (see paragraph 9.13 above). Potentially, UTM providers might have been certified with a "limited certificate", setting out conditions or exemptions to certain requirements in the ATM/ANS Implementing Regulation.

9.36 However, the possible use of limited certification is not without issues. Maintaining the current framework unchanged, whilst also allowing exemptions, would be more difficult to administer than modifying legislation for UTM. Moreover, it could give rise to complexity and uncertainty for applicants. In particular, the range of different UTM services could mean it would be difficult to grant exemptions in a consistent manner.

9.37 Furthermore, the current power to issue limited certificates only exempts certain service providers from a limited set of business and financial requirements in the ATM/ANS Implementing Regulation. Changes to the current regulation would still be

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26 Anonymous 1 response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 110, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

27 FAA response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 27, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

28 Drone Alliance Europe response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p20, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

needed to expand limited certification for UTM providers and to ensure exemption from requirements other than business and financial. Any such legislative change might also have needed to create powers to impose appropriate conditions and limitations on the provider, in the interests of safety, potentially creating more complexity and uncertainty.

9.38 It is because of these drawbacks, particularly as regards the potential lack of clarity and increasing complexity, that we did not provisionally propose a system of limited certification and instead proposed that legislative change be made specifically to address the certification of UTM services. Clear requirements provide certainty for operators and service providers, ensuring compliance with precisely expressed safety and operational requirements. This provides a better means of facilitating safe flight of UAS.

9.39 As we now recommend legislative change to accommodate UTM certification, there is no need for limited or modified certification to be used as a primary means of UTM certification. In our view, it is preferable to build any flexibility that is needed to certify UTM services into the regulatory framework as flexible requirements, rather than using exemptions.

Our recommendation

9.40 In our view legislative change should be made to accommodate UTM services.

9.41 In addition to the reasons outlined in our second consultation paper for legislative change, we recognise that consultees have emphasised the fundamentally different nature of UTM services when compared to conventional ATM/ANS. Unlike conventional ATM/ANS, UTM services will be automated, distributed digitally and provide a wider range of information than current services. The current regime does not adequately reflect these aspects of UTM provision.

9.42 Although in our view legislative change is needed, we emphasise again that we are neutral as to the type of legislative change. Accommodation of UTM in legislation might be achieved by several routes, including amending or adding to the current ATM/ANS regime or via the creation of stand-alone regulation. This is a policy matter for the CAA and Department for Transport if they decide to implement our recommendation.

Recommendation 24.

9.43 We recommend that there should be legislative change to accommodate the certification of UTM service providers.

COORDINATION WITH CONTROLLING AUTHORITIES

9.44 In our second consultation paper, we also considered how some UTM services might be required to coordinate with existing ATS providers.

9.45 A core principle of airspace management is that there should only be one controlling authority for any given volume of airspace. There are clear safety reasons for this. Aircraft within an integrated airspace must be effectively managed and different aircraft should not be in receipt of conflicting air traffic information. For this reason, existing legislation provides that there can only be a single provider of ATS for a given block of airspace who is designated as the controlling authority for that airspace.

9.46 The requirement for a single controlling entity is found not only in domestic regulation but also at high-level by the Chicago Convention. Annex 11 of the Chicago Convention requires that "responsibility for the control of all aircraft operating within a given block of airspace shall be vested in a single air traffic control unit".[29]

9.47 However, the Chicago Convention does allow for coordination between different air traffic control units within an airspace. Annex 11 of the Chicago Convention also provides that "control of an aircraft or groups of aircraft may be delegated to other air traffic control units provided that coordination between all air traffic control units concerned is assured".

9.48 As described in the previous section, some UTM services will provide information that are similar to ATS, helping to separate and deconflict UAS and other aircraft. In integrated airspace, if only for safety reasons, a UTM service that provides an ATS-like service might be expected to coordinate with the controlling ATS provider. This would help ensure that UAS and conventional aircraft are not in receipt of conflicting information.

Potential options for coordination

9.49 In our second consultation paper we explored how effective coordination might be achieved between UTM service providers and ATS units. We discussed two potential options and invited views from consultees. These potential options were enhanced agreements; and the establishment of a common information service.

Enhanced agreements

9.50 The first potential solution to coordination could be to allow UTMSPs to enter into agreements with ATS providers to operate within their designated airspace.

9.51 In limited circumstances CAA policy already allows for multiple ATS units to operate in a given volume of controlled airspace. Usually, where the controlling ATS unit (referred to in the policy as "the airspace controlling authority") cannot provide uniform coverage for some areas or activities in its allocated volume. In these circumstances, CAA policy allows the controlling ATS unit to engage other certified ATS units to provide the coverage in their stead. Practically speaking, this arrangement seems to be used mostly for military operations and small areas over and above airfields.[30]

9.52 The supplementing ATS units must demonstrate that they meet the minimum civilian and military technical and staffing standards for ATS provision. The airspace controlling authority and the supplementing ATS unit must also have in place Letters

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29 Annex 11 to the Chicago Convention, Fifteenth Edition, 2018, including amendment 53, para 3.5.2.

30 CAA, *Policy for ATS Provision Within Controlled Airspace by Units not Notified as the Controlling Authority* (19 June 2020) https://www.caa.co.uk/publication/download/15629.

of Agreement which, amongst other things, must define the task to be undertaken by the supplementing unit, detail procedures for the sharing of provision, and describe relevant contingency procedures.

9.53 Because such Letters of Agreements are concluded in relatively limited circumstances, we foresaw the need for "enhanced" versions of these agreements if used for UTM provision. Unlike supplementing ATS unit agreements, which are designed to supplement or replace the services of the airspace controlling authority, UTM services could work alongside or with the airspace controlling authority's own services to effectively separate UAS from conventional aircraft.

Common information service

9.54 The second option for coordination we discussed in our consultation paper was the possibility of a common information service ("CIS").

9.55 A CIS is essentially a service which provides common information to operators and service providers. This service would provide a variety of information including the intended flight plans of operators and/or the current positions of aircraft. This common information would allow different operators and service providers (including the controlling authority) to coordinate operations. This might be particularly useful where there are many operators and many UTM service providers in the same volume of airspace.

9.56 Co-ordination between ATS and multiple UTMSPs has been considered by the EU as part of its U-space concept. Under U-space regulation, Member States must implement a CIS to allow for the sharing of operational data between UTMSPs (referred to as USSPs in U-space regulation) and ATS units.[31]

9.57 Under U-space regulation, the CIS can be implemented in two ways. Firstly, Member States may provide for a guaranteed layer of communication between UTMSPs and ATS units.[32] Alternatively, a Member State might designate a common information service provider ("CISP").[33] A CISP is a new legal entity and is distinct from UTMSPs. Its primary role is to distribute common information to service providers within a designated U-space and must be certified under U-space regulation.

9.58 The decision to implement a CIS is a matter of policy rather than a legal question. For this reason, we did not provisionally propose a CIS be implemented in our second consultation paper. At the time of our second consultation, we understood the CAA to be considering the need for a CIS to enable UAS operations at scale.

9.59 However, were a CIS to be implemented, it would be important to clarify the legal responsibilities of all actors that provide and use the CIS. For example, UTMSPs and ATS units would need to be subject to relevant obligations, such as the obligation to exchange accurate aeronautical information. If the CIS were to be implemented using a CISP, then this provider would need to be under the obligation to provide information in a non-discriminatory manner to all airspace users. We invited consultee

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31 U-space Regulation (EU) No 2021/664 Official Journal L 139 of 23.04.2021 p 161, art 5(2).

32 U-space Regulation (EU) No 2021/664 Official Journal L 139 of 23.04.2021 p 161, GM1 art 5.

33 U-space Regulation (EU) No 2021/664 Official Journal L 139 of 23.04.2021 p 161, art 5(6).

views about the rights and duties that should be associated with the use and provision of a CIS to inform a possible future CIS.

The Future of Flight review

9.60 Since the publication of our second consultation paper the CAA have published the "Future of Flight: BVLOS Roadmap".[34] This document provides detail on how the CAA will work with industry and government to meet their own objectives of routine Beyond Visual Line of Sight ("BVLOS") operations by 2027; and enabling "Advanced Air Mobility" flights involving passengers by the end of 2028.[35]

9.61 The Future of Flight: BVLOS Roadmap sets out three "operational pathways" for routine BVLOS operations. These are:

(1) atypical pathway development;

(2) low level over urban environment pathway development; and

(3) fully integrated pathway development.

For each of these pathways, policies and "airspace" considerations are set out along a five-year timeline.

9.62 Importantly, for the purposes of our review, the document sets out the policies and airspace development the CAA sees as necessary to facilitate the "interaction between UTM and ATM".[36]

9.63 The CAA document labels these types of interactions under the policy heading of System Wide Information Management ("SWIM"). SWIM is a concept which refers to "standards, infrastructure and governance enabling the management of the ATM-related information and its exchange between qualified parties via interoperable services."[37] At a basic level, the purpose of SWIM is to enable a "many-to-many" information distribution model which allows providers and users of ATM information and services to easily exchange information between themselves. Exchange of information between ATM and UTM service providers is one use case for SWIM.

9.64 The CAA's BVLOS Roadmap foresees that in the short term, "procedures" will be developed to enable interaction between UTM and ATM.[38] The future of flight policy document is unclear as to the form these procedures will take. However, in its response to our consultation, the CAA gave some indication of what it foresees as being necessary:

> it is easier to envisage an efficient and safe operational solution with more than one provider where two or more parties agree to offer services that complement one

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34 CAA, *Future of Future of Flight: BVLOS Roadmap* (October 2025) (CAP 3182).

35 CAA, *Future of Future of Flight: BVLOS Roadmap* (October 2025) (CAP 3182) p 3.

36 CAA, *Future of Future of Flight: BVLOS Roadmap* (October 2025) (CAP 3182) pp 11 to 13.

37 ICAO, *Manual on System Wide Information Management (SWIM) Concept* (Doc 10039 2015) para 2.3.1.

38 CAA, *Future of Future of Flight: BVLOS Roadmap* (October 2025) (CAP 3182) pp 11 to 13.

> another with clear responsibilities and accountabilities in the provision of services within an airspace volume, underpinned by contractual arrangements and supported by Letter of Agreements and Memoranda of Understanding [CAA].[39]

9.65 To some extent this mirrors the types of arrangements between controlling authorities and ARU, which are also underpinned by letters of agreement.[40] It seems to us, that these procedures may, in practice, be similar to the enhanced agreements which we discussed at paragraphs 9.50 to 9.53 above, and in our second consultation paper.[41]

9.66 But the use of procedures is only seen as a short-term solution. From 2028 onwards the CAA foresees the need for a CISP function to facilitate the interaction between UTM and ATM providers.[42]

9.67 In October 2025, the CAA announced that they had conducted an initial review of a submission by NATS (En Route) plc ("NERL") called NATS OpenAir.[43] According to the CAA, the NATS OpenAir proposal encompasses the introduction of a CISP function – understood as a form of procedures or agreements that may facilitate appropriate information sharing. Further to this proposal the CAA have indicated that:

> given the likely criticality of a CISP function for the UK future airspace architecture, we are currently expediting work to advise the Department for Transport on the optimal role of the CISP in alignment with the target airspace architecture.[44]

9.68 In the same announcement the CAA indicated that, whilst they recognise the important role of NERL,[45] they also continue to welcome inputs from other industry stakeholders on the concept of SWIM and related issues.

9.69 This raises questions about the possible form of a CISP function. As discussed in the previous section, a common information service might be provided as a distinct service, or it may also be provided through a guaranteed layer of exchange of information between different parties. During our review, some stakeholders also suggested that a peer-to-peer exchange of information between operators might be considered a form of CIS provision. However, neither the roadmap document, nor the announcement about the OpenAir consultation, give detailed information about the type of CISP function to be provided. The CAA have indicated that the "technical

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39 CAA response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p10, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

40 See above at paras 9.49 to 9.53.

41 See Aviation autonomy: Consultation paper 2 on uncrewed aircraft systems traffic management (2025) Law Commission Consultation Paper No 271 paras 4.95 to 4.98.

42 CAA, *Future of Future of Flight: BVLOS Roadmap* (October 2025) (CAP 3182) pp 11 to 13.

43 NATS (EN Route) plc, more commonly known as "NERL", are the UK's sole provider of area control (en route services) for civil aviation.

44 See Civil Aviation Authority, *Future Air Traffic Management* (23 January 2026) https://www.caa.co.uk/commercial-industry/airspace/airspace-modernisation/airspace-modernisation-strategy/future-air-traffic-management/.

45 See footnote 43 above.

work" for a CISP function will be concluded in early 2026, after which they will engage with NERL and other industry stakeholders.[46]

9.70 The intent to set up a CISP function clarifies the way UTM providers will be expected to coordinate with ATS units in the future. However, before an appropriate legal analysis can be made of the CISP function in the UK, more details are necessary about how it will be implemented. The FAA in its response to our consultation also cautioned that a legal analysis of rights and duties associated with a CIS could be premature without more details about how the CIS would work in practice.

> While a common information service may alleviate concerns with inconsistent airspace pictures among operators, this CONOPs would need a proof test. In addition, such a service would need to be able to resolve inconsistent data, for example, different weather reports or aircraft locations that may have a downstream impact on USS's. Information providers to a CIS provider may have upstream impacts. I think more specific details and work are needed before evaluating the potential imposition of rights.[47]

9.71 We agree that there is still much to be decided in terms of the form that the CISP function would take and how it should be provided. For this reason, we do not make any recommendations about how the regulatory framework should be changed to accommodate a CISP function. Attempting to regulate now without a clear picture of what the service might be, and who would be able to provide it, risks hindering policy development and potentially innovation.

Assisting future policy development

9.72 Consultees to our second consultation expressed a range of views about how the interaction between UTM service providers and ATS units should be achieved. They also gave views about the types of rights and duties that should be associated with a CISP.

9.73 In light of the BVLOS roadmap which sets the CAA's intent to develop "procedures" for ATS and UTM coordination in the short term, and a central information service in the longer term, we present consultee views so that they can inform future policy development in this area.

9.74 In general, consultees responded positively to the prospect of both enhanced agreements between UTM providers and ATS providers and to the prospect of a CIS.

Consultee views: Enhanced agreements

9.75 Most respondents were in favour of allowing designated ATS providers to enter into agreements with UTMSPs to provide air traffic services to UAS. Only a small minority were against the provisional proposal.

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46 See CAA website, *Future Air Traffic Management* (2026) https://www.caa.co.uk/commercial-industry/airspace/airspace-modernisation/airspace-modernisation-strategy/future-air-traffic-management/

47 FAA response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 27, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

9.76 Many consultees in favour of allowing designated ATS providers to enter into agreements with UTM service providers cited its positive impact on enabling UAS operations within UK airspace.

9.77 The Royal Aeronautical Society ("RAeS") commented:

> Importantly, such arrangements could support: The safe integration of crewed and uncrewed traffic in shared volumes of airspace (a central tenet of the CAA's AMS and RAeS's airspace resilience recommendations), Flexible delegation of roles and responsibilities, reducing regulatory bottlenecks while maintaining a single accountable operational architecture, Incremental pathway to integrated service provision, allowing for varying levels of automation, autonomy, and geographic scope to be accommodated within a consistent legal framework.[48]

9.78 Another consultee emphasised the importance of such agreements in ensuring safety within integrated airspace:

> These agreements would enable UTMSPs to facilitate coordination between their highly automated services and existing Air Traffic Management (ATM) services, thereby avoiding conflict with the single-provider rule governing traditional ATS. The ability to interoperate and have a distributed system that is able to exchange data will enable an innovative airspace integration of all aircraft.[49]

9.79 As regards the practicality of this arrangement, NATS noted that it currently has agreements in place with other air navigation service providers and military units to permit the provision of ATS in joint airspace, meaning there is precedent for this approach.[50]

9.80 Some consultees who supported enhanced agreements thought it would be a positive measure because it might promote a free market in the provision of UTM, rather than a monopoly.

> In a free market economy, this of course should be permitted, assuming required safety standards are met, and market competition is retained.[51]

Concerns raised

9.81 Whilst most consultees support enhanced agreements, stakeholders also raised various concerns about how the arrangements would work in practice.

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48 RAeS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

49 Anonymous 1 response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 110, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

50 NATS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 62, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

51 Neuron Innovation response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 73, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

9.82 Some consultees expressed the view that enabling ATS providers to enter into agreements with UTMSPs to provide air traffic services to UAS could lead to problems with the allocation of liability. The RAeS' Air Law Specialist Group cautioned that:

> Such commercial agreements would be commercially negotiated between the parties. Thought needs to be given to the need for statutory limits to provide for and enforce risk allocation, and liability, to be confident that contracted risks are properly mitigated. There is a risk that a contractual imbalance of power may give rise to a party not having a meaningful remedy in the event of a breach. Without statutory certainty, legal risks may not properly be covered, leaving an uncertain outcome with, for example, insurers.[52]

9.83 Similarly, the British Standards Institution responded:

> careful consideration would be required regarding how this arrangement would operate in practice, particularly in scenarios where future legislation might permit multiple UTMSPs to operate within a given airspace volume. Critical issues would include the delineation of operational responsibilities, coordination protocols between multiple service providers, and most importantly, how liability would be allocated and managed when incidents occur. The complexity of liability management becomes particularly acute when multiple parties are involved in service provision, potentially creating ambiguity about responsibility and accountability that could undermine both safety and legal certainty.[53]

9.84 However, most consultees raising this concern also took the view that this risk could be managed with appropriate regulation. For example, the CAA suggested that these agreements be concluded on the condition that there remains "one accountable provider for the safe operation of the airspace".[54]

Consultee views: CIS

9.85 Our second consultation paper did not specifically ask if a CIS was either necessary or desirable. Nevertheless, many consultees in their responses expressed views about whether a CIS was necessary. Some consultees provided views about the legal rights and duties that various actors should have in relation to a CIS.

9.86 Several stakeholders strongly supported the establishment of a CIS. For example, RAeS commented:

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52 RAeS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

53 British Standards Institution response, Aviation autonomy: Responses to the second consultation (2026) p 3, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

54 CAA response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 10, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

> We support the establishment of a Common Information Service (CIS) as a critical enabler for safe and efficient integration of uncrewed aircraft systems (UAS) and advanced air mobility (AAM) operations within the UK's shared airspace.[55]

9.87 However, several stakeholders favoured a peer-to-peer approach to information sharing, as opposed to a CIS.

> A CIS is not required. Existing standards by ASTM show it's not necessary, and in fact the leading work in the US by Google Wing, Manna, Amazon, and Anra Technologies, show it's not necessary. This appears to be a lobbying effort to centralise/ monopolise data services and limit consumer choice through data control. I would strongly recommend the government leave the free market alone in this area. The market has solutions that are much more healthy for the future of UK aviation, which bypass incumbent actors who tax the industry with unnecessary services on the grounds of "safety"[56]

> We firmly believe that this direct, peer-to-peer data sharing model among UTMSPs offers substantial advantages. It is inherently more efficient, as it bypasses the potential bottlenecks and latency associated with a centralized intermediary. It is also more resilient, as it distributes the burden and reduces single points of failure. Furthermore, this decentralized approach fosters innovation within the broader UTM ecosystem by empowering individual UTMSPs to develop and deploy novel solutions and services without being constrained by a centralized system's capabilities or limitations. This direct interaction promotes competition and collaboration, leading to a more dynamic and responsive UTM environment.[57]

Legal rights and duties of CISP

9.88 Regardless of the policy choices that are made in relation to CIS implementation, an important element of future work will be setting out legal rights and duties associated with such a service. These rights and duties would need to be clear for all parties who partake in the service: UTM service providers; ATS units; and CIS providers.

9.89 Views amongst those who provided insight into the potential legal rights and duties of UTMSPs, ATS units and CIS providers, were varied. Several respondents agreed that legal rights and duties should be imposed but did not hold views as to the form of these rights and duties. For example, the CAA responded:

> we consider that rights and duties should be the same for all providers listed proportionate to their role. This would ensure that all available data has a

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55 RAeS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

56 Neuron Innovation response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 73, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

57 Anonymous 1 response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 110, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

guaranteed level of accuracy, integrity and quality. This is something to be considered within the SWIM Project and the DAT Project at the CAA.[58]

9.90 Another consultee, NATS, did not feel best placed to advise as to the legal rights and duties behind a CIS, but it noted that the requirements set out in U-Space regulation may be a helpful starting point.[59]

9.91 NATS also thought that rules ensuring the integrity of shared aeronautical data would be needed for a CIS to be effective. NATS also thought that a requirement to use the CIS (in a way that was proportionate) would also be necessary:

> For a common information service to be effective, there should be legislation to require the exchange of aeronautical data of adequately high integrity in a standardised format, among ANSPs, UTMSPs and CISP, to enable shared use of airspace between crewed and uncrewed aircraft. Along this line of reasoning, there should also be a requirement for controlling airspace authorities, UTMSPs or ANSPs, to use the common information service to assist in flight planning, with their usage of CISP functions appropriate to the operations. For example, an UTMSP may need the geographical awareness aspect of CISP functions, but not the airspace authorisation aspect, for UAS flights in uncontrolled airspace.[60]

9.92 One stakeholder encouraged a more limited approach to imposing rights and duties upon UTMSPs, ATS units and CIS providers, with some issues instead being negotiated upon a commercial basis.

> Some aspects, such as information integrity and security would almost certainly have to be determined by regulation; while it is tempting to say that matters such as reliability of provision, service standards etc. should be provided on a standard basis we believe that the starting point should almost certainly be to allow providers and recipients of C.I.S. services to negotiate these on a commercial basis, along with pricing.[61]

9.93 The British Standards Institution ("BSI") provided a unique response, suggesting that given the potential importance of a common information service, consideration should be given to whether this service should be designated as a Critical National Infrastructure and treated as a regulated utility service similar to current arrangements in relation to NATS NERL, which provides en route ATS services for all aircraft in UK airspace. Further, BSI stated that standards for aspects of the CIS should be prioritised:

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58 CAA response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 10, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

59 NATS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 62, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

60 NATS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 62, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

61 Anonymous 1 response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 110, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

Standards development in this area is currently nascent, and we recommend prioritizing early standards development given the complexity of integration between legacy ATM systems and emerging UTM infrastructure. This would ensure that CIS implementation is supported by robust technical standards that address interoperability, data integrity, cybersecurity, and operational resilience requirements from the outset.[62]

9.94 One stakeholder, the RAeS, set out the duties and rights of various actors in detail.[63] We set out their views in the table below:

Table 9.1 – RAeS views on the duties and rights associated with a CIS

Actor	Duties	Rights
UTM Service Providers (UTMSPs)	• Mandatory participation in CIS where operating in designated areas (for example, complex, high-density, or mixed-use airspace). • Provision of timely, accurate, and validated data on flight intent, real-time positions, operational status, and contingency planning. • Compliance with interoperability, cybersecurity, and data protection standards. • Coordination with ATS and CIS providers, including adherence to dynamic airspace usage rules and priority protocols.	• Equitable access to CIS data, including ATS-supplied constraints and other UTMSP flight intents. • Ability to flag inaccuracies or system issues in shared data. • Right to receive updates to defined operational data standards and CIS protocols.

62 British Standards Institution response, Aviation autonomy: Responses to the second consultation (2026) p 3, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

63 RAeS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

Actor	Duties	Rights
Air Traffic Services (ATS) Units	• Integration of relevant data into CIS, including airspace status (for example, NOTAMs, capacity constraints, tactical interventions), real-time traffic information, and separation instructions. • Timely coordination with UTMSPs on dynamic airspace management and deconfliction activities. • Alignment of ATS procedures with UTM-enabled operations to ensure a unified traffic picture in integrated airspace.	• Authority to override UTM trajectories in emergent situations to preserve overall airspace safety. • Access to a full operational picture from CIS, including strategic UTM data and UAS conformance monitoring.
Common Information Service (CIS) Providers	• Ensure real-time, secure, and equitable dissemination of relevant aeronautical and operational information across all actors. • Maintain data integrity, latency tolerances, and system availability standards. • Provide transparent and auditable access protocols. • Facilitate a federated, standards-based architecture that supports interoperability among heterogeneous systems.	• Authority to enforce compliance with data exchange protocols. • Right to require conformance certification from UTMSPs and ATS units interfacing with the CIS. • Recourse to regulatory enforcement in case of non-compliance by connected parties.

CISP rights and duties: major themes

9.95 Most consultees agreed that there should be legal rights and duties imposed for those who participate and use a CIS. However, there was little consensus about the exact form or scope of these rights and duties. Some major themes did emerge from consultation responses.

9.96 Firstly, several responses highlighted the importance of standardising the way in which data is exchanged between various parties. This might require mandating the format of data shared and creating relevant standards to ensure interoperability. Consultees highlighted the need for legal rules related to the accuracy and integrity of data shared between parties. Some consultees also stressed that equality in access to data was crucial.

9.97 Secondly, some consultees urged caution about having overly prescriptive rules. These respondents emphasised that a balance needed to be struck between flexibility and accommodating different means of implementation, and the need to maintain dissemination of relevant data and adequate levels of data security.

9.98 Lastly, a point strongly emphasised by the RAeS was that of authority. Firstly, the RAeS indicated that the CISP should have the authority to enforce compliance with data exchange protocols and to require certification for systems interfacing with its service. To ensure compliance, RAeS thought that the CISP should have "recourse to regulatory enforcement in the case of non-compliance". The RAeS also thought that ATS providers should have the authority to override the trajectories of provided by UTM providers in "emergent situations" for safety reasons.

9.99 Discussion of authority brings up an important consideration for the implementation of any CISP function. Regulation will need to carefully set out which parties have the authority or priority in terms of setting conditions for use of the CIS. Thought should also be given to how conditions will be enforced. A new set of penalties may be needed to ensure compliance with safety and operational aspects of the CIS, and these will need to be clear and proportionate.

CONCLUSION

9.100 UTM is a crucial enabler for future UAS operations. To ensure that UAS can be integrated safely into UK airspace, there must be appropriate services which enable them to fly safely, minimise the risk of mid-air collisions and optimise their operations. In this chapter we have set out the reasons why we have recommended that there be legislative change to accommodate UTM, which is distinct from other types of ATM/ANS.

9.101 We have summarised in this chapter that there were a variety of different views on the part of consultees in relation to how UTM services providers should coordinate with ATS providers in controlled airspaces. Coordination is important to ensure that UAS and conventional aircraft are not in receipt of conflicting air navigation information which may lead to unsafe situations.

9.102 We explained how recently the CAA have confirmed their intent to create procedures for coordination in the short term but that, long term, they foresee the need for a CISP function. A CISP function may be implemented in various ways and we have therefore not made recommendations about how a CIS, or CISPs, should be regulated.

Part 3: Recommendations for autonomous UAS operations and the longer term

Chapter 10: Autonomous UAS operations

10.1 In part 2 of the report we made recommendations for law reform with a view to achieving equivalent safety between crewed aircraft operations and remotely piloted Uncrewed Aircraft Systems ("UAS") operations.

10.2 In this part of the report, we look at autonomous UAS operations where there is no remote pilot who is able to intervene.[1] In these operations the responsibilities of the remote pilot must be transferred elsewhere in order for autonomous operations to achieve equivalent safety with crewed operations.

10.3 A potential solution we identify is to transfer some of the remote pilot's responsibilities to the operator. In the context of specific category operations, we discuss how this may result in some operational responsibilities of the remote pilot being met at the pre-deployment stage by the operator using UAS which are capable of meeting those responsibilities, for example not to fly into zones for emergency response efforts. In the context of certified category operations, and more specifically passenger-carrying operations, we discuss the various actors who could assume responsibility for various safety-related obligations of the remote pilot.

10.4 However, we recognise that there are many unknowns in relation to autonomous UAS operations, such as the types of UAS involved, the technology, and the concept of operations for autonomous use cases. Given this, it will be necessary for legal rules relating to these operations to be developed iteratively. This will allow for autonomous UAS operations to be carried out at a level of safety equivalent to crewed operations but will also facilitate innovation. The recommendations for law reform that are made in this chapter are high level and leave sufficient flexibility in the legal framework for the Department for Transport ("DfT") and the Civil Aviation Authority ("CAA") to make supplementary rules and guidance as more information emerges about autonomous UAS operations over time. This fits with the iterative approach to policy development we discuss in chapter 2.

10.5 In the first section of this chapter, we discuss the existing legal framework for autonomous UAS operations and highlight gaps in the law. We then look at key actors in autonomous UAS operations. In the third section we make recommendations for law reform in relation to pre-deployment issues. Finally, we discuss operational issues such as flight-related responsibilities.

LEGAL BACKGROUND

10.6 On the international level, there are no formal standards relating to autonomous UAS operations. The legal standards being developed by the International Civil Aviation Organization in relation to UAS focus on remotely piloted operations.

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[1] We adopt the definition of autonomous found in UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 2(17). We discuss this further in chapter 4 of the report.

10.7 The existing domestic legal framework for UAS does provide for autonomous UAS operations in the specific and certified categories but prohibits them in the open category.[2] In the specific category, there are some rules regarding autonomous UAS operations, and we discuss these further below. However, the legal framework is silent in relation to autonomous UAS operations in the certified category.

THE PROBLEM

10.8 In autonomous UAS operations, the remote pilot – the person who would ordinarily be responsible for safely conducting the flight, for the operation and safety of the aircraft, and for the safety of all crew and passengers on board – is no longer involved.

10.9 We anticipate that the following actors will be involved in autonomous UAS operations:

(1) Operator: the existing legal framework envisages an operator of autonomous UAS operations.[3] We anticipate that many of the responsibilities of the operator that exist in remotely piloted operations would continue to exist for autonomous UAS operations.

(2) Designers and manufacturers: in chapter 12 of the report, on civil liability, we discuss how these actors take on a new significance in the context of higher levels of automation and autonomy and may become more of a focus in litigation.

10.10 There may or may not be the following additional actors:

(1) Cabin crew: cabin crew in crewed operations perform duties related to the safety of passengers and flight.[4] Cabin crew often carry out duties including welcoming passengers onto the aircraft; demonstrating the use of safety equipment; checking passengers are seated and using seat belts ahead of take-off.

(2) Ground handling staff, in the context of crewed operations, are responsible for: ground supervision; flight dispatch and load control; passenger handling; baggage handling; freight and mail handling; apron handling of aircraft; aircraft services; fuel and oil handling; and loading of catering.[5]

(3) Flight supervisor: in our first consultation paper we discussed the possibility – in the context of autonomous passenger-carrying operations – of a role for a flight supervisor who could take on various legal responsibilities of the pilot which do

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2 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 UAS.OPEN.060(2)(d).

3 See for example UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.050(1)(b), which talks about the requirement for the operator to allocate certain responsibilities in autonomous specific category UAS operations.

4 UK Regulation (EU) 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew, art 2(11).

5 UK Regulation (EU) 2018/1139 on common rules in the field of civil aviation and establishing a European Union Safety Agency, art 3(23).

not relate to the piloting task itself, such as passenger briefings and ensuring seat belts are worn.

10.11 The involvement of actors listed in the previous paragraph is likely to vary from use case to use case and may also depend on policy decisions made by the DfT and CAA. For example, one area for policy development which we raise in chapter 7 is whether – given concerns about passenger safety – passenger-carrying operations with neither a pilot nor crew on board should be permitted. This issue applies equally to autonomous UAS operations.

10.12 The central problem to resolve in relation to autonomous UAS operations is how to ensure parity of safety between remotely piloted and autonomous UAS operations in circumstances where the actor with safety-critical responsibilities is removed from the operation. In the remainder of this chapter, we discuss potential pre-deployment and operational solutions to this problem, as well as several other issues which are specific to autonomous UAS operations.

PRE-DEPLOYMENT ISSUES

10.13 In this pre-deployment section, we discuss four issues:

(1) Whether the greater reliance upon artificial intelligence ("AI") – as is anticipated to be the case in autonomous UAS operations – presents difficulties for certification of UAS.

(2) Whether autonomous UAS operations should be allowed in the open category in order to facilitate innovation.

(3) Whether certain operational responsibilities which would usually fall to the remote pilot should be dealt with at the pre-deployment stage by the operator.

(4) Whether the use of flight data recorder systems or devices should be mandatory for autonomous UAS operations.

Airworthiness and certification

10.14 In our first consultation paper we noted that the use of AI technologies is likely to be central to the development of autonomous flight. This is supported by the EU Aviation Safety Agency's ("EASA") AI roadmap which states that:[6]

> very powerful AI models will be necessary to process and use the huge amount of data generated by the embedded sensors and by the machine-to-machine communications to support flights without human intervention.

10.15 For the purposes of this discussion, we use the following definition of AI as published by an expert working group of the Organisation for Economic Co-operation and Development ("OECD"):[7]

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6 EASA, *Artificial Intelligence Roadmap 2.0* (May 2023) p 10.

7 Organisation for Economic Cooperation and Development, *What is AI? Can you make a clear distinction between AI and non-AI systems?* (2024) https://oecd.ai/en/wonk/definition. We used this definition of AI in

> An AI system is a machine-based system that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments. Different AI systems vary in their levels of autonomy and adaptiveness after deployment.

This definition is similar to that adopted in the EU's AI Act, and the definition used by EASA in its AI roadmap which we refer to above.[8]

Challenges presented by AI

10.16 In our first consultation paper we discussed in detail three challenges for certification of UAS involving AI. In summary, these are:

(1) Predictability and explainability: Because machine learning and deep learning approaches have the potential to generate unanticipated outputs and results, they have the potential to be unpredictable. This makes certification difficult as the performance of the system may not be able to be reliably assured. In order to certify systems, an explanation of the behaviour of AI is needed as this contributes to a strong understanding of the system and, in turn, its safety. The complexity of some AI systems such as those developed via machine learning and deep learning approaches means that they may not be easily explainable to those who are certifying them. Without this understanding, it is difficult to assure and have confidence in the safety of a system.

(2) The importance of data sets: The behaviours of an AI system will be dependent on the knowledge bases and data sets that are used to develop it. The quality of the knowledge bases and data sets therefore becomes a crucial aspect of AI development. We noted that one potential solution would be to put requirements in place for the AI systems and knowledge bases and data sets used to develop the AI model. However, we noted that certification of data sets would be complex. We also noted the possibility of bias within AI systems, and the difficulty of identifying and mitigating those as part of a certification process.

(3) Adaptability: we noted that once software is certified, minor updates can be made without the requirement for additional certification. However, at the core of some forms of AI, such as machine learning, is the ability to adapt and produce different outputs. Unlike traditional software updates, these outputs may be unpredictable and/or lack explainability. Consequently, the certification of such adaptive systems would be particularly difficult, especially in a safety-critical context. We said that it is unclear whether the use of adaptive machine learning systems in safety critical aviation contexts will be feasible, even in the long term.

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our recent discussion paper on AI and the Law, see AI and the Law Discussion Paper (2025) p 5 https://cloud-platform-e218f50a4812967ba1215eaecede923f.s3.amazonaws.com/uploads/sites/54/2025/07/AI-paper-PDF.pdf .

8 EASA, *Artificial Intelligence Roadmap 2.0* (May 2023) p 30 defines AI as "Technology that can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with".

Consultation analysis

10.17 We asked an open question about what changes might be needed to the certification framework in relation to UAS involving AI systems. There were several key themes which emerged from responses to our consultation.

10.18 First, whether or not AI poses problems for the certification framework depends on the nature of the AI system being used.

> There is a fear about using AI, which in my view is unfounded. It is the same process, but a machine makes the assessment, rather than a human, so it is less prone to error… The solution here, therefore, is having sufficient redundancy, on systems which are not linked to, nor affected by, the primary system, which can take over in failure modes.[9]

> In principle, no changes to the certification system should be necessary to certify Automated Systems that are Deterministic Systems in nature whereby for a given set of inputs the resulting output(s) are absolutely repeatable.[10]

10.19 Further, that there is a distinction between 'adaptive' or 'learning' systems and 'non-adaptive', or 'learnt' AI systems. In relation to this, the CAA said:

> The former are systems that are allowed to adapt their behaviour whilst in operation and it is an open question whether they would ever be appropriate for safety critical applications. The latter are systems that learn and adapt their behaviour during development (a.k.a. training in AI language) and then remain 'frozen' (that is, no longer adapt their behaviour) once deployed.[11]

10.20 Another theme was the importance of taking an iterative approach to the deployment of AI systems:

> Initially AI-based systems should be introduced for lower levels of decision making where the result of a bad decision is low risk and/or there are additional Deterministic Systems monitoring the output of the AI-based system that can over-ride it if required. This approach would enable confidence in AI-Learning to be built up with a 'safety net.'…Recognising the concerns of using adaptive Machine Learning processes in safety critical applications, provision should be adopted to allow the use of a safety-critical AI-based system in parallel with a deterministic / repeatable system whereby the proposed AI-based output / decision has to be

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9 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/. A similar point was made by Royal Aeronautical Society ("RAeS") and ADS Group.

10 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

11 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

checked by the Deterministic System as being safe before implementation during flight.[12]

Discussion

10.21 First, it is important to clarify that there is a difference between an autonomous UAS operation, and the level of automation of the system itself. The former has a legal definition which relates to the lack of intervention by a remote pilot, separate from the level of technology or level of automation of the aircraft systems. Further, as explained by the CAA in its terminology framework for AI,[13] automation – that is, performance of tasks and operations in a way that reduces the need for human intervention – can, but does not necessarily, involve AI. For the purposes of this chapter, we are thinking about UAS involved in autonomous operations which are likely to involve AI systems.

10.22 Our view is that the nature of the AI system, or the level of AI used in the UAS, is relevant to whether or not the existing legal framework for certification is adequate.

10.23 EASA, in its AI roadmap, classifies AI applications into the following 3 levels:[14]

(1) Level 1: assistance to human (1A Human Augmentation; 1B Human cognitive assistance in decision-making and action selection);

(2) Level 2: human-AI teaming (2A Human and AI-based system cooperation; 2B Human and AI-Based system collaboration);

(3) Level 3: advanced automation (3A the AI-based system performs decisions and actions that are overridable by the human; 3B the AI-based system performs non-overridable decisions and actions, for example to support safety on loss of human oversight).

10.24 EASA's view is that there is no impact on the legal framework in relation to certification where AI applications at levels 1A, 1B and 2A are used. For more advanced AI applications such as those at level 2B, their view is that the overarching legal framework will hold, but that certification specifications and associated acceptable means of compliance and guidance material may need to be amended. The document concludes that for the highest levels of AI, this assumption may need to be revisited.[15]

10.25 By way of context, EASA's view in its AI roadmap (published in 2023) and based on stakeholder prognostics is that the first approvals of level 2 AI will not take place for

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12 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

13 Civil Aviation Authority (CAA), *Speaking a Common Language A terminology framework for AI* (January 2024) (CAP 2966) p 5.

14 EASA, *Artificial Intelligence Roadmap 2.0* (May 2023) p 18.

15 EASA, *Concept paper: Guidance for Level 1 & 2 machine learning applications* (Issue 2 March 2024) p 151.

another 10 years, until around 2035. For level 3B, or 'autonomous AI', EASA anticipates approvals will not take place until 2050 or beyond.[16]

AI applications up to level 2B

10.26 The legal framework for airworthiness and certification in the UK is broadly the same as that in the EU, given that it is derived from assimilated law. Certification specifications in the UK are formulated at the same high-level as those in the EU. Some examples of certification specifications referred to by EASA in its concept paper have, in fact, been adopted by the CAA.[17]

10.27 We agree with EASA that current certification specifications already offer an open framework for the introduction of AI solutions[18] and that there is no impact upon the certification framework where lower-level AI applications (up to 2A) are used.

10.28 We also agree with EASA that higher-level AI applications (2B) could be accommodated by the existing certification framework, with adjustments to certification specifications and associated Acceptable Means of Compliance ("AMC") and Guidance Material ("GM"). If certification specifications do need to be re-visited, this is a matter for the CAA (given that they are responsible for producing certification specifications) to address through new certification specifications, rather than through law reform. Our view is that there is nothing in the legal framework for certification itself which is a barrier to certification where there is reliance on AI level applications up to level 2B.

Non-determinative and more advanced levels of AI

10.29 In relation to non-determinative AI, we note the CAA's response to our first consultation paper which said, "it is an open question whether they [adaptive systems] would ever be appropriate for safety critical applications".[19] We also note the position in CAP 722 that "at this point in time all UAS systems are required to perform deterministically".[20]

10.30 We agree with EASA that for more advanced levels of AI (level 3) – be that determinative or non-determinative – there may be a need to revisit the certification framework, but as approvals of such advanced levels of AI are not expected for at least a decade,[21] we do not make any recommendations in this respect.

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16 EASA, *Artificial Intelligence Roadmap 2.0* (May 2023) p 25.

17 For example, the CAA adopted EASA's amendment 28 to CS-25 on 19 December 2024, including CS 25.1301. CAA, Initial Airworthiness, https://regulatorylibrary.caa.co.uk/cs/Content/PDF%20Files/Initial%20Airworthiness%20Adopted%20CS-25%20Amdt%2028.pdf.

18 EASA, *Concept paper: Guidance for Level 1 & 2 machine learning applications* (Issue 2 March 2024) p 151.

19 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

20 CAA, *Unmanned Aircraft System Operations in UK: Airspace – Policy and Guidance* (April 2024) (CAP 722) para 4.5.1

21 EASA estimates that the first approvals of level 3A systems will not take place until 2035, and level 3B not until at least 2050, see EASA, *Artificial Intelligence Roadmap 2.0* (May 2023) p 25.

10.31 Although our view is therefore that the legal framework for certifying systems involving AI is sufficient for the immediate term, we emphasise the importance of gathering data and experience in relation to AI systems on an ongoing basis, so that changes to the certification regime, including determining the correct standard to ensure equivalent safety, can be made iteratively. In our first consultation paper we referred to possible tools that the CAA could use to facilitate this, such as permits to fly and regulatory sandboxes. We emphasise the importance of ensuring that those regulatory tools are deployed effectively so that iterative development can be facilitated.

Operational authorisation

10.32 The existing legal framework does allow the CAA to authorise autonomous UAS operations in the specific category. As with remotely piloted operations, this would depend on an operation-specific risk assessment being completed by the operator, and the CAA being satisfied that it sets out appropriate plans for the mitigation of risk.

10.33 Autonomous operations in the certified category will not be able to take place until certification standards for UAS have been developed. The added complication for certified category autonomous operations is the likely reliance upon more advanced levels of AI, and the difficulties – as discussed above – that this presents for certification.

10.34 In our first consultation paper we suggested that requiring individual attention from the regulator for specific and certified category autonomous UAS operations could act as a barrier to the growth of the drone industry. We suggested that in the future, as the technology matures, and the CAA and industry gain more experience of these operations, the risk posed by such operations may change. We suggested that in practice, some autonomous operations could be low risk enough to be suitable for the open category and not require pre-authorisation from the CAA or certification.

10.35 As is discussed in more detail in chapter 6, there have been two developments since the publication of our first consultation paper which should mean that obtaining operational authorisation in the specific category is now less cumbersome:

(1) The introduction of UK Specific Operations Risk Assessment ("UK SORA") which means that, generally speaking, it is easier for operators to complete an operational risk assessment for the specific category.

(2) The introduction of the CAA's atypical air environment ("AAE") policy which should assist operators to apply for approval successfully under UK SORA because it makes it easier to evaluate the air risk of their operation.[22] Operations within atypical air environments are granted the lowest air risk classification score during the UK SORA assessment, which means they are subject to requirements proportionate to this lower risk.[23] This should in turn

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22 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 art 11 mentions AAE as a "key element" of the air risk classification assignment (see para 1.117 and 1.118).

23 The CAA has stated that "use of an AAE enables an ARC-a air risk score in SORA": CAA, *Flying UAS BLOS in the Specific Category (UK CAA Guide for Industry)* (July 2024) (CAP 3038) p 17. An "ARC-a" score means "minimal risk", which is the lowest possible: see UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 art 1 (see para 1.115).

reduce the burden on applicants and expedite the approvals process for lower-risk specific category operations.

10.36 The CAA's AAE policy does not appear to envisage autonomous operations, perhaps because they are not anticipated in the near future. We highlight to the CAA and DfT that consultees did suggest that if autonomous operations were allowed in the open category, this should be in low-risk airspace where it is unlikely that other airspace users would be encountered, such as for asset inspection and data gathering. These are the types of operations covered by the CAA's AAE policy.

10.37 If the CAA does make a policy decision that autonomous UAS operations could fall within the AAE policy, then this would – for the reasons explained above – reduce the administrative burden in applying for operational authorisation.

10.38 Our view is that in light of the above developments it is not necessary, at this point in time, to recommend that autonomous operations be allowed in the open category, where there would be no requirement to obtain operational approval from the CAA. We think that the developments above, which will make the process for authorisation in the specific category more efficient, and will still require CAA oversight, are satisfactory. Data and experience can be gleaned from autonomous operations in that category which can then inform a decision at a later point as to whether autonomous operations could be safely accommodated in the open category without the need for any prior authority from the CAA.

Pre-deployment responsibilities of the operator: specific category

10.39 Our view is that for autonomous UAS operations in the specific category, it is sensible to mirror the pre-deployment responsibilities of the operator as they apply in the remotely piloted context.

10.40 However, we recommend that some of the *operational* responsibilities that would otherwise lie with the remote pilot should be reformulated to become additional pre-deployment responsibilities of the operator.

Responsibilities which remain the same as in remotely piloted operations

10.41 The responsibilities of the operator for all operations in the specific category include:[24] establishing procedures and limitations adapted to the type of intended operation and the risk involved, for example: procedures to ensure the safety of operations and measures to protect against unlawful interference; ensuring that personnel involved in the operation have completed relevant training and have been informed of the operations manual;[25] ensuring that operations are carried out in accordance with the operational authorisation; keeping an up-to-date record of unusual technical or

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24 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.050.

25 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC 1 UAS.SPEC.050(1)(a) says that the operator must: develop procedures for its UAS operations within an OM, detailing the scope of the organisation and the procedures to be followed as a minimum. This manual should be expanded as necessary to cover any increased complexity in the types of UAS being flown (based on the manufacturer's recommendations, if available), or of the types of operation being conducted.

operational occurrences; maintaining the UAS in a suitable condition for safe operation.

10.42 Additional responsibilities can be imposed upon the operator by virtue of the operational authorisation. Article 12 of the UK Regulation (EU) 2019/947 ("UAS Implementing Regulation") makes clear that after evaluating the risk assessment and mitigating measures proposed by the operator, any operational authorisation granted by the CAA should include the specific conditions and limitations that apply to the UAS operation and the mitigation measures that the UAS operator has to apply.[26] The additional responsibilities imposed will therefore be determined on a case by case basis.

10.43 In our view, all of the above responsibilities remain applicable in the context of autonomous UAS operations. No reform to the law is required in order for these responsibilities to apply to autonomous UAS operations. The law is drafted broadly enough to cover this.

Additional pre-deployment responsibilities for the operator

10.44 The UAS Implementing Regulation sets out a list of operational responsibilities which the operator must allocate in autonomous operations, and which would otherwise lie with the remote pilot.[27] The following responsibilities would usually be carried out by the remote pilot during flight: (1) comply with the authorised limitations and conditions; (2) avoid any risk of collision with any crewed aircraft and discontinue a flight when continuing it may pose a risk to other aircraft, people, animals, environment or property; (3) comply with the operational limitations in designated geographical zones or airspace; (4) comply with the operator's procedures; and (5) not fly close to or inside areas where an emergency response effort is ongoing unless they have permission to do so from the responsible emergency response services.[28]

10.45 Our view is that it would be difficult for any other actor to meet these responsibilities given they would have no control over the UAS. In our first consultation paper we therefore suggested that it would be more sensible to re-formulate these obligations and require an operator to use a UAS designed in such a manner that it can comply with the five requirements. This reformulation would mean the responsibilities are met at the pre-deployment stage rather than the operational stage.

Consultation analysis

10.46 There was broad support for our proposal. However, several respondents expressed concerns in relation to the formulation of the second and fifth requirements (to avoid any risk of collision with any crewed aircraft, and not to fly close to or inside areas where an emergency response effort is ongoing, respectively).

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26 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 12 (4)(c)(iii)-(iv).

27 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.050(1)(b) and UAS.SPEC.060(2)-(3).

28 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.060(3).

10.47 In relation to the second requirement, several consultees felt that avoiding "any risk" of collision is too stringent. For example:

> mid-air collision and terrain avoidance capabilities based on an accepted target level of safety for the operation, and proportional to the operational air and ground risk (i.e. air traffic density, population density, UAS collision and terrain avoidance capabilities). Note: to avoid ANY risk of mid-air collision between crewed and uncrewed aircraft will be almost impossible to prove to any decent degree of robustness and to require zero risk of collision just means there'll never be any autonomous flight outside of danger areas (if considered acceptable).[29]

10.48 Other consultees queried what is meant by discontinuation of a flight, and how that should be achieved:

> how would the requirement to "discontinue flight" be complied with? If the UAS were to suddenly decide to land, this in itself could pose a risk to other aircraft, people, animals, environment or property.[30]

10.49 In relation to the fifth requirement, not to fly close to, or inside areas where an emergency response effort is ongoing, some consultees suggested that the obligation should be amended to say that the UAS should keep a safe distance from the emergency response zone, for example to:

> avoid flying in close proximity to areas where an emergency response effort is ongoing, unless authorized by the regulator or unless operations have been coordinated with the emergency services.[31]

10.50 Others expressed concern about the difficulties of complying with this requirement:

> This would be much more difficult for the UAS to comply with as many of these response efforts are not notified in any way. It is very difficult for remote pilots to do this now unless they are so close to the response situation that they can see it. In future, such responses may need to alert other air users to their presence, for example, by using aircraft that are always electronically conspicuous. Otherwise, this will be very difficult to achieve and it should apply to all aircraft, for example low flying general aviation, and not just drones.[32]

Discussion and recommendation

10.51 There was a high level of support for our proposal. Our approach mirrors existing responsibilities for remotely piloted operations in the specific category, while

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29 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/. Apian and an anonymous consultee made a similar point.

30 Andrew Taylor response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 19, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

31 Drone Alliance Europe response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 205, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

32 Apian response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 23, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

recognising that for autonomous operations these particular responsibilities need to be met with technological solutions, rather than through an individual monitoring and intervening in flight. Our view is that this approach should ensure parity of safety between remotely piloted and autonomous UAS operations.

10.52 Although consultees expressed concern in relation to the formulation of the second and fifth requirements, these requirements are worded in exactly the same way as the existing requirements for remotely piloted specific category operations. Our view is that replicating the wording will ensure an equivalent level of safety between remotely piloted and autonomous UAS operations.

10.53 More specifically, in relation to concerns about the formulation of the second requirement to "avoid any risk" of collision, the AMC relating to the existing requirement makes clear that the standard applied in practice is to "avoid risk" rather than "avoid any risk".[33] Guidance Material to the provision discusses practical solutions to mitigate risk.[34] It is therefore clear that the requirement is interpreted in practice as being a requirement to mitigate the risk of collision through the operational authorisation process rather than to remove risk altogether. Our view is that this is a sensible approach and that, in order to achieve parity of safety between these types of operations, the wording of the existing provision should be mirrored. The CAA could make clear that the AMC and GM applies equally to autonomous UAS operations.

10.54 In relation to concerns about the formulation of the fifth requirement – not to fly close to an emergency response area – we note that the Guidance Material provides the following elucidation:[35]

> When an emergency response effort is taking place close to the operational area, a safe distance must be maintained between the Unmanned Aircraft and the emergency response site so that the UA does not interfere with, or endanger, the activities of the emergency response services.

10.55 Our view is that this elucidation of what is meant by "not fly close to" is helpful and should be mirrored for the autonomous context in order to ensure parity of safety. The CAA could make clear that the GM applies equally to autonomous UAS operations.

10.56 We consider that in order for the obligation to be effective, emergency services may need to alert other airspace users to the emergency response effort. This is true for remotely piloted operations as well as autonomous ones. We highlight this for consideration by the CAA when making more detailed rules and guidance to supplement the above high level requirements in our recommendation.

10.57 For all of the reasons above, we recommend that the in-flight responsibilities of the remote pilot – as currently set out in paragraph 3 of UAS.SPEC.060 in the annex to the UAS Implementing Regulation – should be reformulated for autonomous

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33 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, AMC1 UAS.SPEC.060(3)(b).

34 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, GM1 UAS.SPEC.060(3)(b).

35 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, GM1 UAS.SPEC.060(3)(e).

operations such that the responsibility is on the operator to use a UAS which can comply with these requirements.

Recommendation 25.

10.58 We recommend that for autonomous operations in the specific category, an operator should be required to use a UAS which can:

(1) comply with the authorised limitations and conditions;

(2) avoid any risk of collision with any crewed aircraft and discontinue a flight when continuing it may pose a risk to other aircraft, people, animals, environment or property;

(3) comply with the operational limitations in designated geographical zones or airspace;

(4) comply with the operator's procedures; and

(5) not fly close to or inside areas where an emergency response effort is ongoing unless they have permission to do so from the responsible emergency response services.

Pre-deployment responsibilities of the operator: certified category

10.59 The above discussion of pre-deployment responsibilities of the operator related to specific category operations where there is a high level of detail about operator and remote pilot responsibilities in the existing legal framework for UAS.

10.60 In the certified category, and as discussed in the context of remotely piloted UAS operations in chapter 5, there is very little detail about the responsibilities of the operator. The main existing pre-deployment responsibility for operators in the certified category is to obtain certification.[36] The legislation does not distinguish between operators of remotely piloted and autonomous UAS operations in this respect. It is not clear at this stage what the requirements will be for certification of the operator involved in autonomous operations, and we anticipate that this will develop iteratively over time and vary according to use case.

10.61 In chapter 7 of the report we make recommendations about pre-deployment responsibilities of the operator in remotely piloted passenger-carrying operations (which would take place in the certified category). These may be a useful starting point for the CAA and DfT as and when they formulate pre-deployment responsibilities of the operator for autonomous UAS operations in the certified category. It is likely that some of the responsibilities will be relevant to the autonomous context.

10.62 It may also be that, in a similar way to autonomous UAS operations in the specific category, some of the remote pilot's operational responsibilities need to be met at the

[36] UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 3(c).

pre-deployment stage by the operator using UAS which are capable of meeting those responsibilities.

Detect and record accidents

10.63 At present, there is no requirement for operators of autonomous UAS to use flight data recording systems, though we note that Guidance Material to the UAS Implementing Regulation does recommend that operators in the specific category make use of these.[37]

10.64 In our first consultation paper we said that for autonomous operations, where there is no remote pilot to observe unusual technical or operational occurrences, it is important to ensure that flight data recorder systems are used to support investigations into, and learnings from, accidents. We provisionally proposed that use of such systems should be mandatory for autonomous drone operations.[38]

Consultation analysis

10.65 We received 36 responses to this question. Almost all were in favour of mandating the use of flight data recorder systems for autonomous drone operations; three disagreed and three selected a response of "other".

10.66 Several consultees who agreed with the proposal emphasised that flight recorder systems are beneficial for improving safety after an accident or incident:

> The ability to gather information that would support any investigation, such as that of the AAIB, as well as internal investigations in the event of any unexpected occurrence is vital to that ongoing safety culture. When there is no remote pilot operating the aircraft and it is controlled autonomously, it is essential to understand what has happened and why. Therefore, a requirement to create and maintain such data logs (which a clear retention period) would be necessary.[39]

10.67 Law firm Kennedys Law LLP believed the data from flight data recorder systems would also be beneficial in the context of insurance:

> The risk of potential claims – whether third party claims or hull claims – are likely to increase significantly with routine UAS BVLOS flights. The data captured by the FINS technology will be of the upmost importance to insurers pricing these evolving risks.[40]

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37 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, GM1 UAS.SPEC.050(1)(g)(iii).

38 In our first consultation paper there were separate chapters on drones (chapter 7) and VTOLs (chapter 6). We asked this question in the context of our chapter on drones. Below we make a similar recommendation in relation to VTOLs.

39 UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

40 Kennedys response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 307, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

10.68 Several consultees, both those who agreed and did not agree with the provisional proposal, said that there should be flexibility as to the type of recording technology required. In particular, several said it was not feasible for drones to carry traditional flight recorder devices used in crewed aviation:

> We note the pragmatic implications of sitting this in data recorder systems physically on the drone, and the additional weight and complexity of protecting these against crash damage. We would like to propose that solutions can exist where flight data is continuously streamed off the autonomous drone (or drones) over a C2 link and stored for a determined period of time after a flight sufficient to allow recovery and longer-term storage if an incident did subsequently occur.[41]

10.69 Another issue raised was the type of data that operators should be required to collect for autonomous operations:

> Consideration ought to be given to the parameters currently recorded on digital flight data recorder systems that need to be installed to determine if the current parameters recorded are suitable for Autonomous operations. In particular, if there may be additional parameters exclusive to Autonomous operations that need to be recorded (for example computational outputs and flight commands generated by AI-technologies) or some parameters that ought to be deleted (for example pilot pressure/force applied to various flight controls).[42]

10.70 Finally, the RAeS also raised the issue of how long the operator should be required to retain recorded information:

> Provisions should be made to ensure data needs to be kept for a certain period of time, say 24 hours as a guide / minimum, as any issues with that drone should be reported within that timeframe.[43]

Discussion and recommendations

10.71 There was general support for the proposal to mandate the use of flight data recording systems for operations involving autonomous drones. Flight data recorders provide a key source of information in the investigation of an accident by the Air Accident Investigation Branch, which is the civil aviation safety investigation and accident investigation authority in the UK.[44] This becomes even more important for autonomous drones which will not have a remote pilot with any knowledge of incidents themselves. Flight data recorders will support the AAIB in its function to prevent future

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41 BT Group response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 109, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

42 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

43 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

44 The Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2018 SI No 321, art 7.

accidents [45] and allow lessons to be learned by the entire aviation community. On this basis, we recommend that use of flight data recorder systems or devices should be mandatory for autonomous drone operations.

10.72 We acknowledge the views of consultees who said that any requirement about flight data recording should not extend to the type of technology to be used. Our view is that the high-level formulation of our recommendation to use flight data recorder systems or devices is flexible enough to allow different solutions to be used to record and store relevant flight data. Which types of technologies are acceptable could be determined by the CAA as part of its operational authorisation if the operation is in the specific category or could be set out in AMC or other guidance.

10.73 We make no recommendations regarding the type of data which must be recorded, which is a technical issue to be determined by the CAA or DfT. We also make no recommendation as to the length of time for which data must be retained. We consider this to be a matter for the CAA in conjunction with the Air Accident Investigation Branch. There may be issues unique to autonomous operations which mean that data should be retained for longer than for other operations.

Recommendation 26.

10.74 We recommend that use of flight data recorder systems or devices should be mandatory for autonomous drone operations.

10.75 The above recommendation relates to autonomous drone operations taking place in either the specific or certified category. In our consultation paper we did not explicitly consider whether there should be a similar requirement in relation to autonomous VTOL operations. In order to ensure parity of safety between autonomous drone and autonomous VTOL operations, we think it is sensible to make an equivalent recommendation relating to autonomous VTOLs.

Recommendation 27.

10.76 We recommend that use of flight data recorder systems or devices should be mandatory for autonomous VTOL operations.

OPERATIONAL RESPONSIBILITIES

Specific category operations

10.77 In remotely piloted operations the remote pilot is responsible for pre-flight checks such as ensuring that the operating environment is compatible with the authorised

[45] UK Regulation (EU) 996/2010 on the investigation and prevention of accidents and incidents in civil aviation, art 1.

limitations and conditions and ensuring that the UAS is in a safe condition to complete the intended flight safely.[46]

10.78 It is clear from the wording of the UAS Implementing Regulation that in autonomous operations, these responsibilities of the remote pilot become the responsibility of the operator.[47] The operator is obliged to allocate the responsibilities, but the legal responsibility remains with them.

10.79 To whom the operator allocates these pre-flight responsibilities will largely depend on the concept of operations for the autonomous operation. What is important is that it is the operator who is responsible for ensuring that the pre-flight checks are carried out. This could be discharged practically by a range of individuals such as an employee of the operator, ground handling staff, or through technological solutions. No law reform is necessary to achieve this.

10.80 As discussed at paragraph 10.57 above, we recommend that the other operational responsibilities of the remote pilot – namely those relating to the flight itself – are reformulated and met by the operator at the pre-deployment stage.

Certified category operations

10.81 We noted in part 2 of the report that as of yet there are no operational requirements for certified category UAS operations specified in the legal framework. That is the case for both remotely piloted and autonomous operations.

10.82 In chapter 7 of our report we made recommendations about operational responsibilities of the remote pilot for certified category operations involving the carriage of passengers. These related to flight preparation, conduct of the flight, and accidents and reporting. Below, we use those recommendations as a starting point for a discussion about how responsibilities of the remote pilot might be re-allocated in certified category autonomous UAS operations.

Re-allocating responsibilities to the operator

10.83 One possibility would be to make the operator legally responsible for the pre-flight, conduct of flight, and reporting responsibilities that we discuss in chapter 7 (to the extent that these are applicable to autonomous UAS operations – something which is likely only to become clear over time).

10.84 In a similar way to the position with crewed aircraft today, the actor with legal responsibility could then delegate those responsibilities to others to discharge practically, such as to cabin crew, ground handling crew, or to a ‘flight supervisor (which we discuss further below) to the extent that concepts of operation provide for these roles. Legal responsibilities could also be met through technological solutions, for example the aircraft could notify the operator that hold luggage was properly secured.

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46 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.060(2).

47 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.SPEC.050(1)(b).

Re-allocating responsibilities to other members of crew

10.85 Another possibility is that the responsibilities relating to pre-flight checks, conduct of the flight, and reporting obligations, could be re-allocated to a mixture of crew members such as cabin crew and ground handling staff (If there are any). Rather than delegating responsibilities to these actors (as per the model if responsibilities were re-allocated to the operator), the legal responsibility could lie with these actors.

Re-allocating responsibilities to a flight supervisor

10.86 A third possibility is that a new legal actor could be created. In our first consultation paper we called this potential actor a flight supervisor. We asked for views on whether there should be a role for a person supervising the flight of an autonomous passenger-carrying VTOL and acting as a point of contact in relation to it. We asked what powers or responsibilities this person should have. In our discussion of the role of the flight supervisor in our consultation paper we said the following:[48]

(1) The flight supervisor would not have the central legal responsibility for the safe operation of the aircraft, as they would not be able to intervene in the course of the flight.

(2) In relation to pre-flight checks, in our view it would be possible for a supervisor to complete the majority of these (with assistance from ground crew or automated systems, as necessary), with appropriate training. One exception might be the check that aircraft operating limitations will not be exceeded at any time during the flight.

(3) In terms of the conduct of the flight, our view was that some checks such as seat belts and briefings could be the legal responsibility of the flight supervisor. In relation to maintaining good order, we said that this would be difficult for a supervisor without the power to change the course of an aircraft. We suggested that a supervisor could issue instructions to passengers, for example to return to their seats, and that these could be supported through a criminal sanction.

(4) In relation to accidents and reporting, we suggested that the supervisor could have legal responsibility for making sure flight recorders are operating properly and for informing the competent authority of bird strikes and near-misses.

Consultation analysis

10.87 Fewer than half of consultees responded to this question. Of those that did, several referred to the role of the remote pilot and therefore answered on the basis that a flight supervisor would be additional to a remote pilot. In autonomous operations – as per the legal definition, which we have adopted for the purposes of our report – there is no remote pilot. We therefore do not discuss those responses here.

10.88 Some consultees agreed with the suggestion of a new ‘flight supervisor’ role and highlighted the importance for consumers:

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[48] Aviation Autonomy (2024) Law Commission Consultation Paper 261, paras 6.121 to 6.135.

there must be such a role…to ensure consumer confidence and trust, it will be essential for there to be a responsible person who can be contacted at all times, support passengers remotely during take-off and landing and can assist with any incidents onboard.[49]

10.89 Some consultees who agreed with the idea of a flight supervisor suggested responsibilities and qualifications for the role:

> The qualification of any supervisor may need to be similar to that of an existing pilot (or more so that person should have been a pilot) in order to be able to communicate with effectiveness remotely as they have been there before and done it and experienced what a passenger might feel.[50]

> Yes there should be a supervising role for a person in the case of truly autonomous passenger-carrying air operations. This should include supporting interaction with ATC, ensuring contingency plans / emergency response systems are satisfactory and overall aircraft airworthiness.[51]

10.90 The RAeS said that the flight supervisor should be allowed to authorise restraint, and that the actor should be allowed to delegate responsibilities to others, for example the safety briefing and seat belts.[52]

10.91 Finally, several consultees said that the legal responsibilities that we suggested for a 'flight supervisor' should remain with the operator:

> There must be such a role, with a set of responsibilities. For a fully autonomous RPA, there will be no remote pilot. The operator is accountable for the safe operation, and responsibility must be delegated to an appropriate person(s) in the organisation. The operator management structure and Nominated Persons associated with it are key here. Ground operations become a significant role with many of the pilots' responsibilities in practice devolved at a working level to ground staff. Duties would include inter alia: passenger liaison and welfare, passenger information (e.g. in cases of emergency what to do); pre-flight checks. There are unknowns in this operating environment that will undoubtedly require addressing.[53]

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49 CAA Consumer Panel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 138, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

50 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

51 Vertical Aerospace response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 574, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

52 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

53 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/. RAeS, Skyports and Chris Daniels of Flare Bright made similar points.

Discussion

10.92 There was no consensus amongst consultees about whether the role of a 'flight supervisor' should be introduced, and about the responsibilities of that actor.

10.93 We note that the CAA's view is that the approach taken in relation to specific category operations should be mirrored in the certified category context: the responsibilities which would otherwise be the responsibility of the remote pilot fall to the operator to allocate.[54] Several other consultees agreed that the responsibilities outlined above should fall ultimately to the operator.

10.94 We can see some force in this argument:

(1) It would mean that there is one key actor *legally* responsible for safety of an operation. The operator in autonomous operations is likely to have safety related responsibilities in a similar way to the remotely piloted context, for example implementation of safety management systems and operations manuals. Supplemental safety responsibilities would be consistent with that role.

(2) An operator could then still delegate practical responsibilities to other individuals such as cabin crew, and ground staff, or – if it were preferable for one actor to be practically responsible for all of the delegated responsibilities – a flight supervisor. We note that it would be especially important – in autonomous VTOL operations without a remote pilot or any cabin crew – to have an individual practically responsible for passenger safety who could be contacted at all times.

10.95 It is not clear at this stage whether all, or any, of the safety responsibilities we recommend in chapter 7 would be applicable to autonomous UAS operations. As the CAA notes above, there are unknowns in the operating environment and much will depend on information about, and experience of, autonomous UAS operations over time. The discussion above gives a flavour of the types of responsibilities that may need to be re-allocated in autonomous UAS operations in the certified category. Our view is that, broadly speaking, responsibilities of the remote pilot should shift to the operator to allocate, and that the operator should be legally responsible for the overall safety of the operation.

Transitions

10.96 In chapter 4, we recommended that if switching between autonomous and remotely piloted phases of flight is permitted, UAS regulation should be amended accordingly so as to ensure legal certainty for all parties involved. We recommend that any such amendment should be accompanied by supplemental frameworks setting out: (1) the conditions for such a transfer; and (2) who is legally responsible for the operation of the aircraft before, during and after a transition. A detailed discussion is set out in chapter 4.

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[54] CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

CONCLUSION

10.97 There is much uncertainty about autonomous UAS operations, and in fact some doubt whether fully autonomous operations in the legal sense will ever take place.[55] In this chapter we have discussed the main problem presented by autonomous UAS operations: how to deal with responsibilities which would otherwise lie with the remote pilot when they no longer exist. For specific category operations, where operational responsibilities of the remote pilot are articulated in the existing legal framework, we have made a recommendation about how some of these responsibilities should be met by the operator at the pre-deployment stage. For the certified category, where no operational responsibilities have yet been articulated, we have discussed – through the lens of our second use case, VTOLs – how responsibilities of the remote pilot as recommended in chapter 7 could be re-allocated.

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55 See, for example Ramin Norouzi of Dronzit Aerospace's response to Consultation Paper 1: "Entirely autonomous or fully autonomous VTOL operation should not be considered equivalent to 'no ability for a human to intervene and change the course of the aircraft'. Such equivalency is unreasonable, insensible, and in contrast to what industry has anticipated such as the MVS role envisaged by FAA and Boeing/Wisk outlined in paragraph 6.58. It's not even obvious why any manufacturer would want to have their fully autonomous VTOL prevent the human-remote-pilot intervention in the control of the aircraft and course of the flight, as it is against fundamental safety requirements". Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

Chapter 11: Integration of autonomous use cases

11.1 This report has been divided into four parts. Part 1 of the report dealt with the relevant regulatory and policy context for this project. In part 2 of the report, we recommended legal changes which are needed to accommodate routine operations of remotely piloted uncrewed aircraft systems ("UAS"). In this third part of the report, we have set out options and recommendations for reform in the longer term. These are aimed at the most advanced use cases of drones and VTOLs, those that involve autonomous systems.

11.2 In this chapter, we consider the full integration of autonomous UAS into UK airspace. Integrating autonomous UAS brings with it different challenges from remotely piloted UAS, the primary challenge being that the entire operation is expected to be conducted without the need for human intervention in the flight of the aircraft.

11.3 We begin by considering what integration means and when it might be achieved. We discuss how the Civil Aviation Authority ("CAA") and Department for Transport aim to ensure that UAS operations are conducted at an equivalent level of safety to crewed operations. We explain that the UK intends to achieve this via a combination of elements such as electronic conspicuity and UAS Traffic Management.

11.4 In the final part of the chapter, we look at the rules of the air which we also discuss in chapter 8 of the report. The rules of the air are the primary regulations with which integration of conventional air traffic is achieved today. The rules of the air dictate the interaction of air traffic in both controlled and uncontrolled airspaces. If integration is to be achieved in the long term, it seems to us that this vital set of rules must be updated specifically to accommodate new air users such as UAS. However, as we describe, this is a longer-term endeavour that will require technology, standards and procedures to be developed.

INTEGRATION

11.5 At its simplest, integration refers to UAS operations occurring routinely without the requirement for special provisions. As we described in the previous parts of this report, the UK's Airspace Modernisation Strategy ("AMS") sets out a pathway for the safe integration of UAS in unsegregated airspace.[1] UAS operations will transition from airspaces where they are completely separated, to temporary reserved areas where other airspace users can use the same airspace, subject to conditions.[2] Then, finally, once their safety is proven, UAS will be allowed to operate in completely unsegregated airspace.

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1 Civil Aviation Authority, *Airspace Modernisation Strategy 2023–2040 Part 1: Strategic objectives and enablers* (February 2024) (CAP 1711).

2 For example, that access be managed through an ANSP: CAA, *Airspace Policy Concept: Airspace Requirements for the Integration of Beyond Visual Line of Sight (BVLOS) Unmanned Aircraft* (April 2023) (CAP 2533) para 3.7. We consider this transition from "segregation" to "accommodation" in relation to remotely piloted UAS in chapter 8 of the report. See chapter 8, paras 8.11 – 8.18.

11.6 The UK is not alone in seeking the integration of UAS. Integration is a long-term ambition, described by the International Civil Aviation Organization ("ICAO") and other regulators.[3] Some states have taken a different approach to the integration of UAS into their airspaces. For example, the EU has pursued a strategy that uses its U-Space concept to accommodate UAS alongside conventional aircraft before eventually transitioning to full integration.[4] In contrast, the US Federal Aviation Administration ("FAA") is currently taking a "risk-based approach" to integration, incrementally expanding existing regulations to allow small UAS operations, before developing regulations to enable operations of greater complexity.[5]

11.7 The primary issue which we have highlighted in part 2 of this report is that the safe operation of UAS in the same volume of airspace as conventional aircraft is not straightforward.[6] UAS have several characteristics which mean that the sharing of airspace with UAS comes with a risk of increased collision. Among other things, many UAS are smaller and may be harder for other aircraft to see.[7] They also present "heterogenous" flight profiles.[8] Some UAS will fly slower than conventional aircraft, at lower altitudes; whilst other UAS will fly at high altitudes and at greater speed.[9] All of these factors mean it may be harder for conventional aircraft to anticipate and avoid UAS traffic.

An equivalent level of safety

11.8 The CAA has stated that the transition from temporary reserved areas to integrated operations will only occur once there is data available to support safety arguments for routine UAS operations.[10] The CAA will expect that civil UAS operating in the UK must meet at least the same safety and operational standards as manned aircraft when conducting the same type of operation in the same airspace.[11]

11.9 Further, the CAA will require that

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3 International Civil Aviation Organisation, *Remotely piloted aircraft system (RPAS) concept of operations (ConOps) for international IFR operations* para 1.4.1.2.

4 The U-space concept is described in chapter 9 at paras 9.56 and 9.57.

5 FAA, *Normalising Unmanned Aircraft Systems Beyond Visual Line of Sight Operations* (Federal Register (US) Vol. 90, No 150 38212). The FAA has published a notice of proposed rulemaking which proposes performance-based regulations to support the integration of UAS into the national airspace system (NAS). This is intended to provide a predictable and clear pathway for safe, routine, and scalable UAS operations.

6 See chapter 8, para 8.5.

7 See discussion at chapter 8, para 8.6.

8 Complete Air Traffic System Global Council, *Seamless Airspace: Are Today's Flight Rules Ready for the Future of Aviation?* (2025) p 7.

9 CATS Global Council, *Seamless Airspace: Are Today's Flight Rules Ready for the Future of Aviation?* (2025) p 14.

10 CAA, *Beyond Visual Line of Sight (BVLOS) Programme background*, https://www.caa.co.uk/drones/regulations-consultations-and-policy-programmes/policy-programmes/beyond-visual-line-of-sight-bvlos/.

11 CAA, *Unmanned Aircraft System Operations in UK Airspace - Policy and Guidance* (April 2024) (CAP 722) para 1.1.1.

> when compared to the operations of manned aircraft of an equivalent class or category, UAS operations must not present or create a greater hazard to persons, property, vehicles or vessels, either in the air or on the ground.[12]

11.10 This is a high bar for UAS operations. Under its obligations as a signatory to the Chicago Convention, the CAA is required to create a National Aviation Safety Plan which sets out the safety expectations for aircraft operations in the UK.[13] At a high level, the acceptable level of safety performance in the UK can be summarised as

> No accidents involving commercial air transport that result in serious injuries or fatalities. No serious injuries or fatalities to third parties as a result of aviation activities.[14]

11.11 Therefore, the integration of UAS can only occur once UAS are safe enough that their operation will not carry significant risk of death or serious injury.

WHAT IS NEEDED TO ENSURE AN EQUIVALENT LEVEL OF SAFETY?

11.12 The CAA has already begun to consider what is needed for UAS operations to achieve an equivalent level of safety to crewed operations. The answer is complex and involves many different technical and policy elements, many of which are still being developed. Most of these elements are linked to, and dependent on, initiatives undertaken as part of the UK's AMS.[15]

11.13 The AMS highlights the avoidance of mid-air collisions with UAS as a key concern. At present, in uncontrolled airspace, aircraft are responsible for maintaining their own visibility to others and keeping a lookout for other aircraft to avoid them. This "see and avoid" approach can pose difficulties as smaller aircraft (including UAS) can be difficult for other pilots to see with the naked eye. This limitation therefore creates a barrier to their airspace integration.[16]

11.14 In response to this, the AMS promotes electronic conspicuity of airspace users to each other and to air navigation service providers. As we discuss in chapter 8, "electronic conspicuity" is an umbrella term for a range of technologies that enable aircraft to detect each other, thereby reducing the risk of collision.[17] It includes devices which are fitted to aircraft, as well as ground-based and satellite-based technology.

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12 CAA, *Unmanned Aircraft System Operations in UK Airspace - Policy and Guidance* (April 2024) (CAP 722) para 1.1.1.

13 Signatory states are obligated to create a National Aviation Safety Plan by Annex 19 to the Chicago Convention, Second Edition, 2016, including amendment 1.

14 CAA, *The UK National Aviation Safety Plan 2022 – 2024* (August 2022) (CAP 2393) p 8.

15 CAA, *Airspace Modernisation Strategy 2023–2040 Part 1: Strategic objectives and enablers* (February 2024) (CAP 1711). See also CAA, *Future of Flight: BVLOS Roadmap* (October 2025) (CAP 3182) p 2.

16 CAA, *Airspace Modernisation Strategy 2023-2040 Part 1: Strategic objectives and enablers* (February 2024) (CAP 1711).

17 CAA, *Airspace Modernisation Strategy 2023-2040 Part 1: Strategic objectives and enablers* (February 2024) (CAP 1711) p 20.

11.15 Electronic conspicuity is most effective when all airspace users can detect and be detected.[18] Overall, the AMS aims to promote the "widest possible use of electronic conspicuity," ensuring information is shared between airspace users and service providers.[19]

11.16 The CAA has been considering potential electronic conspicuity solutions since at least 2014,[20] mainly focusing on which technologies would be required. The most recent development came in July 2025 when the CAA released an electronic conspicuity Concept of Operations ("ConOps") setting out their current thinking on technical requirements.[21] The ConOps is subject to consultation, and the intention is to release further iterations before finalising electronic conspicuity policy at the end of 2027.[22]

11.17 The electronic conspicuity ConOps highlights that electronic conspicuity will play a significant part in facilitating beyond visual line of sight ("BVLOS") UAS operations. However, it also emphasises that whilst electronic conspicuity is important for UAS operations, it is just one part of a broader set of solutions supporting their introduction. The electronic conspicuity ConOps highlights that the following key capabilities will also be crucial to the safe integration of UAS:

(1) Detect and avoid;

(2) Command and control (C2) links;

(3) System-wide information management (SWIM);

(4) UTM;

(5) Ground infrastructure (GI); and

(6) Communications.

11.18 Most of these capabilities are also objectives and work streams within the AMS. We briefly describe each in turn.

Detect and avoid (DAA)

11.19 We have referred to the concept of "detect and avoid" or "DAA" throughout this report.[23] DAA has been defined by ICAO in the context of remotely piloted operations as the capability of UAS to "see, sense or detect conflicting traffic or other hazards

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18 CAA, *Airspace Modernisation Strategy 2023-2040 Part 1: Strategic objectives and enablers* (February 2024) (CAP 1711) p 20.

19 CAA, *Airspace Modernisation Strategy 2023-2040 Part 1: Strategic objectives and enablers* (February 2024) (CAP 1711) p 21.

20 In 2014, an EC Working Group was established. CAA, *Electronic conspicuity devices* (February 2021) (CAP 1391) p 7.

21 CAA, *Electronic Conspicuity – Initial Technical Concept of Operations (EC ConOps) 2025* (July 2025) (CAP 3140).

22 CAA, *Electronic Conspicuity – Initial Technical Concept of Operations (EC ConOps) 2025* (July 2025) (CAP 3140) p 11.

23 See, for example, the discussion at chapter 8, para 8.54.

and take the appropriate action".[24] Similarly, the CAA have described DAA in the context of remotely piloted operations as a system which "enables the remote pilot to exercise their responsibilities with regard to other aircraft within the standardised rules of the air".

11.20 The CAA have described DAA as "a critical enabler" for BVLOS remotely piloted UAS operations and the safe integration of remotely piloted UAS into the wider airspace environment.[25] Without adequate DAA systems, the CAA does not think it is possible to "fully replicate the pilot cockpit see-and-avoid capability" and therefore UAS can be accommodated but not fully integrated.[26]

11.21 The CAA have developed a policy concept of DAA for UAS operations of various levels of automation. This document sets out general requirements for DAA. The CAA envisages that the "top-level" functions of a generic DAA system will be as follows:[27]

(1) **detect** – a surveillance function for other nearby aircraft and tracking of potential threats;

(2) **decide** – evaluation and selection of manoeuvre to avoid any necessary threats;

(3) **command** – trigger the selected avoidance manoeuvre;

(4) **execute** – Implement the traffic avoidance manoeuvre; and

(5) **feedback**, continually re-evaluate the encounter during the manoeuvre to see if the collision risk has changed.

11.22 The CAA policy concept stresses that the above functions can be implemented in different ways, and according to many different standards. However, the core functionality should be the same with minor differences.[28]

11.23 As part of the DAA policy concept, the CAA has linked DAA capabilities with residual "Air Risk Class".[29] It anticipates that where an operation presents a higher risk of collision then more will be expected in terms of DAA capabilities or risk mitigation. So, for example, if the encounter rate with other crewed air traffic is demonstrated to be negligible, the tactical capabilities of the DAA system may be less than that of a UAS in a higher Air Risk Class. When operations have a risk which carries the "highest severity consequence" it is foreseen that a more advanced and certified DAA system will be necessary as well as "additional layers of mitigation", which presumably would

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24 ICAO, *Remotely piloted aircraft system (RPAS) concept of operations (ConOps) for international IFR operations*, p 6.

25 CAA, *Detect and Avoid Policy Concept Consultation Document* (July 2024) (CAP 3015) para 1.5.

26 CAA, *Detect and Avoid Policy Concept Consultation Document* (July 2024) (CAP 3015) para 1.5.

27 CAA, *Detect and Avoid Policy Concept Consultation Document* (July 2024) (CAP 3015) p 11.

28 CAA, *Detect and Avoid Policy Concept Consultation Document* (July 2024) (CAP 3015) p 11.

29 CAA, *Detect and Avoid Policy Concept Consultation Document* (July 2024) (CAP 3015) para 2.5.

include measures such as electronic conspicuity or some form of air traffic management.[30]

11.24 The CAA have now consulted on their policy concept for DAA. They are currently reviewing response to the policy concept and expect to publish a full policy and develop supporting guidance material in 2026.

UAS Traffic Management (UTM)

11.25 UTM is the focus of chapter 9 of this report. As discussed there, UAS require a different combination of air traffic management services than traditional aircraft. As such, it is likely that the number of Air Traffic Management/Air Navigation Services providers specialising in UAS services will increase. These specialised services are referred to as "UTM". These services may provide general aeronautical information such as weather and traffic information. However, they are also likely to provide critical functions such as aircraft separation and flight path redirection when necessary. As we discuss in chapter 9, the CAA intends to release a Concept of Operations for UTM in 2026, setting out required services for UAS operations.

Command and control (C2) Links

11.26 A C2 link is the link between a remotely piloted aircraft and the remote pilot station for the purpose of managing the flight. According to the CAA, there are a variety of possible architectures and considerations in the design, security, and management of the C2 link.[31]

11.27 Fundamental questions about C2 links are still under evaluation by the CAA. For example, what information should be carried over a C2 link for different types of operation. The CAA makes a distinction between "control" and "non-payload communication". Control information is used to control the aircraft, whilst "non-payload communication" is any other information provided through the link to the aircraft. One possibility is that this "non payload" information might include air traffic control information. It is anticipated that this "non payload" information will vary between use cases, the particular C2 systems employed by the operator, and could be different during various phases of flight. All of these factors will affect the required data rates, link integrity, and link availability for each operation.[32]

11.28 C2 links are most relevant for remotely piloted aircraft. We assume, however, that even autonomous aircraft will usually require some connection to allow an operator to understand the status of their autonomous aircraft. Non-payload information provided by a C2 link is obviously potentially as relevant to autonomous operations as it is to remotely piloted ones.

11.29 According to the CAA electronic conspicuity ConOps there is a separate stream of work that will set out the CAA's policy for C2 links to UAS. This policy will be linked to the electronic conspicuity policy as C2 links may also carry electronic conspicuity

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30 CAA, *Detect and Avoid Policy Concept Consultation Document* (July 2024) (CAP 3015) p 9.

31 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) paras 2.36 to 2.41.

32 CAA, *C2 Link policy concept for SAIL 1 to 3 consultation* (September 2025) (CAP 3154) para 1.11.

data. The electronic conspicuity ConOps indicates that an electronic device might be able to report when a UAS has lost its C2 link.[33]

11.30 At an ICAO level, the ICAO RPAS panel has been developing detailed C2 link standards and Standard and Recommended Practices, as well as a dedicated C2 link manual. Work is also underway on the concept of required link performance (RLP), which encompasses the minimum performance of C2 links in different airspaces as well as consideration related to link reliability and latency (the speed with which communications can pass between the aircraft and its ground station). The CAA notes that work on RLP may last well into the 2030s.[34]

11.31 In parallel, the CAA has initiated a policy development programme for UAS and RPAS C2 links in the UK. The CAA's first published policy concept for C2 links was released in September 2025. This initial policy concept and consultation is aimed at lower risk remotely piloted operations in the specific category of operations. Work is ongoing on higher risk categories, which may include operations which would be considered "autonomous".[35] The concepts for higher risk categories are expected to be released in following years.[36]

11.32 The CAA note that although they expect to have C2 link policy in place by the end of 2028, this end date is subject to when ICAO publishes its initial set of Standard and Recommended Practices for RPAS.[37] Presumably this is because the ICAO Standard and Recommended Practices will set out their own requirements for the performance of C2 links, which the UK will be obligated to implement.

Systems-Wide Information Management (SWIM)

11.33 We briefly discuss the concept of SWIM in chapter 9. Broadly speaking, SWIM can be summarised as "standards, infrastructure and governance enabling the management of the ATM-related information and its exchange between qualified parties via "interoperable" services."[38]

11.34 At a basic level, the purpose of SWIM is to enable a distribution model where dispersed sources and users of air traffic management/air navigation services ("ATM/ANS") information can view and collaboratively update the same piece of information. Due to its distributed nature, SWIM is sometimes conceptualised as an "aviation intranet."[39] SWIM is fundamentally different from the current information

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33 CAA, *Electronic Conspicuity – Initial Technical Concept of Operations (EC ConOps) 2025* (July 2025) (CAP 3140) p 52.

34 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.38.

35 CAA, *C2 Link policy concept for SAIL 1 to 3 consultation* (September 2025) (CAP 3154) para 1.6.

36 CAA, *C2 Link policy concept for SAIL 1 to 3 consultation* (September 2025) (CAP 3154) para 1.6.

37 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.41.

38 ICAO, *Manual on System Wide Information Management (SWIM) Concept* (Doc 10039, 2024) para 2.3.1.

39 See module B1-SWIM: ICAO, *2016-2030 Global Air Navigation Plan* (Doc 9750-AN/963) (5th ed 2016) p 72.

model used in air traffic management, which relies on exchanging information through one-to-one messaging.[40]

11.35 SWIM will allow airspace users to have "a shared, consistent view of critical aviation data".[41] This in turn will enable better decision-making, coordination and situational awareness for users, especially in mixed-user airspace environments. It is considered essential for the integration of new technologies into the aviation sector.[42] Ultimately, the end goal of SWIM is to provide airspace users better situational awareness of airspace.[43] This would obviously be beneficial to both UAS operations and conventional aircraft for the purpose of planning flights and avoiding collisions.

11.36 According to the AMS, the CAA is developing a UK SWIM implementation framework. This will be informed by both international SWIM development, including requirements for international air transport and those requirements anticipated to be necessary for the integration and evolution of diverse airspace users. It is anticipated that by the end of 2026, the CAA will have defined a concept or design of SWIM that will allow industry to deliver SWIM-compliant services by 2027.[44] After this point, further delivery elements identified by the AMS, will be implemented by the end of 2033.[45]

Ground Infrastructure (GI)

11.37 This element refers to ground-based infrastructure for the management of aircraft, for example, radar systems. According to the AMS, work in this area

> addresses the technical ground-based systems and other requirements that enhance EC, and subsequently enabling the assured position information to achieve integration operations of crewed and uncrewed systems in UK airspace.[46]

11.38 A major part of the ground infrastructure element in the AMS includes the creation of infrastructure which can broadcast a Traffic Information Service ("TIS-B"). TIS-B will allow "appropriately equipped manned and unmanned aircraft" to be able to receive information about other appropriately equipped aircraft that are nearby. This work would include licensing the 978 MHz frequency for ground infrastructure equipment to support the implementation of TIS-B. The 978 MHz frequency could also enable the

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40 ICAO, *Global Air Traffic Management Operational Concept* (Doc 9854, 2005) para 11.2.

41 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.44.

42 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.44.

43 ICAO, *Global Air Traffic Management Operational Concept* (Doc 9854, 2005) para 11.2.

44 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) paras 2.47 to 2.49.

45 CAA, *Airspace Modernisation Strategy 2023-2040 Part 2: Delivery elements* (January 2023) (CAP 1711a) p 19.

46 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.29.

provision of "flight information system broadcasts" ("FIS-B") which could provide more general information about weather and airspace restrictions.[47]

11.39 It is anticipated that TIS-B will be initially deployed as a localised service for the benefit of all airspace users in certain airspaces. At present, the funding mechanisms for scaled TIS-B operations in the UK are uncertain.[48] The AMS indicates that work to address how to scale TIS-B is yet to commence and will require working with industry delivery partners.[49] However, the CAA indicates that a concept of operations is in development.[50]

11.40 The AMS indicates that other activities supporting the development of ground infrastructure policies, in respect of BVLOS UAS integration, will be completed in 2026.[51] However, it is unclear what specific activities the AMS is referring to.

Communications

11.41 Related to the ground infrastructure element in the AMS is the "Communications" stream of work. Communications, Navigation and Surveillance ("CNS") infrastructure, and the radio spectrum they require, are key to the integration of all aircraft, both crewed and uncrewed.

11.42 CNS capabilities are typically provided through regionally or globally harmonised radio spectrum and aligned with ICAO standards. Communications activities in support of AMS encompass many different initiatives including upgrades to CNS infrastructure as well as the management of the radio spectrum for aviation communications.

11.43 But at a high level there are two aspects tied to this delivery element of the AMS which are noteworthy for the purposes of this report and the topic of integration.

11.44 The first aspect is related to the "modernisation" of CNS infrastructure. The roadmap for CNS infrastructure development envisages an increased transmission of digital data between the ground and aircraft. The AMS foresees a need to provide enhancements to current capabilities, ultimately building to routine use of "digital air-ground systems". These systems will mean that there is less dependence on voice-based systems, such as those employed by air traffic control services. This has obvious application to autonomous aircraft, which will not have a human on board to verbally communicate with service providers and other airspace users.

11.45 The second aspect has to do with redundancies and interference with aircraft. Aviation has increasingly become dependent on Global Navigation Satellite Systems ("GNSS")

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47 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.68.

48 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.33.

49 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.33.

50 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.32.

51 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.30.

to provide accurate navigation. In recent years, the vulnerabilities of GNSS have been exploited to disrupt the service of these systems. Long-term CNS activities include the "migration" to "space-based technology" and enhanced contingency for communications including the use of multiple frequencies and alternative position navigation and timing ("A-PNT"). A-PNT will be used alongside existing GNSS and provide additional redundancy should navigation signals be lost or interfered with. Interference with UAS has been cited as a concern by many of the consultees to our consultation. This work has the potential to mitigate the effects of any such interference.

11.46 To enable long-term upgrades to CNS infrastructure, the CAA has provided input to the UK Space Agency which has outlined a business case for a UK GNSS Space-Based Augmentation System.[52] The CAA is also pursuing an "optimisation programme" for existing ground infrastructure which will "enhance Global Navigation Satellite Systems (GNSS) resilience for suitably equipped aircraft".[53]

Achieving equivalence: bringing elements together

11.47 As can be seen from the previous section, there are many technical, policy and infrastructural elements that may be required to ensure that all UAS operations can achieve a level of safety that is equivalent to crewed operations. Under active development by the CAA, most of these elements require further testing and refinement.

11.48 There are also further questions to be asked about how these various elements will apply to different UAS operations. Different use cases may require different combinations of the elements to achieve the required safety levels. The CAA has already indicated that lower risk operations may only need rudimentary forms of electronic conspicuity, DAA and UTM to be considered safe.[54] However, higher risk operations will require several layers of "mitigation" in place to achieve the same safety levels. Autonomous operations present a higher risk in shared airspace and therefore it is likely more elements will need to be in place before they can be integrated.

11.49 For the purposes of this chapter, it has been necessary to set out all of the various elements that will be required before autonomous aircraft can be integrated. It is important to recognise that many of the elements that are required for equivalent safety and integration are not legal matters that can be addressed by this review. Rather they require policy development, the establishment of technical standards and the creation of critical infrastructure. Further, they relate to the reform and

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52 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.92.

53 CAA, *Airspace Modernisation Strategy Part 3: Deployment Plan* (2nd ed, August 2025) (CAP 1711b) para 2.91.

54 UK Regulation (EU) 2019/947 on rules and procedures for the operation of unmanned aircraft, AMC art 11 para 1.108. See also CAA, *Electronic Conspicuity – Initial Technical Concept of Operations (EC ConOps) 2025* (July 2025) (CAP 3140) para 2.10 and CAA, *Detect and Avoid Policy Concept Consultation Document* (July 2024) (CAP 3015) para 4.21.

modernisation of UK airspace in general, and all air operations, not just to the uncrewed use cases which we have been asked to focus on.

11.50 Throughout this report we have instead focussed up-on the legal elements relating to accommodation and integration of UAS into airspace. We now turn to the principal legal instrument by which integration is achieved today, the rules of the air. As we discussed in relation to the accommodation phase and in our first consultation paper, it seems to us that these must be updated to account for UAS and autonomous operations.

RULES OF THE AIR

11.51 The effective sharing of airspace requires an agreed set of rules for the conduct of flight operations. This is fulfilled by what are called the "rules of the air".[55] Ships and other maritime vessels are also bound by "rules of the road" at sea, which are laid down in the International Regulations for Preventing Collisions at Sea, 1972. The primary purpose of the rules of the air is to ensure that aircraft do not collide with each other. Currently, only "applicable" rules of the air are required to be applied to UAS operations in the specific and certified categories.[56]

11.52 We explain in chapter 8 that parties to the Chicago Convention must establish their own rules of the air, but these should be aligned with the rules set out in Annex 2 to the Chicago Convention. In the UK, the rules of the air are contained in UK Regulation (EU) 923/2012 establishing the Standardised European Rules of the Air ("UK SERA").[57] UK SERA is supplemented by the Rules of the Air Regulations 2015,[58] and some provisions in the Air Navigation Order 2016.[59]

11.53 The rules of the air set out in detail the various classes of airspace and the requirements of all users in airspace. Amongst other things, they set out rights of way for all airspace users. They also provide requirements for the use and provision of different classes of airspace. For example, they provide that in class A airspace, pilots and air traffic controllers must maintain two-way communication with each other.[60]

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55 These are similar to the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS), a set of common rules which govern how vessels should behave to avoid collisions at sea.

56 See discussion at chapter 5, paras 5.36 and 5.41.

57 The rules themselves are found in the annex to the regulation.

58 SI 2015 No 840. The rules of the air in the UK were previously contained in the Rules of the Air Regulations 2007 SI No 734 ("2007 Regulations"), which implemented the standards in Annex 2 to the Chicago Convention. When the UK Regulation (EU) No 923/2012 on the Standardised European Rules of the Air ("UK SERA") was implemented, the Rules of the Air Regulations 2015 SI No 840 ("2015 Regulations") were passed in order to revoke the 2007 Regulations and preserve some additional rules which were not found in the UK SERA. These include requirements relating to acrobatic flight over congested areas, lighting of airships by day, and flight rules within aerodrome traffic zones. The 2015 Regulations grant some exemptions from the requirements of UK SERA.

59 Some provisions of UK Regulation (EU) 965/2012 ("Air Operations Regulation") also set requirements which must be followed by the pilot-in-command of an aircraft.

60 UK Regulation (EU) 923/2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation, annex, SERA.6001(a)(1).

11.54 In our first consultation paper we highlighted that there are some rules of the air which present less difficulty in terms of translatability to autonomous systems. This may be the case, for example, in relation to the requirements for things like minimum height levels or cruising levels. Prescriptive rules like these could be more easily programmed and adhered to without difficulty.

11.55 Of more concern are some of the rules relating to communication. These rules cannot be easily translated to autonomous systems because they are often premised on communication by a human.[61] In the complete absence of a human, some of the rules of the air may be impossible to adhere to.

11.56 Furthermore, there are several rules that involve an element of human judgement. This is most obviously true in relation to SERA.2105 which gives the "pilot-in-command" of an aircraft "the final authority as to the disposition of the aircraft while in command".[62] This rule is fundamental to conventional flights but will have no applicability to aircraft used for autonomous operations because they will have no pilot.

11.57 As yet there has been no major effort at an ICAO level to revise the rules of the air for UAS. However, the issue has been raised at the latest general meeting of the ICAO assembly. A recent working paper presented to general assembly for discussion highlighted the

> growing need to evolve current flight rules and airspace structures to ensure the safe, inclusive, and scalable integration of increasingly diverse and automated operations.[63]

11.58 The paper was prompted by a review of the adequacy of the current flight rules by the Complete Air Traffic System Global Council (CATS). CATS undertook its review to address the emergence and integration of new entrants to airspace such as automated aircraft VTOLS and persistent high-altitude platforms.[64] As flight rules and airspace structure form the "regulatory backbone" of aviation, CATS sees their modernisation as necessary for the integration of "automation-enabled airspace".[65]

11.59 The core issue for CATS is that the current rules and systems of airspace management rely on visual separation by pilots or, under IFR conditions, air traffic controllers to provide tactical separation and maintain situational awareness. The paper review argues that this approach will not be able to cope with the high volume of heterogeneous operation types that might occur in the future.

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61 Aviation Autonomy (2024) Law Commission Consultation Paper No 261, paras 5.64 to 5.73.

62 UK Regulation (EU) 923/2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation, annex, SERA.2015.

63 ICAO, *Modernising flight rules for the future of aviation: an evolutionary imperative* (A42-WP/529, September 2025) p 1.

64 CATS Global Council, *Seamless Airspace: Are Today's Flight Rules Ready for the Future of Aviation?* (2025).

65 ICAO, *Modernising flight rules for the future of aviation: an evolutionary imperative* (A42-WP/529, September 2025) para 4.1.

11.60 The CATS review also highlights that automation challenges current assumptions about who should be responsible for an aircraft. Automation means that humans may be relegated to supervision roles in relation to aircraft. Questions then arise about who should be responsible for the separation of automated operations in shared airspace. Human supervisors, automated systems or other service providers could all play a role and share some responsibility.[66]

11.61 For the reasons above, CATS proposes reviewing current flight rules. To this end, it proposed that there needed to be a "digitally coordinated inclusive, and performance-based airspace framework" to support all airspace users.[67] CATS foresees the need for "self-separating aircraft" and for centralised digital services to coordinate aircraft.

Digital Rules of the Air

11.62 CATS is not alone in proposing a transition to digital infrastructure to manage aircraft. In 2022, NASA proposed a new set of flight rules in order to accommodate and help facilitate automation in aviation. The NASA paper proposed the creation of a mode of "digital flight", defined as

> an operating mode in which flight operations are conducted by reference to digital information, with the operator ensuring flight-path safety through cooperative practices and self-separation enabled by connected digital technologies and automated information exchange.

11.63 Digital flight would then be facilitated by related regulations which would sit alongside existing rules of the air. These "Digital Flight Rules" ("DFR") would be an alternative means of separation to the current rules for aircraft, available to appropriately equipped aircraft.

11.64 DFR, as conceived by NASA would be reliant on four "essential elements".[68]

(1) **Digital information, connectivity and services**. Digital flight operators must use automation to plan and revise the aircraft's flight path and be able to share this with other operators in real time.

(2) **Shared traffic awareness**. DFR is intended to be based on self-separation without relying on ATC or visual means, therefore aircraft would need to share information about their flight path intent and operations directly with other aircraft.

(3) **A shared set of "co-operative practices" that DFR operators follow**. Specified in regulations, industry standards or recommended practices and encoded in the automation of the aircraft.

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66 CATS Global Council, *Seamless Airspace: Are Today's Flight Rules Ready for the Future of Aviation?* (2025) p 8.

67 ICAO, *Modernising flight rules for the future of aviation: an evolutionary imperative* (A42-WP/529, September 2025) para 3.3.

68 National Aeronautical and Space Administration, *Digital Flight: A New Cooperative Operating Mode to Complement VFR and IFR* (September 2022) section 3.5.

(4) **Separation automation**. Aircraft automation would synthesise the first three elements to execute separation automatically.

11.65 NASA envisages that during flight, a DFR operator would interact with the separation automation in much the same way an IFR pilot interacts with air traffic control. The automation would serve as the DFR operator's tool for detecting traffic conflicts, determining manoeuvres, and resolving conflicts as required.[69]

Do DFR solve integration?

11.66 We consider that most of the essential elements required for DFR overlap with the elements described in the first part of the chapter. These elements are already recognised by the CAA as necessary for the safe integration of both remotely piloted and autonomous UAS.

11.67 Digital information, connectivity and services speak to concepts of UTM which we have looked at in depth in this report. Similarly, "shared traffic awareness" will require services which can share flight information amongst operators. This might be achieved by a Common Information Service,[70] or as we have also discussed, via new types of UTM such as DSS which share information about flight intent directly between aircraft.[71]

11.68 Separation automation, which is another key aspect of the DFR concept, is stated by NASA to involve systems on the aircraft which can "synthesise information" to automatically avoid other aircraft. Although not expressed as such, this essentially refers to DAA capabilities which are also part of the CAA's strategy to integrate UAS.

11.69 As we concluded in the first half of the chapter, many of these elements require policy to be developed and tested. They also rely on infrastructure which, as indicated by the AMS, is not yet in place. As such, much of the DFR concept relies on technical developments and infrastructure rather than developing rules *per se*. The exception to this is the "shared set of co-operative practices" conceived of by NASA. This speaks to a shared set of practices and behaviours that operators must follow. In other words, a ruleset for operations, albeit one which will be encoded in the automation of an aircraft using DFR.

11.70 It is this aspect of the DFR concept which we believe is most important to highlight in relation to integration. If autonomous aircraft are to be integrated into airspace without restrictions, all airspace users should have shared understanding of how to use airspace together. When we consulted on creating new rules of the air for UAS, one of the consultees, ARPAS-UK, highlighted that new rulesets for autonomous aircraft cannot exist independently but will need to consider other airspace users:

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69 NASA, *Digital Flight: A New Cooperative Operating Mode to Complement VFR and IFR* (September 2022) para 3.5.4.

70 Discussed in chapter 9 at paras 9.54 to 9.59.

71 See chapter 9, para 9.23.

> The issue with DFR … is that of coexistence, currently there is no explanation how in unusual circumstances the two sides communicate as the assumption remains Air-to-Air[72]

11.71 We agree that this would be an important aspect of any update to the rules of the air. Neither NASA's DFR concept, nor the review undertaken by CATS, yet consider how autonomous UAS and conventional airspace users should interact. Rules for these types of interactions will need to be created to ensure that the rules of the air remain a complete set of rules for all airspace users. Not all aircraft will be able to make use of "shared traffic information" or "digital services" and will need to be considered in order for integration to be successful.

Achieving a complete set of shared rules

11.72 Achieving a complete set for all users is not straightforward. This was reflected in feedback to our first consultation, when we asked about how the rules of the air should be reformed to account for autonomous flight.

11.73 In general, consultee views were mixed about how the rules, as a whole, should be developed in light of autonomous flight. Some consultees could see the need for a new set of rules or amendments to the current rules. Others thought the current approach of applying only applicable rules of the air would continue to work for the foreseeable future.[73]

11.74 However, a recurring theme in the responses was that whilst the rules of the air would eventually need to be revised or added to, reforms should take place over a longer time frame and be approached in an incremental fashion. Some consultees emphasised a long-term approach to reform of the rules of the air as beneficial to safety. They noted that a long lead-in time to new rules of the air would allow "developing technologies to reach a safe deployable stage".[74] Making a similar point, the Royal Aeronautical Society was of the view that it would be "problematic to attempt to adapt the current rules of the air whilst autonomous use cases are still in their relative infancy."[75]

11.75 Kate Staples, former General Counsel of the CAA, encouraged the Law Commission to consider reform of aviation law as an ongoing process. Rather than seeking to arrive at a new rules of the air in one step, she suggested that successive waves of reform may be a better way to resolve the issue:

> if we allow for waves of development and differentiated regulatory decisions, we may get to a tidy end point eventually and that point may resemble the point we

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72 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

73 This is the current approach to the application of the Rules of the Air under the UAS Delegated and Implementing Regulations. We discuss this approach in chapter 8 at paras 8.41 to 8.47.

74 Ramin Norouzi response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 397, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

75 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

currently have. To do that, however, we need a number of different routes and need different mechanisms to get there.[76]

Specific changes to shared rules

11.76 Although most consultees did not express a definite view about how the rules of the air, in their entirety, should be reformed, many consultees had strong views about how to adapt the rules of the air in relation to specific issues. York Gliding Centre, for example, suggested:

> the ability of the remote and autonomous vehicle to detect other airspace users needs to be reflected in equivalent rules for visibility and separation eg reliable detection ranges may mean that the visibility and separation rules may need to be reconsidered.[77]

11.77 Whilst Zipline, a drone operator, suggested that the Law Commission consider the approach taken by the FAA's Aviation Rulemaking Committee. Zipline noted that the Aviation Rulemaking Committee recommended taking a "risk-based" approach to issues such as the right of way rules for uncrewed aircraft.[78]

11.78 Another consultee, British Hang Gliding and Paragliding Association, thought that the rules of the air should clarify how autonomous aircraft should behave towards crewed aircraft:

> Remotely piloted and autonomous aircraft (including those carrying passengers) must be required to give way to crewed aircraft…They must be able to detect hang gliders and paragliders and take whatever action necessary to avoid a collision, and maintain such a distance that does not cause hang gliders and paragliders to be affected… The effects of turbulent air can be as disastrous upon our aircraft as physical collision.[79]

11.79 A significant number of consultees also responded to a question in our first consultation paper about emergency scenarios. Currently, the Rules of the Air allow the pilot in command to set them aside where safety requires it. In our first consultation we asked whether autonomous aircraft should be allowed to set aside the rules if safety requires, or whether autonomous aircraft should be subject to a comprehensive set of rules for emergency procedures.

11.80 Many consultees were of the view that a comprehensive set of rules for emergency scenarios should be developed for autonomous aircraft, as a starting point. Eventually

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76 Kate Staples response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 303, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

77 York Gliding Centre response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 596, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

78 Zipline International response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 613, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

79 British Hang Gliding and Paragliding Association response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 91, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

autonomous aircraft could then be allowed to operate outside the rules of the air when the technology was mature and if the situation called for it.

11.81 Developing such a comprehensive set of rules for emergency scenarios would be difficult. It would require consideration of a wide range of possible emergency scenarios and then considering how autonomous aircraft should react in response. UKRI Future Flight Challenge suggested that the issue could be approached as follows:

> Deriving such a set of rules will likely need significant inputs from all airspace users and will either need to be driven by the regulator directly or by a rule making committee that proposes a solution to the regulator and they can adopt or adapt as they deem fit. It would also be sensible to look at what approaches to this issue are being taken internationally as this is not unique to the UK, as well as what approaches are being taken with autonomous cars and ships.[80]

11.82 This would be a good approach to developing a comprehensive set of rules for emergency scenarios - one which would consider views from a wide variety of aviation stakeholders as well as lessons learnt from other industries. Further than this though, in our view the approach should also be utilised for the rules of the air in general.

A forum to collaborate on the rules of the air

11.83 Although most consultees were not wedded to a particular approach to reforming the rules of the air, it was apparent from the consultations, and also throughout the course of our review, that different airspace users have strong views about individual issues relating to integration of autonomous use cases.

11.84 We recommend that the Department for Transport and CAA establish a forum to collaborate on the rules of the air for UAS and autonomous use cases. Such a forum should facilitate a structured dialogue between developers of UAS, regulators and other airspace users. This forum should consider how the rules of the air should be adapted for UAS and autonomous use cases and integration more generally. We do not envisage that this forum should have any powers to amend law or regulation. However, it should be able to make recommendations to the UK Government for reform. The forum's work could also inform, and feed into, relevant international initiatives on UAS integration in which the UK participates.

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80 UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

Recommendation 28.

11.85 We recommend that the UK Government should establish a forum for collaboration on the rules of the air for UAS and their integration. This forum should consider:

(1) how the rules of the air should be applied or modified in relation to UAS and autonomous air operations; and

(2) the integration of UAS into UK airspace.

CONCLUSION

11.86 Integrating autonomous UAS into UK airspace will require the progressive development of many technical, policy elements and regulatory elements. Essential capabilities such as electronic conspicuity, detect-and-avoid, UTM and SWIM will need to be developed further before they can support routine autonomous operations in unsegregated airspace. Much of this work falls outside the scope of legal reform and will depend on coordinated progress across policy, standards and infrastructure.

11.87 Autonomous operations will also challenge core assumptions underpinning the existing rules of the air, many of which rely on human communication and judgement. While international proposals such as modernised flight rules and Digital Flight Rules indicate likely future directions, consultees emphasised the need for incremental, collaborative reform. For this reason, we have recommended a dedicated forum bringing together regulators, operators and other airspace users to support the process of integration.

Part 4: Civil and criminal liability

Chapter 12: Civil liability

12.1 In our consultation papers, we discussed how civil liability attaches to those involved in the operations of uncrewed aircraft systems ("UAS"), both following an accident and in relation to their day-to-day operations. We explained how straightforward mechanisms for compensation following an accident have been key to the commercial success of the aviation sector. Should an accident occur, affected parties should have a route to obtaining redress.

12.2 Throughout this chapter we again explain the various civil liability mechanisms that exist in the aviation sector. Alongside these explanations, we set out our civil liability recommendations in relation to both remotely piloted UAS and autonomous operations. In many instances, a change for remotely piloted UAS will also cover autonomous use cases.

12.3 This chapter is not a comprehensive review of civil liability in the aviation sector. Throughout the course of this review we have examined the issue of civil liability by focusing on liability for: death and injury caused to passengers; damage to their baggage; damage to cargo; and damage caused to people and property on the surface. These types of damage seemed to us the most urgent and relevant areas when considering the safe operation of drones, vertical take-off and landing vehicles ("VTOLs") and uncrewed aircraft systems traffic management ("UTM"). Liability in relation to these types of damage is primarily governed by strict liability regimes.

12.4 We are also concerned with liability gaps related to the use of UAS. That is, situations where the law provides for redress for conventional aircraft but would provide no prospect of a successful claim again anyone if the same situation were to involve a UAS.[1] Because we anticipate that the manufacturer of UAS might become more of a focus for litigation in the future we also discuss manufacturer's liability for defective products. For completeness we have also outlined liability for mid-air collisions and the liability of UTM providers, issues which are also highly relevant to the operation of UAS.

12.5 We note at the outset of this chapter that contracts play an important role in aviation and may also have implications for liability depending on the particular terms and conditions agreed between the parties. Aviation contracts can be highly complex agreements between many different parties including manufacturers, carriers, insurers and airport operators. They will differ greatly depending on the parties involved and the particular use case. However, because our areas of focus are mainly governed by

[1] As we highlighted in our second consultation paper, within the law of civil liability, it is not the case that for all harms suffered there is always someone against whom a successful claim could potentially be made. For example, pure economic loss is only recoverable in tort law in a limited set of circumstances. This would not be a "liability gap".

strict liability regimes which are set out in legislation, we do not consider contractual liability.[2]

12.6 This chapter is dived into four parts. In the first part, we look at liability in the case of an accident involving UAS. This analysis includes two components.

(1) **Strict liability regimes**: Aviation has strict liability regimes that operate in the case of accidents. This includes death or personal injury to passengers or damage to their baggage; damage to cargo; or surface damage. Our view is that these will continue to operate to provide compensation and we deal with these first.

(2) **Claims outside the strict liability regimes**: After an accident, there is also the possibility of claims for damage/loss suffered not covered by the strict liability regimes, or for additional claims over and above the strict liability regimes.

12.7 Related to the question of liability for accidents involving UAS, there is the question of insurance cover in respect of those liabilities. We consider this in the second part of the chapter.

12.8 In the third part of the chapter we consider trespass and nuisance. Here we are dealing with the intrusive operation of drones rather than liability for accidents.

12.9 At the end of the chapter, we briefly discuss the carriage of dangerous goods by UAS. We are aware that in the future, operators may wish routinely to carry dangerous goods, including items such as batteries and blood samples.

CIVIL LIABILITY IN THE CASE OF ACCIDENTS

12.10 Following an aviation accident, many different parties could be involved in any subsequent litigation. These include passengers, members of the public, air carriers, Air Traffic Management and Air Navigation Services ("ATM/ANS") providers and the designers and manufacturers of aviation systems. Insurers may also make secondary claims based on the rights of those they have insured, once they have indemnified those parties (a process known as "subrogation").

12.11 The law has various mechanisms for making people responsible for accidents. Some are aviation specific, and some are not. The law may place operational responsibilities on actors within the aviation system (such as the pilot) without necessarily making them liable to pay damages to persons who are injured because of a breach of those responsibilities. By way of example, UK Regulation (EU) 923/2012 on the Standardised European Rules of the Air ("UK SERA") explains that the pilot-in-command is responsible for:

[2] Art 27 of the Montreal Convention 1999, the main source for many of the strict liability provisions in civil aviation in the UK, specifically provides that parties are free to contract but must not lay down conditions which conflict with the Convention.

taking such action, including collision avoidance manoeuvres based on resolution advisories provided by ACAS equipment, as will best avert collision.[3]

12.12 Depending on the circumstances, breaching that provision could be a criminal offence, and result in a fine for the pilot.[4] If breaching the provision involved fault on the part of the pilot, and led to damage, the pilot might well be civilly liable. However, this liability is not automatic. In many instances the carrier or operator may also be liable and, having more resources, will be the preferred target for any litigation.

12.13 This next section discusses strict liability within the aviation industry for accidents causing: death or injury to passengers; damage to their baggage; damage to cargo; and damage to people and property on the ground. After that we turn to claims that are not subject to strict liability.

EXISTING STRICT LIABILITY REGIMES

12.14 In both of our consultation papers we explained that there are several strict liability regimes that operate in the aviation sector. These regimes channel liability through the carrier, operator or owner of an aircraft.

12.15 Of particular importance is the Montreal Convention 1999 (the "Montreal Convention"), which deals with liability for death or injury to passengers, and damage to baggage and cargo. The Montreal Convention only applies to "international carriage". The UK ratified the Montreal Convention in 2004 and a statutory instrument implementing its contents came into effect in the same year.[5] There is also a body of common law which addresses many of the same issues as the Montreal Convention, but it now only applies to carriage provided free of charge otherwise than by an air transport undertaking or the Crown.[6]

12.16 UK air carriers engaged in the carriage of persons, or their baggage, are subject to UK Council Regulation (EC) 2027/97. That regulation (as amended) applies provisions of the Montreal Convention to both national and international air carriage.[7]

12.17 Domestic law also requires that owners of aircraft, or those that lease them long term, are strictly liable for "surface damage" to third parties. It makes the owner or long-term lessee of an aircraft liable where material loss or damage is caused to "any person or property on land or water by, or by a person in, or an article, animal or person falling from, an aircraft while in flight, taking off or landing".[8]

12.18 Our consultation papers considered the application of these strict liability regimes to uncrewed operations. We examined strict liability as it relates to passengers, cargo

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3 UK Regulation (EU) 923/2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation, annex, SERA.3201.

4 See chapter 13.

5 The Carriage by Air Acts (Implementation of the Montreal Convention 1999) Order 2002 SI No 263.

6 Montreal Convention 1999, art 1(1); Carriage by Air Acts (Application of Provisions) Order 2004 SI No 1899, art 8.

7 UK Council Regulation No 2027/97 on air carrier liability in the event of accidents, arts 1 and 3.

8 Civil Aviation Act 1982, s 76(2).

and surface damage. In general, we concluded that, because these schemes are directed at the carrier, operator, or the owner of an aircraft, the lack of a pilot on board the aircraft would not affect the operation of current law. We provisionally proposed that the strict liability regimes for passengers and cargo were adequate and asked consultees for their views. We also identified that the law is currently unclear about the liability position of long-term lessees of UAS for surface damage. For this reason, we provisionally proposed that the law should be amended to clarify liability in cases where a UAS is leased.

12.19 In the following sections we discuss each of the strict liability schemes, our proposals in relation to them and our conclusions.

Strict liability regime for death and injury to passengers

12.20 Article 17 of the Montreal Convention provides that an air carrier is liable for death or bodily injury which results from an accident occurring on board an aircraft (or in the course of embarking or disembarking). An air carrier is "an air transport undertaking with a valid operating licence" and a UK air carrier is "an air carrier with a valid operating licence granted by the Civil Aviation Authority ("CAA")."[9]

12.21 The Montreal Convention provides that for damages up to a set amount, the carrier may not exclude or limit its liability. That amount was originally expressed in gold francs, but is now expressed in Special Drawing Rights, or "SDRs".[10] The current figure (applicable in the UK for death or injury to passengers) is 151,880 SDRs, or approximately £156,000.[11] Up to that limit the scheme is one of "strict liability"; in other words, it is not necessary to show that the air carrier was at fault. Beyond that limit, article 21(2) of the Convention creates a presumption of liability and reverses the burden of proof such that the carrier must now prove that it should not be liable. This means that to limit its liability to £156,000 the carrier must prove that the damage:

(1) was not due to the negligence or other wrongful act or omission of the carrier or its servants or agents; or

(2) was solely due to the negligence or other wrongful act or omission of the person claiming compensation (or the person from whom the claimant derives their rights).[12]

12.22 In practice air carriers do not seem to have succeeded in limiting their liability using article 21(2) when an accident resulting in death or injury of a passenger has occurred. Accidents have almost always been attributable to the fault of an air carrier

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9 UK Regulation (EC) No 2027/97 on air carrier liability in the event of accidents, art 2(1)(a) and (b). An "air transport undertaking" is not defined. However, the Transport Act 2000 defines it, for the purposes of that Act, as "undertaking…which includes the provision of services for the carriage by air of passengers or cargo for hire or reward." Transport Act 2000, s 95(5).

10 Special Drawing Rights (SDRs) is an international currency unit created by the International Monetary Fund. At the time of publication, 1 SDR = approximately 1.03 GBP.

11 The Carriage by Air (Revision of Limits of Liability under the Montreal Convention) Order 2025 SI No 123, art 3.

12 Montreal Convention 1999, art 21(2).

and its servant and agents, which include the pilot. Historically, the Montreal Convention has therefore predominately operated as an unlimited liability regime.

12.23 The Montreal Convention also makes an air carrier liable for damage to baggage checked in to the hold. In our first consultation paper, we considered that, since there is no requirement that there should be a pilot, this provision of the Convention also applies to uncrewed aircraft.

12.24 One question that arises in relation to UAS is the identification of the "air carrier". As we set out in our first consultation paper, in our view, this will be the operator of a remotely piloted or autonomous VTOL. As we discuss in chapter 7, we expect that such operators will be required to hold a valid operating licence in order to transport passengers and will therefore fall under the definition of "air carrier" as discussed above at paragraph 12.20. It is unnecessary to consider the position of operators in the open and specific categories, as passengers cannot be carried in these categories of operation.[13]

Our proposal

12.25 The strict liability regime is designed primarily to enable compensation from the carrier, rather than the pilot. In our provisional view, the replacement of a pilot by a remote pilot, or the removal of the pilot altogether, would not make any significant difference to the effectiveness of the current regime. In most cases, an air carrier will be much better placed to compensate claimants than other parties.

12.26 We acknowledged in our first consultation paper that different types of accident may become more common with passenger-carrying UAS. For example, damage caused by other passengers may become more common without the restraining influence of cabin and flight crew. However, as we also described in our first consultation paper, "accident" has been construed widely to include damage caused by other passengers in the aircraft and is therefore already covered by the current regime.

12.27 For the reasons above we provisionally considered that the current law governing air carrier liability for injury or death of passengers in the UK was adequate for the introduction of remotely piloted and autonomous operations.

Consultation analysis

12.28 A slight majority of consultees agreed with our proposal that the current law is adequate for introduction of remotely piloted and autonomous operations. No respondents explicitly disagreed, but the rest of the consultees only partially agreed or raised additional issues.

12.29 Most of the responses that agreed with our provisional proposals did so without qualification. For example, one consultee said:

> We provisionally agree that the current law governing air carrier liability for injury or death of passengers in the UK, applicable to both domestic and international air

[13] See chapter 5, para 5.6.

> transport, is adequate for the introduction of remotely piloted and autonomous operations.[14]

Uncertainty about the Montreal Convention

12.30 However, a large proportion of consultees were unsure about the suitability of the current regime. Some responses noted that they only agreed with our proposal in part. For example, Stewarts agreed that the law is adequate in relation to remotely piloted operations (with lower levels of automation) but would become less adequate as aircraft systems became more automated. Several other consultees were also of the view that the current regime would continue to work in the short term but would eventually require change. In its response to the second consultation, the Royal Aeronautical Society ("RAeS") explained why, longer term, the strict liability regime created by the Montreal Convention would no longer be fit for purpose.

> the development of automated systems is likely to result in passengers and families being unable to take advantage of the unlimited liability regime as automated systems provide key control of functions. Extensive automation, particularly where that automation is unknown to pilots (e.g. Boeing 737 Max and its MCAS system) provides a possibility that carriers may be able to take advantage of the liability limit under article 21(2).[15]

12.31 As discussed above at paragraph 12.21, under article 21(2)(a) of the Montreal Convention, a carrier can limit their liability to £156,000 if the carrier can prove that damage:

> was not due to the negligence or other wrongful act or omission of the carrier or its servants or agents.[16]

12.32 Essentially, consultees like the RAeS thought that a carrier might be able to argue that damage caused by a highly automated system was outside their control. Any such automation used in passenger carrying aircraft will have been through an intensive certification and approval process by a civil aviation regulator. As long as the carrier had maintained a highly automated aircraft in line with the certification specifications, and the manufacturer's instructions, it may be relatively easy for them to show that there was no negligence or a wrongful act on their part, or on the part of their agents.

12.33 Ultimately, these consultees thought this might leave passengers undercompensated, forcing them to bring claims against other parties, such as aircraft manufacturers, for amounts in excess of the limit provided by article 21(1).

Updating the Montreal Convention

12.34 Some consultees thought that the regime established by the Montreal Convention was already reaching the point where revision was necessary. Stewarts suggested that

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14 Anonymous 3 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 649, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

15 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

16 Montreal Convention 1999, art 21(2)(a).

had recent litigation relating to the Boeing 737 Max been pursued under the Montreal Convention, the litigants may have run into difficulty in relation to article 21(2), even though there was a relatively low level of automation (level 2 on the JARUS scale) involved in that aircraft.[17] In 2018 the 737 Max aircraft was involved in two separate accidents where the automation of the aircraft's manoeuvring was a major contributing factor.[18]

12.35 However, no consultee suggested developing a new liability scheme. Rather, those respondents who highlighted the potential failings of the Montreal Convention were in favour of solving the issues they highlighted by revising the Convention. There were three main reasons for this view. Firstly, the current regime was seen as beneficial for claimants as it made it straightforward for passengers to make claims. Secondly, it was also thought the current system provided more certainty for insurers, as the existing presumption of liability allows them to accurately model their exposure and charge premiums accordingly.[19] A third reason, raised by Professor Leloudas, was that maintaining an international approach to liability in the aviation sector would be less confusing:

> it is essential to mention that an international approach is to be preferred (as in the case of conventional aircraft) as it is expected that the boundaries between domestic and international carriage on novel aircraft might soon be blurred and raise issues of application of the Convention.[20]

12.36 Updating the Montreal Convention would take time and international cooperation, and would in any event introduce uncertainty. In their response, the RAeS noted that the Montreal Convention took eight years to develop and implement and for this reason recommended that work should begin on revising it as soon as possible.[21]

Updating Montreal for remotely piloted UAS

12.37 Some consultees suggested one change to the Montreal Convention that may be relatively straightforward and much quicker to implement than updating the Convention for automated systems. These consultees thought that the Montreal Convention should be amended to make explicit that remotely piloted operations are covered:

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17 The JARUS scale is discussed in chapter 4.

18 David Shepardson, *Boeing settles lawsuits with two 737 MAX crash victims' families* (7 April 2025) https://www.reuters.com/legal/boeing-settles-lawsuits-with-two-737-max-crash-victims-families-2025-04-07/.

19 Stewarts response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 525, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

20 George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

21 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

In relation to remotely piloted operations (that are not Highly Automated), to avoid unnecessary litigation, it needs to be clarified that the scope of the Convention and Regulation covers remotely piloted aircraft.[22]

Clarification is required in Article 1 that such novel aircraft are part of the Convention's cover.[23]

12.38 Kennedys Law LLP also mentioned that, for liability to attach, the definition of 'carrier' under the Montreal Convention would "need to extend to include the remote pilots of the drone vehicle that carries passengers".[24]

Our conclusion

12.39 A majority of consultees agreed with us that, because the current liability regime focusses on the air carrier rather than the pilot, the absence of a pilot on board the aircraft does not make any significant difference to the operation of the current regime.

12.40 We remain of the view that should a remotely piloted or autonomous UAS operation be certified and licensed to carry passengers, the provisions of the Montreal Convention would still operate. However, we agree with consultees that longer term, to put the issue beyond doubt, it may be beneficial to make this clear in the Convention itself.

12.41 We also thank consultees for pointing out how article 21(2) could be used by air carriers to limit their liability when automation is used, potentially leaving passengers undercompensated. It was apparent that consultees thought that this was a general issue with the operation of the Montreal Convention, one which would become relevant for all passenger-carrying aircraft, both crewed and uncrewed. We agree with consultees that the operation of article 21(2) is a potential issue for all of commercial aviation as systems are increasingly automated.

12.42 It was clear, though, that consultees sought an international solution to these issues. They wanted the current regime to be amended at an international level to ensure consistency between domestic and international operation. We agree that an international solution is necessary to ensure consistency.

12.43 The Law Commission's role, and the scope of this report, is limited to the law of England and Wales and focuses, in particular, on uncrewed aircraft. Consequently, we do not have standing to make recommendations about amendments to an international Convention that applies to air carriers in general. Our conclusion is that the domestic law does not need to be changed at this time to accommodate UAS operations. As we discuss in chapter 2 of this report remotely piloted and autonomous

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22 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

23 George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

24 Kennedys response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 307, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

operations that carry passengers are still likely many years away.[25] It is a matter for the Department for Transport to consider how they might best engage the International Civil Aviation Organization to consider necessary amendments to the Montreal Convention to address increased automation in commercial air transport.

Strict liability regime for damage caused to cargo

12.44 Air carriers that carry cargo within the UK fall under a modified version of the Montreal Convention system, introduced by schedule 1 to the Carriage by Air Acts (Application of Provisions) Order 2004.[26] It applies to "all carriage of persons, baggage or cargo performed by aircraft for reward", and gratuitous carriage by aircraft "performed by an air transport undertaking".[27] Its scope is therefore different from that of UK Regulation (EC) 2027/97: there is no need for the carrier to have an operating licence.

12.45 Article 18 of the Carriage by Air Act 1961 provides that the carrier will be liable for:

> damage sustained in the event of the destruction or loss of, or damage to, cargo upon condition only that the event which caused the damage so sustained took place during the carriage by air.[28]

12.46 As with liability for death or bodily injury to passengers, there is a limit to the liability, which operates by weight.[29] The weight limit may, however, be displaced if the sender makes a "special declaration" and, if required, pays an additional fee.

12.47 The air carrier may rely on a defence of contributory negligence, if the carrier proves that the damage was caused or contributed to by the negligence or other wrongful act or omission of the person claiming compensation.[30]

12.48 An air carrier will also escape liability if the destruction, loss or damage was due to:

(1) an inherent defect, quality or vice in the cargo;

(2) defective packing of the cargo by another person;

(3) an act of war or armed conflict; or

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25 See also chapter 10 at para 10.25 where we discuss the timelines foreseen by the European Union Aviation Safety Agency (EASA) for when various levels of AI applications are likely to be used in UAS. EASA does not foresee autonomous systems being approved until 2050.

26 SI 2004 No 1899. This in turn amends sch 1B to the Carriage by Air Act 1961. For further detail, see *Chitty on Contracts* (35th ed 2022) para 38-104.

27 Carriage by Air Act 1961, sch 1B, art 1, as applied by the Carriage by Air Acts (Application of Provisions) Order 2004, sch 1.

28 Carriage by Air Act 1961, sch 1B, art 18(1), as applied by the Carriage by Air Acts (Application of Provisions) Order 2004, sch 1.

29 Carriage by Air Act 1961, sch 1B, art 22(3) gives a limit of 17 SDRs per kilogram (as applied by the Carriage by Air Acts (Application of Provisions) Order 2004, sch 1).

30 Carriage by Air Act 1961, sch 1B, art 20, as applied by the Carriage by Air Acts (Application of Provisions) Order 2004, sch 1.

(4) an “act of public authority” carried out in connection with the entry, exit or transit of the cargo.[31]

Our proposal

12.49 There is nothing in the law that confines liability to any particular type of aircraft. In our first consultation paper, we were provisionally of the view that liability will apply to UAS.

12.50 We noted that in practice it seems likely that cargo carried by smaller drones will be of a greater value than the current limit of 17 SDRs per kilogram. As a result, greater use is likely to be made of special declarations and additional fees. We did not see that this would, at present, require a change to the existing law.

12.51 For this reason, we provisionally concluded that the current law governing liability for damage to cargo in the UK is adequate for the introduction of remotely piloted and autonomous operations.

Consultation analysis

12.52 The majority of respondents who answered this question agreed that the current law governing liability for damage to cargo is adequate. No respondents disagreed. But some respondents, while on the whole agreeing with the Law Commission’s analysis, suggested ways in which the current law could be amended to make it more suited to the introduction of remotely piloted and autonomous operations.

12.53 One issue that consultees highlighted was that the term “cargo” is undefined in the regulation. For this reason, both the RAeS and Professor George Leloudas suggested that “cargo” should be defined, both internationally and domestically, which might in turn promote the movement of cargo by UAS.[32] Professor Leloudas noted that this could become more of an issue if UAS become more commonly used as “non-conventional” ways of moving cargo for commercial and humanitarian purposes. As an example, he noted that it might be unclear whether domesticated animals carried on a VTOL would fall within the definition of cargo:

> an essential issue in the context of this consultation, as several of these new types of aircraft will be used as air taxis in urban environments and are expected to transport a good number of domesticated animals.[33]

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31 Carriage by Air Act 1961, sch 1B, art 18(2), as applied by the Carriage by Air Acts (Application of Provisions) Order 2004, sch 1.

32 George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/; Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

33 George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/;

12.54 He also noted that the current tendency of some courts is only to treat items as cargo where there has been an issuance of an air waybill.[34] An air waybill is an important document exchanged between the seller or supplier of goods, the carrier, and the consignee as the possession of the cargo is transferred from one party to the other. It documents the transfer of cargo between these parties. Professor Leloudas noted that this issuing of air waybills is "a practice that, familiar as it is with conventional airlines, is not necessarily common (and should not be necessary) in carrying cargo by UAS".[35]

12.55 Some consultees noted many new use cases for carrying cargo will emerge. They also noted that air waybills would need to be considered in these contexts. For example, the RAeS said:

> would UAS operators carrying blood between hospitals be required to issue AWBs? While it is possible that the exact requirements could be left to case law, as using UAS for carrying cargo is becoming more popular, we would recommend amending the domesticated version of the Montreal Convention as appropriate.[36]

12.56 Both the RAeS and Professor Leloudas suggested that clarifying that such "non-traditional" carriages fall into the scope of the Montreal Convention and its domesticated version would "neutralise the tendency of some courts to require the issuance of an airway bill for an item to qualify as cargo".

12.57 Another solution suggested by Kennedys Law was, "imposing the need for carriers to provide an airway bill reference for performance of contract for carriage by air for the purpose of delivery". In their view this would "ensure that the current laws governing liability for damage to cargo apply to drone operations."[37]

Our conclusion

12.58 We remain of the view that the current liability and cargo regime is sufficient for remotely piloted and autonomous aircraft. As the regime imposes responsibility on the air carrier rather than the pilot, it will continue to function and provide compensation if cargo is damaged. This position was supported by the majority of consultees.

12.59 As noted above, it is possible that UAS may carry goods which require more use of special declarations. However, at present, we still do not see that this requires a change to the current law. At this early stage of UAS development, much is still

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34 Art 11 of the Montreal Convention states that 'the air waybill or the cargo receipt is *prima facie* evidence of the conclusion of the contract, of the acceptance of the cargo and of the conditions of carriage mentioned therein.' However, art 11 is not applicable to non-international carriage in the UK: Carriage by Air Act 1961, sch 1B, as amended by the Carriage of Air Acts (Application of Provision) Order 2004, s 4 and sch 1.

35 George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/;

36 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

37 Kennedys response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 307, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

unknown about the types of use cases and cargo operations that will develop and be approved.

12.60 In our view it is nonetheless important for the Department for Transport to increase awareness of special declarations when cargo-carrying operations using UAS are authorised. One consultee, UKRI Future Flight Challenge, also made this point:

> The value of the cargo may not be related solely to its weight and therefore the assumption that greater use of special declarations is one that seems logical given the use cases of UAS for delivery of time sensitive items.
>
> This does highlight a need for those offering such delivery services and those using them to be aware of the legal limitations in liability being based on weight and the need to declare any 'special declarations' and agree any additional fees as a result to be made up front.[38]

12.61 As with many other aspects of civil aviation, awareness may be increased via general guidance.

12.62 We also appreciate the consultee views about aspects of the current regime which could be clarified. The first is the definition of cargo. Consultees suggested that this should be clarified at an international and domestic level.

12.63 As in the previous section on death and injury to passengers, the Law Commission is concerned with the law of England and Wales. We cannot make recommendations about how the Montreal Convention should be amended. In relation to the domestic regime, we do not think it would be appropriate to make a recommendation to change the definition of cargo. There are three main reasons for this.

(1) Firstly, any amendments to the domestic regime mean that there could be an increasing divergence between the domestic and international regimes, which may have unforeseen consequences.

(2) Secondly, it is unclear to us, in the absence of a large amount of practical experience, how cargo should be defined in a way that encompasses or excludes all potential use cases appropriately.

(3) Lastly, there is a body of case law that continues to develop in relation to the definition of cargo - one line of case law has, for example, treated unaccompanied animals as cargo under the Montreal Convention.[39]

12.64 For these reasons we do not think it would be helpful to propose legislative intervention which defines cargo, or specifies cargo-carrying use cases.

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[38] UKRI Future Flight Challenge response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 545, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[39] George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

12.65 As for the suggestion that carriers of goods with UAS should be required to issue air waybills, we agree that the existence of an identifiable air waybill could help courts identify when "cargo" has been carried. The Montreal Convention sets out in detail the documentary requirements for an air waybill. This includes information such as the place of departure and destination and an indication of the weight of the consignment.[40] Since 2019 electronic air waybills have become the default.[41]

12.66 However, as we noted at the beginning of this section, the legislation which implements the Montreal Convention is modified in relation to cargo. Crucially, it does not include the provisions on documentation.[42] This being the case, for domestic carriage, any document which indicates the chain of custody from the seller, the carrier and the consignee might be considered an air waybill.

12.67 Accordingly, we are not recommending that air waybills should be mandatory, nor the format that they should take. It is likely that a receipt or documentary evidence of the purchase and delivery will be considered an air waybill. Further, as we have not consulted on the issue, making air waybills mandatory may have unforeseen consequences.

12.68 In the short to medium term, as most consultees agreed, the current regime should continue to function to provide compensation when cargo is damaged, even if it is carried by a UAS. We acknowledge though that in the longer term, when international air carriage by UAS is more common, the issue will need to be revisited.

Strict liability regime for surface damage

12.69 Section 76(2) of the Civil Aviation Act 1982 provides compensation for damage sustained at ground level. In particular, it enables damages to be claimed:

> where material loss or damage is caused to any person or property on land or water by, or by a person in, or an article, animal or person falling from, an aircraft while in flight, taking off or landing.[43]

12.70 Unlike the two strict liability regimes above, this does not derive from international law. Furthermore, there is no statutory limit to the compensation that can be claimed for surface damage.

12.71 Damages can be claimed "without proof of negligence or intention or other cause of action, as if the loss or damage had been caused by the wilful act, neglect, or default of the owner of the aircraft."[44] However, the section states that such damages will be recoverable "unless the loss or damage was caused or contributed to by the negligence of the person by whom it was suffered". It is unclear whether negligence

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40 Montreal Convention 1999, art 5.

41 International Air Transport Association, *e-freight/e-AWB*, https://www.iata.org/en/programs/cargo/e/efreight/.

42 With the exception of art 3(3) and 3(5), which are not relevant for cargo. See also *Shawcross and Beaumont: Air Law* (Issue 195 2025), V [916], chapter 42, 1:108.

43 Civil Aviation Act 1982, s 76(2).

44 Civil Aviation Act 1982, s 76(2).

by the person who has suffered the damage is a complete defence to a claim under section 76(2), or only a partial defence.[45]

12.72 The person liable for any damage is the owner of the aircraft.[46] However, the liability will fall on a lessee of the aircraft if:[47]

(1) the aircraft has been demised, let out or hired for a period exceeding 14 days to any other person: and

(2) no pilot, commander, navigator or operative member of the crew of the aircraft is in the employment of the owner.

12.73 This situation is often referred to as a "dry lease". An air carrier who is not the owner may also be liable under section 76, depending on the terms on which the aircraft is leased.

12.74 The liability created by the section is not exhaustive; damage to people or property on the surface may give rise to other types of liability on the part of the owner, operator or pilot. As explained by Shawcross and Beaumont:

> … the pilot may be liable in negligence, and a plaintiff may have a choice of defendants. Selecting the owner will avert the need to prove negligence, but other factors (such as jurisdictional issues, or insurance matters) may point to a different choice in a particular case.[48]

12.75 It is also possible that a claim could be brought against the manufacturer under the product liability regime (see below at paragraph 12.99).

12.76 As we noted in our first consultation paper, the terminology used in this section is not typical of aviation law. It would be more typical to refer to an "operator" than an owner. The use of the word "owner" dates back to the early days of aviation law and the Air Navigation Act 1920.[49] We draw attention to this issue, as it may be desirable for the law to be updated here to mirror terminology that is currently in use. This is, however, a general problem with aviation law, rather than one specific to UAS, and in our view is beyond the scope of this review.

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45 Civil Aviation Act 1982, s 76(2). It is undecided in England and Wales whether s 1 of the Law Reform (Contributory Negligence) Act 1945 applies to this subsection. The principles underpinning when that Act will apply have been articulated by Lord Hoffmann in *Standard Chartered Bank v Pakistan National Shipping Corporation (No 2)* [2002] UKHL 43, [2003] 1 AC 959 at [11] and [12]. We note that *Shawcross and Beaumont* take the view that the Law Reform (Contributory Negligence) Act 1945 applies to claims under the subsection, referring to a decision by the Supreme Court of New South Wales: *Southgate v Commonwealth of Australia* (1987) 13 NSWLR 188 (NSW SC). See *Shawcross and Beaumont: Air Law* (Issue 195 2025), V [916].

46 The term "owner" is not defined in the Civil Aviation Act 1982. We suggest that it means someone with a general property interest in the aircraft: see, Sale of Goods Act 1972, s 61.

47 Civil Aviation Act 1982, s 76(4). For a more detailed explanation of "dry" and "wet" leasing see paras 12.82 and 12.83.

48 *Shawcross and Beaumont: Air Law* (Issue 195 2025), V [920].

49 Air Navigation Act 1920, s 9(2) (repealed).

Our proposal

12.77 The strict liability regime for surface damage simply places liability upon the owner or lessee of the aircraft. At present, while it is theoretically possible to bring an action against the pilot in negligence, in practice this seems unlikely. The pilot is likely to have fewer resources than an owner or lessee, making them a less attractive target in a civil claim. A claimant would also have to demonstrate fault on the part of the pilot. As a result, we expressed the provisional view in our first consultation paper that the absence of an onboard pilot, or their replacement with a remote pilot, will not make a difference to the way the regime works and will make little difference to the position of a potential claimant.

12.78 One question that arises is the impact of the shift in liability from an owner to a lessor for uncrewed aircraft. At present a lessee would be liable for surface damage if the aircraft is "demised, let out or hired" for more than 14 days and the owner does not employ any "pilot, commander, navigator or operative member of the crew of the aircraft". Again, this wording dates back to the Air Navigation Act 1920.[50] The phrase "demised, let out or hired" does not correspond to the various types of aviation lease which feature in modern aviation law. This is another element of the current law which the UK Government may wish to modernise but is outside the scope of this review.

12.79 In any event, the logic appears to be that, for shorter leases, the owner remains responsible for and involved in the maintenance of the aircraft and should therefore be responsible for accidents. For leases where the owner continues to employ crew, the owner still enjoys a degree of control over the operation which makes it appropriate that they should be responsible for surface damage.

12.80 We do not yet know to what extent leasing will be a feature of the market for UAS in the UK. It seems likely to us that VTOLs may be leased in a manner similar to other passenger-carrying aircraft. If the existing pattern of aircraft leasing in the UK is replicated for VTOLs, most leases will be for longer than 14 days. The future picture is more unclear for drones, though we expect that leasing will form part of the market.

12.81 For some use cases, a UAS might be leased with a remote pilot. In our view, this pilot would fall within the definition of a pilot or commander for the purposes of section 76(2) of the Civil Aviation Act 1982. For other use cases, ground crew will still play a role, even in the absence of a pilot. We would expect such ground crew to fall within the definition of "operative crew", with the result that section 76(2) would allocate liability depending on who employed them. There may however be instances where a UAS is leased without a pilot or ground crew. We considered this scenario in our first consultation paper.

12.82 The distinction between leases of aircraft with and without crew, referred to in section 76(4), is commonly referred to as wet and dry leasing; these are both terms with their origin in the maritime context. So called "wet leasing" is a lease where crew continue to be employed by the original operator and their services are supplied with the aircraft. Leasing an aircraft without its crew is known as a "dry lease". However, the

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50 Air Navigation Act 1920, s 9(2) (repealed).

legal definition is slightly different. The UK Regulation (EU) 965/2012 (the "Air Operations Regulation") defines a wet lease agreement as an agreement:[51]

(1) in the case of commercial air transport operations, between air carriers pursuant to which the aircraft is operated under the air operator's certificate of the lessor; or

(2) in the case of commercial operations other than commercial air transport operations, between operators pursuant to which the aircraft is operated under the responsibility of the lessor.

12.83 A dry lease agreement is defined as:

> an agreement between undertakings pursuant to which the aircraft is operated under the air operator certificate of the lessee or, in the case of commercial operations other than commercial air transport, under the responsibility of the lessee;[52]

12.84 How the regulation of wet leases applies to UAS is not entirely clear. As we describe in chapter 5 of this report, "applicable operational requirements" of the Air Operations Regulation do apply to the certified category of UAS.[53] At present there is no guidance as to which requirements are applicable and which are not. UAS in the specific and open categories are not subject to the requirements.

12.85 In our first consultation paper, we highlighted that leaving the section unamended would mean that, for any lease of a UAS over 14 days, the lessee would be responsible for surface damage. That would be the case even if the lease was functionally (even if not in law) a "wet lease" and the parties had agreed operational responsibility should remain with the lessor. In practice, this could be dealt with by the lessee of the aircraft seeking a contractual indemnity from the lessor in respect of any liability.[54] However, we expressed the view in our first consultation paper that the law would be clearer if it reflected the agreement between the parties involved.

12.86 We therefore provisionally proposed that, in the case of UAS, responsibility for surface damage should only transfer from the owner to the lessee if (a) the lease is for over 14 days, and (b) the parties agree that responsibility should transfer (the lease is "dry").

Consultation analysis

12.87 Just under half of the respondents to this question agreed with our provisional proposal without qualifying or expanding upon their agreement. A great number of

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51 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex I, para 127.

52 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex I, para 40.

53 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 7. The application of the Air Operations Regulation to the specific category is not mentioned in art 7(2), which only refers to UK SERA.

54 See *Shawcross and Beaumont: Air Law* (Issue 195 2025), V [917] fn 2.

respondents did not explicitly agree with our proposal but instead brought up a range of issues. Only a single respondent disagreed with our provisional proposal.

12.88 Those that agreed thought our proposal would ensure that it was clear when the lessee was liable for surface damage. Skybound Rescuer said:

> This gives clear accountability/responsibility to the lessee and makes sense given they would assume operational control of the UAS and be therefore responsible for the overall safety, maintenance etc of the UAS. I believe this approach aligns with practices in other industries where liability typically transfers to the lessee and 14 days is a good threshold for establishing the split between short term and long term.[55]

12.89 ARPAS UK agreed with our proposal but pointed out that in relation to some UAS the position could be more complicated:

> for concepts such as Drone in a Box operated by multiple parties from a single point – there could be multiple long-term lessees who could be liable.[56]

12.90 But respondents with a legal background were not certain that the law needed to be changed. They questioned whether the parties' agreement should be used to determine liability for surface damage. For example, the RAeS Legal Group said:

> we query whether using the parties' agreement as a factor in determining whether the lessee has essentially immunity from third-party damage is advisable regarding transparency and certainty of law. Overall, we do not agree that any change to s.76 is required. The proviso that the liability should transfer to the lessee where this is specified under the lease agreement will result in difficulties in potential claimants identifying the correct defendant (as they will not have access to the liability provisions of the relevant lease) and may also result in the actionable defendant under the cause of action not having the requisite insurance in place to meet such liabilities. If the liability onus remains on the insured, the responsibility to maintain the correct and adequate insurance will be easier to regulate.[57]

12.91 Some respondents also raised issues with the 14-day threshold for transfer of liability to the lessee, which they felt was arbitrary. The RAeS explained that the reason for a 14-day threshold was purely historical:

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55 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

56 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

57 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

14-day threshold is outdated regarding modern practices. There is no legal or policy basis for imposing a 14-day requirement, and it arises solely from 1920s law (and the Rome Convention 1952 to which the UK is not a Party).[58]

Our conclusion

12.92 Although there was reasonable support for this proposal, consultees identified several implementation issues. In particular, we accept that relying on the parties' contractual arrangements to determine strict liability for surface damage could create confusion for third parties. Two distinct relationships are involved, each governed by different principles. First, there is the liability relationship between the owner or lessee and the person who has suffered damage. Second, there is the contractual relationship between the owner and the lessee, which binds only those parties and should not affect third parties. For this reason, we do not recommend amending section 76(2). Certainty over who is liable for surface damage during long-term leasing arrangements is essential, and the current law provides that certainty, although parties leasing an uncrewed aircraft for extended periods may still need to rely on contractual indemnities.

12.93 We also recognise that, as some consultees noted, 14 days is an arbitrary threshold for liability to be determined. However once again in the interests of certainty, we believe that keeping the current time frame is preferable. Keeping the current time frame of 14 days also ensures consistency between UAS and conventional aircraft.

CLAIMS FOR DAMAGES NOT COVERED BY THE STRICT LIABILITY REGIMES

12.94 We expect that, should a passenger or bystander suffer damage because of a UAS, in most instances, they would seek to make a claim against the air carrier, operator or owner of an aircraft via one of the strict liability regimes detailed in the previous section. In the short to medium term, we believe that these would continue to operate and provide compensation.

12.95 However, there may be circumstances in which a party wishes to make a claim in respect of damage caused by a UAS and their claim is not covered by one of the strict liability regimes. For example, an operator may wish to make a claim against an aircraft manufacturer or an ATM/ANS provider for damages resulting from a UAS accident. Insurers having paid out damages after an accident may also wish to bring secondary claims against parties such as the aircraft designer (a practice known as "subrogation").

12.96 It is also possible that passengers and parties who receive damages via the strict liability regimes may feel undercompensated by them. For this reason, they may also wish to make further claims against other parties who they believe caused or contributed to an accident.

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58 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

12.97 It is also worth reiterating that, in the case of surface damage, the strict liability regime created by section 76(2) of the Civil Aviation Act 1982 is not exhaustive.[59] Damage to people or property on the surface may give rise to other types of liability and a party who has suffered damage has the choice of whom to bring a claim against.

12.98 In our consultation papers, we explored how additional claims might be brought against several parties who might feature more prominently in future litigation involving UAS, such as designers, manufacturers and uncrewed traffic management ("UTM") service providers. We also considered liability as it relates to mid-air collisions. We consider these below.

Designers and manufacturers

12.99 As set out in our consultation papers, and as highlighted in the responses of some consultees, historically, fault for accidents has generally been attributable to the pilot or another agent of the operator. For this reason, aviation liability regimes have developed in such a way as to make the air carrier, owner or long-term lessee of an aircraft strictly liable for damages that occur during its operation.

12.100 However, as aviation systems become more automated, it is possible manufacturers and designers may become more of a focus for litigation. Where an automated system is involved, air carriers, insurers and passengers may wish to make additional claims against the manufacturer of such a system. We note that passengers brought claims against Boeing in the US following the tragic events of the Boeing 737 Max accidents.[60] A leading factor in those accidents was found to be the MCAS systems which automated some parts of aircraft operation.[61]

12.101 In our consultations, we considered the two principal forms of claim against manufacturers and designers under the general law: claims against manufacturers and designers based on the tort of negligence and claims against producers of products under the Consumer Protection Act 1987 which creates a strict liability regime. We set out these two types of product liability claim in the following sections.

12.102 When considering negligence and strict liability in the context of product liability it is important to note that the law generally reflects a policy choice to place the cost of damages on those who are best placed to control risk, ensure a product's safety, and to insure against loss.[62] The reduction of evidential burdens and unnecessary litigation are also relevant considerations.[63]

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59 See para 12.69 for an explanation of s 76 of the Civil Aviation Act 1982 and surface damage.

60 David Shepardson, *Boeing settles lawsuits with two 737 MAX crash victims' families* (7 April 2025) https://www.reuters.com/legal/boeing-settles-lawsuits-with-two-737-max-crash-victims-families-2025-04-07/.

61 MCAS stands for Manoeuvring Characteristics Augmentation System. The causes of these crashes are complex and include difficulties in the relationship between Boeing and the US Federal Aviation Administration. For one account, see the US House of Representatives House Committee on Transportation and Infrastructure, *The design, development & certification of the Boeing 737 MAX: final committee report* (September 2020).

62 Liability for Defective Products (1977) Law Com No 82; Scot Law Com No 45 para 23.

63 Liability for Defective Products (1977) Law Com No 82; Scot Law Com No 45 para 23.

12.103 Developers of UAS may be best placed to control risk and ensure safety, particularly given the 'just culture' prevalent in the aviation sector. Complex automated aviation systems increase the difficulty of proving fault, reinforcing the importance of strict liability regimes and the need for clear remedies. Insurance will also form an important part of the wider ecosystem of UAS operations, providing more predictable pathways to redress.

12.104 Alongside these policy considerations, it is important to reiterate that the relationship between operators (and/or owners or lessors) and manufacturers and software designers can be complex and involve a series of contracts. The liability created by contracts is different to that in tort or under the Consumer Protection Act 1987. Liability in contract will largely depend on the terms of individual contracts. Contracts might also include specific warranties about the products and software being provided. For this reason, we do not address any issues arising from contract law in this review but note it is an additional factor which may need to be considered as part of any litigation.

Negligence

12.105 Manufacturers and designers owe a duty of care to the consumers of their products. This extends to those who are injured by the products in foreseeable circumstances. In order to succeed, the claimant must show that:

(1) a duty of care was owed to them;

(2) the duty was breached;

(3) the breach caused a loss to the claimant; and

(4) the loss was not too remote.

12.106 It is possible that, following an accident, an air operator or passenger could sue a manufacturer or software developer in negligence. The standard of the duty of care owed is likely to be that of the reasonable manufacturer or designer: in other contexts, designers have been found to owe a duty of "reasonable skill and care" when designing products.[64]

12.107 In some aviation cases, negligence may be inferred if the circumstances of an accident suggest that negligence was involved and the defendant cannot offer an alternative explanation. This principle is known as *res ipsa loquitur* (in Latin: "the thing speaks for itself") and has been applied in the aviation context in the past. In the Privy Council case of *George v Eagle Air Services Ltd*,[65] Lord Mance noted:

> Aircraft, even small aircraft, do not usually crash, and certainly should not do so. And, if they do, then, especially where the crash is on land as here, it is not unreasonable to suppose that their owner/operators will inform themselves of any unusual causes and not unreasonable to place on them the burden of producing an

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64 See for example *IBA v EMI (Electronics) Ltd* (1981) [1955-95] Professional Negligence and Liability Reports 179.

65 *George v Eagle Air Services Ltd* [2009] UKPC 21, [2009] 1 WLR 2133 at [13].

explanation which is at least consistent with absence of fault on their part. The respondents have in fact never suggested or attempted to suggest any explanation of the accident or any reason preventing them giving an explanation. In the Board's opinion, they have in the result failed to displace the inference of negligence which in the circumstances results from the crash itself.

12.108 While that case related to operators, it is possible that a similar inference could be drawn in a claim against manufacturers or designers, although the factual basis for such an interference arising might be more complex in causative terms, for reasons we explain below in paragraphs 12.110 and 12.111.

12.109 Where an aviation accident has resulted in injury or death to passengers, the damage or loss caused by any negligence may also be reasonably obvious or become apparent after an investigation. Some risks involved with safety-critical systems may also have been reasonably foreseeable by a manufacturer and designer.

12.110 However, with increased automation or complex AI systems, there may be difficulties proving some of these elements. Aviation supply chains are already long and complicated, involving many different parties, such as software developers and component manufacturers. Where many actors are involved in the creation and manufacturing of a system, it may be difficult to determine which actor breached their duty of care. This potential problem is exacerbated if artificial intelligence techniques like machine learning are used to train or develop an aviation system. Many more actors, such as those who select or compile training data, may be involved in its development.

12.111 There may also be times when it is not possible to tell why an automated system has acted the way it has, and therefore whether the problem could be ascribed to any breach of duty. Even if a breach of duty is established, it may also be difficult to understand whether a particular breach caused the loss being claimed.[66]

12.112 As we stated in our previous consultations, this is undoubtedly a complex issue and the law of negligence has not yet "caught up" with the novel aspects that arise when AI systems are involved. The Law Commission recently published a paper outlining the issues that AI might create in relation to negligence.[67] It is, as yet, unclear whether the current law of negligence will be able to deal adequately with cases involving complex automation. Much will turn on the automated system at issue and the particular facts of the case.

12.113 The problem may be lessened if the courts follow the approach taken in professional negligence, where the test for whether a standard of care has been met is whether the defendant's actions were in accordance with a practice accepted by a responsible

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66 This is a widely recognised concern: one of the UK Government's five principles for the development and use of AI is "appropriate transparency and explainability". See Department for Science, Innovation and Technology and Office for Artificial Intelligence, *A pro-innovation approach to AI regulation* (2023). For a discussion of some of the problems in relation to negligence and artificial intelligence, see B Soyer and A Tettenborn, "Artificial intelligence and civil liability – do we need a new regime?" (2022) 30 *International Journal of Law and Information Technology* 385.

67 AI and the Law (2025) Law Commission Discussion Paper.

body of professional opinion (known as the "*Bolam* test").[68] This may be more viable once standards for development of systems using machine learning have been developed and adopted. This approach is, however, untested in the aviation context.

12.114 Bringing a claim in negligence against a manufacturer is already difficult, even with the current state of technology. Shawcross and Beaumont note that:

> to succeed in a products liability case based on liability in negligence, a plaintiff must establish that the defendant was at fault in being negligent in respect of the design or manufacture of the product. In an aviation context, given the technical sophistication of the industry, this may be a difficult task.[69]

12.115 That is not to say it is impossible; there has been at least one successful claim brought in the Spanish courts against the manufacturer of a collision avoidance system, brought on the basis of product liability regimes in Arizona and New Jersey (where the manufacturers were based).[70] It is, however, difficult – which is why we have also looked in depth at the statutory scheme for product liability provided by the Consumer Protection Act 1987.

Consumer Protection Act 1987

12.116 The Consumer Protection Act 1987 ("CPA 1987") sets out a strict liability regime covering damage caused by "products", a term which explicitly applies to aircraft.[71] The Act implements the EU Product Liability Directive 1985, which did not expressly include software in its definition of a product and arguably does not govern it.

12.117 The 1987 Act provides that where damage is caused wholly or partly by a defect in a product, the producer of the product will be liable (as well as any person who held themselves out as the producer or imported the product).[72] Importantly for our purposes, unless the designer has held themselves out as the producer, for example, by putting their name or distinguishing mark on it, liability does not extend to the designer of a product where they differ from the producer.[73] Where two or more people are liable, the liability will be joint and several.[74]

12.118 Section 3 of the 1987 Act provides that there will be a defect in the product if "the safety of the product is not such as persons generally are entitled to expect".[75] When

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68 *Bolam v Friern Hospital Management Committee* [1957] 1 WLR 582.

69 *Shawcross and Beaumont: Air Law* (Issue 195 2025), IV [406].

70 Judgment of the Supreme Court of 13 Jan. 2015, ECLI:ES:TS:2015:181. The case applied US law, due to Spain's ratification of the Hague Convention on Product Liability. See discussion in H Schebesta, "Risk regulation through liability allocation: transnational product liability and the role of certification" (2017) 42 *Journal of Air and Space Law* 107.

71 Consumer Protection Act 1987, s 45(1). "Goods" is defined as including "substances, growing crops and things comprised in land by virtue of being attached to it and any ship, aircraft or vehicle".

72 Consumer Protection Act 1987, s 2.

73 *Shawcross and Beaumont: Air Law* (Issue 195 2025), IV [407].

74 Consumer Protection Act 1987, s 2(5). Joint and several liability means, broadly, that each defendant can be sued for the whole of the loss, but can claim a contribution from the others.

75 Consumer Protection Act 1987, s 3(1).

determining what people are entitled to expect, "all the circumstances shall be taken into account", including:[76]

(1) the marketing of the product and any instructions given as to how the product is to be used;

(2) what might reasonably be expected to be done with or in relation to the product; and

(3) the time when the product was supplied by its producer to another.

12.119 The damage covered includes death and personal injury. It also includes any loss of or damage to property which would ordinarily be described as being intended for private use, occupation or consumption, and which the claimant mainly intended to use as such.[77]

12.120 Several defences are available. One of the most significant in the context of new aviation technologies is if the defendant can show that:

> the state of scientific and technical knowledge at the relevant time was not such that a producer of products of the same description as the product in question might be expected to have discovered the defect if it had existed in his products while they were under his control.[78]

12.121 Another is that the defect did not exist in the product at the time the product was first supplied to another.[79] Relatedly, claims under the CPA 1987 are also subject to a 10-year "longstop", barring any product liability claim brought more than 10 years after the product was first put into circulation.[80]

Product liability and UK aviation

12.122 In the aviation context, a key limitation of the product liability regime created by the Consumer Protection Act 1987 is that it is primarily directed towards consumers. While the 1987 Act covers damage *by* any product, it only applies to damage *to* individuals or their property. Property not ordinarily intended for private use, occupation or consumption does not qualify. This means that commercial actors in aviation, such as an air operator, could not bring a claim under the 1987 Act.

12.123 As well as this limitation upon who can claim under the 1987 Act, there are also questions about how its provisions apply to software. As we highlighted in our previous consultations, it is doubtful that software supplied intangibly is a product for the purposes of the 1987 Act.[81] This issue has been remedied within the EU where a

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76 Consumer Protection Act 1987, s 3(2).

77 Consumer Protection Act 1987, s 5.

78 Consumer Protection Act 1987, s 4(1)(e) and (2).

79 Consumer Protection Act 1987, s 4(1)(d) and (2).

80 Limitation Act 1980, s 11A.

81 *St Albans CDC v International Computers Ltd* [1996] 4 All ER 481; Automated Vehicles: a joint preliminary consultation paper (2018) Law Commission Consultation Paper No 240, Scottish Law Commission

revised directive on liability for defective products has been adopted.[82] It makes clear that software and digital manufacturing files fall within the definition of a product and will extend the range of occasions on which liability can be assessed (for example, where software updates are provided).[83]

12.124 This ambiguity in the law in the UK regarding the status of software is problematic for new automated technologies which will rely on software. For this reason, the Law Commissions' final report on automated vehicles in 2022 recommended that the UK Government should review product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies generally.[84]

12.125 In the future, automated technologies in aviation will present similar issues if product liability is not clarified. Consultees highlighted that some UAS are already becoming more like products where software is an integral component and the law needed to be reviewed in light of this:

> Drones are in many aspects more similar to IT products and smart devices than they are to aviation technology. Therefore it would make good sense to review existing liability and consumer protection laws to ensure they capture the technology.[85]

Our proposal

12.126 In our consultations we said that a thorough review of the law in this area was required, ideally supported by public consultation. Because the issues relate generally to the law of product liability and the way it operates, in our view, the review should cover product liability as a whole, rather than be confined to aviation.

12.127 Therefore, we provisionally proposed that there should be a review of product liability law (including the Consumer Protection Act 1987) to take account of the challenges of emerging technologies.

Consultation analysis

12.128 The majority of consultees who answered this question agreed with our proposal. No consultee disagreed that a review should be conducted. Many of those who agreed set out their general views/reasons why a review is needed. For example, Skybound Rescuer said:

Discussion Paper No 119 paras 6.65 to 6.92. In another context, under the Commercial Agents (Council Directive) Regulations 1993, software provided electronically has been found to amount to "goods"; see C-410/19 *Software Incubator Ltd v Computer Associates (UK) Ltd* [2021] ECR-I 742.

82 Directive (EU) 2024/2853 on liability for defective products, Official Journal L 18.11.2024.

83 Directive (EU) 2024/2853 on liability for defective products, Official Journal L 18.11.2024, art 4(1).

84 Automated Vehicles: joint report (2022) Law Com No 404; Scot Law Com No 258 Recommendation 71, para 13.34. The UK Government's response notes that the recommendation "highlights a very important issue and we will be engaging more widely with government to understand next steps". HM Government, *Connected and automated mobility 2025: realising the benefits of self-driving vehicles in the UK* (August 2022) p 126 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1099173/cam-2025-realising-benefits-self-driving-vehicles.pdf.

85 Altitude Angel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 10, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

> The UK has been falling behind other nations around the world due to over-regulation as a result of outdated legislation that, at the time of its inception, would not have accounted for the leaps in technology we've experienced to date, ranging from UA technology, to driverless cars to the emergence of AI. Product liability law should be reviewed and re-written to continue to protect consumers, whilst also breaking-down barriers to allow the UK tech industry to thrive.[86]

12.129 While the International Underwriting Association said:

> We agree that a review of product liability law will be required to sufficiently account for the challenges associated with emerging technologies. While the current law is well-established and is applicable to a variety of products, the law must be updated to ensure the rights of consumers and of manufacturers are evenly maintained as emerging technologies continues to develop.[87]

12.130 Professor George Leloudas said that the absence of reform in this area disadvantaged victims, operators and also manufacturers.

> It disadvantages victims as there is doubt i) if and to what extent such new technologies fall into the strict liability regime of the CPA 1987, with the alternative being to bring an action under the law of negligence and having to prove that the product was negligently manufactured — a costly endeavour considering the novelty and difficulty in explaining the decision-making procedure of some of these technologies, such as machine learning, and ii) whether the CPA 1987 would cover RCCs that are established abroad but remotely operate novel aircraft in the UK.
>
> It also disadvantages aircraft operators as i) they are subject to the negligence regime and will face similar issues of proving negligence with some of these new technologies, and ii) software and AI manufacturers tend to take a stricter approach to indemnity provisions and hold-harmless clauses than traditional product manufacturers, which might leave aircraft operators and their insurers with no (or negligible) rights of recourse against them if left unchecked.[88]

A Law Commission project on product liability

12.131 Since our first two aviation autonomy consultations, the Law Commission has begun a project reviewing product liability law.[89] This project considers issues with the operation of the existing product liability regime, particularly in light of emerging technologies such as AI, to determine what law reform might be required to ensure the product liability regime is fit for purpose.

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86 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

87 IUA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 262, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

88 George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

89 Project details can be found here: Law Commission, *Product liability*, https://lawcom.gov.uk/project/product-liability/.

12.132 In doing so, it seeks to help businesses manage their risks of liability for harm caused by defective products by providing greater legal certainty in the digital age. The review will also help determine whether the regime is successfully balancing the competing interests of providing consumers with a straightforward route to claiming compensation for harm caused by defective products on the one hand, whilst balancing support for business on the other. If necessary, reforms will be proposed to correct that balance.

12.133 Project work began in September 2025 and it is expected that a consultation paper will be published in late 2026. A three-month consultation will follow and then a final report is expected to be published in late 2027.

12.134 Importantly for the purposes of this project on aviation autonomy, product liability will now be reviewed, potentially making the operation of these types of claims more certain for all potentially liable parties under the product liability regime.

Liability of ATM/ANS and UTM service providers

12.135 Unlike for air carriers, there is no international regime governing the liability of air traffic management and air navigation service ("ATM/ANS") providers.[90] The UK Regulation (EU) 2017/373 ("the ATM/ANS Implementing Regulation") only requires the following:

> **ATM/ANS.OR.D.020 Liability and insurance cover**
>
> (a) Air navigation services providers shall have in place arrangements to cover liabilities related to the execution of their tasks in accordance with the applicable law.
>
> (b) The method employed to provide the cover shall be appropriate to the potential loss and damage in question, taking into account the legal status of the providers concerned [...] and the level of commercial insurance cover available.
>
> (c) Air navigation services providers which avail themselves of services of another service provider shall ensure that the agreements that they conclude to that effect specify the allocation of liability between them.[91]

12.136 We understand that in practice, the ability to "cover liabilities" means that providers must have adequate insurance in place or funds available to compensate victims in case they are found liable.

12.137 Because there is no strict liability in place, in England and Wales, the liability of ATM/ANS providers therefore arises from the law of negligence. It is generally

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90 *Shawcross and Beaumont: Air Law* (Issue 181 2025), VI [102].

91 UK Regulation (EU) 2017/373 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, annex III, ATM/ANS.OR.D.020.

accepted that service providers (and particularly air traffic controllers) owe a duty of care to those who rely on their operations.[92]

12.138 Our second consultation paper focused on the provision of ATM/ANS services to UAS; we refer to this subset of ATM/ANS services as UTM services. We refer to providers of these types of services as UTM service providers.

Our proposal

12.139 We thought that it was important that UTM providers should be able to cover any potential liability incurred during the execution of their duties. In our view, the liability provisions that related to ATM/ANS providers were equally important for UTM service providers.

12.140 For this reason, we provisionally proposed that UTM service providers should be subject to the same liability requirements as other ATM/ANS service providers as currently set out in the ATM/ANS Implementing Regulation.[93] They should be required to: (1) have in place measures to cover any liability incurred during the course of the provision of their services; and (2) where using the services of another ATM/ANS service provider (including UTM service providers), have in place arrangements to allocate liability.

Consultation analysis

12.141 The majority of consultees were in support of our provisional proposal. A single consultee disagreed.

12.142 NATS supported both aspects of the provisional proposal, as did the CAA, which stated "service users should have the same protections under the law whether they have used or benefited from ATM or UTM services."[94]

12.143 Moonrock Insurance were also supportive, believing the requirements "encourage responsible innovation" and "ensure that new entrants build robust systems and maintain adequate insurance". In its response, Moonrock also discussed the impacts of increased autonomy on liability.[95]

12.144 Another respondent who was supportive of both proposals also gave a detailed analysis of the more nuanced issues associated with both ATM/ANS liability and future UAS/UTM applications. On insurance, this respondent suggested that the law impose minimum levels of coverage:

> … In our view Annex 3, ATM/ANS.OR.D.020 to the ATM/ANS Regulation is unsatisfactory, when compared with, for example, Regulation 785/2004 (on operators' insurance requirements) in not prescribing minimum levels of cover.

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92 *Shawcross and Beaumont: Air Law* (Issue 195 2025), VI [103].

93 As set out above at para 12.135.

94 NATS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 62, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/.

95 Moonrock Insurance response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 55, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

> Although one would hope it is the exceptional case, if the acts or omissions of a UTMSP result in the total loss of a large commercial aircraft, with 300 or more people on board, the loss, and thus the liability exposure, could be £1 billion. It is fair to say that the instances in which ATS providers have been seriously implicated in major accidents are relatively few, and less than that of the operator or equipment supply community. However the per event exposure is substantial, although we have no direct experience of the level of legal liability cover which major ATS providers typically carry.[96]

12.145 We also invited consultees' broader views about the current law on ATM/ANS liability and UTM service provision.

12.146 The RAeS ATM Specialist Group suggested that there could be a UTM specific liability regime for specific classes of UTM service provision. They said:

> Consideration should be given to introducing a strict liability framework for defined classes of UTM service provision, particularly where failure may lead to third-party damage or harm on the ground, in line with the RAeS emphasis on proactive risk mitigation and safety assurance.

They suggested that a UTM-specific strict liability regime should

> include mandatory data retention periods, forensic logging standards, and regulatory oversight of failure attribution processes.

12.147 However, the RAeS Specialist Air Law Group noted that any reform would need to consider both UTM and ATM/ANS as a whole. They emphasised the connected nature of these types of services.

> the AAM/UTM environment will consist of layered and distributed services, provided by multiple actors. This increases complexity and interdependence—and therefore the potential for failure propagation. Clear and enforceable liability arrangements, including indemnification and allocation of responsibilities between UTMSPs and other ATM/ANS providers, are essential to mitigate systemic risk and ensure incident response, investigation, and remediation can be conducted effectively.

12.148 The RAeS Specialist Air Law group emphasised that fairness and regulatory parity would be crucial to the development of the sector.

> Applying equivalent liability standards ensures regulatory consistency and competitive neutrality across the ATM/UTM ecosystem. This guards against regulatory arbitrage, maintains a level playing field, and reinforces trust among operators, regulators, and the public.[97]

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96 Anonymous 2 response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 118, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

97 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80 https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/.

12.149 Several consultees highted issues related to automation, autonomy and AI in general. We discuss these issues in chapter 10, noting the role of certification and the use of iterative processes to develop regulations designed to ensure safety. We also noted the current European Aviation Safety Agency timeline.

Our conclusion

12.150 Most consultees who responded to our consultations agreed that UTM service providers should be subject to the same liability requirements as other ATM/ANS providers.

12.151 We consider UTM to be a subset of ATM/ANS provision and that it would be difficult to differentiate these services in an interconnected ATM/UTM environment. For this reason, we recommend that the liability requirements set out in the ATM/ANS Implementing Regulation should also apply to UTM service providers.

12.152 We also consider that, in the short to medium term, the current requirements for a provider to have "sufficient means" to cover any liability related to the provision of their services is proportionate.

12.153 We appreciate that minimum levels of cover may eventually be desirable for some use cases but are conscious that at this stage of development it is unclear what reasonable levels of minimum cover will be for UTM service providers. In the short to medium term, during the separation and accommodation phases of UAS integration, UTM service providers will provide services in specific volumes of airspace to relatively low risk operations. As capability is proven, UTM provision might then be expanded to include higher risk operations. In our view, at this point in time, it is better to allow the regulator at the operator certification stage to assess whether the cover that the UTM service provider has in place is proportional to its operations. This may change in time as more experience with UTM services is gained and the requisite legal regulations are developed, as we discuss in chapter 9 of the report.

12.154 We also note that one consultee thought that some UTM service providers should be subject to a new strict liability regime.[98] There are two main reasons why, in our view, a strict liability regime for UTM service providers would be not appropriate at this time.

12.155 Firstly, consultees stressed that should an accident occur involving UTM service provision, it would be difficult to ascertain who was responsible for it. The RAeS said in its response, "we do not agree that it would be obvious that an ATM/ANS provider would be responsible for an accident". They noted that following an accident there might be many parties at fault, including the pilot, operator, manufacturer, ATM/ANS services or a UTM service provider.

12.156 For passenger services or surface damage, there are clear reasons why liability is channelled through the air carrier or operator of an aircraft. As consultees described, the air carrier, or their agents, have historically been at fault when an accident has

[98] NATS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 99, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/.

occurred.[99] Insurance has therefore focused on the air carrier/operator role, allowing for it to be appropriately priced. In our view, before a strict liability regime could be implemented for UTM service providers, there would need to be a clear rationale for why liability should be channelled through the UTM service provider and more data about the risk profile of UTM provision. Careful consideration would also need to be given to how such a scheme might interact with existing strict liability regimes, such as the Montreal Convention, and how strict liability should be apportioned amongst the various parties who are strictly liable.

12.157 We also do think it is not possible at this stage to delineate between different types of UTM service provider for the purposes of a strict liability regime. UTM service providers could provide an array of different services and information. Some services will provide very general information about the weather or air traffic whilst others will provide more immediate safety critical information such as the positions of aircraft in the sky.[100]

12.158 The RAeS Specialist ATM group suggested that only some UTM services such as those that provide "strategic deconfliction, dynamic airspace management, or coordination with CIS/ATS units that influence flight safety should be subject to the strict liability regime.[101] However, UTM services are still developing. There are, as yet, no certified UTM service providers in the UK. We understand that some UTM services may be clearly identifiable as providing services like "strategic deconfliction", but other services may be harder to categorise. As discussed in our second consultation paper, one model of UTM provision involves the sharing of information between operators. As such, there may be no identifiable UTM provider *per se*.

12.159 Finally, as the RAeS also highlighted, there will be a high level of "interdependency" between ATM/ANS providers and UTM service providers. They may work together to manage airspace or could potentially share information to provide services. The CAA has itself indicated that UTM service providers could provide "value added" services to crewed aircraft, further blurring the lines between UTM providers and conventional ATM/ANS providers.[102] We think it would be premature at this time to separate UTM services from other ATM/ANS services for the purposes of liability.

12.160 For these reasons we do not recommend that UTM service providers should be subject to a bespoke strict liability regime at this stage of development.

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99 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/ and Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/.

100 We note that safety critical information may vary depending on the particular use case. For example, weather information might be very important for a drone operation where drones cannot fly above a certain wind speed.

101 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

102 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

Liability for mid-air collisions

12.161 Section 76 of the Civil Aviation Act 1982 applies to damage caused to property or people on the surface, but it does not apply to mid-air collisions. There is no specific legal regime for these. Claims for personal injury or damage to baggage fall under the Montreal Convention, which is exhaustive. However, it is possible for claims for other sorts of damage (for example, for death or personal injury of a pilot, or damage to an aircraft) to be brought; possibilities include negligence, or breach of a statutory duty. Depending on the circumstances, the defendant could be the owner or the operator of an aircraft, the pilot or remote pilot, or possibly an air traffic controller.

12.162 We discussed claims in negligence above at paragraphs 12.105 to 12.115. Depending on the circumstances, a negligence claim could be made against many different parties including the owner or the operator of an aircraft, the pilot, or possibly an air traffic controller for a mid-air collision.[103]

12.163 Statutory duties are obligations imposed by legislation. For example, the Air Navigation Order 2016 imposes several duties on the pilot-in-command of an aircraft.[104] There are two potential impacts of these types of duties for civil liability in the event of a mid-air collision.

12.164 First, a breach of statutory duty might provide the basis for a cause of action. In some instances, the statute explicitly states that breach of the duty is actionable if loss has been suffered. The Airports (Groundhandling) Regulations 1997 are one such example.[105]

12.165 More commonly, a statute is silent on whether breach of a duty imposed by it gives rise to civil liability. When this is the case, the breach of statutory duty will only give rise to a private law cause of action where the duty protects a limited class of people affected and if Parliament impliedly intended a private law right to arise.[106] For example, if a pilot breached one of the duties in the Air Navigation Order 2016 causing loss to a third party, this might, depending on the circumstances, give rise to an actionable claim for breach of statutory duty.

12.166 Statutory duties are also relevant because proof of the breach of statutory duty is likely to assist in proving negligence. This is particularly likely to be the case where the breach of statutory duty gives rise to criminal liability under the statute (while remaining silent on civil liability).[107] This is the case with several of the duties in the Air Navigation Order 2016. Section 11 of the Civil Evidence Act 1968 creates a presumption that the person convicted committed the offence, unless the contrary is proved, allowing a party to rely on the fact of criminal conviction as evidence in civil proceedings.[108]

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103 *Shawcross and Beaumont: Air Law* (Issue 195 2025), V [810].

104 See for example, SI 2016 No 765, arts 68 to 74.

105 The Airports (Groundhandling) Regulations 1997 SI No 2389, s 26.

106 *X (Minors) v Bedfordshire County Council* [1995] UKHL 9, [1995] 2 AC 633 at [731].

107 *James v The White Lion Hotel* [2021] EWCA Civ 31 at [104], [2021] QB 1153 at [100 – 104].

108 Civil Evidence Act 1968, s 11(2).

Our proposal

12.167 The main difficulty in relation to future negligence claims for mid-air collisions caused by remotely piloted and autonomous aircraft are those outlined above at paragraphs 12.109 to 12.115. There is a risk that greater use of sophisticated systems will make it harder to prove what went wrong in a mid-air collision, and to establish fault.

12.168 However, in our first consultation we provisionally concluded that the position of the passenger is adequately protected by the current law, which allows claims to be brought by passengers against their own air carrier. We therefore did not believe that reforming the law in this area was necessary for the industry to develop. In our first consultation paper, we asked consultees whether they agreed.

Consultation analysis

12.169 Many responses agreed with our assessment that the law was sufficient in this area. However, most responses highlighted a variety of issues but were not definitive about whether the law required reform.

12.170 Many responses thought that the law would be sufficient for the short to medium term but were uncertain how things would develop in the future. For example, NATS stated the following:

> Our preliminary view is that the current law is adequate to deal with these types of damage. However, this view may be subject to change depending on how the landscape in relation to uncrewed aircraft systems develop.[109]

12.171 Kate Staples agreed that the current law was sufficient subject to appropriate data being available for interrogation.[110] For this reason, it was important to "enable data to be interrogated for conclusions to be drawn" and if there was "some degree of channelling" of this data.

Difficulty proving fault

12.172 A theme throughout the responses was the potential difficulty in demonstrating fault with a sophisticated system that used AI or was autonomous. Some responses were equivocal about the current law because they thought it would be difficult to draw conclusions about the causes of an accident involving automated systems and that it may be difficult to determine who was at fault. As one respondent noted:

> Liability for mid-air collisions is essentially fault-based, at least as between the two operators. … With very highly automated systems, the problem arises as to whether one can show fault on the part of the other. It is of course likely that other systems

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109 NATS response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 346, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

110 Kate Staples response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 303, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

(eg a traffic management system) are also involved which provides for further complexity in a fault-based analysis.[111]

12.173 The RAeS provided further insights on the difficulties of bringing a fault-based claim in this context:

> In relation to Highly Automated and Autonomous aircraft, establishing the reason for the impact would be difficult and likely only possible after the conclusion of the official investigation.[112]

Rules of the air

12.174 The CAA emphasised the importance of "rights of way" (one aspect of the rules of the air). They thought liability for mid-air collision would require development of the rules for right-of-way and also thought mandatory electronic conspicuity would be a factor to consider.

> Any discussion of mid-air collisions needs to account for right-of-way. Are there cases where the UA would have right-of-way? Is there mandatory equipment to broadcast position and heading of the UA?[113]

12.175 Andrew Taylor was also concerned about rights of way and suggested autonomous aircraft should always give way to crewed aircraft, which would (in his view) make the UAS liable in a collision.[114]

Our conclusion

12.176 Many of the responses to our provisional proposal on mid-air collisions highlighted concerns that had been raised in previous consultation questions; namely, that it would be difficult to understand any faults that occur involving autonomous and AI systems.

12.177 As we have emphasised, our main concern has been with passengers and other third parties who may be harmed by accidents involving UAS and, in our view, the current law will function to give them compensation. Furthermore, the Law Commission is conducting a review of product liability, which could further assist passengers and third parties to make claims when accidents involving UAS occur. This review is also likely to consider whether, long term, complex technologies like AI are better catered for by a strict liability regime.

12.178 For these reasons, in our view, the current law is adequate for the short to medium term. We do not recommend that the current law as it relates to mid-air collisions

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111 Anonymous 2 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 631, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

112 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

113 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

114 Andrew Taylor response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 19, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

requires change at this time to enable remotely piloted UAS use cases. We recognise that, as the CAA highlighted, some operational norms for remotely piloted UAS will need to be adopted. The rules of the air are crucial (especially aspects like rights of way) and they should be clear for all remotely piloted UAS use cases. We discuss the importance of the rules of the air in chapter 8.

12.179 In the longer term, as automation increases and aviation systems incorporate AI technologies, we agree that the law of negligence will need to be reviewed more generally. We discuss this in chapter 10 of the report, where we noted the long timelines for fully autonomous UAS using complex AI systems. We also discuss the iterative process used to develop effective rules of the air and safety standards.

INSURANCE

12.180 Insurance is a key aspect of the current regulatory framework for liability in aviation. The existing regulatory framework mandates the insurance of aircraft. Furthermore, even without this requirement, insurance would be necessary for many operations. As we noted in our first consultation paper, national licensing authorities typically require air carriers to hold insurance before issuing an air transport licence.[115]

International law and air carrier liability

12.181 The origins of international, mandatory insurance stem from the Warsaw Convention 1929. The Warsaw Convention responded to the threat of conflicting, domestic law on air carrier liability and was one of the first international conventions governing aviation law.[116] Importantly, the Warsaw Convention did not prescribe mandatory aviation insurance; however, the introduction of a framework of air carrier liability provided an environment in which the requirement for insurance grew.

12.182 The Montreal Convention sought to consolidate and clarify the Warsaw System. As well as increasing the levels of compensation available to passengers in the event of an accident, article 50 of the Convention stipulated that:

> States Parties shall require their carriers to maintain adequate insurance covering their liability under this Convention.[117]

Domestic regulation

12.183 In response to the introduction of article 50 of the Montreal Convention, the EU introduced Regulation 785/2004 (the "Insurance Regulation").[118] In the UK, this was supported by the Civil Aviation (Insurance) Regulations 2005.[119] Following the UK's

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115 See *Shawcross and Beaumont: Air Law* (Issue 195 2025), IX [2].

116 ICAO, *The Warsaw System on air carriers liability*, https://applications.icao.int/postalhistory/the_warsaw_system_on_air_carriers_liability.htm.

117 Montreal Convention 1999, art 50.

118 Regulation (EC) 785/2004 on insurance requirements for air carriers and aircraft operator, Official Journal L 138 of 30.04.2004 p 1.

119 SI 2005 No 1089.

exit from the EU, the assimilated Insurance Regulation[120] remains the primary source of aviation insurance law.

12.184 The assimilated Insurance Regulation establishes minimum insurance requirements for air carriers and air operators (but not pilots). These actors are defined in the Insurance Regulation as follows:

> 'air carrier' means an air transport undertaking with a valid operating licence;[121]
>
> 'aircraft operator' means the person or entity, not being an air carrier, who has continual effective disposal of the use or operation of the aircraft; the natural or legal person in whose name the aircraft is registered shall be presumed to be the operator, unless that person can prove that another person is the operator.[122]

12.185 The Insurance Regulation requires that "each and every flight" must be covered by insurance.[123] Model aircraft with a maximum take-off mass of less than 20 kg are excluded.[124] While the Insurance Regulation does not provide a definition of "model aircraft", the CAA defines the term, for insurance purposes, as "any unmanned aircraft which is being used for sport or recreational purposes only".[125] As a result, UAS under 20 kg which are not used for commercial purposes are not currently required to have insurance.

12.186 As with other aspects of the Montreal Convention, minimum levels of insurance cover are expressed in Special Drawing Rights, or SDRs. Air carriers must have minimum insurance cover of 250,000 SDRs per passenger, except in the case of non-commercial aircraft with a maximum take-off mass of less than or equal to 2,700kg, in respect of which cover must be at least 100,000 SDRs per passenger. For commercial operations, the minimum insurance cover for baggage is 1288 SDRs per passenger for baggage, and 22 SDRs per kg for cargo.[126]

12.187 In addition to prescribing requirements to insure against claims concerning passengers, cargo and baggage, the Insurance Regulation prescribes a minimum level of third-party cover.[127] Typically, this covers personal injury and property damage to third parties as a result of the operation of aircraft. There are ten categories of aircraft, divided according to maximum take-off mass. The category determines the

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120 UK Regulation (EU) 785/2004 on insurance requirements for air carriers and aircraft operators.

121 UK Regulation (EU) 785/2004 on insurance requirements for air carriers and aircraft operators, art 3(a).

122 UK Regulation (EU) 785/2004 on insurance requirements for air carriers and aircraft operators, art 3(c).

123 UK Regulation (EU) 785/2004 on insurance requirements for air carriers and aircraft operators, art 4(2).

124 UK Regulation (EU) 785/2004 on insurance requirements for air carriers and aircraft operators, art 2(2)(b).

125 CAA, *Unmanned Aircraft System Operations in UK Airspace* (December 2022) (CAP 722) p 21. This definition in CAP 722 is informed by those set out in UK Regulation (EU) 923/2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation.

126 UK Regulation (EU) 785/2004 on insurance requirements for air carriers and aircraft operators, art 6(2) and (3).

127 UK Regulation (EU) 785/2004 on insurance requirements for air carriers and aircraft operators, art 7.

level of cover required.[128] Again, the requirements do not apply to model aircraft with a maximum take-off mass of under 20 kg.

12.188 Insurance policies must cover "war, terrorism, hijacking, acts of sabotage, unlawful seizure of aircraft and civil commotion".[129] However, insurance obligations regarding war and terrorism do not apply to aircraft with a maximum take-off mass of less than 500kg that are used for non-commercial purposes or local flight instruction which does not involve crossing borders.[130]

12.189 Failure to comply with the requirements of the Insurance Regulation is an offence.[131]

Application of existing framework to unoccupied aircraft and future challenges

12.190 It is clear that the existing regulations discussed above were drafted with traditional, crewed aircraft in mind. The focus of the insurance requirements is therefore on passengers, baggage and cargo. As we discussed in our first consultation, this does not reflect the reality that many uncrewed aircraft will be unoccupied; for example, if they are being used for surveillance. In that case the primary risk will be damage caused to third parties. This risk may be increased by the fact that unoccupied aircraft typically fly at lower altitudes than traditional aircraft, increasing the possibility of damage to structures on the ground.

12.191 We also highlighted that it was potentially unsatisfactory that UAS used for sport and recreational purposes are not subject to mandatory insurance requirements, so long as the UAS has a maximum take-off mass of 20 kg or less. Under the UAS Regulations, at present the lowest-regulated category of drone (which may fly over groups of people) is limited to a much lower maximum take-off mass of 100 g.[132]

12.192 In our first consultation, we noted that the UK Future of Flight Regulatory Review has already considered the question of insurance for UAS.[133] As well as the issues highlighted above, this review also explored:

(1) whether the requirements should reflect the risk of an operation, which reflects not only maximum take-off mass but also the operation's flightpath and complexity; and

(2) protection of third parties where a UAS which is untraceable or uninsured causes damage.

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128 CAA, *Minimum insurance levels* (2020) https://www.caa.co.uk/media/xrfgev1r/20200804insurance-minima.pdf.

129 UK Regulation (EU) 785/2004 on insurance requirements for air carriers and aircraft operators, art 4(1).

130 UK Regulation (EU) 785/2004 on insurance requirements for air carriers and aircraft operators, art 2(2)(g).

131 Civil Aviation (Insurance) Regulations 2005 SI No 1089, art 4.

132 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 2(4). This was recently changed from 250 g: see the Unmanned Aircraft (Amendment) Regulations SI 2025 No 1106, regs 1(2), 5(1).

133 Department for Transport, *Future of Transport Regulatory Review: Future of Flight Government Response* (September 2023) pp 22 to 24.

12.193 As a result of the review, the UK Government has committed to introduce legislation to enable the Secretary of State to make regulations in relation to insurance requirements for new and novel aircraft.[134] The exact form the requirements will take has yet to be finalised and is to be discussed further with the Future of Flight Industry Group. We welcome this commitment.

12.194 We also flagged one issue which was not raised in the Future of Flight Regulatory Review and that is particularly relevant to our project. We described how insurance in relation to multiple simultaneous operations (MSOs) had not been specifically considered as part of the UK Government's review of UAS insurance. We highlighted that in future it might be necessary for insurance requirements to reflect the risk posed by MSOs.

Our proposal

12.195 In our first consultation paper, we provisionally proposed that MSOs should be considered in the UK Government's work on UAS insurance. We also welcomed views from stakeholders about any difficulties they envisaged applying existing insurance requirements to uncrewed aircraft systems.

Consultation analysis

12.196 Most consultees agreed outright with our provisional proposal that MSOs should be considered as part of any UK Government work in this area.

12.197 In their response the RAeS highlighted the risk posed by "drone swarms".[135] Drone swarms are MSOs where multiple UAS flown in close proximity to each other:

> Regarding swarms (which in civil use, are often used for light show displays and are full of <250 gram drones), there have been a few incidents (mainly in China) of light show drones falling out of the sky[136] and in one case due to jamming from a rival light show supplier.[137]

12.198 Kennedys Law LLP also suggested that drone swarms presented unique risks, not related to individual aircraft weight, and this should be addressed:

> The weight of the drone (or total weight of "drone swarms") may not adequately reflect the risk exposure from swarm operations and, therefore, this would not be a sufficient measure for the level of insurance required.
>
> Furthermore, it is likely that as technology develops, the weight of drones may decrease, but be used for the same operational purpose; this highlights an example

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134 Department for Transport, *Future of Transport Regulatory Review: Future of Flight Government Response* (September 2023) p 55.

135 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

136 Holly Patrick, *Hundreds of drones crash after glitching during show in China* (16 August 2023) https://www.independent.co.uk/tv/lifestyle/china-drone-crash-zoo-show-b2394312.html.

137 *Dozens of drones fall from sky during light show in China*, https://www.newsflare.com/video/457082/dozens-of-drones-fall-from-sky-during-light-show-in-china.

where a decrease in weight is unlikely to have any effect on risk during operation. This is also an example of where sharing of data captured by the FINS technology in drone swarms specifically will be important to insurers pricing such risks.[138]

12.199 Some responses to this question suggested that considering MSOs was less important than considering the operation as a whole. Apian, for example, responded:

> Multiple simultaneous operations do not automatically increase the risk of an operation. In fact, human error continues to be a frequent reason for aviation accidents and incidents so replacing human decisions with a system does not necessarily increase risk. Perhaps insurance regulations could consider more factors than mass as mass does not always correlate to safety risk. Additional considerations could be type of operations, hours flown, location of operations etc. When approaching the requirements in that way, multiple simultaneous operations would be considered.[139]

The scope of the Insurance Regulation

12.200 Consultees were also invited to raise other issues with the current insurance regime for UAS. One of the major themes that emerged from the responses was the scope of the Insurance Regulation. As explained above, non-commercial UAS under 20 kg are not currently required to obtain insurance. To many consultees, the distinction between commercial and non-commercial UAS of this size was not justified. Consultees highlighted the risk of damage posed by uncrewed aircraft will depend on the size, weight and speed of the aircraft rather than the commercial nature of its activities.

12.201 For example, Chris Daniels of Flare Bright said:

> I don't understand the legal differences between model aircraft and UAS. This differential in weight specifications for insurance will create an arbitrage that will be exploited by many. That difference needs explaining or getting rid of.[140]

12.202 Professor George Leloudas similarly disagreed with the distinction:

> … This is a nonsensical arrangement, considering that the impact of a UAS crash on third parties is the same irrespective of its use. One might even argue that insurance is more critical for the recreational operations of UAS as remote pilots might have less experience in operating UAS, considering that there is no minimum age for being a remote pilot of a UAS in the Open category.... While operations in the Open category, where most recreational UAS fall into, impose restrictions on their areas of operation and their weight, it is plausible that a recreational UAS operating in the A3 category, due to a technical fault or human mistake, would crash on a moving car causing its driver to lose control and resulting in property damage and physical

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138 Kennedys response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 307, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

139 Apian response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 23, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

140 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

injuries. The remote pilot could be liable for causing such an accident. Yet, the absence of insurance would limit the recovery prospects of the car's insurers or any civil claim the injured third parties bring against the remote pilot of the UAS. Or a recreational UAS might be "hijacked" by a terrorist that intends to use it to cause damage to critical urban infrastructures: the absence of war risk insurance will delay the recovery of damages…[141]

Professor George Leloudas proposed the law be amended so that non-commercial UAS are subject to the same insurance requirements but "arguably at lower levels than the current lowest one of the Regulation, namely 750,000 SDRs per flight."

War risk or on an aggregate basis

12.203 Professor George Leloudas also questioned if the current arrangement in the Insurance Regulation which allows insurers to provide war risk insurance on an aggregate basis should be maintained for uncrewed aircraft. He thought that the unique risk profile of UAS meant that insurance should be required on a "per event" basis.

> … The practice of the airline insurance market is linked to the catastrophic potential of commercial aircraft, as witnessed by the 9/11 attacks. To avoid the recurrence of the insurance crisis that followed 9/11, third-party war risk coverage for commercial airlines is provided using several layers of excess insurance, and it is only available on an aggregate basis. Considering that access to UAS is considerably more straightforward than that of aircraft, it is arguable that they can cause catastrophic third-party damages against which the war risks insurance market requires protection via the aggregate limits. We believe that a review of whether war-risk insurance for novel aircraft must still be provided on "an aggregate" basis (following conventional aviation insurance practices) or be required on a "per event" basis should be undertaken due to the unique characteristics of their operations.[142]

Access to data

12.204 The International Underwriting Association highlighted the issue of data and the need of insurers to acquire data on UAS operations in order to price insurance fairly:

> The Law Commission must establish how it can be ensured that insurers have access to data to determine liability if an accident were to occur. This point was also raised during discussions on legislation to support the roll-out of Automated Vehicles. The Automated Vehicles Act (AV Act) has a provision for sharing information stored by 'licensed no-user-in-charge operators' and 'authorised self-driving entities' with insurers, with further details on how this information will be shared to follow in secondary legislation. Access to flight data recorder systems or

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[141] George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

[142] George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

similar devices could help with determining the circumstances of an accident and assigning liability, as well as any sensors or cameras used by aircraft.[143]

Our conclusion

12.205 Insurance will be a key component in the development of the UK UAS sector. As we said in our first consultation paper, we welcome the UK Government's commitment to a review on UAS insurance.

12.206 Many of our consultees agreed with us that the unique nature of MSOs should be considered as part of any revision of aviation insurance requirements. As we highlight in chapter 6, we believe that these types of operations will feature prominently in many future use cases for UAS. In addition to drone swarms, these use cases might also include large scale delivery or transport operations and passenger-carrying services.

12.207 We agree that there are several aspects of insurance for UAS, in addition to MSOs, that should be considered as part of the UK Government's review of UAS insurances.

12.208 Firstly, consultees felt that, in general, the overall risk of an operation, rather than weight, or whether the operation is commercial, should be the defining factor as far as insurance is concerned.

12.209 Secondly, some consultees stressed that access to data about incidents would be critical.

12.210 Thirdly we note that, although the issue of war risk was only brought up by one consultee, it is potentially significant to the operation of the UAS insurance sector as a whole and, as such, should also be considered.

Recommendation 29.

12.211 We recommend that the UK Government include the following as part of its review on UAS insurance requirements:

(1) MSO;

(2) operational risk;

(3) access to data for the purposes for the purposes of insurance; and

(4) war risk.

[143] IUA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 262, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

TRESPASS AND NUISANCE

12.212 In our first consultation paper, we considered civil liability at common law for the torts[144] of private nuisance and trespass in relation to aircraft.

12.213 At common law, an owner's rights in relation to the airspace above the land are restricted to such height as is necessary for the ordinary use and enjoyment of the land and the structures upon it. As a result, in *Bernstein of Leigh v Skyviews & General Ltd,* an aerial photography company was found not to be trespassing.[145]

12.214 Private nuisance is a wrongful interference with the claimant's enjoyment of rights over land.[146] The use of UAS might constitute a private nuisance if it constitutes a substantial and unreasonable interference with a claimant's land or their use or enjoyment of that land. The most commonly claimed remedies are injunctions (meaning a court order to stop the behaviour) or damages.

12.215 Trespass concerns unlawful presence on someone else's land. It is not necessary to prove that the presence has caused damage.[147] If a UAS flies over land belonging to someone else, this may amount to trespass, particularly if the UAS is lingering at very low altitude.

12.216 Section 76 of the Civil Aviation Act 1982 excludes liability for trespass or in nuisance in respect of a flight or the "ordinary incidents" of a flight, so long as:

(1) the flight is "at a height above the ground which, having regard to wind, weather and all the circumstances of the case is reasonable"; and

(2) provisions of any Air Navigation Order, or order under section 62 of the Civil Aviation Act 1982, are complied with.[148]

12.217 In our view, section 76(1) of the Civil Aviation Act 1982 applies to uncrewed aircraft. Its application to VTOLs, which are expected to behave in some ways like traditional aircraft, may be fairly straightforward. However, drones are expected to operate differently – at lower altitudes with potentially with more descents – and therefore raise new questions about how section 76 will be interpreted.

12.218 For example, in our first consultation paper we queried how the criterion of "reasonable height" will be applied to drones. Most aircraft fly with a *minimum* operating height of between 150 to 600 metres, to avoid the risk of collisions and to minimise disturbance to those on the ground.[149] In the open category, however,

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144 Civil wrongs for which a remedy can be claimed.

145 *Bernstein of Leigh v Skyviews & General Ltd* [1978] QB 479 at p 488.

146 The tort of nuisance was recently summarised by the Supreme Court in *Fearn and others v Board of Trustees of the Tate Gallery* [2023] UKSC 4, [2024] AC 1.

147 M Hones and A Dugdale, *Clerk & Lindsell on Torts* (24th ed 2023) para [18-08].

148 Civil Aviation Act 1982, s 76(1). The section also requires compliance with any orders made under s 62 of the Civil Aviation Act 1982, which was repealed by the Transport Act 2000.

149 UK Regulation (EU) 923/2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation, annex, SERA.5005(c)(5); SERA.5005(f) and SERA.5015(b).

drones have a *maximum* height; usually 120m above ground.[150] This height limit has also been adopted in the specific category for the pre-defined risk assessment outlined in CAA guidance.[151] The height limit is partly to reduce the risk to those on the ground.

12.219 For the above reasons, we discussed whether the criterion of "reasonable height" remains appropriate for drones or whether operational restrictions on height should also be accompanied by other requirements, such as limits on the frequency of flights in a given area.

Our proposal

12.220 We anticipated that problems of intrusive operation of drones (for example, in residential areas) will eventually be dealt with by regulation of matters such as flying altitude, data capture and frequency of flights and/or descents. In our view, such regulation is a better means of controlling intrusion than introducing additional criteria into the statutory defence to nuisance and trespass (beyond the existing requirement that a flight be in accordance with the requirements of aviation legislation).

12.221 In the short to medium term, though, we thought that section 76 could be better adapted to address drone use cases. At present the exclusion of liability for nuisance and trespass provided by section 76(1) Civil Aviation Act 1982 is only available if the provisions of "any Air Navigation Order, or under section 62 of the Civil Aviation Act 1982" are complied with. However, section 62 has been repealed and whilst there are several air navigation orders in force, they regulate matters that may be unrelated to any intrusion complained of (for example, failure to register an aircraft). Instead, many requirements potentially relevant to the intrusion of drones are contained in assimilated law. This being the case, the requirement of compliance with air navigation orders has little meaning for UAS.

12.222 For this reason, we provisionally proposed that the conditions of exemption from liability for private nuisance and trespass in section 76 of the Civil Aviation Act 1982 should be modified in their application to UAS so as to require compliance with requirements of aviation legislation that are relevant to limiting intrusion into the claimant's land. This would mean that to make use of section 76 an operator would need to show that they had complied with all regulations which are relevant to intrusion on the claimant's land. This might include, for example, regulations related to maximum height,[152] or those related to discontinuing the flight if the operations pose a risk to people or property.[153]

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150 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, art 4(1)(e). Some subcategories of the open category also have a minimum distance: UAS.OPEN.040(2) requires flights to be conducted at a "safe horizontal distance of at least 150 metres from residential, commercial, industrial or recreational areas".

151 CAA, *Unmanned Aircraft Systems Specific Category Operations - Pre-defined Risk Assessment Requirements, Guidance & Policy* (August 2023) (CAP 722H) p 11.

152 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.010(2).

153 UK Regulation (EU) 2019/947 on the rules and procedures for the operation of unmanned aircraft, annex, UAS.OPEN.060(2)(b).

Consultation analysis

12.223 Fewer than half of the responses to this question agreed with our provisional proposal. However, most responses did not directly engage with the question asked but rather raised broader issues about nuisance and trespass.

12.224 These issues included the definition of nuisance, the role of local authorities, and property rights. A few respondents thought that a wholesale review was needed to clarify how concepts such as "nuisance" and "reasonable height" would apply to drones. As Consortiq wrote:

> I think it needs to go further than this, precedent needs to be established as to what control a person has over the airspace above their property and what constitutes nuisance for a drone.
>
> The terms in the Chicago convention and existing case law do not cover drones, with the reduced heights and different noise profiles of these new vehicles an update is required.[154]

12.225 These responses speak to wider concerns about how drones will be operated in the future. As drone operations scale, there will be increased anxiety about their potential impacts. Drone operations in other countries have seen significant opposition as they have expanded over suburbs and residential areas.[155] These issues are not strictly speaking a legal question but a policy one – where should large scale commercial drones be allowed to operate and for what purposes?

12.226 As we indicated above at paragraph 12.220, we think that in the longer term, problems of intrusive operation of drones (for example, in residential areas) will eventually be dealt with by regulation of matters such as flying altitude, data capture and frequency of flights.

12.227 However, in the short to medium term we think it is important that, should a case be brought where the exemption under section 76(1) is at issue, the court should be able to consider all regulations which are relevant to the intrusion of a particular drone on or above the claimant's land.[156] As we set out above, the Air Navigation Order 2016 has only limited application to many UAS use cases, and section 62 has been revoked. This does not reflect the reality that regulations relevant to intrusion may be found outside the Air Navigation Order. For this reason, we think section 76(1) should be updated to account for this.

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154 Consortiq response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 194, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

155 Louise Ducrocq, "D15 residents and Manna debate drone food deliveries" (2025) Radio Nova https://www.nova.ie/drone-food-delivery-d15-manna-349428/.

156 As indicated above these might include provisions of relevant regulation relating to operating height, or airspace restrictions.

Recommendation 30.

12.228 We recommend modifying the exemption from liability for private nuisance and trespass under section 76 of the Civil Aviation Act 1982, as it applies to UAS, so that it is conditional on compliance with aviation legislation relevant to preventing intrusion into a claimant's land.

CARRIAGE OF DANGEROUS GOODS

12.229 In our first consultation paper, we noted that there is a market demand for the transport of dangerous goods.[157] Such goods include toxic medicines, pathology samples (such as blood and urine), goods containing lithium (such as batteries), and fuel for other vehicles.[158] Multiple consultees also highlighted the role that UAS could play in the transportation of medical devices.

12.230 The carriage of dangerous goods is heavily regulated. In addition to being aware of the liability regimes for cargo outlined above, operators who wish to carry cargo that may be classed as dangerous goods must take note of the additional operational responsibilities they may have. However, operator responsibilities for dangerous goods might need to be adapted in the case of remotely piloted and autonomous flight. While this is more of an operational issue than a liability issue, in order to be comprehensive, we set out our analysis here.

Regulatory background to dangerous goods

12.231 As we explained in our first consultation paper, Annex 18 to the Chicago Convention sets broad standards for the safe transportation of dangerous goods by air. Obligations are placed on operators and shippers[159] to ensure the safe transportation of such articles. Technical Instructions add detail to these broad standards.

12.232 In domestic law, the Air Operations Regulation requires that the transport of dangerous goods be conducted in accordance with Annex 18 as amended by the Technical Instructions.[160] The Air Operations Regulation also provides that, subject to exceptions, an operator must only transport dangerous goods by air if approved by the CAA.[161]

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157 CAA, *RPAS Carriage of Dangerous Goods Market Demand Summary* (October 2022) (CAP 2483) p 3.

158 CAA, *RPAS Carriage of Dangerous Goods Market Demand Summary* (October 2022) (CAP 2483) p 3.

159 Shippers are those who dispatch the goods.

160 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex IV, CAT.GEN.MPA.200.

161 UK Regulation (EU) 965/2012 laying down technical requirements and administrative procedures related to air operations, annex V, SPA.DG.100. There is also another provision dealing with weapons and munitions of war.

12.233 Additionally, there are the Air Navigation (Dangerous Goods) Regulations 2002.[162] These Regulations contain provisions regarding: requirements for the carriage of dangerous goods, the operator's obligations, the shipper's responsibilities, the pilot-in-command's obligations, training, the provision of information to passengers, documents, records, and enforcement powers. Among other things, they also place several obligations on the operator,[163] and set out criteria in respect of CAA approval to carry dangerous goods.[164]

Adapting the regulations on dangerous goods

12.234 The regulations governing the carriage of dangerous goods were not written with UAS in mind. As the E-Drone Research Project Consortium explained in their consultation response:

> The regulations governing the transport of Dangerous Goods (DG) by air have developed exclusively from the perspective of crewed aircraft, in particular the large, fixed-wing, airliner-type aircraft used to transport the vast majority of air freight. Hence, as a novel mode for payload transport, the application of DG regulations to drones is an emerging legislative arena, still under development in different regions around the world.[165]

12.235 The CAA has also acknowledged that it may not be possible for operators to comply with the full scope of the technical instructions.

> To the extent possible, the full scope of Technical Instructions should be complied with. However, considering the differences in the type of operations carried out by UAS\RPAS and the type/s of aircraft involved, there may be circumstances when the full provisions of the Technical Instructions are not appropriate or necessary.[166]

12.236 As a result, the approach taken is to authorise the carriage of dangerous goods by UAS on a case-by-case basis through the granting of operational authorisations in the specific category. In 2023, guidance on best practice for the carriage of dangerous goods by UAS was issued.[167] Operators that follow this guidance are more likely to be granted operational authorisation.[168]

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162 SI 2002 No 2786. These were made under the power (that is now contained in) art 97 of the ANO (which only applies to UAS in the certified category).

163 Aviation autonomy (2024) Law Commission Consultation Paper No 261, para 9.78.

164 Aviation autonomy (2024) Law Commission Consultation Paper No 261, para 9.80.

165 E-drone research project consortium response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 229, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

166 CAA, *Guidance on the Carriage of Dangerous Goods as Cargo for UAS/RPAS Operators in the Specific Category* (June 2023) (CAP2555) para 5.3.

167 CAA, *Guidance on the Carriage of Dangerous Goods as Cargo for UAS/RPAS Operators in the Specific Category* (June 2023) (CAP2555).

168 CAA, *Guidance on the Carriage of Dangerous Goods as Cargo for UAS/RPAS Operators in the Specific Category* (June 2023) (CAP2555) foreword.

12.237 Crucially, there are proposals to update the Acceptable Means of Compliance and Guidance Material to the UK Regulation (EU) 2019/947 ("UAS Implementing Regulation") in respect of the carriage of dangerous goods. These proposals were published this year and are still being consulted on.[169] They are intended to

> clarify regulatory expectations, align policy with established safety objectives, and provide operators with appropriate means to demonstrate compliance when transporting dangerous goods in both the specific and certified categories.[170]

12.238 Among other things, the new Acceptable Means of Compliance would achieve the following:

(1) provide guidance on the articles and substances that may be considered "dangerous goods" for the purposes of UAS operations;

(2) provide that risks associated with Dangerous Goods operations are sufficiently mitigated in the Specific category when conducted in accordance with the Technical Instructions;

(3) provide guidance on when the threshold of risk is met for certified category operations;

(4) require operators to produce a Dangerous Goods Procedures Manual;

(5) require the development and implementation of an Emergency Response Plan;

(6) address training standards.

12.239 The effect of these amendments should be that operators who wish to carry dangerous goods in the specific category have more certainty and are able more efficiently to gain operational authorisation.

12.240 However, there still remain considerable gaps in the legal framework in respect of the carriage of dangerous goods by UAS in the certified category. The proposed amendments provide guidance on when the safety threshold for certified category operations might be met, and they also provide that the use of crash-protected containers may be required. But there is nothing else beyond this. Accordingly, as with other aspects of the legal framework for certified category operations, more detailed rules will have to be developed in the longer term.

12.241 We understand that comprehensive changes are due to be made to Annex 18 by 2030.[171] In theory, it would be possible for rules to be developed at a domestic level in advance of this. However, as we explain in chapter 2, aviation regulation at the domestic level must take into account the international context and, in our view, it

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169 See CAA, *Proposed Amendments to UK Acceptable Means of Compliance and Guidance Material for UK Regulation (EU) 2019/947 and UK Regulation (EU) 2019/945* (CAP 3170 and CAP3171) (September 2025).

170 CAA, *Guidance on the Carriage of Dangerous Goods as Cargo for UAS/RPAS Operators in the Specific Category* (June 2023) (CAP2555).

171 ICAO Dangerous Goods Panel Working Paper, *Proposed Amendment to Annex 18 to Clarify States' Responsibilities with Respect to the Safe Transport of Dangerous Goods by Air* (DGP/30-WP/4 24/9/25).

would be counter-productive to develop a completely independent set of rules in advance of the changes that are to be made at the international level in 2030.[172] This also aligns with indications we have received from the CAA, and there were no suggestions from consultees that rules for the carriage of dangerous goods in the certified category needed to be developed in the short term.

12.242 In the meantime, any operators who wish to carry dangerous goods in the certified category may be able to apply for an exemption in certain circumstances.[173]

CONCLUSION

12.243 In this chapter we have discussed many different aspects of civil liability relating to UAS.

12.244 We first described the strict liability regimes which operate in the aviation sector. In our assessment, the strict liability regimes will continue to function effectively in respect of UAS. They will provide a minimum level of cover for passengers and those on the ground that have suffered damage because of an accident.

12.245 Consultees highlighted that the minimums provided by the strict liability regime for death and injury to passengers may prove insufficient in the future. However, they advocated for an update to the Montreal Convention rather than a bespoke regime for UAS. Some emphasised that this concern applied generally to aviation, rather than being a problem specific to UAS use cases. For this reason, we urged the UK Government to begin engaging with the International Civil Aviation Organization about updates to the Montreal Convention.

12.246 We also discussed negligence and product liability, which may feature more significantly in future claims for damage after an accident. We noted that these areas of law need to be reviewed more generally in light of advances in AI and automation and highlighted that the Law Commission has initiated a project on product liability which began in 2025. The results of this review would have general application to all sectors, including aviation, and should make claims in product liability relating to automation and AI more certain for all actors involved.

12.247 We also examined insurance and trespass and nuisance. We welcome the UK Government's commitment to a review of UAS insurance and recommend that they consider MSOs as part of that review. For trespass and nuisance, we have proposed that the statutory defence in section 76(1) of the Civil Aviation Act 1982 be amended such that it considers all relevant aviation regulation and not just that found in Air Navigation Orders.

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172 ICAO, Dangerous Goods Panel Working Paper, *Proposed Amendment to Annex 18 to Clarify States' Responsibilities with Respect to the Safe Transport of Dangerous Goods by Air* (DGP/30-WP/4 24/9/25).

173 The Technical Instructions allow the CAA to grant an exemption from the provisions of the instructions in instances of: (a) extreme urgency, (b) when other forms of transport are inappropriate; or (c) when full compliance with the prescribed requirements is contrary to the public interest: Part 1; 1.1.3. The CAA can issue exemptions from regulatory provisions under article 266 of the ANO and article 71(1) of the Basic Regulation.

12.248 Finally, for completeness, we also set out an analysis of the carriage of dangerous goods by UAS. We are aware that some operators may wish to carry dangerous goods as part of their operations and that this may become more common over time.

Chapter 13: Criminal Liability

13.1 Criminal liability in the aviation sector encompasses a broad and complex range of issues. This chapter covers four main areas.

13.2 First, as we explain in chapter 3, the aviation industry is highly regulated, with extensive requirements placed on key actors to uphold safety standards. The first part of this chapter addresses criminal liability arising from breach of these safety requirements.

13.3 Second, the nature of air transport renders it particularly vulnerable to intentional and malicious acts of interference. In response, specific criminal offences — such as hijacking — have been established to address these threats. These 'aviation security' offences are distinct from the safety offences in that they concern unlawful acts committed by an individual intent on causing some sort of damage, destruction or interference, rather than with breaches of aviation safety requirements. They are the subject of the second part of this chapter.

13.4 Third, the increase in the use of uncrewed aircraft introduces a new dimension of criminal liability, namely liability arising from the use of drones for criminal acts and the difficulties faced by police in combatting them. The Air Traffic Management and Unmanned Aircraft Act was passed in 2021 in order to give police powers in relation to this issue. The third part of this chapter considers whether the Act is operating satisfactorily.

13.5 Fourth, the advent of remotely piloted and autonomous flight may create the need to establish criminal offences to deal with novel aspects of certain new technologies. In the final section of this chapter, we consider whether new offences specific to uncrewed aircraft system traffic management ("UTM") need to be created in light of our recommendation in chapter 9 that legislative change should be introduced to accommodate UTM services.

13.6 As we discussed in our consultation papers, one notable feature of criminal procedure in this area is that, in addition to the Crown Prosecution Service, the Civil Aviation Authority ("CAA") can bring criminal proceedings.[1] Between 2013-2023, the CAA brought between 1 and 17 successful prosecutions a year, with the annual average steadily declining over that period.[2] The CAA follows the CPS Code for Crown Prosecutors, which states that a prosecution may only be brought if there is a

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1 Civil Aviation Act 1982, s 20(1A). The section does not however apply to Scotland, where regulators do not have powers of prosecution.

2 Details of CAA enforcements and prosecutions are released annually and can be found on their website. See CAA, *Enforcement and prosecutions,* https://www.caa.co.uk/our-work/about-us/enforcement-and-prosecutions/.

reasonable prospect of securing a conviction and the prosecution is in the public interest.[3]

13.7 Although criminal prosecution is an important tool, it is just one of many "formal enforcement tools" used by the CAA to ensure compliance in the aviation sector. Arguably, regulatory sanctions such as suspension or revocation of licences are more effective at motivating organisations to remain compliant with regulations. Consequently, whilst criminal sanctions are a significant tool, compliance in the aviation sector may often be driven by other regulatory enforcement mechanisms. This regulatory background is worth bearing in mind while reading the rest of the chapter.

BREACH OF AVIATION SAFETY REQUIREMENTS

13.8 In chapter 3, we explain that domestic aviation safety requirements are contained in a range of different instruments. Many are contained in assimilated regulations and there are also some important requirements in the Air Navigation Order 2016 ("ANO 2016").

13.9 When it comes to failure to comply with these safety requirements, the aviation sector is known for its "just culture" approach. The "just culture" approach is concerned with promoting safety and compliance with applicable regulation, rather than punishing breaches of it. Actors within the aviation sector are encouraged to engage with the regulator when they find themselves in breach of their obligations. This in turn is intended to promote safety by allowing issues to be brought to the regulator's attention and rectified. Extensive regulatory requirements and the "just culture" approach mean that, in practice, criminal proceedings are rare.[4]

13.10 That culture notwithstanding, extensive provision has been made to create offences for breach of aviation safety requirements so that a prosecution can be brought if necessary. The main way this is achieved is through the ANO 2016. As will be seen from the discussion below, we consider that the criminal liability framework established under the ANO 2016 is complicated and lacks clarity in some key respects. We have therefore reached the view that the framework should be simplified.

13.11 We first explain how the criminal liability framework under the ANO 2016 works. We then set out what we consider to be the problems with this framework, before recommending reform.

Criminal liability under the ANO 2016

13.12 Article 265 of the ANO 2016 is the principal provision creating criminal liability for breach of aviation safety requirements. It has two main functions.

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3 As set out in Crown Prosecution Service ("CPS"), *Code for Crown Prosecutors* (2018) paras 4.1 to 4.14 https://www.cps.gov.uk/publication/code-crown-prosecutors. See also CAA, *Safety and Airspace Regulation Enforcement* Guidance (May 2015) (CAP 1074) pp 8 and 9.

4 See chapter 3, paras 3.46 and 3.47.

13.13 First, it creates criminal offences and sets penalties for the contravention of over five hundred aviation safety requirements. This is done through articles 265(5) to (8), which establish four offences of increasing severity. Each offence relates to a different set of safety requirements, as categorised within schedule 13. The relevant safety requirements are contained both within the ANO 2016 itself and in other aviation safety regulations.[5]

13.14 Second, it contains a deeming provision reflecting the unique responsibilities of the operator and the pilot in command for the safety of an aircraft. The effect of the deeming provision is that, where a safety regulation has been contravened in relation to an aircraft, the pilot and operator are deemed to have committed the same contravention – not through their own act or omission, but by operation of law pursuant to article 265(1).

13.15 Two defences are available.[6]

(1) The "reasonable care" defence: a person who has been charged with an offence of contravening an aviation safety requirement will be deemed not to have contravened a safety requirement if they can prove that their act or omission – which would have otherwise been a contravention – was due to a cause not avoidable by the exercise of reasonable care by that person.

(2) The "due diligence" defence: a pilot or operator deemed liable under article 265(1) will not be deemed liable if they can prove that the contravention occurred without their consent or connivance and that they exercised all due diligence to prevent the contravention.

13.16 It is important to note that, for the most part, article 265 does not apply to uncrewed aircraft in the open and specific categories.[7] As we explain in chapter 5, these aircraft have their own bespoke safety regime and are generally not subject to the same safety requirements as crewed aviation. It is therefore logical that they should be largely exempt from the criminal offences in articles 265(5) to (8), given that these offences correspond to the full suite of safety requirements applicable to crewed aviation.[8]

13.17 Instead, uncrewed aircraft in the open and specific categories are subject to the Unmanned Aircraft (Offences and Consequential Amendments) Regulations 2025, which create offences and penalties for contravening the safety requirements in the bespoke uncrewed aircraft system ("UAS") framework. For these offences, there is no

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5 Many of these are contained in assimilated legislation.

6 A further defence is available in circumstances where a person has been charged with contravening a safety requirement by reason of that person having been a member of the flight crew of an aircraft on a flight for the purpose of commercial air transport, public transport or commercial operation. In these circumstances, the "flight is to be treated…as not having been for that purpose if the person proves that they neither knew nor suspected that the flight was for that purpose.": SI 2016 No 765, art 265(4)

7 SI 2016 No 765, art 23(1)(c).

8 As listed in schedule 13 of the ANO 2016.

deeming provision and no due diligence defence, but the reasonable care defence is still available.[9]

13.18 This picture is complicated by the fact that UAS in the open and specific categories are not absolutely exempt from the application of article 265. Although these aircraft have their own framework, there are still a small number of safety requirements in the ANO 2016 which apply to them. Most notably, this includes the requirement not to endanger the safety of any person or property.[10] Article 265 applies in full in relation to these particular requirements (including the deeming provision and the due diligence defence).[11]

Problems with article 265

13.19 In our first consultation paper, we asked a series of questions about the approach to criminal liability in the ANO 2016 in the context of remotely piloted and autonomous UAS. We asked about the liability of the remote pilot and the operator and discussed the operation of the defences in article 265.[12]

13.20 Following consultation, we have reached the view that article 265 of the ANO 2016 is in need of reform. The provision is unnecessarily complicated and unclear in some key respects, particularly in relation to the defences. Its application also gives rise to outcomes that are not easily explainable or justifiable. We consider the main problems to be as follows.

13.21 First, it is difficult to explain why a person relying on the due diligence defence has to prove both an absence of consent or connivance *and* that they have exercised all due diligence. If a person fails to prove that the contravention happened without their consent or connivance, that person could never hope to show that they nevertheless exercised all due diligence. Conversely, if a person can show that they did not consent or connive, they still need to prove that they exercised all due diligence, the evidence for which will presumably have gone some way in showing that they neither consented or connived in the contravention. In other words, the consent or connivance limb appears somewhat redundant; it is essentially subsumed in the question of whether the person exercised all due diligence.

13.22 Second, the "consent or connivance" limb of the due diligence defence requires the involvement of at least two people, where one consents to or connives with the actions of another. However, aviation safety requirements are often drafted in a neutral way without placing responsibility for compliance directly on a particular actor.[13] In these circumstances, there may only be one party involved and the

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9 Unmanned Aircraft (Offences and Consequential Amendments) Regulations 2025, reg 7.

10 SI 2016 No 765, art 241.

11 SI 2016 No 765, art 23(3).

12 We asked about the criminal liability of the operator (CQ52), the remote pilot (CQ55), and the defences available to them (CQ53 and 54).

13 The Air Navigation Order 2016 and the relevant safety regulations are replete with examples. They often take the form "an aircraft must not…". For example, article 77(a) of the ANO 2016 provides that "an aircraft must not fly unless it is equipped with equipment which complies with the law of the country in which the aircraft is registered or the State of the operator".

"consent or connivance" limb would not therefore appear to be relevant.[14] In our first consultation paper, we said that this may also be a particular issue in the context of autonomy because the wording "consent or connivance" does not seem to reflect the reality of the interactions between an operator and an autonomous system.[15]

13.23 Third, in addition to the above problems, there seems to be no reason why a defence based on the absence of consent or connivance and the exercise of all due diligence is particularly suited to the aviation context. It originally appeared in the ANO 1949 as a defence to a corporate officer liability provision,[16] and a similar formulation is a relatively common defence in this context.[17] The reason why it subsequently became a defence to the deemed liability of the pilot and operator is unclear,[18] but its genesis indicates that the defence does not have some underlying rationale or justification peculiar to the context of the deemed liability of the operator or pilot.

13.24 Fourth, it is unclear whether a person deemed liable under article 265(1) can rely on the reasonable care defence. On one view, once the deeming provision has been triggered, it has effect "for the purposes of the following provisions of [the] article." The reasonable care defence – in article 265(3) – is found in one of the following provisions of the article.[19] Therefore, the defence must be available to a person deemed liable under article 265(1).[20] The difficulty with this view is that where an operator or pilot has been deemed by *operation of law* to have contravened a provision, there is not necessarily a relevant *act or omission* for the purposes of article 265(3).[21] These diverging features are hard to reconcile and result in a lack of clarity.

13.25 Fifth, it is questionable whether there is a meaningful difference between exercising "reasonable care" and "all due diligence" in the context of aviation safety. Even assuming that there is a difference, there appears to be no obvious justification or explanation for having these separate defences.

Reforming the criminal liability framework

13.26 In our first consultation paper, we provisionally proposed that article 265 should be reformed. At the same time, we were conscious of the fact that the focus of our project is on remotely piloted and autonomous flight, whereas article 265 applies to aircraft

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14 This could be because the deeming provision is triggered – thereby making the pilot or operator liable – without there necessarily being another person directly responsible for the underlying contravention.

15 Aviation Autonomy (2024) Law Commission Consultation Paper No 261 at para 9.44.

16 See Air Navigation Order 1949 SI No 349, art 65(3) (since repealed).

17 See Law Commission Corporate Criminal Liability Options Paper, chapter 9. One point of difference is that the two limbs of the defence in the aviation context are conjunctive, which is not normally the case.

18 The change occurred when the offences provision was restructured in the Air Navigation Order 1960 SI No 972, art 75 (since repealed). The corporate officer liability provision appears to have been removed and the formulation based on an absence of consent or connivance and the exercise of all due diligence instead became a defence to the deemed liability of the pilot and operator.

19 SI 2016 No 765, art 265(3).

20 In support of this view, it might be noted that this is how the provision was originally devised in the Air Navigation Order 1949 SI No 349, art 65(1)(a).

21 The wording of the provision is clear that subsections (1) and (2) should be read together. Though, this does not necessarily indicate that the reasonable care defence in (3) should be excluded.

more generally. We therefore limited ourselves to discussing the ways in which the framework could be made to work for our use cases and, on that basis, provisionally proposed an amendment to the due diligence defence only in relation to autonomous flight.

13.27 On further reflection, we have now reached the view that piecemeal reform to create an exception for autonomous flight would add an additional layer of complexity to a provision that already lacks clarity. Accordingly, we consider that the best course of action is to reform the provision more generally. Although prosecution for breach of aviation safety requirements is rare, it is important to ensure that the criminal liability framework is robust, clear, and logical, particularly with the advent of new technologies. We have set out below the factors that, in our view, should be taken into account in reforming article 265.

13.28 First, as a general rule, it should be an offence to contravene an aviation safety requirement. Although criminal prosecutions may be rare and often not necessary in light of the "just culture" approach, the importance attached to aviation safety and the potential seriousness of a contravention of a safety requirement means that prosecution should be an available option.

13.29 Second, without prejudice to the liability of any other party, the operator and pilot should be deemed liable whenever contravention of an aviation safety requirement occurs. The pilot and operator are the parties with the most control over the aircraft and the deemed liability provision ensures that they take measures proactively to ensure that the aircraft is flown and used in line with applicable requirements. Further, for large aircraft operations, it may be very difficult to pinpoint the person or persons who contravened a particular provision by their act or omission. The deeming provision ensures that someone is ultimately responsible for the safety of the aircraft.

13.30 Third, as a logical corollary of the previous point, where there is no pilot, the operator should be deemed liable.[22] Operators have a broad range of responsibilities relating to the operation and safety of the aircraft they use. Before undertaking aviation operations, operators must carefully consider the inherent risks and how to mitigate those risks. As a general principle, it seems appropriate that criminal liability should attach to an operator that fails to ensure the safe flight of an uncrewed aircraft that it operates.

13.31 Fourth, an operator or pilot deemed liable for a contravention should have available to them the same defence as a person who is charged with directly contravening a provision. In other words, there is no need for two separate but similar defences. As discussed above, many aviation requirements are drafted in such a way that it is unclear who has responsibility for compliance. This means that, in some cases, it may be possible for a prosecution to be brought against the operator or pilot either for directly committing the offence or by virtue of the deeming provision. In our view, there is no principled reason why the available defences should differ depending on which route is chosen by the prosecution. The purpose of the defences is to require pilots or

[22] For the most part, this is only relevant for UAS in the certified category. As explained above, the deeming provision does not apply to the offences in the Unmanned Aircraft (Offences and Consequential Amendments) Regulations 2025 – which addresses the bespoke UAS framework for UAS in the open and specific category.

operators to exercise a consistent standard of care in order to avoid liability and that objective is undermined if the defences vary.

13.32 Fifth, the defence available should not require the person to prove an absence of "consent or connivance". As outlined above, this requirement creates unnecessary complexity – particularly in the context of autonomy.

13.33 Sixth, in principle we see no issue with there being separate offences for UAS in the open and specific category, given that these aircraft have their own bespoke regulatory framework. The defence available to a person charged with one of these offences should be aligned with the defence available under article 265, as is the case currently.

13.34 These factors should be taken into account in reforming the criminal liability framework under the ANO 2016. Given that article 265 applies beyond the context of remotely piloted and autonomous UAS, we have sought to keep our analysis relatively high level and refrained from recommending how the provision should be drafted. It is envisaged that the CAA will consider whether there are additional factors pertaining to aviation more generally.

Recommendation 31.

13.35 We recommend that the criminal liability framework under the Air Navigation Order 2016 is reformed, taking into account the six factors set out at paragraphs 13.28 to 13.33.

AVIATION SECURITY OFFENCES

13.36 Domestic law contains a number of offences that can broadly be termed 'aviation security offences'.[23] In the main, the aviation security offences are derived from international instruments. These instruments were developed against the backdrop of an increase in "extrinsic threats and dangers" to civil aviation, as opposed to the "inherent and natural risk associated with flight".[24] Thus, they are distinct from the safety offences discussed above in that they concern intentional and unlawful acts committed by an individual intent on causing some sort of damage, destruction or interference – rather than with breaches of aviation safety requirements.[25]

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23 According to Annex 17 of the Chicago Convention, aviation security is "a combination of measures and human and material resources intended to safeguard civil aviation against acts of unlawful interference."

24 Jiefang Huang, 'Security Regulations: international requirements' in *Routledge Handbook of Public Aviation Law* Paul Stephen Dempsey and Ram S Jakhu (2017).

25 That is not to say that there is no overlap between the two or with other offences. Prosecutors may be able to choose between proceeding under the Aviation Security Act 1982 or other legislation such as the ANO 2016. Prosecutors should select charges which reflect the seriousness and extent of the offending. See Crown Prosecution Service ("CPS"), *The Code for Crown Prosecutors*, para 6.1, https://www.cps.gov.uk/publication/code-crown-prosecutors.

13.37 Among the key international instruments are:[26]

(1) The Hague Convention 1970, which addresses the crime of hijacking.[27] A protocol to this convention, agreed in Beijing in 2010, updates the offence.[28]

(2) The Montreal Convention 1971, which introduced a number of offences that could be committed against the safety of an aircraft.[29] A protocol was added in 1988 to expand the list of crimes to include attacks against airports serving international aviation.[30]

(3) The Beijing Convention 2010 (to be distinguished from the Beijing Protocol on hijacking)[31] deals with many unlawful acts relating to civil aviation, including the use of civil aircraft for the purpose of causing death or serious damage and the use of certain dangerous substances. It is intended to consolidate, update and prevail over the Montreal Convention and its airport protocol for those state parties that have ratified the treaty.[32]

13.38 The UK is a party to three of these treaties.[33] In terms of domestic implementation, the main pieces of relevant legislation are the Civil Aviation Act 1982, the Aviation Security Act 1982 and the Aviation and Maritime Security Act 1990. While it is not possible in this report to assess the impact of autonomy and high automation on each individual offence contained within these acts, in our consultation papers we selected some of the offences in the Aviation Security Act 1982 as being of particular relevance and potentially giving rise to some difficult issues.

13.39 The Aviation Security Act 1982 creates a number of offences. These include:

(1) hijacking (section 1);

(2) destroying, damaging or endangering safety of aircraft (section 2);

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26 See also Annex 17 to the Chicago Convention.

27 Convention for the Suppression of Unlawful Seizure of Aircraft, signed at The Hague on 16 December 1970 (the "Hague Convention").

28 Protocol Supplementary to the Convention for the Suppression of Unlawful Seizure of Aircraft, done at Beijing on 10 September 2010 (the "Beijing Protocol").

29 Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation, signed at Montreal on 23 September 1971 (the "Montreal Convention"). The Convention on Offences and Certain Other Acts Committed on Board Aircraft, signed at Tokyo on 14 September 1963 (the "Tokyo Convention") 1963 was the first international Convention to address offences committed on board the aircraft.

30 Protocol for the Suppression of Unlawful Acts of Violence at Airports Serving International Civil Aviation, at Montreal on 23 September 1971, signed at Montreal on 24 February 1988 (the "Airport Protocol").

31 Convention on the Suppression of Unlawful Acts Relating to International Civil Aviation done at Beijing on 10 September 2010. The Protocol to Amend the Convention on Offences and Certain Other Acts Committed on Board Aircraft, done at Montreal on 4 April 2014 (the "Montreal Protocol"), expands the scope of the Tokyo Convention 1963 by adding additional jurisdictional bases.

32 The Tokyo Convention 1963 and the Convention on the Marking of Plastic Explosives for the Purpose of Detection, done at Montreal on 1 March 1991 (the "MEX Convention") were also agreed under the auspices of ICAO.

33 The UK is not a party to the Beijing Protocol 2010 and the Beijing Convention 2010.

(3) interfering with air navigation (section 3);[34]

(4) offences in relation to certain dangerous articles (section 4).

13.40 In our consultation papers, we said that there does not seem to be any major reason in principle why the type of aircraft (whether autonomous or remotely piloted) would render these provisions inappropriate or inapplicable. At the same time, we highlighted several potential issues. First, we noted that the offence of hijacking may need to be updated.[35] Second, we queried whether the interference with air navigation offences in section 3 would adequately cover UTM.[36] We also highlighted the possibility that some new UAS use cases may not be adequately captured by the current offences and we asked consultees more generally whether any other security offences may need to be updated.[37] We discuss each of these in turn below.

Updating the offence of hijacking

13.41 Section 1(1) of the Aviation Security Act 1982 provides that

> a person on board an aircraft in flight who unlawfully, by the use of force or by threats of any kind, seizes the aircraft or exercises control of it commits the offence of hijacking.

13.42 Hijacking is punishable by life imprisonment.[38] There are three elements of the offence to which we draw attention in the context of remotely piloted and autonomous flight.

13.43 First, force or a threat of any kind must be used to seize the aircraft or to exercise control of it.

13.44 Second, the offence can only be committed by a person on board an aircraft. As it stands, hijacking is therefore not applicable to any of the uncrewed, non-passenger carrying use-cases we have discussed in this report. Taking control of an uncrewed aircraft by the use of force or threats outside the aircraft would not qualify.

13.45 Third, the aircraft has to be “in flight”. An aircraft is considered to be in flight when all its external doors are closed following embarkation until the moment when such doors are opened for disembarkation. In the case of a forced landing, it also includes any period until the competent authorities take over responsibility for the aircraft and for persons and property on board.[39]

13.46 The effect of these three stipulations is that, as currently defined, the offence of hijacking requires the individual physically to be on board an aircraft that is in flight

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34 Section 3 is titled “other acts endangering or likely to endanger the safety of aircraft” in the Act.

35 Aviation Autonomy (2024) Law Commission Consultation Paper No 261, CQ 60.

36 Aviation autonomy: Consultation paper 2 on uncrewed aircraft systems traffic management (2025) Law Commission Consultation Paper No 271, CQ 8.

37 Aviation Autonomy (2024) Law Commission Consultation Paper No 261, CQ 61.

38 Aviation Security Act 1982, s 1(3).

39 Aviation Security Act 1982, s 38(3)(a). See also 1970 Convention on Unlawful Seizure of Aircraft, art 3.

and it requires them to use force or threats to take control of the aircraft in some way. This may be applicable to some of the passenger-carrying use cases we have discussed in this report. For example, in theory, it may be possible to hijack a passenger-carrying VTOL by the use of force or threats on board the aircraft.[40]

13.47 However, as we noted in our first consultation paper, it now seems more likely that the unlawful control or seizure of an autonomous or remotely piloted aircraft would be achieved by exploiting weaknesses in its computer systems or programming ("hacking"), or by the use of threats or force at a remote operations centre. Given the three requirements outlined above, these acts would not currently constitute hijacking. In our first consultation paper, we expressed the view that, because of the seriousness and potential safety risks involved, any unlawful seizure or control of an aircraft should be treated as hijacking.

13.48 Our view was reinforced in light of developments at the international level. The Hague Hijacking Convention, to which the UK is a party, has now been supplemented by a 2010 protocol – "the Beijing Protocol" – which the UK has signed but not ratified. For states that have expressed their consent to be bound by it, the Beijing Protocol has expanded the scope of the offence of hijacking in two relevant ways.

13.49 First, it has updated the possible methods by which the aircraft can be taken control or seized for the purposes of the offence. The updated definition now includes "coercion" and "technological means" as possible ways of committing the offence. The Protocol has also removed the requirement that the offender must be on board the aircraft.

13.50 Second, it has expanded the period in which hijacking can occur, so that it can now be committed during the time an aircraft is "in service". An aircraft is considered to be in service from the beginning of the pre-flight preparation of the aircraft by ground personnel or by the crew for a specific flight until twenty-four hours after any landing. In the case of an emergency landing, the flight is considered to be ongoing until the competent authorities assume responsibility for the aircraft and for the persons and property on board.

13.51 These changes only take effect in international law for the parties that have expressed their consent to be bound by the Protocol.[41] As mentioned, the UK has signed the Protocol but not ratified it, and the definition of hijacking in domestic law, in section 1(1) of the 1982 Act, remains unchanged.

13.52 In our first consultation paper, we considered that the changes made to the Hijacking Convention by the Beijing Protocol made sense in light of the problems outlined above. We therefore sought views on:

(1) Whether the domestic offence of hijacking should be updated to reflect the fact that autonomous or remotely piloted aircraft might be seized or controlled by technological means or by persons not on board the aircraft.

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[40] The use of force or threats does not necessarily mean that a pilot has to be overcome by force. A security system could be breached by the use of force, or threats could be directed at fellow passengers or crew, but the result would have to amount to seizing or exercising control.

[41] Through ratification, acceptance, approval or accession.

(2) Whether the period in which an autonomous or remotely piloted aircraft can be hijacked should be expanded from when it is "in flight" to when it is "in service".

Consultation analysis

13.53 For the most part, consultees were strongly in favour of making these changes. Skybound Rescuer made the point that:

> As drones become larger and more common-place in the UK's airspace there will be an increased likelihood they will become a target for terrorism, hostile state actors and other nefarious parties. Such changes to domestic law will ensure the security of the flight has been considered at all stages of the operation, with penalties in place for anyone that attempts to target a UA in this manner.[42]

13.54 Chris Daniels of Flare Bright, responding in a personal capacity, similarly said that:

> Hijacking was a major problem in aviation in the late 1960s and early 1970s when the legislation was created. The first takeover of an autonomous passenger carrying aircraft (by whatever means, and as pointed out in the consultation, most likely on the ground, technologically) will have a similar effect. So worth pre-empting this with legislation ahead of the inevitable event.[43]

13.55 Some of the responses, while in favour of making these changes, suggested additional factors for us to consider. National Air Traffic Services ("NATS"), for example, said that:

> consideration could be given to extending the definition of 'hijacking' to include 'manipulation' i.e. not taking control but (for example) impacting an operation via GNSS spoofing etc.[44]

13.56 Some consultees also raised issues about the second strand of the proposal relating to the period during which hijacking can occur. Professor George Leloudas suggested that the definition of "in-flight" might require adjustment to reflect new types of aircraft that do not have external doors.[45]

13.57 In a similar vein, another consultee raised an issue relating to the definition of "in-service."

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42 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

43 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

44 NATS response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 346, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/. GNSS spoofing refers to the broadcasting of counterfeit satellite signals to deceive global navigation satellite system ("GNSS") receivers, causing incorrect position, navigation, and timing data. See EASA, *Global Navigation Satellite System (GNSS) Outages and Alterations*, https://www.easa.europa.eu/en/domains/air-operations/global-navigation-satellite-system-outages-and-alterations.

45 George Leloudas response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 249, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

> This begs the question of whether a hijacker who takes unlawful control of an operation system while no aircraft are in flight or in service and thereafter controls the UAS commits an offence within s.1 of the 1982 Act, on the basis that the aircraft is not in service (or in flight) at the time of seizure. This may merit further consideration.[46]

13.58 The CAA also commented on the definition of in-service:

> The term in-service is correct but we will need to define it so that includes the 'hijack' of an autonomous system whether it is on the ground or in the air operating. It should be considered in connection with the Computer Misuse Act 1990 and the Hijacking Act [Aviation Security Act 1982], as we will now have remote threat actors who could be capable of remotely 'hijacking' remotely piloted aircraft mid-flight.[47]

13.59 ARPAS-UK disagreed with expanding the period when hijacking can occur. They said that the period should remain "in flight."

> The duration before and/or after the operation of 24hrs based on the Beijing Protocol is too long based on multiple flights and storage to consider this to be hijacking. An alternative suggestion would be to consider the concept of data breaches based on some form of cyber-security threat — which although not amounting to hijack does result in the future potential to exercise control.[48]

Discussion and recommendations

Including 'manipulation' in the definition of hijacking?

13.60 As noted, the significant majority of consultees were in favour of updating the law to reflect the terms of the Beijing Protocol. The only substantive issue raised in respect of updating the offence to include unauthorised seizure by technological means or by persons not on board the aircraft was the issue of 'manipulation' of the aircraft.

13.61 While we agree that it is debatable whether acts such as GNSS spoofing would fall within the terms of the hijacking offence, in our view, to adapt the definition to include 'manipulation' would fundamentally alter the offence, which has its foundations in seizing or taking control of the aircraft. Methods that do not involve seizing or taking control of the aircraft are best captured by other offences, and we discuss below whether 'manipulation' is adequately captured by section 3 of the 1982 Act and offences in the Computer Misuse Act 1990.

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46 Anonymous 4 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 663, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

47 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

48 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

Can hijacking take place after a flight has landed?

13.62 All but one consultee was in favour of expanding the period in which hijacking can occur. As noted above, ARPAS-UK argued that a period of 24 hours after the flight has landed is too long.

13.63 We do not agree. While it may be more commonplace for hijacking to take place before the flight has landed, it is not yet clear what form future threats might take. Presumably, the rationale underlying the expansion in the period during which hijacking can occur reflects the fact that a person accomplishing hijacking via technological means has a much larger window of opportunity in which to seize or take control of the aircraft. For example, hijacking might be relevant where an aircraft has completed its flight but is being unloaded on the ground for a number of hours. In these circumstances, the flight is still under the control of the operator and so it would be possible to seize control.

13.64 It is also relevant that the definition of 'in service' is not a new one. The Montreal Convention 1971 already uses the same definition of 'in service' to delineate the scope of the offences of destroying or damaging an aircraft and it is replicated in the Aviation Security Act 1982 in respect of the domestic equivalent of those offences.

13.65 Importantly, the changes will also bring the UK into line with international law as reflected in the Beijing Protocol.

Clarifying the definition of "in service"

13.66 One consultee took the opposite view from ARPAS-UK. They suggested that the definition might not be wide enough because an individual could take unlawful control of an aircraft before it is in service and, as things stand, that unlawful seizure would not constitute hijacking.[49] As noted above, the Beijing Protocol defines 'in service' as beginning from "the pre-flight preparation of the aircraft by ground personnel or by the crew for a specific flight".

13.67 We are of the view that the Beijing Protocol is drafted broadly enough to cover such circumstances. It is true that the seizure of an operations system *before* the pre-flight preparation stage would not, in and of itself, constitute hijacking. But, in this example, the hacker is taking control of the operations system with a view to later seizing control of the operation of the aircraft. In our view, the conduct in question would fall within the scope of the offence from the moment the pre-flight preparation began because this would be the moment that the hacker took control of that "specific flight" — irrespective of when they took control of the system. Furthermore, such conduct would be covered by section 1(1) of the Criminal Attempts Act 1981, which provides that a person is guilty of committing an offence if, with intent to commit that offence, they do an act which is "more than merely preparatory to the commission of the offence."

13.68 We have considered the other points raised by consultees in relation to the period during which hijacking can occur. In particular, the CAA suggested that the term 'in

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[49] Anonymous 4 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 663, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

service' would have to be defined so that it includes hijacking of autonomous systems regardless of whether the system is on the ground or in the air.

13.69 In our view, this point does not concern the definition of 'in service'. Instead, it goes to the method by which an individual seizes or takes control of the aircraft. As discussed, we recommend that the definition of hijacking is updated such that it does not need to take place on board the aircraft and incorporates taking or seizing control by technological means. There is no reason why this expanded definition should not encompass the hijacking of a system not on board the aircraft. We consider that the circumstances envisaged by the CAA would be covered by the new recommended definition.

Recommendation

13.70 Having considered the above points raised by consultees, we are convinced that the current definition of hijacking in domestic legislation is ill-suited to the context of autonomous aviation. An updated definition that aligns with the terms of the Beijing Protocol would more effectively address hijacking concerns as they pertain to remotely piloted and autonomous UAS.

13.71 We are aware that the changes we proposed would apply to all aircraft and not just remotely piloted or autonomous aircraft. While it is outside of our terms of reference to consider the effect on other types of aircraft, we record that consultees did not raise any issues in this regard.

Recommendation 32.

13.72 We recommend that the offence of hijacking in section 1 of the Aviation Security Act 1982 should be updated to reflect the possibility that remotely piloted or autonomous aircraft might be seized or controlled by technological means or by persons not on board the aircraft.

Recommendation 33.

13.73 We recommend that the period during which the offence of hijacking within the meaning of section 1 of the Aviation Security Act 1982 can occur should be expanded from when the aircraft is "in flight" to when the aircraft is "in service".

Security offences relating to air navigation

13.74 In our second consultation paper, we considered the security offences contained within section 3 of the Aviation Security Act 1982 relating to unlawful interference with air navigation. We discussed whether these offences are adequate for UTM services.

13.75 We first considered section 3(1), which makes it an offence unlawfully and intentionally to interfere with property used for air navigation purposes (and is punishable by a maximum sentence of life imprisonment):

> It shall…be an offence for any person unlawfully and intentionally to destroy or damage any property to which this subsection applies, or to interfere with the operation of any such property, where the destruction, damage or interference is likely to endanger the safety of aircraft in flight.

13.76 Property is defined, in section 3(2), as including any land, building or ship used for the provision of air navigation facilities and "any apparatus or equipment so used, whether it is on board an aircraft or elsewhere".

13.77 We expressed our provisional view that the phrase "used for the provision of air navigation facilities" is sufficiently broad to cover any facilities or equipment used for the provision of UTM services. We said that it is likely that a court would take a purposive approach and would interpret UTM as facilitating air navigation and the safety of aircraft.

13.78 We also considered section 3(3), which makes it an offence

> for any person to communicate any information which is false, misleading or deceptive in a material particular, where the communication of the information endangers the safety of an aircraft in flight or is likely to endanger the safety of an aircraft in flight.

13.79 There are two defences available under section 3(3). The first is that the defendant believed and had reasonable grounds for believing that the information was true. The second is that the defendant was lawfully employed to perform duties which consisted of or included the communication of information and communicated the information in good faith in the performance of those duties.[50]

13.80 Similar to section 3(1), our provisional view was that the offence in section 3(3) and the associated defences are defined in broad enough terms to be applicable to scenarios involving UTM service provision.

Consultation analysis

13.81 The majority of consultees expressed agreement with our provisional view that the section 3 offences are adequate for UTM services. However, some consultees did have some concerns.

13.82 The Royal Aeronautical Society ("RAeS"), reflecting the views of their members, gave a detailed response. They said that:

> while section 3 provides an important baseline for protecting against acts of violence and unlawful interference with air navigation installations, it was conceived for a conventional, physical infrastructure model and does not fully reflect the digital and distributed architecture of modern UTM systems.[51]

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50 Aviation Security Act 1982, s 3(4).

51 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 480, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

13.83 In this vein, they drew attention to "new vectors for interference and manipulation that were not envisaged in the 1982 Act". These risks included: digital and cyber vulnerabilities,[52] decentralised and non-physical infrastructure,[53] and emergent classes of actors and threats.[54]

13.84 NATS had concerns that were similar to those of the RAeS. They explicitly disagreed with our suggestion that section 3 was adequate to cover UTM offences.

> Whilst [the offences in section 3 are] important for protecting physical aviation infrastructure and can be applied to UTM services to ensure safety and security in unmanned traffic management, there is a risk that they may not cover all the needs from a UTM services perspective, particularly in relation cybersecurity.
>
> As it is expected for increased autonomy in the provision of ATM/ANS to UAS, for these services to be resilient, they will need strong cybersecurity measures to protect against digital threats, which do not appear to be specifically addressed by Section 3 of the Act. Therefore, to ensure protection for UTM services, specific regulations that cover both physical and cybersecurity threats which address all potential vulnerabilities, including intentional spoofing of UT data links, and ensure drones are safely integrated into the airspace would be helpful.[55]

13.85 Drone Alliance Europe said that the offences are adequate in principle but said that:

> It is crucial to draw a clear distinction between malicious actors and operators acting in good faith. The following activities should not trigger criminal liability: CAA-approved security testing, routine system troubleshooting, non-malicious misconfigurations, other legitimate operational activities. This approach would maintain the focus on intentional or truly reckless interference while avoiding the unintended criminalisation of responsible operators.[56]

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52 In terms of digital and cyber vulnerabilities, they said: "section 3 is primarily aimed at physical acts of sabotage or interference. However, as UTM systems rely heavily on real-time data, algorithmic decision-making, and cloud-based communications, cyberattacks (e.g. jamming, spoofing, data corruption, denial-of-service) now present a material threat to the safe operation of airspace. These threats may not be adequately addressed by current language focused on "damage" or "interference" with "installations"."

53 In terms of decentralised and non-physical infrastructure, they said that: "UTM services are often virtualised, distributed across software platforms and networks, with no fixed location or physical facility. As such, enforcement under section 3 may be ambiguous if there is no identifiable "aerodrome" or "navigation facility" that can be shown to have been physically interfered with."

54 In terms of emergent classes of actors and threats, they said that: "the integration of new entrants, many from the tech and software sector, will diversify the safety culture and threat landscape. Malicious or negligent actors may attempt to tamper with or operate unauthorised digital services (e.g., counterfeit UTM functions or rogue data injection), which may not be caught under traditional aviation security offences unless those services are recognised explicitly in law."

55 NATS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 62, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

56 Drone Alliance Europe response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 20, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

Discussion and recommendations

13.86 While consultees directed their comments at section 3 offences generally, it is necessary to consider the two offences separately. As noted above, the section 3(1) offence concerns interference with property used for air navigation facilities. The section 3(3) offence, meanwhile, concerns the communication of false, misleading or deceptive information.

Section 3(1): interference with the operation of property used for air navigation facilities

13.87 In our second consultation paper, we expressed the view that a court would likely take a purposive approach to the offence in section 3(1). We considered that the phrase "property used for the provision of air navigation facilities" could be interpreted as extending beyond physical infrastructure to include whatever facilities are necessary for the safe navigation of aircraft in flight.[57] It follows, on this view, that the offence is capable of encompassing unlawful acts of interference with the operation of property (which might include, for example, data or signals) used in the provision of UTM services.

13.88 This view is supported by the definition of "air navigation installation" in the 1982 Act, which is defined in terms of physical infrastructure.[58] This suggests that "property used for the provision of air navigation facilities" has a broader meaning — otherwise, the section 3(1) offence could simply have been defined in terms of destroying, damaging or interfering with an air navigation installation. To this extent, the fact that there is "no identifiable aerodrome" or physical "navigation facility" is not determinative of whether the offence applies.

13.89 However, we agree with the RAeS that the advent of UTM systems and the development of new UAS use cases are likely to bring with them "new vectors for interference and manipulation".[59] In this context, it is important to future-proof the law to ensure that all acts endangering or likely to endanger the safety of aircraft are covered.[60]

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57 In interpreting a statutory provision, courts are willing to apply the 'always speaking' principle: "as a general rule, a statute should be interpreted taking into account changes that have occurred since the statute was enacted. Those changes may include, for example, technological developments, changes in scientific understanding." *News Corp UK & Ireland ltd v Commissioners for His Majesty's Revenue and Customs* [2023] UKSC 7, [2024] AC 89 at [29].

58 Section 38(1) defines "air navigation installation" as meaning "any building, works, apparatus or equipment used wholly or mainly for the purpose of assisting air traffic control or as an aid to air navigation, together with any land contiguous or adjacent to any such building, works, apparatus or equipment and used wholly or mainly for purposes connected therewith."

59 This is particularly the case because "modern systems such as [UAS] and future technologies such as eVTOLs are expected to place additional dependencies on GNSS as their prevalence in the aviation system grows." See Giancarlo Buono, "GNSS jamming – navigating the impacts of radio frequency interference to essential aviation systems" (2025) European Civil Aviation Conference, https://www.ecac-ceac.org/news/articles/gnss-jamming-navigating-the-impacts-of-radio-frequency-interference-to-essential-aviation-systems.

60 We note that some of the conduct in question may also constitute an offence under the Computer Misuse Act 1990, which we discuss below.

13.90 We note that the Beijing Convention 2010 – which the UK has signed but not ratified – provides an updated definition of "air navigation facilities". [61] "Air navigation facilities" are defined as including "signals, data, information or systems necessary for the navigation of the aircraft". [62] We consider that updating the terms of the offence in line with this definition would provide helpful clarification and ensure that the law reflects different types of unlawful interference that could occur in the future. We therefore make a recommendation to that effect.

13.91 We are also of the view that a further amendment should be made to ensure that the scope of the offence is not restricted to "property used for the provision" of air navigation facilities. The focus on "property used for the provision" creates unnecessary complications and sits uncomfortably with the updated definition of air navigation facilities as defined in the Beijing Convention. For example, it is important to ensure that acts which involve an interference with a signal, but which do not necessarily involve a direct interference with the apparatus or equipment (the property) which broadcasts the signal, are covered by the offence. For that reason, we recommend that the interference aspect of the offence is constituted, more straightforwardly, as one of interfering with the operation of air navigation facilities. [63] Effecting this change may simply be a case of removing the words "property used for the provision" in respect of the interference aspect of the offence. However, the drafting of any amendment is a matter for Parliamentary Counsel and consideration would have to be given as to how this change would affect the separate destroying and damaging aspects of the offence, as well as how it would affect the definition in section 3(2).

13.92 The key point is to ensure that any unlawful and intentional interference with the operation of a UTM system constitutes an offence under section 3(1), including circumstances in which the interference is with signals, data, information or other systems necessary for the navigation of UAS using UTM services. [64]

Recommendation 34.

13.93 We recommend that section 3(1) of the Aviation Security Act 1982 should be amended to clarify that any unlawful and intentional interference with the operation of air navigation facilities constitutes an offence under this section, including circumstances in which the interference is with signals, data, information or other systems necessary for the navigation of aircraft.

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61 The Beijing Convention is intended to prevail over the Montreal Convention 1971 for those states that have expressed their consent to be bound by it. Beijing Convention 2010, art 24.

62 Beijing Convention 2010, art 2(c).

63 This would reflect the position in international law. See Montreal Convention 1971, art 1(d) and Beijing Convention 2010, art 1(d).

64 This is not to say that the update to the offence should be restricted to the use-case of UTM. See the discussion below.

Section 3(3): communication of false, misleading or deceptive information

13.94 As with the section 3(1) offence, the purpose of the provision is to prevent the endangerment of an aircraft in flight. In this context, we do not see any reason why the "communication of information" does not include communication by technological means, nor why it would be inapplicable to UTM services. We are of the view, therefore, that section 3(3) covers a situation in which a person has intentionally communicated any false, misleading or deceptive material to an aircraft via a UTM service.

13.95 As an example, consultees mentioned the falsification of flight data in the context of UTM, which involves the communication of false information (the processing or sharing of false flight data) that is likely to endanger aircraft (the UAS using the UTM service).[65] Similarly, spoofing involves broadcasting counterfeit satellite signals to deceive global navigation satellite system ("GNSS") receivers, causing incorrect position, navigation, and timing data.[66] On the face of it, this involves the communication of misleading or deceptive information that is likely to endanger the safety of aircraft in flight.

13.96 We also consider that the defences to section 3(3) are worded in broad enough terms to be applied to scenarios involving UTM service provision. This would mean that the defendant would have a defence where they reasonably believed the information they sent to a UAS was true, or they were an employee and communicated the information in good faith as part of their duties. The availability of the defences addresses the concern raised by Drone Alliance Europe in their consultation response about avoiding the unintended criminalisation of responsible operators operating in good faith.

13.97 Although we consider that section 3(3) applies in principle to UTM services, there may be a potential difficulty where the communication of information comes from an autonomous or highly automated system rather than from a person. Consultees did not provide us with specific examples of this, and it is not helpful to speculate in the abstract. However, in order to future-proof the provision, we recommend clarifying section 3(3) to ensure that it covers circumstances in which a person has intentionally deployed an autonomous or highly automated system with the purpose of communicating or transmitting false, misleading or deceptive information (where the communication of the information endangers the safety of an aircraft in flight or is likely to do so). This should be the case even if the person cannot be said to have formulated or devised the exact content of the false, misleading or deceptive information themselves; the touchstone is whether they intended to deploy an autonomous or highly automated system with this purpose in mind.

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65 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 480, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

66 EASA, *Global Navigation Satellite System (GNSS) Outages and Alterations*, https://www.easa.europa.eu/en/domains/air-operations/global-navigation-satellite-system-outages-and-alterations.

Recommendation 35.

13.98 We recommend clarifying section 3(3) of the Aviation Security Act 1982 to ensure that it covers circumstances in which a person has intentionally deployed an autonomous or highly automated system with the purpose of communicating or transmitting false, misleading or deceptive information, where the communication of the information endangers the safety of an aircraft in flight or is likely to do so.

Other issues with aviation security offences

13.99 The security offences discussed so far have addressed specific issues we identified in our consultation papers, namely relating to hijacking and UTM services. Additionally, we asked consultees for more general views on whether any other security offences need to be updated to account for increased autonomy in aviation.[67]

Consultation analysis

13.100 Consultees had already raised the issue of 'manipulation' in the context of hijacking and in the context of UTM services. However, the issue of 'manipulation' was also raised as a more general issue.

13.101 NATS suggested that "the 'manipulation' of an aircraft, not necessarily with the intent of seizing could be considered an offence separate from hijacking".[68]

13.102 Altitude Angel similarly stated:

> manipulation or other terms could be introduced. Ie the spoofing or blocking of satellite navigation signals with the intent to interrupt aircraft dependent on this would not directly fall under hijacking — but the malicious intent is clear.[69]

13.103 The LMA made the point that:

> [the aviation security] offences must include any unlawful interference with the aircraft's communications, monitoring, and control systems, including the RCC. At the same time, it might be worth considering offences related to manipulating the decision-making process of autonomous aircraft.[70]

13.104 Some of the consultation responses related to cyber-security. The US Federal Aviation Authority ("FAA"), for example, expressed their view that there should be

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67 Aviation Autonomy (2024) Law Commission Consultation Paper 261, CQ 61.

68 NATS response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 346, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

69 Altitude Angel response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 10, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

70 Lloyds Market Association response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 339, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

consideration of "cybersecurity aspects…such as data theft, GPS/GNSS spoofing, and jamming". Similarly, York Gliding Centre said there should be consideration of

> the impact of malware on the potential to allow autonomous air vehicles to be used by malevolent powers as weapons to attack ground targets without the owners' or manufacturer's knowledge.[71]

13.105 Chris Daniels of Flare Bright and the RAeS raised a point about enforcement of the offences against remote actors. Chris Daniels said

> Any takeover or diversion of an autonomous aircraft (by spoofing, jamming etc) is likely to be hard to trace to those doing it. A criminal gang or state actor is likely to ensure their actions are undiscoverable. There is therefore a likely crime of permitting illegal interactions with any UAS or VTOL, which would cover IT system operators and telecom providers as well as ATM operators – this will force them to put in place security and counter-measures to try and prevent this occurrence, which currently will be easy (as evidenced by military operations achieving this currently).[72]

13.106 The British Hang Gliding and Paragliding Association suggested considering whether damage against new types of aircraft would be covered.

> there is the possibility of additional physical damage to a small pilotless eVTOL that isn't designed to cause hijack but is something unlikely to impair the flight controls of a larger aircraft. What might need to be considered is whether there is something about what is defined as an aircraft and the offences involved.[73]

13.107 The CAA were of the view that the offences were fine for the present time.

> There is the Computer Misuse Act [1990] and Aviation Security Act 1982. A drone is considered an aircraft and much legislation covers it adequately.[74]

13.108 Skybound Rescuer made several suggestions:

> Consideration should be made to make disruption of optics and sensors a criminal offence, much in the way shining a laser at an aircraft is an offence.
>
> An offence could also be created for distracting/disrupting a remote pilot.
>
> Legislation mirroring that of 'vehicle interference' (section 9, Criminal Attempts Act 1981), could also be created, making it an offence to interfere with the UA or anything carried in or on it. This would serve to protect any cargo the UA could be

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71 York Gliding Centre response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 596, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

72 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

73 British Hang Gliding and Paragliding Association response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 91, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

74 CAA response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 114, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

carrying as well as parts. Other offences mirroring those which apply to motor vehicles could also be created, such as TWOC (Taking Without Owners Consent — S12(1) Theft Act 1968), preventing the taking of a UA, without the owner's consent, for his or another's use, or allowing themself to be carried in or on it, this covers circumstances whereby someone has assumed control of a UA, piloting it or allowing themselves to be a passenger, without the consent of the owner, but without the intent to 'permanently deprive' them of the UA as set-out in the legal definition of Theft (S1(1) Theft Act 1968). Currently TWOC covers 'conveyances' which includes conventional aircraft, the definition of 'conveyance' could perhaps be expanded to include UA to prevent any legal challenge.[75]

13.109 Finally, the National Police Chief's Council stated that:

> it may be prudent to explore the offences relating to prohibited behaviour in the ANO. In particular, sections 240 & 241. These offences may need to be reviewed for appropriateness in relation to direct physical attacks on drones. There is a potential risk as the number of drones increases and aggressors decide to take decisive action against them (and they may be seen as flying at heights which invite unwanted intervention). It may be appropriate to add 'wilful' to "recklessly or negligently.[76]

Discussion

13.110 One of the main issues raised by consultees was whether various acts of 'manipulation' are adequately covered by the existing offences. We have already set out our view that the offence of hijacking should not be amended to include manipulation because that offence is directed more at the usurpation of control than any type of manipulation through misinformation or exploitation. In our view, the various acts of manipulation put to us by consultees are best analysed in terms of sections 3(1) and 3(3) of the 1982 Act.

13.111 We have already explained our reasons for recommending that sections 3(1) and 3(3) are reformed to account for future threats against UTM services. We are also of the view that this analysis applies to the security of aircraft more broadly, essentially for the same reasons as outlined above. Thus, the different forms of manipulations referred to by stakeholders are in principle capable of constituting an offence under sections 3(1) or 3(3), provided that the provision is reformed in line with our recommendations above.[77]

13.112 It is also the case that some of the conduct in question would be likely to constitute an offence under the Computer Misuse Act 1990. Section 1 of the Act creates an offence of unauthorised access to computer material. Section 2 creates an offence of unauthorised access with intent to commit or facilitate commission of further offences.

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75 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

76 NPCC response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 375, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

77 This is our view in principle. Clearly, it is not possible to assess every possible act of manipulation against an aircraft in the abstract.

Section 3 creates an offence in relation to unauthorised acts with intent to impair, or with recklessness as to impairing, the operation of a computer.[78]

13.113 Of particular relevance is section 3ZA, which creates an offence in relation to unauthorised acts causing, or creating risk of, serious damage. It provides that a person is guilty of an offence if

(a) the person does any unauthorised act in relation to a computer;

(b) at the time of doing the act the person knows that it is unauthorised;

(c) the act causes, or creates a significant risk of, serious damage of a material kind; and

(d) the person intends by doing the act to cause serious damage of a material kind or is reckless as to whether such damage is caused.

13.114 Damage is of a "material kind" if it is: damage to human welfare in any place; damage to the environment of any place; damage to the economy of any country; or damage to the national security of any country.[79]

13.115 Notably, it is specified that an act causes damage to human welfare only in certain circumstances. These are: loss to human life, human illness or injury, disruption of a supply of money, food, water, energy or fuel; disruption of a system of communication; disruption of facilities for transport; and disruption of services relating to health. Many of these circumstances are potentially applicable to the various acts against the safety of aircraft put to us by consultees above.

13.116 The Computer Misuse Act 1990 does not define "computer".[80] Nonetheless, in our view, the various acts of manipulation described by consultees constitute acts relating to a computer or computer material for the purpose of the Act. In the context of admissibility of evidence, Lord Hoffmann described a computer as "a device for storing, processing and retrieving information, for example signals down a telephone line, strokes on a keyboard or a device for chemical analysis of gas".[81] Recently, in the context of artificial intelligence, the Supreme Court has held that artificial neural networks are computer programs for the purposes of section 1(2) of the Patents Act 1977.[82] Following similar logic, it is therefore very likely that the offences in the Computer Misuse Act would apply to manipulation or interference with the decision-

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78 There is also an offence of making, supplying or obtaining articles for use in offences under section 1, 3 or 3ZA (Computer Misuse Act 1990, s 3A).

79 Computer Misuse Act 1990, section 3ZA(2)

80 The Crown Prosecution Service's Prosecution Guidance gives as a reason that "rapid changes in technology would mean any definition would soon become out of date". See Crown Prosecution Service, *Computer Misuse Act,* https://www.cps.gov.uk/prosecution-guidance/computer-misuse-act.

81 *DPP v McKeown*, *DPP v Jones* [1997] 1 WLR 295 at p 302.

82 *Emotional Perception AI Limited v Comptroller General of Patents, Designs and Trade Marks* [2026] UKSC 3.

making process of an autonomous UAS or otherwise to interference with any systems that involve the processing of information or data.[83]

13.117 In our view, therefore, even if the various acts of manipulation raised by consultees are not caught by section 3 of the Aviation Security Act 1982, the Computer Misuse Act 1990 is likely to apply. Moreover, the penalty for contravening section 3ZA is adequate to reflect the seriousness of offences committed against the safety of aircraft.[84] Indeed, an increase in the maximum penalty was one of the reasons that section 3ZA was introduced.[85]

13.118 To the extent that consultees referred to spoofing and different acts of manipulation as "cyber-security matters", the same analysis would apply.[86] Beyond these observations, however, we are restricted by our terms of reference and cannot consider cybersecurity matters directly. For example, the point raised about enforcement against remote actors and the possibility of making it an offence for telecommunications companies falls outside our terms of reference.

13.119 Finally, in relation to the point made by the British Hang Gliding and Paragliding Association, we have made clear our view elsewhere in the paper that the new use cases under consideration are 'aircraft' for the purposes of the relevant legislation. This means that the existing offences apply to these aircraft, irrespective of their size vis a vis larger traditional aircraft.

THE AIR TRAFFIC MANAGEMENT AND UNMANNED AIRCRAFT ACT 2021

13.120 In our first consultation paper, we discussed the Air Traffic Management and Unmanned Aircraft Act 2021 ("ATMUAA 2021"), which addresses certain aspects of airspace management, air traffic licensing and the unlawful use of unmanned aircraft.

13.121 The part of the Act addressing unmanned aircraft was, in part, enacted as a legislative response to certain incidents of drone misuse, including the use of drones to drop supplies in prisons and a high profile incident in which Gatwick airport had to be temporarily closed.[87] In our first consultation paper, we asked for consultee views

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83 It is also worth noting article 1(a) of the Council of Europe's Convention on Cybercrime 2001 (Budapest) (ETS No 185), which describes a computer as "any device or a group of interconnected or related devices, one or more of which, pursuant to a program, performs automatic processing of data".

84 A person guilty of an offence under section 3ZA is liable, on conviction on indictment, to imprisonment for a term not exceeding 14 years, or to a fine, or both – unless subsection (7) applies. Subsection (7) provides that where the offence is committed as a result of an act causing or creating a significant risk of serious damage to human welfare (in the sense of loss of human life or human illness or injury) or serious damage to national security, a person guilty of the offence is liable, on conviction on indictment, to imprisonment for life, or to a fine, or both.

85 See the Explanatory Notes to section 41 of the Serious Crime Act 2015.

86 For completeness, we also note the Wireless Telegraphy Act 2006. Section 68 makes it an offence for a person, without authority, to use apparatus for the purpose of deliberately interfering with wireless telegraphy. The offence is punishable by up to two years' imprisonment and an unlimited fine.

87 See Home Office, *Counter-Unmanned Aircraft Strategy,* October 2019, https://www.gov.uk/government/publications/uk-counter-unmanned-aircraft-strategy/table and also D Hirst and J Brown, *Air Traffic Management and Unmanned Aircraft Bill (HL)* (Briefing Paper 8851, House of Commons Library) (March 2021).

on whether the Act was operating satisfactorily in the case of highly automated and autonomous flight.

Overview of the Act

13.122 The long title of the Act states that one of its purposes is:

> To confer police powers relating to unmanned aircraft and requirements in Air Navigation Orders and to provide for fixed penalties for certain offences relating to unmanned aircraft.

13.123 An "unmanned aircraft" is defined in the Act as any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board.[88] Schedule 8 to the Act sets out the powers it confers on police officers and prison authorities. Some examples of these powers are:

(1) the power to require an aircraft to be grounded

(2) the power to stop and search persons or vehicles; and

(3) the power to enter and search premises under warrant in relation to certain offences involving an unmanned aircraft.

13.124 Schedule 9 to the Act makes provisions regarding the powers of police officers relating to requirements in the ANO 2016. Police officers may, for example, ask a remote pilot to provide evidence of their competency to pilot an unmanned aircraft.

13.125 Schedule 10 to the Act allows police to issue fixed penalty notices for certain prescribed offences relating to unmanned aircraft. It also inserts a new article 265G into the ANO 2016 which makes the ANO 2016 offences subject to Schedule 10's fixed penalty regime if they are prescribed under paragraph 2(2) of Schedule 10. No offences have yet been prescribed.

Consultation analysis

13.126 In our first consultation paper, we asked consultees how the Act was working.

13.127 Many of the responses discussed the practicalities of how the offences in the Act are enforced and prosecuted. The ADS Group's response, for example, raised the question of who is responsible for prosecution:

> Consideration should be given to the practical issue of who prosecutes violations under the Acts. There is a question as to whether the National Police Air Service deem it a police matter to deal with drone incursions in restricted airspace – or rather within the CAA's remit. However, while the CAA may have limited resource to handle this, their role should not be diminished.[89]

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88 The Air Traffic Management and Unmanned Aircraft Act 2021, section 18.

89 ADS Group response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 1, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

13.128 The RAeS also raised the practicalities of prosecution:

> Consideration needs to be given to the practicalities of communication between police officers/prison authorities and Highly Automated and Autonomous aircraft…Provision should be made to clarify what agency / agencies are responsible for prosecutions involving the misuse of drones.[90]

13.129 Chris Daniels of Flare Bright made a similar point.

> As mentioned previously, there is a practical issue of who prosecutes these issues. I've heard NPAS (the National Police Air Service) state it wasn't a police matter to deal with drone incursions in restricted airspace — it was the CAA's issue. But the CAA has limited resource to deal with this.[91]

13.130 Chris Daniels also mentioned potential legal gaps in relation to unlawful drone activity around prisons:

> I suspect that as drones are used for a range of criminal activity, specific legislation will be needed to deal with this. The Prison exclusion zone is a broad brush way of dealing with previously legally permitted drone issues (flying mobile phones into a prison) and it is likely that there are many legal loopholes that will get exploited by criminal gangs, and others in the future.[92]

13.131 Skybound Rescuer drew attention to the potential difficulties police may have in identifying a pilot when they are operating beyond the visual line of sight ("BVLOS"):

> Whilst the Police can find operator details by looking-up the operator ID on a UA, it may be more difficult to identify the Pilot in extended BVLOS circumstances, where the pilot could be anywhere in the country or the world. Some operators may be uncooperative or intentionally hinder investigation into a pilot. Currently under the Air Navigation Order 2016, operators must keep detailed flight logs with details of pilots that must be available to authorities on demand. To streamline this process, perhaps powers similar to section 172 of the Road Traffic Act could be added to the Air Traffic Management and Unmanned Aircraft Act 2021, requiring the Operator, on receipt of a letter from Police, to furnish them with details of the Pilot at the requested time/date, within 28 days or face a monetary fine and referral to the CAA for breach of their obligations under the ANO.[93]

13.132 They also suggested including the use of a power to search an uncrewed aircraft:

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90 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 419, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

91 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

92 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

93 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

> The act includes Police powers to stop and search individuals suspected of committing drone-related offences. As we begin to see wider use of cargo and passenger carrying UA, coupled with increased automation, it would be wise to also add powers to search UA, especially as there may not always be an individual operating the craft. This could also include search/seizure powers at UA heliports.

13.133 An anonymous consultee made a general point about the powers given to police.

> We have insufficient experience of the 'stop and search' type and [fixed penalty notice] provisions under the 2021 Act to comment meaningfully…What is of interest to me is, first, the way that the 2021 Act amends the Police Act 1997 to put various UAS offences on a par with serious crimes to enable senior police officers to authorise action to prevent the use of drones for malicious purposes. I am unaware of how frequently it has been used, and no doubt there will many situations for which these powers will be valuable to prevent potentially serious events.[94]

13.134 The same consultee also raised an issue about counter-UAS measures to disrupt drones being used illegally.

> The 2021 Act was a missed opportunity to put a path to effective counter-UAS measures in place. There are multiple landowners and businesses who wish to prevent inappropriate use of UAS harming their interests, and, now, many sources of detector and effector capability for that purpose. Previous Government indications were that a regime would be introduced to regulate and license the use of such equipment but, at least so far as effector equipment is concerned, this remains the province of law enforcement agencies even though it remains unclear how far they actually want that responsibility in relation to private interests.

13.135 The Light Aircraft Association were doubtful that the technology is available/common enough to facilitate the proper functioning of the Act.[95]

13.136 ARPAS-UK, meanwhile, suggested that it is not clear how the powers in the Act relate to autonomous aircraft, given that the aircraft is not under the control of the pilot and therefore “cannot be grounded or brought under direct control”.[96]

Discussion and recommendation

Responsibility for enforcement and prosecution

13.137 One theme that emerged from the responses was a lack of clarity about who has responsibility for enforcing and prosecuting offences under the Act. It was not clear to consultees what the process was for this, including the interaction between the different bodies and agencies involved.

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94 Anonymous 4 response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 663, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

95 Light Aircraft Association response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 320, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

96 ARPAS-UK response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 36, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

13.138 Practical matters relating to the enforcement and prosecution of drone misuse offences fall outside of our remit. However, we note that the National Police Chiefs' Council, the CAA, the Home Office and the Department for Transport ("DfT") signed a memorandum of understanding in 2014, which was updated in 2016.[97] Its purpose was to "clearly identify the roles and responsibilities of each participant" as they relate to:

(1) The investigation and prosecution of drone offences set out in the Air Navigation Order 2009

(2) Information sharing for the purpose of developing Government strategy and legislation in respect of drones

(3) Engagement with the media in respect of drones

(4) Educating the public in respect of drone use and misuse.

13.139 In particular, the MoU was intended to

(1) Clarify the investigation and prosecution responsibilities between the parties

(2) Establish shared communication lines

(3) Outline the scope of information sharing between parties

(4) Establish agreement to develop a joint Education package

(5) Enhance co-ordination of media engagement.

13.140 We have been informed by the CAA that this memorandum of understanding is no longer in force.

13.141 It is a matter for the relevant departments, bodies and agencies to define their respective roles and responsibilities. We limit ourselves to saying that, if a new memorandum of understanding were to be adopted, it would make sense to consider the changes that have occurred since 2016, in particular: the increased powers given to the police under the 2021 Act; the advances in drone technology and in other forms of uncrewed aircraft; and the need to consider autonomous aircraft.

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97 Memorandum of Understanding between National Police Chief's Council and Civil Aviation Authority and Home Office and Department for Transport (2014), available at: https://data.parliament.uk/DepositedPapers/Files/DEP2016-0743/160915_MOU_between_DfT_CAA_HO_Police.pdf

Recommendation 36.

13.142 We recommend that the relevant departments, bodies and agencies involved in the enforcement of drone misuse offences consider adopting a new memorandum of understanding on this issue or otherwise place their existing or future arrangements for co-operation on a formal footing.

Misuse of drones around prisons

13.143 We acknowledge the point made to us about unlawful drone activity around prisons. The extent of the problem has been made clear by recent media reports[98] and we are aware of data published in July 2025 about the high number of drone incidents at prisons.[99]

13.144 We note that there are already several offences relating to the unlawful use of unmanned aircraft in the context of prisons. One of the functions of the 2021 Act was to give the police powers in relation to these offences.[100] Although Chris Daniels of Flare Bright intimated that there may be a need for further legislation, it has not otherwise been suggested to us that the police lack relevant powers or that there are any specific legal gaps.[101] Rather, the issue seems to be at the operational level. This has been acknowledged by the Ministry of Justice.[102]

13.145 In the absence of responses to the contrary, we do not consider that the offences relating to the misuse of drones around prisons or the related powers in the ATMUAA 2021 are inadequate. To the extent that there is an issue in relation to enforcement of these offences, this is an operational matter and not an issue of law reform. We refer to our recommendation above about placing co-operation between the different departments, bodies and agencies on a formal footing.

Remote ID

13.146 Skybound Rescuer pointed out that the police may find it difficult to identify a pilot when they are operating a UAS beyond visual line of sight.[103] We note that the ability of authorities and the public to identify operators has recently been considered by the CAA.

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98 Mollie Malone, *Drones getting into prisons like 'pack of wasps'* (2025) https://news.sky.com/story/drones-getting-into-prisons-like-pack-of-wasps-as-footage-shows-why-drug-drops-are-so-hard-to-stop-13450520.

99 Ministry of Justice, *Counter-drone efforts rise as prison sightings revealed* (31 July 2025) https://www.gov.uk/government/news/counter-drone-efforts-rise-as-prison-sightings-revealed.

100 See ATMUAA 2021, sch 8, paras 5(c) and 8. The Act also made changes to section 93 of the Police Act 1997 (see ATMUAA 2021, sch 8 para 11).

101 Chris Daniels response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 167, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

102 Ministry of Justice, *Counter-drone efforts rise as prison sightings revealed* (31 July 2025) https://www.gov.uk/government/news/counter-drone-efforts-rise-as-prison-sightings-revealed.

103 Skybound Rescuer response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 478, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

13.147 The CAA has announced that, as of 1 January 2026, Mandatory Direct Remote ID is a product and operational requirement for any new drone.[104] The effect of this requirement is that

> any UK class marked aircraft UK1, UK2, UK3, UK5 and UK6 UAS (equivalent to C1, C2, C3, C5 and C in the EU), placed on to the market after this date must have Remote ID capabilities built in by the manufacturer and it must be used by the operator of the drone.[105]

13.148 These changes were already foreshadowed in the regulatory regime,[106] but the CAA considered it necessary to consult before the requirement was implemented in practice.[107]

13.149 The idea is that the remote ID system will periodically automatically transmit:

(1) the UAS operator registration number;

(2) the unique serial number of the UA;

(3) a time stamp;

(4) the geographical position of the UA and its height above the surface or take-off point;

(5) the route course of the UA;

(6) the geographical position of the remote pilot; and

(7) an indication of the emergency status of the UAS.[108]

13.150 Our view is that these requirements should be given time before their efficacy can be assessed.

NEW OFFENCES RELATING TO UTM SERVICES

13.151 In chapter 9, we recommend that legislative change should be introduced to accommodate UTM services. We conclude this chapter by discussing whether this recommendation brings with it any attendant issues of criminal liability.

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104 Legacy UAS have a transitional period of two years to add remote ID functionality to their aircraft. It is possible to be granted an exemption under a specific category operational authorisation. See Unmanned Aircraft (Amendment) Regulations 2025 SI No 1106.

105 CAA, *Remote ID in the UK* (CAP 3172) (September 2025) p 2.

106 UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, annex, part 2(12), part 3(14), part 4(9). UK Regulation (EU) 2019/945 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, art 40(5).

107 CAA, *Review of UK Unmanned Aircraft Systems (UAS) Regulations* (November 2023) (CAP 2610) pp 22 to 26.

108 CAA, *Remote ID in the UK* (CAP 3172) (September 2025) p 3.

13.152 It is not necessary to list all of the offences that might be applicable to UTM services; the key point is that, should any legislative changes be introduced, appropriate provisions must be made to ensure equivalence in respect of criminal offences. In our second consultation paper, we identified three pieces of legislation that we considered to be particularly relevant: the ANO 2016, the Aviation Security Act 1982 and the Air Navigation (Single European Sky) Penalties Order 2009. On this basis, we asked three questions. The first related to the existing offence of using air traffic services ("ATS") equipment without approval.[109] The second was about the aviation security offences relating to air navigation.[110] The third related to the Penalties Order.[111]

13.153 We have discussed the aviation security offences above. The other two questions – relating to UTM equipment and the Penalties Order – are dealt with below.

New offence for UTM equipment

13.154 The ANO 2016 contains a provision on air traffic services equipment, which we identified in our second consultation paper as being relevant to the provision of UTM services.

13.155 Article 205 requires equipment used for air traffic services to be approved by the CAA.

> A person must not cause or permit any air traffic service equipment to be established or used in the United Kingdom otherwise than under and in accordance with an approval granted by the CAA to the person in charge of the equipment.

13.156 Schedule 1 to the ANO 2016 defines air traffic service equipment as

> Any ground based equipment, including an aeronautical radio station, used or intended to be used in connection with the provision of a service to an aircraft in flight or on the ground which equipment is not otherwise approved by or under this Order but excluding –
>
> (a) any public electronic communications network; and
>
> (b) any equipment concerning which the CAA has made a direction that it is not air traffic service equipment for the purposes of articles 205 and 206.

13.157 Breach of article 205 is a criminal offence.[112]

13.158 Our recommendation in chapter 9 to introduce legislative change to deal with UTM would mean that article 205 could no longer be applied to UTM. This would be the case even though some UTM services will provide functions similar to conventional

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109 Aviation autonomy: Consultation paper 2 on uncrewed aircraft systems traffic management (2025) Law Commission Consultation Paper 271, CQ 7.

110 Aviation autonomy: Consultation paper 2 on uncrewed aircraft systems traffic management (2025) Law Commission Consultation Paper 271, CQ 8.

111 Aviation autonomy: Consultation paper 2 on uncrewed aircraft systems traffic management (2025) Law Commission Consultation Paper 271, CQ 9.

112 We explain how criminal liability under the ANO 2016 works in the first section of this chapter.

ATS, such as separation between aircraft or the provision of aeronautical information which facilitates safe operations.

13.159 Given these similarities, we have recommended in chapter 9 that a UTM-equivalent of article 205 is introduced. In other words, it is our view that the equipment used to provide UTM services should be subject to CAA approval. We have also said that the requirements for approval should be risk-based and proportionate to the type of service on offer and the safety risk involved.

13.160 In our second consultation paper, we provisionally proposed that this should be an offence.

Consultation analysis

13.161 Consultees that responded directly to the question all agreed that it should be an offence for any person to use or permit the use of equipment to provide a UTM service if the equipment has not been approved by the CAA. However, the need for the criminal sanction to be proportionate was repeatedly emphasised.

13.162 For example, the RAeS suggested that the offence be

> risk-based and proportionate, with differentiated requirements for tactical vs. strategic services, or for services operating only in segregated airspace;[113]

13.163 They also said that it should be

> accompanied by clear guidance on the approval process, including the certification of software components, updates, and AI-based decision logic; and supported by transitional arrangements, allowing emerging providers to innovate and test technologies within sandboxed or limited deployment frameworks prior to full approval.

13.164 An anonymous consultee said that:

> in principle, ultimately a criminal sanction is likely to need to be the ultimate deterrent, but, across the range of UTM services and the applications to which they are put, it may be that imposing a criminal penalty would be excessive.[114]

13.165 Drone Alliance Europe expressed their view that there should be "proportionate enforcement":

> It is important to distinguish between deliberate non-compliance and cases of negligence or accidental misuse that do not compromise the performance, quality, or security of the UTM service. While punitive action may be proportionate to intentional violations, unintentional or minor infractions should be considered for

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113 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

114 Anonymous 2 Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 118, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

alternative responses rather than criminalisation to ensure that penalties remain proportionate to the severity of the behaviour.[115]

13.166 They also said that there should be "liability protection and due diligence":

> A due-diligence defence mechanism should be established for operators who maintain records demonstrating they verified their provider's approval status. Operators should be protected from liability for the actions of third-party UTM service providers when they have conducted appropriate due diligence.

13.167 National Highways also stressed that "suitable penalties" will need to be developed.[116]

Discussion and recommendation

13.168 As explained above, if legislative change is made to accommodate UTM services, article 205 would no longer apply to these services. In chapter 9, we have therefore recommended that a UTM-equivalent to article 205 is introduced so that equipment used for UTM services must be approved by the CAA.

13.169 Consultees agreed that it was necessary to create an accompanying UTM-specific offence. Our view is that, in order to ensure there are no gaps in criminal liability, it should be an offence for any person to use or permit the use of equipment to provide a UTM service if the equipment has not been approved by the CAA.

13.170 We agree with consultees that a range of penalties should be available. This would allow for a proportionate response depending on the seriousness of the breach of the underlying requirement. It also aligns with our recommendation in chapter 9 that the UTM-equivalent to article 205 should place requirements on different services proportionate to their importance and safety function.

Recommendation 37.

13.171 We recommend that it should be an offence for any person to use or permit the use of equipment to provide a UTM service if the equipment has not been approved by the CAA.

Penalties Order

13.172 In our second consultation paper, we asked about the Air Navigation (Single European Sky) (Penalties) Order 2009 (the "Penalties Order").

13.173 The Penalties Order was originally introduced to create sanctions in domestic law for infringements of EU regulations associated with the Single European Sky initiative

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115 Drone Alliance Europe Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 20, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

116 National Highways, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p58, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

("SES"). The Single European Sky initiative is a regulatory effort to harmonise air traffic management and air navigation services ("ATM/ANS") provision and airspace management across the EU.[117] When the UK was a member of the EU, it was required to ensure compliance, in part, by laying down sanctions for infringements of Single European Sky regulations and implementing rules made under those regulations.

13.174 The Order was seen as necessary because whilst the certification regime for ATM/ANS providers allows for the CAA (as the certifying authority) to revoke a provider's certification, revocation of a certificate is a major action and one of last resort. The CAA is generally required to ensure a continuity of services and so minor offences are generally not sufficient to trigger the revocation of a certificate. For this reason, it was concluded that the UK needed to introduce more graduated sanctions that could be applied to minor offences related to the Single European Sky regulations.[118]

13.175 The Single European Sky regulations have since been assimilated into domestic law, meaning that the Penalties Order continues to be a key measure governing criminal liability in the ATM/ANS sector.[119]

13.176 The Order creates offences for breaches of obligations in the following regulations:[120] UK Regulation (EC) 550/2004 (the "Service Provision Regulation");[121] the interoperability implementing rules;[122] and UK Regulation (EU) 255/2010 (the "Air Traffic Flow Management Regulation").[123]

13.177 Some key provisions in the Order are:[124]

(1) a person must not provide any air navigation services without the certification required for the provision of such services by article 7.1 of the Service Provision Regulation;

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117 See Single European Sky (recast) Regulation (EU) No 2024/2803 Official Journal L of 11.11.2024.

118 See The Air Navigation (Single European Sky) (Penalties) Order 2009 SI No 1735, explanatory memorandum paras 7.1 to 8.4.

119 We note that the Penalties Order has not been updated since 2013 to reflect updates to regulation or the exit of the UK from the EU.

120 The Penalties Order also creates offences for Regulation (EU) 1035/2011 (the "Common Requirements Regulation") and Regulation (EC) 552/2004 (the "Interoperability Regulation"). These have since been repealed which means the offences created by the Order for these regulations are defunct.

121 UK Regulation (EC) 550/2004 on the provision of air navigation services in the single European sky.

122 UK Regulation (EU) 1032/2006 ("Flight Data Regulation"), UK Regulation (EU) 1033/2006 ("Flight Plan Regulation"), UK Regulation (EU) 633/2007 ("Flight Message Transfer Regulation"), UK Regulation (EU) 262/2009 ("Mode S Interrogator Regulation"), UK Regulation (EU) 29/2009 ("Data Link Services Regulation"), UK Regulation (EU) 1206/2011 ("Aircraft Identification Regulation"), UK Regulation (EU) 1207/2011 ("Surveillance Performance and Interoperability Regulation"), UK Regulation (EU) 1079/2012 ("Voice Channel Spacing Regulation").

123 UK Regulation (EU) 255/2010 laying down common rules on air traffic flow management.

124 SI 2009 No 1735, arts 3 to 6 and 9(1)(a) and (b)

(2) where the CAA designates an air traffic service provider to provide air traffic services on an exclusive basis within a specific airspace block under article 8.1 of the Service Provision Regulation –

(a) it must ensure that the terms of that designation are notified, and

(b) no other air traffic services provider may provide air traffic services within that airspace.

(3) air navigation service providers must not avail themselves of the services of other air navigation service providers that have not been certified under article 7.1 of the Service Provision Regulation;

(4) a person must not provide any meteorological services in airspace for which a provider of meteorological services has been notified as having been designated on an exclusive basis under article 9.1 of the Service Provision Regulation, unless he is the designated provider; and

(5) a person must not, with intent to deceive –

(a) use any certificate or any designation issued or required by or under article 7, 8 or 9 of the Service Provision Regulation which has been forged, altered, revoked or suspended, or to which he is not entitled;

(b) lend any certificate or any designation issued, having effect or required by or under article 7, 8 or 9 of the Service Provision Regulation to, or allow it to be used by, any other person.

13.178 There are also other offences related to false declarations of compliance and failing to facilitate compliance monitoring by the CAA.[125]

13.179 Article 11 of the Penalties Order establishes criminal liability for parties who act contrary to obligations imposed by relevant assimilated ATM/ANS legislation. For example, offences related to the Service Provision Regulation apply to air navigation service providers, including air traffic service providers and meteorological service providers.[126] The offences related to the Air Traffic Flow Management Regulation apply to ATS units, aircraft operators, airport managing bodies and local air traffic flow management units.[127]

13.180 Most offences in the Penalties Order are subject to article 12 which provides:

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[125] SI 2009 No 1735, art 9(1)(c) to (e). Article 8(3) of the Order (compliance monitoring) requires ANSPs to "facilitate inspections and surveys" by authorised persons. It requires that ANSPs: (1) produce relevant documents and data; (2) make available facilities and equipment; and (3) provide oral explanations on site when requested by an authorised person. Article 11(2) of the Order makes it an offence to fail to comply with any of these obligations.

[126] The relevant offences related to the Service Provision Regulation are art 11(1)(a) and (b), (2)(a) and (3) of the Order.

[127] The relevant offences related to the Air Traffic Flow Management Regulation are art 11(4)(aa) and 11(4A) of the Order.

It is a defence for the person charged to prove that the person took all reasonable steps and exercised all due diligence to ensure that the article in question was complied with.

13.181 There are three levels of sanctions for ATM/ANS offences under the Penalties Order. In order of decreasing severity, the range of penalties available in England and Wales is set out below.

(1) Offences in article 11(1) and (2): imprisonment not exceeding two years if convicted on indictment in the Crown Court, an unlimited fine on summary conviction in a magistrates' court. These offences include: providing air navigation services without certification; providing air traffic services within airspace which is designated to another air traffic services provider on an exclusive basis (contrary to notified terms); and using the services of other providers who have not been certified under article 7.1 of the Service provision Regulation.

(2) Offences in article 11(3): an unlimited fine on either summary conviction in a magistrates' court or conviction on indictment in the Crown Court. These offences include providing meteorological services in airspace for which another provider has been designated as the exclusive provider; and failing to comply with a designation to provide meteorological services on an exclusive basis.

(3) Offences in article 11(4) and (4A): a fine not exceeding £2500 on summary conviction in a magistrates' court. These offences include: those that occur when air traffic service providers fail to comply with obligations imposed when they are designated as the exclusive provider within an airspace; and failing to comply with various declarations required by SES regulation.

Applying the Penalties Order to UTM

13.182 The key principle behind the Penalties Order is that there should be more graduated sanctions related to air navigation services. The order allows for the punishment of minor infringements in a proportionate way, avoiding the CAA having to withdraw or suspend the provider's certification.

13.183 In our second consultation paper, we said that the same approach should apply to UTM services: as with the current provision of ATM/ANS, it will also be the case that the suspension or withdrawal of certification may be too heavy-handed a sanction in many instances of provider non-compliance.

13.184 If UTMSPs were certified as air navigation service providers ("ANSPs") under the current regulatory provisions, the Penalties Order would apply. However, as we discuss in chapter 9, new UTM regulation is required to cater for the unique nature of UTM.

13.185 As such, we provisionally proposed that if new UTM service provision regulation is introduced, it should be supported by the establishment of similar offences and penalties to provide graduated sanctions similar to those discussed above. We said that, amongst other things, a new Penalties Order might address infringements of the

requirement to be certified; facilitating compliance monitoring; and interactions with other service providers.

Consultation analysis

13.186 There was broad support for our provisional proposal. All consultees that responded substantively to the consultation question agreed that offences and penalties similar to those found in the Penalties Order should be adopted in relation to UTM services.

13.187 The RAeS stated that:

> This approach will help uphold safety, foster responsible innovation, and maintain public and stakeholder confidence in the UK's future airspace architecture—consistent with the principles laid out in Shaping the Future of Advanced Air Mobility Safety… [128]

13.188 They also said that "a penalties framework for UTM—aligned with that used for conventional ATM/ANS—will reinforce regulatory parity and foster trust in the evolving aviation ecosystem" and that "the Penalties Order provides a precedent for targeted, proportionate enforcement through civil sanctions". [129]

13.189 NATS agreed that "this approach ensures consistency and clarity in term[s] of the regulatory framework which will be applied". [130]

13.190 The CAA also pointed out that suspending or withdrawing the certification of a UTMSP is likely only to be relevant for the most severe breaches, and that there are a range of regulatory enforcement tools available.

> Whilst suspending or withdrawing the certification of a UTMSP may be appropriate for the most severe breaches of the regulations, whilst other regulatory tools are available to address other instances of non-compliance for ATM they should equally be available for UTM. These tools are rarely if ever used as the CAA has a wide range of regulatory enforcement tools available which address safety. [131]

13.191 Some consultees agreed with the proposal but cautioned that the Penalties Order would need to take account of technological developments. National Highways noted that "this will likely be a fast-developing technology and any offences and penalties must keep pace", while GATCO stressed that careful consideration should be given to

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128 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

129 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

130 NATS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 62, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

131 CAA response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 10, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

how the penalties deal with the concept of autonomy "where a human is not physically operating an autonomous air system".[132]

13.192 Some of those who responded went into further detail about the specifics of a future Penalties Order for UTM. NATS said that:

> Implementing penalties for unauthorised access to UTM systems, like those set out in Provision 7 of the Penalties Order, unauthorised access to protected computer systems, will help deter such activities and maintain the integrity of UTM services. This may also go some way in addressing [cybersecurity risks].[133]

13.193 Drone Alliance Europe recommended "implementing a proportionate penalty structure" in which:

> The highest sanctions (unlimited fines, potential imprisonment) are reserved only for conduct that genuinely threatens safety, such as operating an uncertified UTM in controlled airspace; and routine administrative non-compliance should attract lower, civil-level fines.[134]

They said that "this graduated approach would ensure penalties align with the actual safety risk posed by different types of violations."

13.194 RAeS, reflecting the views of their members, made the point that "UTM differs markedly from traditional ATM in terms of its digital infrastructure, automation and diversity of actors", and that "simply transposing the Penalties Order without modification risks regulatory misalignment or disproportionality".[135]

13.195 On this basis, they listed a number of considerations and ways in which the Penalties Order "should be carefully adapted and modernised to reflect the unique characteristics and operational environment of UTM". This included the idea of proportionality and tiered penalties.

> UTM providers will range from large integrated service platforms to smaller, function-specific actors. Penalties should be tiered based on risk, scope of operations, and compliance history, to ensure smaller or early-phase providers are not discouraged from entering the market.

13.196 RAeS also suggested new categories of offence specific to UTM service provision. These included

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132 GATCO response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 30, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

133 NATS response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 62, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

134 Drone Alliance Europe response, Law Commission, Aviation autonomy: Responses to the first consultation (2025) p 205, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-first-consultation/.

135 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

(1) Failure to conform to data exchange or interoperability standards;

(2) Providing unauthorised or counterfeit UTM functions;

(3) Breaches of cybersecurity protocols or failure to report cyber incidents;

(4) Misuse of distortion of CIS information.

13.197 Additionally, the RAeS suggested preventative enforcement tools:

> Consistent with the RAeS emphasis on predictive safety and safety culture, the penalty regime should also support preventative enforcement tools—such as improvement notices, corrective action plans, and structured regulatory engagement—prior to or in place of financial penalties in the first instance.

13.198 Finally, the RAeS mentioned considerations of transparency and due process:

> RAeS supports transparent, rules-based enforcement to support stakeholder trust. The penalty framework should include clear routes for appeal, redress, and regulatory guidance, particularly as UTM is an emergent and fast-evolving sector.

Discussion and recommendation

13.199 We remain of the view that offences and penalties similar to those found in the Penalties Order 2009 should be introduced to accompany any UTM service regulation. Consultation responses have solidified our view that suspension or withdrawal of certification may not always be an appropriate response to breach of the regulations. Providing for graduated sanctions is therefore the best way to achieve a proportionate response that replicates the purpose of the Penalties Order 2009 as it applies to ATM/ANS. We also note that the ability to penalise minor infringements without the interruption of services may be particularly beneficial if the development of the market means there are relatively few UTM service providers to provide continuity of service.

13.200 In terms of specifics, we suggested in our second consultation paper that a new Penalties Order might address: infringements of the requirement to be certified; facilitating compliance monitoring; and interactions with other service providers. Consultees also made some suggestions about the content of a Penalties Order for UTM. For example, it would seem sensible to consider the RAeS' suggested categories of offences.

13.201 However, although we agree that these are sensible suggestions, we do not consider it appropriate to make formal recommendations about the specific content of a future Penalties Order at this stage. We take note of the RAeS' warning that "simply transposing the Penalties Order without modification risks regulatory misalignment or disproportionality" and we are of the view that this should be a matter worked out by

the relevant bodies as and when the contours of UTM service provision become clearer.[136]

13.202 Finally, we note that the recommended changes could be achieved through new legislation or, alternatively, the Penalties Order could be updated to account for any new UTM regulation.

Recommendation 38.

13.203 We recommend that offences and penalties similar to those found in the Penalties Order 2009 should be introduced to accompany any UTM service regulation.

CONCLUSION

13.204 In this chapter we have discussed four main aspects of criminal liability in the aviation sector.

13.205 First, we recommended reform of article 265 of the Air Navigation Order 2016, which deems pilots and operators the primary parties with whom criminal liability rests. Although this approach is fundamentally sound, the provision is unnecessarily complicated and unclear in some key respects, particularly in relation to the defences. For this reason, we recommended that article 265 be reformed with a view to ensuring that it is clear, understandable and can be applied as appropriate to remotely piloted and autonomous operations.

13.206 Second, we made recommendations in respect of aviation security offences. These offences concern unlawful acts against an aircraft as well as associated services and facilities. We have recommended modernising the offence of hijacking in line with the Beijing Protocol, which the UK has signed but not ratified. This will ensure that the offence encompasses interference and seizure of the aircraft by technological means and by actors not on board the aircraft. We are also of the view that section 3 of the Aviation Security Act 1982 should be amended to address challenges arising from new technologies, particularly UTM services.

13.207 Third, we noted that the enforcement of the ATMUAA 2021 would benefit from a clearer understanding between the police, DfT, the Home Office and the CAA. In our view, a renewed memorandum of understanding between these and other agencies would be beneficial. Any such agreement will be aided by the future rollout of Remote ID for UAS, which will help authorities identify operators during operations.

13.208 Finally, we considered criminal offences in the context of UTM, which is still in its infancy. As a starting point we have recommended that, in general, the offences relating to ATM/ANS should also be replicated for UTM. For this reason, there should be an offence for using unapproved UTM equipment to provide a service to UAS. We

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136 Royal Aeronautical Society response, Law Commission, Aviation autonomy: Responses to the second consultation (2026) p 80, https://lawcom.gov.uk/publication/aviation-autonomy-responses-to-the-second-consultation/

have also recommended that proportionate, graduated sanctions should be introduced for breaches of UTM regulation – similar to today's Penalty Order for ATM/ANS – to deter breaches of the law whilst also ensuing continuity of service.

Chapter 14: Recommendations

Recommendation 1.

14.1 We recommend that the current definition of remote pilot set out in the UK UAS Delegated Regulation 2019/945 should be retained.

Paragraph 4.56

Recommendation 2.

14.2 We recommend that in a commercial air transport operation a remote pilot as defined in the UK UAS Delegated Regulation 2019/945 should have the responsibilities of the commander of an operation within the meaning of the UK Air Operations Regulation 965/2012.

Paragraph 4.67

Recommendation 3.

14.3 We recommend that where the Air Navigation Order 2016 applies to UAS operations, references to “pilot” and “pilot-in-command” should include “remote pilot”.

Paragraph 4.68

Recommendation 4.

14.4 We recommend where the applicable requirements in UK SERA 923/2012, the UK Air Operations Regulation 965/2012 and the UK Common Airspace Usage Requirements 1332/2011 apply to UAS operations, references to “pilot” and “pilot-in command” should include “remote pilot”.

Paragraph 4.69

Recommendation 5.

14.5 We recommend that if MSO are authorised, UAS regulations should be amended to make clear that a remote pilot can serve as the pilot for multiple aircraft simultaneously.

Paragraph 4.92

Recommendation 6.

14.6 We recommend that if switching between autonomous and remotely piloted phases of flight is permitted, if, UAS regulations should be amended accordingly so as to ensure legal certainty for all parties involved, any such amendment should be accompanied by supplemental frameworks setting out:

(1) the conditions for such a transfer; and

(2) who is legally responsible for the operation of the aircraft before, during and after a transition.

Paragraph 4.122

Recommendation 7.

14.7 We recommend that, where the Air Navigation Order 2016 applies to UAS operations, the definition of "operator" should also include "UAS operator".

Paragraph 4.140

Recommendation 8.

14.8 We recommend that, where the applicable requirements of UK SERA 923/2012, the UK Air Operations Regulation 965/2012 and the UK Common Airspace Usage Requirements 1332/2011 apply to UAS operations, the definition of "operator" in these regulations should include "UAS operator".

Paragraph 4.141

Recommendation 9.

14.9 We recommend that operators of remotely piloted VTOLs should be certified.

Paragraph 7.48

Recommendation 10.

14.10 We recommend that operators of remotely piloted VTOLs should continue to be required:

(1) to have the means necessary for the scale and scope of operations planned;

(2) to use only suitably qualified and trained personnel;

(3) to implement a management system to ensure safety;

(4) to ensure operations only take place in accordance with the operations manual;

(5) to establish procedures to minimise the consequences to safe flight operations of disruptive passenger behaviour;

(6) to develop and maintain security programmes suitable for the aircraft and type of operation;

(7) to have a management system to prevent fatigue;

(8) to ensure the continuing airworthiness of the aircraft; and

(9) to establish procedures for any reasonably foreseeable emergency situation.

Paragraph 7.66

Recommendation 11.

14.11 We recommend that licences should be required for remote VTOL pilots. So far as appropriate, these should follow the classes and ratings adopted for crewed VTOLs.

Paragraph 7.97

Recommendation 12.

14.12 We recommend that a remotely piloted VTOL should be capable of detecting and recording information relating to accidents and near accidents.

Paragraph 7.109

Recommendation 13.

14.13 We recommend that the remote pilot of a VTOL should be required to ensure that:

(1) the aircraft is airworthy;

(2) specified instruments and equipment are installed and operative;

(3) the mass of the aircraft and centre of gravity location are such that the flight can be conducted within prescribed limits;

(4) all cabin baggage, hold luggage and cargo is properly loaded and secured; and

(5) aircraft operating limitations will not be exceeded at any time during flight.

Paragraph 7.127

Recommendation 14.

14.14 We recommend that the remote pilot should have a responsibility to not allow a person to be carried in the aircraft who appears to be under the influence of alcohol or drugs to the extent that the safety of the aircraft or its occupants is likely to be endangered.

Paragraph 7.159

Recommendation 15.

14.15 We recommend that the remote pilot should be responsible for ensuring passengers are:

(1) given a safety briefing; and

(2) seated and wearing seat belts during taxiing, take-off and landing, and at such other times deemed necessary in the interests of safety.

Paragraph 7.174

Recommendation 16.

14.16 We recommend that the remote pilot should have the power to take reasonable measures, including authorising the restraint of passengers, as set out in section 94 of the Civil Aviation Act 1982.

Paragraph 7.190

Recommendation 17.

14.17 We recommend that when it is impracticable to obtain authorisation from the remote pilot, a person on board a VTOL aircraft (other than a crew member) should be permitted to take reasonable measures, including restraint, which they have reasonable grounds to believe are immediately necessary to protect the safety of the aircraft or of persons or property on board.

Paragraph 7.215

Recommendation 18.

14.18 We recommend that the powers of crew members on-board a remotely piloted VTOL should be broadened so that they reflect those of the commander under section 94 of the Civil Aviation Act 1982, to take reasonable measures, including restraint, as necessary:

(1) to protect the safety of the aircraft or persons or property on board;

(2) to maintain good order and discipline; or

(3) to enable the crew to disembark or deliver a person.

The powers should be limited to circumstances where it is impracticable to communicate with the remote pilot.

Paragraph 7.231

Recommendation 19.

14.19 We recommend that operators should be required to ensure that passengers are able to contact a member of crew at all times during an operation.

Paragraph 7.243

Recommendation 20.

14.20 We recommend that it should be a criminal offence for a remote pilot of a VTOL to act in that capacity when their performance is impaired through drink or drugs.

Paragraph 7.257

Recommendation 21.

14.21 We recommend that it should be a criminal offence for a remote pilot of a VTOL to act in that capacity when the level of alcohol in their blood, breath or urine is over a prescribed limit.

Paragraph 7.258

Recommendation 22.

14.22 We recommend that remote pilots of VTOLs should be prohibited from performing duties when unfit due to injury, fatigue, medication, sickness or other similar causes, and that the existing related criminal sanctions for breach of this prohibition should be replicated for remote pilots.

Paragraph 7.262

Recommendation 23.

14.23 We recommend that the remote pilot of a VTOL should be subject to the reporting obligations currently applicable to pilots under the UK Air Operations Regulation 965/2012.

Paragraph 7.277

Recommendation 24.

14.24 We recommend that there should be legislative change to accommodate the certification of UTM service providers.

Paragraph 9.43

Recommendation 25.

14.25 We recommend that for autonomous operations in the specific category, an operator should be required to use a UAS which can:

(1) comply with the authorised limitations and conditions;

(2) avoid any risk of collision with any crewed aircraft and discontinue a flight when continuing it may pose a risk to other aircraft, people, animals, environment or property;

(3) comply with the operational limitations in designated geographical zones or airspace;

(4) comply with the operator's procedures; and

(5) not fly close to or inside areas where an emergency response effort is ongoing unless they have permission to do so from the responsible emergency response services.

Paragraph 10.58

Recommendation 26.

14.26 We recommend that use of flight data recorder systems or devices should be mandatory for autonomous drone operations.

Paragraph 10.74

Recommendation 27.

14.27 We recommend that use of flight data recorder systems or devices should be mandatory for autonomous VTOL operations.

Paragraph 10.76

Recommendation 28.

14.28 We recommend that the UK Government should establish a forum for collaboration on the rules of the air for UAS and their integration. This forum should consider:

(1) how the rules of the air should be applied or modified in relation to UAS and autonomous air operations; and

(2) the integration of UAS into UK airspace.

Paragraph 11.85

Recommendation 29.

14.29 We recommend that the UK Government include the following as part of its review on UAS insurance requirements:

(1) MSOs;

(2) operational risk;

(3) access to data for the purposes for the purposes of insurance; and

(4) war risk.

Paragraph 12.211

Recommendation 30.

14.30 We recommend modifying the exemption from liability for private nuisance and trespass under section 76 of the Civil Aviation Act 1982, as it applies to UAS, so that it is conditional on compliance with aviation legislation relevant to preventing intrusion into a claimant's land.

Paragraph 12.228

Recommendation 31.

14.31 We recommend that the criminal liability framework under the Air Navigation Order 2016 is reformed, taking into account the six factors set out at paragraphs 13.28 to 13.33.

Paragraph 13.35

Recommendation 32.

14.32 We recommend that the offence of hijacking in section 1 of the Aviation Security Act 1982 should be updated to reflect the possibility that remotely piloted or autonomous aircraft might be seized or controlled by technological means or by persons not on board the aircraft.

Paragraph 13.72

Recommendation 33.

14.33 We recommend that the period during which the offence of hijacking within the meaning of section 1 of the Aviation Security Act 1982 can occur should be expanded from when the aircraft is “in flight” to when the aircraft is “in service”.

Paragraph 13.73

Recommendation 34.

14.34 We recommend that section 3(1) of the Aviation Security Act 1982 should be amended to clarify that any unlawful and intentional interference with the operation of air navigation facilities constitutes an offence under this section, including circumstances in which the interference is with signals, data, information or other systems necessary for the navigation of aircraft.

Paragraph 13.93

Recommendation 35.

14.35 We recommend clarifying section 3(3) of the Aviation Security Act 1982 to ensure that it covers circumstances in which a person has intentionally deployed an autonomous or highly automated system with the purpose of communicating or transmitting false, misleading or deceptive information, where the communication of the information endangers the safety of an aircraft in flight or is likely to do so.

Paragraph 13.98

Recommendation 36.

14.36 We recommend that the relevant departments, bodies and agencies involved in the enforcement of drone misuse offences consider adopting a new memorandum of understanding on this issue or otherwise place their existing or future arrangements for co-operation on a formal footing.

Paragraph 13.142

Recommendation 37.

14.37 We recommend that it should be an offence for any person to use or permit the use of equipment to provide a UTM service if the equipment has not been approved by the CAA.

Paragraph 13.171

Recommendation 38.

14.38 We recommend that offences and penalties similar to those found in the Penalties Order 2009 should be introduced to accompany any UTM service regulation.

Paragraph 13.203

Appendix 1: Terms of Reference

1.1 We set out below terms of reference in respect of work for the Law Commission.

Introduction

1.2 Innovation in technology is paving the way for greater automation and autonomy in aviation. This has the potential to bring about substantial benefits to the entire aviation system, UK industry, and the public. For this potential to be realised, it is imperative that the UK's legislative and regulatory framework is both sufficiently agile to facilitate innovation and robust enough to maintain high safety standards. If the existing legislative framework cannot reliably answer questions from operators, insurers, regulators or investors, technological progress may stall.

1.3 Modern pilots are familiar with automated functions within the cockpit that can carry out complex tasks with little intervention. The introduction of unmanned aircraft systems[137] has seen a rapid advance in software and hardware systems that can carry out a whole flight, from take-off to landing, without any remote pilot intervention. This involves a scaling up of the functions that are automated – that is, functions performed through pre-programmed logic, waypoints, or routines designed to achieve end-to-end operation. Beyond even greater automation, there is the prospect of autonomous flight systems based on technology that uses machine learning or artificial intelligence. These are often non-deterministic systems that operate, observe, learn, and adapt without human intervention. They will present new challenges beyond those presented by increased automation in the cockpit.

1.4 We can say with confidence that these challenges will include the following:

(1) High automation and autonomous systems in aviation will change the role of the pilot, or remote pilot, and may in due course remove the need for a pilot in command, in the aircraft or from a remote pilot station.

(2) Traditional liability models (criminal and civil) which rely on human mental states will be strained and safety assurance will require different approaches to regulation.

(3) New forms of aircraft such as electric vertical take off and landing (eVTOL) craft are being developed with these advances in technology in mind. The advanced air mobility market is attracting significant investment and R&D and may require adaptation to the legislative framework to accommodate this emerging industry safely.

(4) Safety roles will change; air traffic management / air navigation services systems may themselves benefit from or require increased automation, or the use of autonomous systems, to manage safely a diverse range of air traffic.

[137] Also referred to as remotely piloted aircraft systems (RPAS).

1.5 The Civil Aviation Authority (CAA), with the support of Department for Transport (DfT), has asked the Law Commission to undertake a review of aviation legislation to prepare the UK for autonomy in aviation. The aim is:

(1) First, to review the existing legislation with a view to identifying any legislative blockers, gaps or uncertainties to the safe deployment of high automation and autonomous systems in aviation.

(2) Secondly, to propose law reform measures aimed at making sure that the legislative and regulatory framework is ready for the oncoming advances in automation in aviation and autonomous flight.

1.6 The Law Commission will be working closely with the CAA and the Department for Transport in developing its reform proposals. It will engage key stakeholders in the aviation and AI sectors to understand the challenges. The review will be heavily based on consultation and will retain an element of agility in order to be able to deliver on priority areas within the proposed time frame for this project (two years).

Scope

1.7 The scope of the review is as follows:

(1) To consider the reforms necessary to provide a robust and future-proofed legal framework capable of supporting the safe deployment of high automation and autonomous systems in aviation (collectively "autonomous systems"), including the following:

(a) Drones (remotely piloted, non-passenger carrying vehicles);

(b) Advanced Air Mobility (such as electrical vertical take-off and landing vehicles providing short journeys for up to ten people); and

(c) Air Traffic Management and Air Navigation Services (including Communications, Navigation and Surveillance and Aeronautical Information Services).

(2) The review will consider domestic UK legislation (including retained EU legislation) but will have regard to international law, notably the Chicago Convention and Annexes.

(a) In particular, the review will seek to identify:

(i) Areas where the law allocates responsibilities (including safety responsibilities) to a human person (for example, the pilot or air traffic controller), and the issues that arise (including for associated regulatory oversight) where an underlying function is performed by autonomous systems.

(ii) Any issues that arise in the attribution of civil and criminal responsibility where control is shared between the autonomous system and a human user, including ramifications for insurance.

1.8 Whilst they are not the focus of the review, in delivering the above-described scope the Law Commission will have regard to the following:

(1) Terminology relating to automation and autonomy in the aviation sector and issues that may arise if this terminology is not used consistently.

(2) The desirability of harmonising approaches to transport autonomy, and the extent to which aviation law might benefit from emerging approaches across the automated and autonomous operation of different types of transport, such as the Law Commission's project on automated vehicles.

(3) Data.

1.9 The project will be confined to civil aviation, and will not extend to:

(1) Defence;

(2) Cybersecurity and terrorism;

(3) Land use; or

(4) Labour relations.

Work products and sequencing

1.10 The **first phase** of the review will focus on the current legislative framework, seeking to identify issues and challenges to the safe deployment of high automation and autonomous systems in aviation, including obstacles, legislative or regulatory gaps, and areas of uncertainty.

1.11 The scope of the second phase will depend on the size of the task identified in phase 1. Following the first phase, a review point will see the Law Commission, CAA and DfT agree which issues identified in the first phase will progress to the second, bearing in mind the available time and resources.

1.12 The **second and third phases** will, after two public consultations, make recommendations to reform the law aimed at ensuring that the issues identified in the first phase, and priority issues agreed at the review point, are addressed so that the legislative framework is ready for the oncoming advances in automation in aviation and autonomous flight.

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