Aviation Autonomy

Summary of the Final Report

Executive summary

1.1 In our report on aviation autonomy, published on 20 May 2026, we make recommendations for law reform with a view to ensuring that operations involving remotely piloted or autonomous uncrewed aircraft systems ("UAS") – such as drones – can take place with equivalent levels of safety to crewed flight.

1.2 There is already a legal framework in place which governs the use of drones and other UAS. Our view is that although this is on the whole fit for purpose, there are some areas which require clarification or supplementary rules. Without these changes to the law, advances and innovation cannot be safely enabled (see paragraph 1.12).

1.3 It is harder to predict longer-term changes that may be needed as the aviation sector evolves. Passenger-carrying UAS operations are currently in development and we set out legal change required for their safe operation. Further legal changes would need to take account of international aviation law, which is likely to eventually include detailed rules governing UAS operations. Also, many detailed provisions relating to certification of UAS and their integration into the same airspace as crewed aircraft will need to be created through an iterative process as technology progresses.

1.4 Our report is divided into parts according to the anticipated timeframe for these various developments. Our recommendations for the longer term inevitably need to leave flexibility for the various unknowns. Our recommendations for the short to medium term are more focussed but leave flexibility for the regulator to develop detailed technical requirements.

1.5 Our short-term recommendations, set out in parts 1 and 2 of our report, include those relating to legal definitions of key terms, and ones which ensure consistency across legislation. We recommend that legal amendments would be required if the Civil Aviation Authority ("CAA") and Department for Transport decide to allow the remote piloting of more than one UAS at a time, and to allow transitions between remotely piloted and autonomous flight. We also recommend law reform to enable the provision of traffic management services to UAS. In the second part of our report we also set out why we think the current rules of the air are adequate in the short term.

1.6 Looking to the medium term, chapter 7 of our report focusses on law reform to enable safe remotely piloted operations involving carriage of passengers. In this chapter we look at current obligations placed on pilots of commercial flights and make recommendations about how many of those should be mirrored for remote pilots. Other recommendations to safeguard passengers include ensuring they can contact a remote member of crew when there are no crew on board and providing passengers with a power to restrain other passengers when this is advised by the remote pilot, or in emergency situations where the pilot cannot be contacted.

1.7 In the longer term, operations may take place with no remote pilot who is able to intervene. In part 3 of our report, we look at the allocation of the responsibilities of the pilot in these autonomous operations. We recommend that some responsibilities – ones we anticipate will still make sense in the context of autonomous operations –

should move to the operator. For other responsibilities, there are too many unknowns to make recommendations, but we discuss several models for allocating legal responsibility, and their relative merits. In part 3 we also set out the developments that may be needed to achieve the UK's long-term aim of integrating uncrewed aircraft with crewed aircraft. Although there are too many uncertainties to make recommendations for law reform, we explain what key elements are needed to ensure that all aircraft are aware of other aircraft and can avoid collisions.

1.8 The regulation of aviation focuses on ensuring a high level of safety. Nevertheless, sadly, accidents can still happen. We therefore consider overarching issues of civil and criminal liability in part 4 of our report. In terms of civil liability, current aviation law has a strict liability system. Even if the aircraft operator was not at fault, they are required to pay damages for death or injury to passengers, damage to baggage and cargo, and damage to third parties. Our view is that this system will continue to apply to air carriers that use remotely piloted and autonomous aircraft. However, we recognise that more may need to be done with regard to product liability for autonomous and remotely piloted aircraft that rely on artificial intelligence.

1.9 In relation to criminal liability, we make a variety of recommendations for reform to make the law clearer, less complicated and fit for the 21st century. This includes updating the law on hijacking 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.

The Law Commission's review of aviation autonomy

1.10 On 14 April 2026, the Law Commission of England and Wales published a report recommending reform of the law regulating civil aviation. Reform is needed to enable remotely piloted and autonomous operations to take place lawfully and with an equivalent level of safety as applies to crewed aircraft. There must also be appropriate legal mechanisms for attributing civil and criminal liability when things go wrong. This document summarises the main recommendations we make in that report.

The need for this review

1.11 The Department for Transport and the Civil Aviation Authority ("CAA") asked the Law Commission to review the current aviation legislation and to identify the barriers to the safe deployment of highly automated and autonomous systems in aviation. We were asked to focus on three use cases:

(1) drones (remotely piloted, non-passenger carrying vehicles);

(2) advanced air mobility (and in particular vertical take-off and landing aircrafts ("VTOLs") providing short journeys for up to ten people); and

(3) air traffic management and air navigation services (including communications, navigation and surveillance and aeronautical information service as they relate to drones and VTOLs).

1.12 While there already is legislation governing uncrewed aircraft systems ("UAS"), several anticipated developments within the industry will require changes or additions to the existing law. These changes are required to ensure that the same level of safety is maintained, particularly in those situations where the responsibility is placed on a pilot who will not be in the aircraft or who is not able to see the aircraft. We set these out below.

Key Area	Development
BVLOS flights	Beyond visual line of sight operations are expected to expand soon. The UK's Future of Flight Action Plan envisages such operations routinely at scale by 2027.
Multiple Simultaneous Operations (MSO)	Technology will soon allow remote pilots to oversee multiple flights at the same time. There are several use cases being trialled and there is one ongoing trial in the UK.
Passenger-carrying services	Operators aim to offer passenger-carrying remotely piloted UAS services in the medium term, and some are pursuing certification abroad but none currently operate in the UK.
Autonomous operations	In the long term, operators may want to carry out autonomous operations where no remote pilot is able to intervene. No such operations have been authorised in the UK as of yet.

Context for reform

1.13 Four key factors have informed our approach to the project.

International legal context

- Aviation regulation is harmonised internationally to ensure consistent safety standards.
- The recommendations in this report take into account the international backdrop.

Domestic legal context

- The UK has recently introduced a domestic legal framework for UAS.
- Our recommendations seek to supplement this framework.

Policy context

- The CAA has introduced an 'accommodation' phase to try UAS operations alongside other airspace users.
- UAS policy is developed iteratively ie it is tested before being refined and adopted.

Technological context

- The technology for UAS is still developing. There is a range of existing and potential aircraft.

How we arrived at our recommendations

1.14 Our recommendations for reform are based on provisional proposals contained in our two consultation papers published in February 2024 and April 2025. We carried out public consultations relating to our proposals in both consultation papers.

1.15 The report makes recommendations on issues covered in both consultation papers and takes into account responses received during both consultation periods.

Next steps

1.16 Our report will be published in April 2026. The Secretary of State will provide an interim response to the recommendations in the report within six-months of publication. A full response setting out which recommendations the UK Government intends to accept, reject or implement in modified form will be provided within one year.

From pilot, to remote pilot, to autonomous aircraft

1.17 The aviation sector already uses a high degree of automation. The term "autopilot" is associated with aviation and describes a range of automated systems that are used by pilots to assist them when flying aircraft. It is expected that technological advances, including those in artificial intelligence ("AI"), will result in even greater use of automation in aviation systems and that this will ultimately lead to uncrewed aircraft which operate without the need for human control. These aircraft are often referred to as "autonomous".

1.18 In order to ensure effective legal regulation, it is important to be able to identify which uncrewed operations are "autonomous" and which are still under human control through a "remote pilot". A clear line needs to be drawn so that the law places responsibilities on the correct individual – the pilot, the operator or another relevant party – which in turn ensures safety.

THE DEFINITION OF REMOTE PILOT

1.19 In chapter 4 of the report, we explain that the current regulatory framework on uncrewed aircraft makes a distinction between "remotely piloted" and "autonomous" operations. Remotely piloted operations are simply those with a remote pilot. Autonomous operations are where an uncrewed aircraft operates without the remote pilot being able to intervene. These definitions create a high bar for autonomous operations but, conversely, a low threshold for remotely piloted operations. 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.

1.20 We have reached the view that this distinction should be retained. We consider that a person overseeing an aircraft flying automatically, who is able to intervene and change its course at any time, should continue to be classified as a remote pilot. The current definition is flexible in that it encompasses a wide range of automation which still requires a responsible human to supervise. However, it also provides a clear dividing line, ensuring that there is clear responsibility and accountability for all aspects of the operation of an aircraft. 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 legal definition of remote pilot should be retained.

Recommendation 1.

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

THE ROLE OF THE REMOTE PILOT

1.22 There is a further question about the responsibilities of the remote pilot and whether these should be aligned with the "pilot-in-command" of a crewed aircraft. This is important because the pilot-in-command is one of the key actors in the regulation of aviation and holds many responsibilities.

1.23 In our view, the responsibilities of the remote pilot should be aligned with those of the pilot-in-command. We have focused in particular on commercial air transport operations such as those that will carry passengers. For these operations, the pilot-in-command is called the "commander" and the Air Operations Regulation places on them particular requirements relating to the safe operation of the aircraft and to ensuring the safety of people and cargo on board. We consider that these responsibilities should also be placed on the remote pilot.

Recommendation 2.

1.24 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.

1.25 The same logic applies outside of commercial operations. Accordingly, we recommend that where the Air Navigation Order 2016 ("ANO 2016") applies to UAS operations, references to "pilot" and "pilot-in-command" should include the remote pilot. We also recommend that the same should be the case where the applicable requirements in the UK Standardised European Rules of the Air ("UK SERA"), the Air Operations Regulation and the Common Airspace Usage Requirements apply to UAS operations. These are the operational rules applicable to UAS operations in the certified category and 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 3.

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

Recommendation 4.

1.27 We recommend that 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

1.28 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 operations are often referred to as Multiple Simultaneous Operations ("MSO"). There is no specific law prohibiting the piloting of multiple aircraft outside of the open category. This creates uncertainty about whether a remote pilot can serve as the pilot of multiple aircraft.

1.29 Ultimately, whether MSO are approved will be a matter for the regulator. In our view, there would need to be additional safeguards and regulation to ensure that MSO are safe. 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.

1.30 Nevertheless, 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 to develop the regulatory requirements to ensure the overall safety of MSO.

Recommendation 5.

1.31 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.

THE FUTURE ROLE OF THE REMOTE PILOT

Transitions between autonomous and remotely piloted

1.32 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. In our first consultation paper, we highlighted that the UK Regulation (EU) 2019/947 ("UAS Implementing Regulation") is silent on the possibility of transitioning between autonomous and remotely piloted phases of an operation. The issue requires careful consideration of potential use cases as well as human factors which are outside our expertise. There is currently insufficient information to determine what requirements would be needed to ensure safety and an effective transfer of responsibilities. This being the case we are not presently in a position to recommend a general change to the law to allow for this transition.

1.33 However, it is possible that in the future a policy decision may be made by the UK 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 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.

Recommendation 6.

1.34 We recommend that if switching between autonomous and remotely piloted phases of flight is permitted, 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?

1.35 Some stakeholders have envisaged the development of a "flight supervisor" role in the longer term. Broadly, this role would involve the person supervising, overseeing or managing the operational status of multiple aircraft. We give some examples of what this might look like in practice in chapter 4.

1.36 Our view is that the "flight supervisor" role envisaged by stakeholders would currently fall within the current 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 the person overseeing the flight would be classified as a remote pilot.

1.37 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. First, we consider that, at present, it would be difficult to distinguish between a "flight supervisor" and a "remote pilot". Second, 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 the Chicago Convention. Third, it does not seem to us necessary to create an entirely new legal role when the current role of remote pilot is sufficient. Fourth, 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.

AN INCREASED ROLE FOR THE OPERATOR

1.38 One consequence of having a clear dividing line between remotely piloted and autonomous operations is that when the operation becomes an autonomous one, responsibility will shift towards the operator. It is therefore particularly important to ensure that the role of the operator is clear in law. We discuss this in chapter 7 and we discuss the increased responsibilities that may be placed on the operator of an autonomous operation in chapter 10. In chapter 4, we focus on the definition of UAS operator, recommending that this role is clarified, both in the ANO 2016 and in respect of the operational requirements applicable to certified category operations. This clarification should ensure that a shift towards greater autonomy does not obscure the legal responsibilities of the various actors involved.

Recommendation 7.

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

Recommendation 8.

1.40 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".

Remotely piloted UAS operations

1.41 Chapters 5, 6 and 7 of the report address issues arising from remotely piloted UAS operations.

1.42 Chapter 5 of the report gives an overview of the key elements of remotely piloted UAS operations. The chapter is intended to assist the reader in situating some of the gaps that we identify in the report. It should be helpful to those who are less familiar with how remotely piloted UAS operations work.

1.43 Chapter 6 focuses on potential obstacles to the accommodation of remotely piloted UAS in the short to medium term. The issues discussed in this chapter are mostly common to both passenger-carrying and non-passenger carrying forms of remotely piloted UAS.

1.44 Chapter 7 looks at issues which are specific to passenger-carrying remotely piloted UAS operations, which we expect will be characterised as commercial air transport ("CAT") operations.

ISSUES COMMON TO BOTH PASSENGER-CARRYING AND NON-PASSENGER CARRYING UAS

1.45 There already exists a relatively new domestic legal framework for UAS which covers remotely piloted UAS operations in the open and specific categories.

1.46 We discuss in chapter 6 of the report some of the potential gaps and barriers in respect of remotely piloted UAS operations which nonetheless remain.

Pre-deployment issues: airworthiness and certification

1.47 In our first consultation paper we noted that there are no certification specifications (technical standards used for certifying that designs for aircraft of parts of aircraft are airworthy) for UAS. Consequently, it is not possible to certify a UAS for initial airworthiness. Instead, the relevant UAS regulation states that 'applicable' certification requirements of three existing airworthiness regulations should apply to UAS. However, there is, to date, no clarity as to which requirements are 'applicable'. This presents a further barrier to certification.

1.48 Existing standards for certification were designed with conventional forms of aircraft in mind. However, 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.

1.49 With this in mind, we sought views in our first consultation paper on how the framework for airworthiness and certification might need to be adapted or developed for highly automated and autonomous aircraft. More specifically, we asked whether provisions should be adopted which allow for the certification of hybrid aircraft (by

which we mean optionally piloted and uncrewed or unoccupied versions of conventional aircraft) and the separate certification of command units.

1.50 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. Changes would become binding at the international level at that time.

1.51 The practical impact of Amendment 108 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 intends to implement the provisions relating to remotely piloted UAS. Our understanding is also that the domestic implementation of Amendment 108 will enable the certification of newly designed hybrid aircraft using a single type certificate and will also provide the foundations upon which command units can be separately certified. Consequently, we conclude in our report that no further domestic law reform is required.

Operational issues

Should BVLOS operations be allowed in the open category?

1.52 Beyond visual line of sight ("BVLOS") operations are ones which take place beyond the visual line of sight of the remote pilot. At present, BVLOS operations can only take place within the specific and certified categories which means that operational authorisation from the CAA or certification is required ahead of the operation. In our first consultation paper, we suggested that in practice, some BVLOS and autonomous operations may be sufficiently low risk to be suitable for the open category and without pre-authorisation from the CAA.

1.53 There have been two linked policy developments which have informed our conclusion that law reform is not necessary in this area. First, since the introduction of the UK Specific Operation Risk Assessment ("UK SORA") by the CAA in April 2025, it is generally speaking now easier to conduct an operational risk assessment in the specific category. Second, the CAA's policy on UAS operations in atypical air environments should assist operators to apply for approval successfully under UK SORA because it makes it easier to evaluate the air risk of their operation. These changes are likely to improve the efficiency of gaining approval for low risk BVLOS and autonomous operations in the specific category. Therefore, we conclude that it is not currently necessary to authorise BVLOS and autonomous operations in the open category.

BVLOS operations: operational responsibilities

1.54 In our first consultation paper, we sought views on operational responsibilities for remotely piloted BVLOS operations in both the specific and certified categories.

1.55 In relation to the specific category, our view is that the current approach of applying operational requirements and limitations as part of the operational authorisation on a case-by-case basis is satisfactory. This enables standards to be developed across a wide variety of use cases. 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.

1.56 In relation to the certified category, there have been developments at the international level which we expect to shape domestic law regarding operational requirements. In July 2024, the International Civil Aviation Organization published Part IV to Annex 6 to the Convention on International Civil Aviation. This sets out high level requirements for the operation of remotely piloted aircraft and is applicable from 26 November 2026.

1.57 Part IV to Annex 6 addresses several of the gaps in the certified category framework and introduces a number of relevant operational responsibilities for remotely piloted BVLOS operations. These include detect and avoid capabilities (and how this relates to the avoidance of collisions, including proximity and right of way), communication requirements, emergency response procedures, operator certification and training, establishment, assurance and termination of the C2 link, and noise mitigation.

1.58 We anticipate that the UK will implement the standards and recommended practices contained within Part IV to Annex 6, and expect that this will resolve some of the gaps in the operational requirements for operations in the certified category. We therefore do not make any recommendations for reform in this area.

1.59 We do make recommendations about certain operational requirements which should apply in the certified category for the purposes of *passenger-carrying* remotely piloted UAS operations. These are found in chapter 7.

Multiple simultaneous operations (MSO)

1.60 In our report we are concerned with MSO in which one remote pilot is responsible for multiple UAS operating independently of each other. In chapter 4 we recommend that if MSO are authorised, the domestic legal framework for UAS should make explicit that it is possible for a remote pilot to serve as the pilot for multiple aircraft simultaneously.

1.61 We considered whether, if MSO are authorised, there should be an upper limit to the number of UAS for which an individual remote pilot can be responsible at one time. We have concluded that the CAA should continue to assess this on a case-by-case basis and set it out in the operational authorisation. 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. This guidance should cover any requirements relating to an upper limit as well as any necessary additional safeguards.

ISSUES SPECIFIC TO REMOTELY PILOTED PASSENGER-CARRYING UAS

1.62 Under the existing legislative framework for UAS, passenger-carrying remotely piloted UAS operations may only take place within the certified category. Currently, there are no detailed operational responsibilities set out for this category of operations, and no detail as to the requirements an operator needs to meet to obtain certification.

1.63 We expect that passenger-carrying remotely piloted UAS operations will be characterised as commercial air transport (“CAT”) operations. There are no rules

setting out the responsibilities of the remote pilot for uncrewed CAT operations. We therefore take as our starting point the key responsibilities of the pilot-in-command of a crewed CAT operation (termed the commander) and 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. We also consider the specific responsibilities of the operator in CAT operations and the role played by some of the other key actors, such as cabin crew and ground-handling staff.

Pre deployment issues

Accessibility

1.64 Accessibility requirements in aviation do not currently extend to the design of aircraft. Instead, the focus is on what assistance is required to allow a person with disabilities or reduced mobility to use that aircraft. However, when it comes to passenger-carrying remotely piloted UAS – such as VTOLs – this may be difficult to replicate. For example, it is not clear at this stage whether the use cases under consideration will have cabin crew on board, who would provide some of the assistance currently required in accessibility regulation.

1.65 In our report we say that the Public Sector Equality Duty ("the PSED") – which extends to the CAA in developing a certification regime for remotely piloted VTOLs – should encourage accessibility by design for this new form of transport. Similarly, we say that the application of the PSED to the CAA in developing a licensing regime for operators of remotely piloted VTOLs should encourage the design, development and introduction of VTOLs with the needs of disabled people in mind.

Certification of the operator

1.66 Operators of crewed CAT are required to be certified. Certification requirements such as having safety management systems in place, and an operational manual, promote safety.

1.67 We recommend that, in order to ensure equivalent safety between crewed and uncrewed operations, operators of remotely piloted passenger-carrying operations should also be certified. The CAA is best placed to make decisions about the specific certification requirements for operators given its central role in ensuring aviation safety.

Recommendation 9.

1.68 We recommend that operators of remotely piloted VTOLs should be certified.

Responsibilities of the operator

1.69 The operator of crewed CAT operations has several pre-deployment responsibilities. These are listed in the Basic Regulation and include: having the means necessary for the scale and scope of the operations planned, using only suitably qualified and trained personnel, and implementing a safety management system.

1.70 We consider that these high-level responsibilities should be replicated in respect of remotely piloted VTOL operations. This will contribute to equivalent safety with crewed operations.

1.71 It is likely that these responsibilities will need to be supplemented by more specific rules as and when more information about the nature of these operations becomes available. Many of the supplementary rules are likely to be technical ones about safety which the CAA as regulator is best placed to decide. Our recommendation provides sufficient flexibility for the development of these specific rules.

Recommendation 10.

1.72 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.

Remote pilot licences

1.73 Pilots of crewed CAT are required to hold a commercial pilot licence. Pilot licensing ensures that pilots have the relevant practical and theoretical knowledge to conduct operations. In order to ensure equivalent safety for remotely piloted CAT operations, we recommend that remote pilots should require a licence. The licensing regime for pilots of crewed VTOLs provides a good basis from which the CAA can develop more precise requirements for remote pilot licences.

Recommendation 11.

1.74 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 accident

1.75 The Initial Airworthiness Special Condition and Means of Compliance for VTOLs as adopted by the CAA in 2024 requires that recorders are installed to ensure accurate and intelligible recording and appropriate safeguarding of data for accident investigation. We recommend a similar requirement for remotely piloted VTOLs. This will assist with accident investigation and provide remote pilots with information that they need in order to enable them to comply with similar reporting conditions to pilots of crewed CAT operations. This in turn should assist with future safety.

Recommendation 12.

1.76 We recommend that a remotely piloted VTOL should be capable of detecting and recording information relating to accidents and near accidents.

Operational issues

1.77 We make a number of recommendations relating to the remotely piloted VTOL operation itself, namely the issues arising immediately prior to, during, and after flight.

Flight preparation

1.78 The following key existing flight preparation responsibilities of the pilot-in-command should also apply to remote pilots of VTOLs:

(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 are properly loaded and secured; and

(5) aircraft operating limitations will not be exceeded at any time during flight.

1.79 We recommend that the remote pilot should have ultimate legal responsibility for these pre-flight checks. This should be the case even if, as is the case for crewed operations, practical assistance is provided by others, or by technology, to meet these responsibilities. This will ensure equivalent safety. Also, making one person legally responsible promotes clarity and, in turn, safety.

It is likely that the remote pilot will need to rely upon ground staff to carry out preparatory checks to a greater extent than pilots. 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 it remains sensible for the remote pilot to be legally responsible for pre-flight checks, it may be useful for guidance to be published which sets out how the remote pilot can satisfy themselves that these 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. This could be met either though formal guidance from the CAA, or by the operator as part of the operations manual.

Recommendation 13.

1.80 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.

Conduct of flight

1.81 Commanders (as discussed at 1.24 above) have particular responsibilities relating to the conduct of flights carrying members of the public. In the context of crewed operations, while the commander often has legal responsibility for conduct-related matters, they usually receive practical assistance from cabin crew or ground crew. At present, it is not clear whether remotely piloted VTOL operations will involve cabin crew or ground crew. We therefore make recommendations taking into account both possibilities.

1.82 For crewed 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 endangered. They may also refuse to transport passengers if their carriage increases the risk to the safety of the aircraft or its occupants. Although cabin crew and ground handling staff may assist with this (as they do today), the remote pilot would have ultimate authority to refuse to begin the flight, given their ultimate responsibility for safety of the operation and of other passengers. Our view is that the remote pilot should have a similar responsibility to commanders of crewed operations.

Recommendation 14.

1.83 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.

1.84 In order to ensure equivalent safety with crewed operations, there should be a requirement for a safety briefing to be delivered, and for ensuring that passengers are seated and wearing seat belts during taxiing, take-off, landing, and at other times as necessary in the interests of safety. Our view is that the remote pilot should be legally responsible for these requirements. Cabin crew and ground handling staff (to the extent that there are any) may assist, 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.

Recommendation 15.

1.85 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.

1.86 Section 94 of the Civil Aviation Act 1982 gives the pilot the power to take reasonable measures, including authorising the restraint of passengers, for the purposes of:

(1) protecting the safety of the aircraft or of persons or property on board;

(2) maintaining good order or discipline on board; and

(3) disembarking or delivering a person to immigration authorities.

We recommend that the remote pilot should also be given these powers. As a result, the remote pilot will have the power to authorise cabin crew (if there are any) to use restraint. The remote pilot will also have the power to authorise passengers to use restraint. We anticipate that this 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 whereby nobody on board could be authorised to take necessary action to ensure the safety of the aircraft and other passengers on board.

Recommendation 16.

1.87 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.

1.88 We also recommend 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 power will only apply where the individual has reasonable grounds to believe the measures are immediately necessary and where it is impracticable to obtain authority from the remote pilot. This mirrors the position for passengers of crewed operations.

Recommendation 17.

1.89 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.

1.90 Finally, we recommend that cabin crew should be allowed to authorise restraint themselves, and to take reasonable measures to protect the safety of the aircraft or persons or property on board, as is the case currently for cabin crew in crewed aircraft. In addition, cabin crew in uncrewed aircraft should have additional power to authorise restraint and take reasonable measures to maintain good order or discipline on board and to disembark or deliver a person to immigration authorities. These additional powers are necessary to ensure safety in situations where there are circumstances where unreliable communication links mean that the commander cannot communicate authority to take reasonable measures. These powers will be limited to circumstances where it is impracticable to communicate with, and obtain authorisation from, the remote pilot.

Recommendation 18.

1.91 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.

1.92 In order to mitigate some of the safety and accessibility issues connected with remotely piloted operations without crew members on board, and in order to facilitate recommendation 16, 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 their management of the aircraft and employment of crew members.

Recommendation 19.

1.93 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.

Condition of the pilot

1.94 We recommend that it should be a criminal offence to act as a remote pilot when performance is impaired through drink or drugs. It should also 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. This is necessary for ensuring an equivalent level of safety between crewed and uncrewed operations.

1.95 We also recommend that the existing prohibition on performing duties when unfit because of the wider range of capacity limiting factors should be replicated for remote pilots of VTOLs. We recommend that the related criminal sanctions for breach of the prohibition should also be replicated. This is to ensure equivalent safety, so that remote pilots of CAT operations are subject to the same rigorous standards as pilots of crewed operations.

Recommendation 20.

1.96 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.

1.97 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.

Recommendation 22.

1.98 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.

Accidents and reporting

1.99 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). Reports must also be submitted for any bird strikes causing significant damage to the aircraft or loss of malfunction of any essential services, as well as reports of any potential bird hazards (as soon as workload allows). We recommend that the remote pilot should be subject to these obligations.

Recommendation 23.

1.100 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.

Uncrewed aircraft systems traffic management (UTM)

1.101 To ensure the safety of UAS operations beyond the visual line of sight of the operator, the UAS will need up-to-date information about obstacles, hazards, and weather. UAS will also need information about other aircraft in the same airspace so that they can avoid potential collisions. This information will be provided by air traffic management and air navigation services ("ATM/ANS"). ATM/ANS for UAS is likely to be different from that provided to crewed aircraft. It is more likely to be automated and to be provided digitally, ie without a human air traffic controller. We refer to ATM/ANS for UAS as uncrewed aircraft systems traffic management or "UTM".

1.102 ATM/ANS providers must be certified. The current ATM/ANS certification regime requires that service providers meet essential requirements. Regulations provide further detail about how providers should meet these essential requirements for the category of service they provide. When satisfied that the provider meets the essential requirements the CAA will certify them.

1.103 In our second consultation paper, we examined how UTM should be regulated. Several emerging UTM services may not easily align with existing categories of ATM/ANS provision. This could make it difficult to certify these services and create uncertainty or a regulatory blocker to UTM and UAS operations.

1.104 In our second consultation paper, we provisionally proposed legislative change to accommodate UTM services. This might be provided for either by amending existing ATM/ANS provisions or by introducing a standalone regime. The core objective of legislative change would be to ensure proportionate, flexible and transparent certification requirements that reflect UTM's operational realities. This would include data-sharing between multiple actors and potentially decentralised service provision. Legislative change could also better provide for smaller or more specialised providers, which may struggle to satisfy the financial and organisational requirements built for traditional aviation. Tailored regulation would increase certainty for industry and support the growth of uncrewed aircraft operations at scale.

1.105 For these reasons, in chapter 9 of the report we recommended that legislative change should be made to accommodate the certification of UTM service providers. Change is needed to ensure that regulation reflects the unique characteristics of UTM, provides proportionate and clear obligations, and enables safe integration of uncrewed aircraft into UK airspace. This could be achieved either through amendments to current ATM/ANS law or by creating standalone provisions.

Recommendation 24.

1.106 We recommend that there should be legislative change to accommodate the certification of UTM service providers.

1.107 After setting out this recommendation, the chapter considers coordination between UTM and existing air traffic service providers within controlled airspace. Controlled airspace needs a single controlling authority to avoid conflicting instructions to aircraft. Because the CAA is still developing its long-term approach to UTM and airspace management, the chapter does not make specific recommendations about how coordination should be achieved. Rather, it summarises and provides consultee views to inform future policy development.

The long term

1.108 In part 3 of the report we look at longer term issues. In chapter 10 we make recommendations relating to autonomous UAS operations, and in chapter 11 we discuss the move from accommodation to integration of UAS operations.

AUTONOMOUS UAS OPERATIONS

1.109 Autonomous UAS operations are ones in which there is no remote pilot able to intervene. As such, 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. The central problem is how to ensure parity of safety with remotely piloted UAS operations in these circumstances.

Pre-deployment issues

Airworthiness and certification

1.110 It is likely that AI systems will be used in at least some autonomous UAS operations. We consider whether this presents challenges to the existing certification framework such that law reform is necessary. Our view is that for lower-level (that is, less advanced) AI applications, the existing certification framework is sufficient. The certification framework should enable adjustments to the certification specifications and to acceptable means of compliance and guidance material to be made by the CAA as required. For more advanced levels of AI there may be a need to revisit the certification framework. As approvals of such advanced levels of AI are not expected for at least a decade, it is too early to make any specific recommendations.

Should autonomous operations be allowed in the open category?

1.111 The existing legal framework allows for autonomous UAS operations in the specific and certified categories only. Our view is that it is not desirable at present to make a recommendation for reform to allow these operations in the open category. Above we discuss two developments which are likely to make the approvals process for the specific category more efficient (UK SORA and the CAA's atypical air environment policy). A policy decision needs to be made by the CAA as to whether autonomous operations would be covered by the atypical air environment policy.

1.112 This will enable the CAA to develop the necessary requirements to ensure the safety of future UAS operations in the open category, developing these requirements from approvals granted to operations in the specific category. An efficient process for granting approvals in the specific category will also help to facilitate innovation.

Pre-deployment responsibilities of the operator

1.113 Operators of autonomous UAS operations in the specific category are subject to the same basic requirements as operators of remotely piloted UAS operations. This includes ensuring that operations are carried out in accordance with the operational authorisation and maintaining the UAS in a suitable condition for safe operation.

1.114 In addition, for the specific category, 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. This includes complying with the authorised limitations and conditions of the operation and avoiding any risk of collision.

1.115 Our view is that it would be difficult for the operator to allocate these to a specific actor where there is no remote pilot. For autonomous operations, we consider that these particular responsibilities need to be met with technological solutions, rather than through an individual monitoring and intervening in flight. We therefore recommend reformulating the obligations so that the operator is required to use a UAS designed in such a manner that it can comply with the requirements.

Recommendation 25.

1.116 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.

Detecting and recording accidents

1.117 Flight data recorders will support the Air Accidents Investigation Branch in its function to prevent future accidents and allow lessons to be learned by the entire aviation community. On this basis, we recommend that the use of flight data recorder systems or devices should be mandatory for autonomous drone and VTOL operations.

Recommendation 26.

1.118 We recommend that use of flight data recorder systems or devices should be mandatory for autonomous drone operations.

Recommendation 27.

1.119 We recommend that use of flight data recorder systems or devices should be mandatory for autonomous VTOL operations.

Operational issues: specific category

1.120 In remotely piloted operations, the remote pilot is responsible for pre-flight checks such as ensuring that the UAS is in a safe condition to complete the intended flight safely. For autonomous operations, the operator is obliged to allocate the responsibilities, but the legal responsibility to ensure pre-flight checks are carried out remains with the operator. 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.

Operational issues: certified category

1.121 As of yet there are no operational requirements for certified category autonomous UAS operations specified in the legal framework. The development of these requirements will depend on the future development of autonomous UAS operations over time. To aid the future development of this legal framework, we discuss some of the responsibilities that we recommend for remote pilots involved in passenger-carrying operations and where those responsibilities should go when the remote pilot is removed from the operation.

1.122 One option would be to re-allocate responsibilities to the operator. The operator could then delegate those responsibilities to others to discharge. Legal responsibilities could also be met through technological solutions, for example the aircraft could notify the operator that hold luggage was properly secured. Another option would be to shift legal responsibility to any cabin crew and ground crew used by a UAS operation. A third option could be to allocate responsibilities to a new legal actor who we term a 'flight supervisor'. The flight supervisor would not be able to intervene in the course of the flight, but could be legally responsible for pre-flight checks, some responsibilities relating to the conduct of the flight such as safety briefings and seat belts, and responsibilities regarding accidents and reporting.

1.123 It is not clear at this stage what safety responsibilities would be applicable to autonomous UAS operation and there is too much uncertainty to make a formal recommendation. However, our view is that, broadly speaking, the allocation of responsibilities of the remote pilot should shift to the operator. The operator should also be legally responsible for the overall safety of the operation. The benefit of this is that there would be one actor who is legally responsible for safety of an operation. 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.

From accommodation to integration

1.124 UK airspace is a shared resource. The CAA has obligations to reflect the needs of all airspace users on an equitable basis. This includes new entrants such as remotely piloted and autonomous UAS.

1.125 However, the safe operation of UAS in the same volume of airspace as crewed aircraft is not straightforward. UAS are often smaller than conventional aircraft which can make them more difficult for other aircraft to detect. Remote pilots will also not have the same situational awareness as a pilot who is present in the aircraft. Therefore, additional safeguards will be required to ensure that this does not affect the ability of UAS to avoid collisions.

1.126 Initially the UK relied on segregation of UAS from other aircraft to ensure safety. However, the UK is currently transitioning from operating UAS in segregated airspace to a more flexible model in which UAS can, in limited circumstances, be flown alongside crewed aircraft. This transitional period is known as the accommodation phase. The Civil Aviation Authority (CAA) has introduced Temporary Reserved Areas (TRAs) as the primary mechanism for this phase. TRAs allow UAS to operate beyond visual line of sight (BVLOS) while still enabling some level of managed access for other airspace users. They are designed to bridge the gap between complete segregation and full integration and to gather the operational data, safety evidence, and technological maturity needed before moving to unsegregated airspace in the future.

1.127 A central issue in the accommodation phase is how to apply the rules of the air, which historically were designed for crewed aviation with a pilot on board. As UAS lack on board pilots, it is not possible to apply the entire ruleset to UAS operations. Instead, current UAS regulation applies the rules of the air as appropriate, meaning only the relevant or applicable requirements of UK SERA are imposed on UAS in the specific and certified categories of operation.

1.128 In chapter 8 of the report, we conclude that this flexible approach to the rules of the air is workable for the current accommodation phase. Several reasons support this position:

(1) first, the CAA retains significant control by determining which rules apply on an operation-specific basis, ensuring that only UAS capable of meeting essential safety requirements are allowed to operate in TRAs;

(2) second, because TRAs are controlled by air navigation service providers, traffic entering the TRA manage the risks associated with shared airspace;

(3) third, maintaining flexibility allows regulators and industry to learn from operational experience, test developing technologies, and adjust requirements before creating a more comprehensive long-term ruleset;

(4) fourth, many of the more fundamental issues with the rules of the air relate to autonomous operations rather than remotely piloted ones. Given autonomous flight is not expected in the medium term, those long-term challenges do not yet arise; and

(5) finally, the adaptive approach keeps the UK aligned with ongoing international developments, including International Civil Aviation Organisation's ("ICAO") evolving standards on RPAS integration.

1.129 Taken together, these factors mean that the current approach is workable for the present. It provides sufficient safety assurance during the accommodation phase while preserving the flexibility needed to support technological progress and prepare for eventual full integration.

Integration: a longer-term challenge

1.130 In chapter 11 of the report, we explain why the full integration of UAS into UK airspace is a longer-term challenge.

1.131 Integration is defined as the point where UAS operate routinely in unsegregated airspace without special provisions or transitional structures. The chapter stresses that such integration requires an aviation ecosystem that can support automated decision-making, separation of all aircraft operations, and facilitate predictable interactions amongst diverse airspace users.

1.132 Chapter 11 also distinguishes autonomous operations from remotely piloted ones, noting that autonomous operations require additional safety elements.

1.133 A central principle guiding integration is the requirement for an equivalent level of safety, meaning autonomous aircraft must not impose greater risks on people, property, or other airspace users than crewed aircraft performing the same type of operation. This is a high bar for UAS operations. Achieving this will require practical experience, substantial operational data and validated technical performance across a range of scenarios and use cases. The chapter underscores that the integration of autonomy is not simply a regulatory step but a major technological milestone that is dependent on a range of different technical and policy elements.

1.134 Most of these elements are linked to, and dependent on, initiatives undertaken as part of the UK's Airspace Modernisation Strategy. Chapter 11 explains how these non-legal elements will be required to achieve integration at the required level of safety. These elements are set out in the table below.

Elements	Integration
Electronic Conspicuity	All aircraft must be capable of being detected electronically by other users and by supporting services, ensuring that autonomous systems possess the visibility required for safe coexistence in mixed airspace.
Detect-and-Avoid	Autonomous aircraft require sensing and decision-making capabilities that can identify conflicts and execute avoidance manoeuvres without human involvement, replicating or surpassing the pilot's safety role.
UAS Traffic Management	A specialised set of services is necessary to support coordinated flight planning, airspace awareness, and separation for diverse autonomous operations, especially where traditional air traffic control is not designed to manage such volumes or patterns of activity.
System-Wide Information Management	Integration requires a shared information environment where users and service providers can access authoritative, synchronised operational data to ensure consistent situational awareness and coordinated responses.
Command-and-Control (C2) Links	Autonomous aircraft depend on secure, reliable communication links for state reporting, contingency management, and supervisory oversight, meaning link robustness and resilience are essential prerequisites.
Ground Infrastructure and Communications	Modernised surveillance systems, improved communication pathways, and resilient backup capabilities must support the increased digital dependence of autonomous operations, ensuring that disruptions do not undermine safety.

1.135 The chapter emphasises that these components are interlinked and are also relevant for the modernisation of the wider aviation ecosystem. It also notes that many of these elements are still under development, subject to ongoing policy work, technical standard-setting, and international coordination, which further reinforces the long-term nature of the integration goal.

1.136 Chapter 11 also revisits the rules of the air, explaining that they remain the backbone for managing interactions between aircraft. While some rules can translate relatively easily to automated systems, many rely on human judgement, pilot discretion, or voice-based communication protocols, making them incompatible with fully autonomous operations. The chapter discusses emerging thinking about modernised rules of the air frameworks, including proposals for digital coordination and automated separation, but it stresses again that none of these concepts can be implemented until the necessary technical foundations are proven and available.

1.137 Stakeholder feedback to our consultation papers supported this cautious, incremental approach. Many consultees agreed that rule changes should be phased and evidence-based rather than prematurely imposed. Some highlighted targeted areas for early refinement, such as right-of-way for uncrewed aircraft, emergency procedures for automated systems, and revised assumptions about visibility and separation of aircraft in integrated airspace.

A forum for collaboration

1.138 The chapter concludes that integration will require coordinated progress along technical, operational, and policy lines. It emphasises that integration is inherently a long-term effort, dependent on technologies and infrastructures that continue to evolve. As has been highlighted in other parts of the report, future rule making will also be dependent on developments at ICAO that will shape global norms in aviation. Because of these overlapping uncertainties, the chapter recommends establishing a dedicated forum through which regulators, industry participants, and other airspace users can collaborate on the future of the rules of the air. This forum would consider how the rules of the air should be applied or adapted to UAS operations and more generally the safe integration of uncrewed systems into UK airspace. The forum would not have any statutory powers to amend law or regulation, but it should be able to make recommendations for reform to the UK Government. The work of this forum might also inform the UK's work at an international level.

Recommendation 28.

1.139 We recommend that the UK Government should establish a forum for collaboration on the rules of the air for UAS and 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 controlled airspaces.

Civil liability

1.140 In chapter 11 we discuss many different aspects of civil liability relating to UAS.

STRICT LIABILITY REGIMES

1.141 The aviation sector has strict liability regimes that operate in the case of accidents. Of particular importance is the Montreal Convention 1999 (as implemented in domestic law), which deals with liability for death or injury to passengers, and damage to baggage and cargo. Domestic law also requires that owners of aircraft, or those that lease them long term, are strictly liable for "surface damage" to third parties. These regimes channel liability through the carrier, operator or owner of an aircraft.

1.142 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.

1.143 Consultees highlighted that the minimum amount 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 ICAO about updates to the Montreal Convention.

CLAIMS FOR DAMAGES NOT COVERED BY THE STRICT LIABILITY REGIMES

1.144 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. 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.

Liability of designers and manufacturers

1.145 As aviation systems become more automated, it is possible manufacturers and designers may become more of a focus for litigation. There are 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.

1.146 We have reached the view that these areas of law need to be reviewed more generally in light of advances in AI and automation. We note 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.

Liability of ATM/ANS and UTM service providers

1.147 In chapter 12 we highlight the liability provisions relating to ATM/ANS providers and discuss whether they should apply to UTM providers. These requirements are set out in UK Regulation (EU) 2017/373 and require ATM/ANS service providers 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, have in place arrangements to allocate liability.

1.148 We recommend that UTM providers should also be subject to these requirements. It is important that UTM providers should be able to cover any potential liability incurred during the execution of their duties.

INSURANCE

1.149 Insurance will be a key component in the development of the UK UAS sector. We note that the UK Future of Flight Regulatory Review has already considered the question of insurance for UAS. 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. 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.

1.150 We also flag that the question of insurance in relation to multiple simultaneous operations (MSOs) had not been specifically considered as part of the UK Government's review. We consider that in future it might be necessary for insurance requirements to reflect the risk posed by MSO.

1.151 We also agree with consultees that there are other aspects of insurance for UAS that should be considered. 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. Secondly, some consultees stressed that access to data about incidents would be critical. 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.

1.152 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.

TRESPASS AND NUISANCE

1.153 In chapter 12 we also discuss civil liability at common law for the torts of private nuisance and trespass in relation to aircraft. Private nuisance is a wrongful interference with the claimant's enjoyment of rights over land. Trespass concerns unlawful presence on someone else's land.

1.154 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.

1.155 We anticipate 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).

1.156 In the short to medium term, though, we consider 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) CAA 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.

1.157 For this reason, we recommend 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 – and not just compliance with regulations found in Air Navigation Orders. This might include, for example, regulations related to maximum height, or those related to discontinuing the flight if the operations pose a risk to people or property.

Recommendation 30.

1.158 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

1.159 The regulations governing the carriage of dangerous goods were not written with UAS in mind. As a result, the approach taken by the CAA 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. Operators that follow this guidance are more likely to be granted operational authorisation. There are also proposals to update the Acceptable Means of Compliance and Guidance Material to the UAS Implementing Regulation, which should give operators more certainty and enable them to more efficiently gain operational authorisation.

1.160 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.

1.161 We understand that comprehensive changes are due to be made to Annex 18 by 2030. In theory, it would be possible for rules to be developed at a domestic level in advance of this. However, in our view, it 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. 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. 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.

Criminal liability

1.162 Criminal liability in the aviation sector encompasses a broad and complex range of issues. These are discussed in chapter 13.

BREACH OF AVIATION SAFETY REQUIREMENTS

1.163 The aviation industry is highly regulated, with extensive requirements placed on key actors to uphold safety standards. Article 265 of the Air Navigation Order 2016 creates criminal liability for breaching these aviation safety requirements.

1.164 We have reached the view that article 265 needs to be reformed. 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.

1.165 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. In chapter 13, we set out six factors that should be taken into account in reforming article 265.

Recommendation 31.

1.166 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

1.167 The nature of air transport renders it particularly vulnerable to intentional and malicious acts of interference. In response, specific criminal offences 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. We consider whether these offences need to be updated to account for remotely piloted and autonomous flight.

Updating the offence of hijacking

1.168 Section 1 of the Aviation Security Act 1982 creates the offence of hijacking. As currently defined, the offence of hijacking requires the individual physically to be on board an aircraft that is in flight and it requires them to use force or threats to take control of the aircraft in some way. This offence is derived from a corresponding offence in the Hague Hijacking Convention.

1.169 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.

1.170 First, it has updated the possible methods by which the aircraft can be taken control of 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.

1.171 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.

1.172 These changes only take effect in international law for the parties that have expressed their consent to be bound by the Protocol. 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.

1.173 We consider that this current definition of hijacking in domestic legislation is ill-suited to the context of autonomous aviation. In particular, 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. 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. We make a recommendation to this effect.

Recommendation 32.

1.174 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.

1.175 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

1.176 There are security offences contained within section 3 of the Aviation Security Act 1982 which relate to unlawful interference with air navigation. The section 3(1) offence concerns interference with property used for air navigation facilities. The section 3(3) offence concerns the communication of false, misleading or deceptive information.

Section 3(1): interference with the operation of property used for air navigation facilities

1.177 We recommend updating the section 3(1) offence to take account of new technologies, in particular UTM services. 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" (as one consultee put it). 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.

1.178 We note that the Beijing Convention 2010 – which the UK has signed but not ratified – provides an updated definition of "air navigation facilities". "Air navigation facilities" are defined as including "signals, data, information or systems necessary for the navigation of the aircraft". 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 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 (which is currently the case). We recommend that the interference aspect of the offence is constituted, more straightforwardly, as one of interfering with the operation of air navigation facilities.

1.179 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.

Recommendation 34.

1.180 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.

Section 3(3): communication of false, misleading or deceptive information

1.181 We also recommend updating section 3(3). 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.

Recommendation 35.

1.182 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.

THE AIR TRAFFIC MANAGEMENT AND UNMANNED AIRCRAFT ACT 2021

1.183 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 the chapter considers whether the Act is operating satisfactorily.

1.184 In our first consultation paper, we asked consultees how the Act was working. 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.

1.185 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 Department for Transport signed a memorandum of understanding in 2014, which was updated in 2016. We have been informed by the CAA that this memorandum of understanding is no longer in force.

1.186 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.

Recommendation 36.

1.187 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.

NEW OFFENCES RELATING TO UTM SERVICES

1.188 In chapter 9, we recommend that legislative change should be introduced to accommodate UTM services. Chapter 13 addresses attendant questions of criminal liability arising from this recommendation.

New offence for UTM equipment

1.189 The ANO 2016 contains a provision on air traffic services equipment in article 205, which we identified in our second consultation paper as being relevant to the provision of UTM services. Breach of article 205 is a criminal offence.

1.190 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 air traffic services, such as separation between aircraft or the provision of aeronautical information which facilitates safe operations.

1.191 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. 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.

Recommendation 37.

1.192 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

1.193 In our second consultation paper, we asked about the Air Navigation (Single European Sky) (Penalties) Order 2009 (the “Penalties Order”). The Penalties Order was originally introduced to create sanctions in domestic law for infringements of EU regulations associated with the Single European Sky initiative. The Single European Sky initiative is a regulatory effort to harmonise air traffic management and air

navigation services provision and airspace management across the EU. 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.

1.194 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.

1.195 We are 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 services providers to provide continuity of service.

Recommendation 38.

1.196 We recommend that offences and penalties similar to those found in the Penalties Order 2009 should be introduced to accompany any UTM service regulation.